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Buying empty flights with public money

The legitimacy of publicly funding air traffic for regional development

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ABSTRACT:

Mediassa ja poliittisessa päätöksenteossa viitataan usein lentokentän ja lentoliikenteen merkitykseen aluetalouden kehityksen mahdollistajana ja vauhdittajana. Julkisten varojen käyttöä lentoliikenteen tukemiseen perustellaan juuri tällä yhteydellä, mutta tutkimustietoa aiheesta on kuitenkin saatavilla melko rajallisesti. Tämän tutkielman tarkoituksena on aiempaan tutkimukseen tutustumalla luoda yleiskatsaus lentokenttien ja lentoliikenteen yhteydestä aluetalouden kehitykseen. Tutkielmassa keskitytään arvioimaan, voidaanko yhteyttä pitää riittävän merkityksellisenä, jotta sillä voitaisiin oikeuttaa julkinen tuki lentoliikenteen hyväksi. Tutkielma pyrkii tuottamaan hyödyllistä tietoa aiheen jatkotutkimukselle, sekä päätöksenteolle alueellisella, kansallisella ja kansainvälisellä tasolla.

Aluetalouden kehitystä on tutkittu talousmaantieteen näkökulmasta laajasti, ja tämän aiemman tutkimuksen pohjalta muodostuu tämän tutkielman teoreettinen viitekehys. Tässä tutkielmassa käytetään aluetalouden kehitystä kuvaamaan neljää indikaattoria: työllisyyttä, väestömäärää, saavutettavuutta ja elinkeinorakenteen monipuolisuutta. Tutkielma toteutetaan systemaattisena kirjallisuuskatsauksena, jonka pohjalta saatua tietoa analysoidaan teoriaohjaavan sisällönanalyysin keinoin. Kirjallisuuskatsauksesta oletetaan nousevan esiin teorian pohjalta valittuihin neljään aluetalouden indikaattoriin kohdistuvia lentokentän ja lentoliikenteen aiheuttamia vaikutuksia. Näin tutkimus siis joko vahvistaa lentokentän ja lentoliikenteen roolin aluetalouden kehityksen mahdollistajana ja vaikuttajana, tai vaihtoehtoisesti heikentää sitä, mikäli yhteyttä aluetalouden kehitystä mittaaviin indikaattoreihin ei pystytä osoittamaan.

Selkein yhteys kirjallisuuskatsauksessa nousee lentoliikenteen ja alueen työllisyyden välille. Lentoliikenteen lisääntyminen johtaa useissa testauksissa työllisyyden kasvuun ja työpaikkojen määrän lisääntymiseen. Myös väestömäärään, saavutettavuuteen ja elinkeinorakenteen monipuolisuuteen oli nähtävissä positiivisia vaikutuksia lentoliikenteen muutoksilla. Aiempi tutkimustieto tarjoaa todisteita lentoliikenteen julkisen tuen perusteluiksi, mutta on kuitenkin otettava huomioon aiemman tutkimuksen maantieteellinen keskittyminen Yhdysvaltoihin ja isompiin metropolialueisiin Euroopassa. Tulokset eivät ole sellaisinaan siirrettävissä ja sovellettavissa esimerkiksi Suomessa tai muualla Pohjoismaissa, joissa maantiede ja elinkeinorakenne lähtökohtaisestikin eroavat huomattavasti metropolialueista. Tämän tutkielman esiin nostamien jo löydettyjen vaikutusten pohjalta voidaan viedä lentoliikenteen vaikutusten tutkimusta pidemmälle alueilla, joilla etäisyydet ovat pitkiä ja taloudellisten keskittymien saavutettavuus hankalampaa. Empiirinen tilastotieteellinen lähestymistapa esimerkiksi Pohjoismaissa sijaitsevien lentokenttien ja alueiden osalta tarjoaisi uskottavampia lähtökohtia julkisen tuen perusteluille jatkossa.

KEYWORDS: regional development, regional economy, air traffic, air transport, public funding

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Abbreviations

PSO	Public Service Obligation
EEA	European Economic Area
IATA	International Air Transport Association
IEA	International Energy Agency
MoE	Ministry of the Environment
MoF	Ministry of Finance Finland
USCB	United States Census Bureau

1 Introduction

COVID-19 put a rapid stop to airline traffic all around the world in the spring of 2020. The pandemic was a death strike for regional air traffic in Finland as well. The level of demand for these usually quite short flights within Finnish borders was not high to begin with before the pandemic and after it, the level just kept decreasing to a point where the routes could not be considered profitable as market-based (Kuukkanen & Heima, 2020). This issue is not new, and it is not a phenomenon only met in Finland. For example, the neighboring Sweden has been tackling the same issue already before COVID-19 (Polo, 2022).

Finland's location in northern Europe is somewhat problematic when assessing it from the point of view of accessibility. The economic and political centers of the EU for example are at least a 3-hour flight away. Long distances are an issue within Finland's own borders too. Finland is a rather big country with long distances between main cities of different regions, which causes difference in national and international accessibility and can therefore lead to divergence in economic and social development of regions (e.g. Caschili et. al., 2015; Vickerman, 1995). For example, for a bigger company to base its headquarters within a reasonable distance from the Helsinki-Vantaa international airport would be much more justified in terms of national and international accessibility than it would be to base in some other city further away from the main airport (Bel & Fageda, 2008; Brueckner, 2003). This leads to inequality between regions in terms of attracting business and therefore creating economic activity and development in the region.

To solve this issue, the Finnish government along with many other states governments has been subsidizing certain flight routes by using public service obligations (PSOs) (e.g. Traficom, 2020). PSOs are a legal subsidiary tool to make it possible to maintain certain routes that would otherwise not be carried by commercial airlines due to them being unprofitable for them (Kociubinski, 2015). Lately, the use of PSOs has been justified with the need to rebuild the regional flight routes discontinued by the impact of COVID-19

(e.g. Traficom, 2022a). In the beginning of 2023, the decision-makers of Finnish government are once again discussing the continuation of subsidizing certain flight routes (MoF, 2023). This again heats up the discussion on the use of public funds; the Finnish Broadcasting Company (YLE) did a somewhat critical article on the matter with a headline loosely translated to "Half-empty planes flying to regions on government's tab" (Tolpo, 2023).

In media, executives of business establishments and entrepreneurship associations have stated for example that "*direct and functional international connections – – are extremely important for the vitality of the whole region*" and that "*for the region's vitality and competitiveness an airport and regular connections are crucial*" (Junko, 2017; Yrittäjä, 2022). However, the use of states intervention in a usually market-based activity such as air travel must have solid justifications. Most often the justification used when subsidizing airline traffic is the target of maintaining vitality of the region and supporting the economic growth and development in the region (Traficom 2022a, p. 6). In Sweden, the Swedish Transport Administration (Trafikverket) engages in subsidizing transportation only if the subsidizing can bring significant improvement to the interregional accessibility of a municipality with restricted transport possibilities (Trafikverket 2023, p. 10). The international and interregional accessibility of a region contribute notably to the region's growth and economic success (Cuadrado-Roura 2001). These justifications used by Traficom and Trafikverket are somewhat in line with the regulations set on air traffic subsidies by the European Union, this will be discussed further in chapter 2.

This thesis focuses on the previous research regarding the connection between air traffic and regional economic development (e.g. Brueckner, 2003; Button et al., 2009; Florida et al., 2014; Green, 2007) and proceeds to first find out the outcomes air traffic and an airport can bring for a region. Secondly this thesis focuses on those outcomes from the point of view of the legitimacy of publicly funding air traffic: can the outcomes be considered efficient enough to contribute to regional economic development, and therefore can the public funding of air traffic be considered justified. The information this thesis

proceeds to gather can be considered beneficial for decision-making regarding the use of PSOs, as well as for future research on the matter. This thesis is carried out as a systematic literature review and theory-based content analysis.

The thesis is organized as follows. This first chapter acts as an introductory part of the thesis. The second chapter focuses on the concept of publicly funding air traffic, chapter two also gives background on the issues related to public funding. The third chapter introduces the theoretical framework of this thesis by studying previous research on regional economic development. The fourth chapter focuses on the research and analysis methods used in this thesis. The fifth chapter includes the literature review and analysis of the material. The sixth chapter includes the findings of the analysis and this thesis. Summary of the key points, discussion of the findings, reliability, and validity along with some ideas of possible future research are in chapter seven.

2 Publicly funding air traffic

Public funding and the allocation of public funds raise various opinions for and against and are certain subjects to cause conflicts in public decision-making. Healthcare, education and recently especially in Europe defence forces are the subjects that provoke discussion regularly. Before and during national elections the discussion escalates, when there is a need for all sides in politics to get their say in where public funds should be allocated and whose solution is the best for the future of the nation. For example, in Finland, the national budget is first allocated between different ministries by the decision of the parliament. After this, the ministries further allocate the funds towards different causes. Different funding instruments, such as the PSOs, therefore receive the funds from the ministries.

The allocation of public funds varies between different governments in different nations. Even if the processes to allocate public funding and the decision-making are different between countries, there still is a need for solid justification in using public money in all of them. Big part of the public funds in western countries come from the people of the country, in tax-income and other obligatory payments for the government. Therefore, the people are also entitled to know where this money is allocated and what exactly is done with it.

2.1 Public service obligations

The general principles for PSOs and the guidelines for public tenders are set in articles 16 and 17 of the EU Air Services Regulation 1008/2008 (European Commission, 2008). The general principles include criteria for the airport and the region, stating the following:

> A Member State, following consultations with the other Member States concerned and after having informed the Commission, the airports concerned and air carriers operating on the route, may impose a public service obligation in respect of scheduled air services between an airport in the Community and an airport serving a peripheral or development region in its territory or on a thin

> route to any airport on its territory any such route being considered vital for the economic and social development of the region which the airport serves. (Article 16)

This goes to show that the basis of justifying the use of PSOs with arguments of regional development and the concept of vitality comes straight from the regulating framework. To be eligible to use PSOs, the region must be either remote or developing, or the region must be in a situation where the lack of air service would significantly decrease the vitality. This is why the positive impact of air traffic is sort of used as a universal truth in governmental decision-making, and that is why the actual impact is such a fruitful concept to study.

If the criteria stated in the previously mentioned articles of the Air Service Regulation are fulfilled, the Member State can propose a PSO on certain routes. The access to a certain flight route can be restricted for only one air carrier if there are no interested air carriers to operate the route in question with regular and continuing air service (market-based). This must be done in accordance with the regulation 1008/2008 by publicly proposing and tendering the route EEA-wide through the Official Journal of the European Union. (European Commission, 2023.) If there are interested air carriers to operate the PSO route under the requirements, there is no restrictions set on the route and therefore also no subsidies paid since the air carriers are voluntarily willing to operate the route market-based (Costa et al., 2021, p. 1783–1784). In 2022, there were 21 tenders published in the EU, including for example France, Greece, Finland, and Sweden tendering their routes (European Commission, 2023).

The administration of PSOs differs between the EEA countries. In Finland, as well as in for example Greece, Ireland, and Portugal the PSOs are processed on a national government level, whereas in for example France and Germany the administration goes through regional level authorities (Bråthen & Halpern, 2012, p. 5). Regional level authorities have different point of view than governmental level decision-makers. On a regional level, the goals of decision-making are more subjective: the well-being and success of

the region. Whereas on governmental level the scope is more on the success and development of the whole nation, not excluding any of the regions. This difference is somewhat fundamental when making decisions regarding air traffic subsidies. The closer the deciding authority is to the region, the more subjective the decisions might be. Therefore, leading to difference between countries on the use of the same subsidy under the same regulations, which again can cause unequal outcomes for airline operators. There has been discussion on if the administration of PSOs should be centralized on EU-level, mostly because the member countries have had different interpretations on where a PSO can be applied, implying that the criteria is not exclusive enough (Williams & Pagliari, 2004, pp. 64–65).

In Finland, the administrative authority is the Transport and Communications Agency (Traficom), which proposes and tenders the PSO-routes, as well as chooses the operators from tendering. The current PSO-routes between Helsinki (HKI) and certain regional airports were tendered in June of 2022 for a period of nine months (31.10.2022 – 30.7.2023). The criteria of proposing a PSO comes from the regulation as mentioned before, but the criteria for the air service operators willing to attend the tender are set in the actual PSO set by the Member State. The following Table 1 shows some of the criteria included in the latest proposal and tender for PSO published by the Traficom. (Traficom, 2022a.)

Table 1. Requirements for air service operators on proposed PSO-routes (adapted from Traficom, 2022a, pp. 3–5).

Route	***Minimum number of rotations***	***Minimum number of seats***	***Luggage***	***Ticket prices***
HKI-Joensuu	á 6/week	42/flight	20kg checked, 8kg carry-on	Max. 250€/one-way & max. 350€/round-trip
HKI-Jyväskylä	á 6/week	21/flight	20kg checked, 8kg carry-on	Max. 250€/one-way & max. 350€/round-trip
HKI-Kajaani	á 6/week	42/flight	20kg checked, 8kg carry-on	Max. 250€/one-way & max. 350€/round-trip

HKI-Kemi-Kokkola	á 6/week	42/flight	20kg checked, 8kg carry-on	Max. 250€/one-way & max. 350€/round-trip

In addition to the requirements shown in Table 1, there is also a requirement for the air service operator to have at least one computer-based booking system and at least one IATA Interline-agreement partner offering transfer flights from Helsinki to Europe. Air service operators have Interline-agreements with each other. Through Interline airlines can offer more routes, that they would otherwise not be capable to offer. To passenger the agreement shows as following; passenger buys a ticket with a stop-over and with a change of airline, when an Interline-agreement is in place, the ticket is valid through the whole route, and all luggage is handled by the two different airlines without the passenger having to check-out and check-in the luggage when changing airlines. (IATA, 2023.) Some technical requirements for the planes are also set in the PSO proposal and tender by Traficom.

In Finland, the flight route between Pori and Helsinki is an exception from the usual PSO-route funded by Traficom. There is an existing PSO on the route, but the PSO includes a clause that the funding must be provided fully by the city of Pori (Traficom, 2022b). Pori has been providing the funding for the route since 2019 (City of Pori, 2022). Travel time between Pori and Helsinki is over 3 hours by train, as is the case with the other PSO-routes funded by Traficom as well. But the route has not been qualified for government funding in the past and seems to continue being the exception to the PSO-routes in Finland, despite the heavy lobbying from the region of Satakunta (Pukkila, 2022).

2.2 Issues in public expenditure

Allocating resources that contribute to the well-being in societies is at the core of every welfare society, hence the name already. One of the biggest issues in public funding and allocation of resources is the limited amount of said resources. This leads to the discussion of what should be funded publicly and to which level should the public sector

intervene in market-based activities. Musgrave (1959) presented the three main tasks a public sector has economically: redistribution of income, allocation of resources and stabilizing economy. These tasks arise from the facts, that not all individuals are satisfied with how the markets produce different outputs or how income is distributed through market-based activity, therefore creating a need for public-sector involvement (Tuomala, 2009, pp. 18–20).

Market failure is a concept often linked with public expenditure and public goods. The definition of public goods has caused dissonance, since there seemingly is not a commonly accepted definition and the term is used to define different things within the field of economics (Holcombe, 2000, pp. 273–275). The average and most used definition (e.g. Holcombe, 2000; Samuelson, 1954; Tuomala, 2009) of a public good is a good, that once produced,

- consumption of one individual does not affect another individual's possibilities to consume the same good (*non-rival*) and/or
- the producer cannot block anyone from consuming it (*non-excludable*).

As Tuomala says (2009, pp. 74–75) purely public goods are somewhat rare. Some goods have one of the previously mentioned features of a public good, but not both, thus being impure public goods. Closest to a pure public good are for example national defence and clean air. It is practically impossible to exclude someone from either one of these goods nor does someone else's consumption affect another's, thus making them non-excludable and non-rival. Education and health services are examples of impure public goods, although there is a lot of debate over this especially considering education (e.g. Locatelli, 2018). The primary purpose of public education is to provide everyone with similar basic knowledge and give possibility to further education, thus also benefitting the society. There however is debate over the fact that to some point, education can be rivalrous, since the number of students can lead to overcrowding of classrooms which again can lead to some students not getting similar opportunities to learn (Menashy, 2009). Locatelli (2018) nevertheless emphasizes the public benefits of education, thus defining it as a public good and justifiable to be intervened by the state.

Public goods are problematic to produce market-based because of the *free rider*-issue (e.g. Samuelson, 1954; Tuomala, 2009). Since the public goods are non-excludable and every individual can consume them with no restrictions as to how many other consumers there are, not everyone wants to pay for them making them non-profitable and not an interest for private sector. Therefore, the public sector is needed to intervene and produce public goods. As discussed before, it is easy to understand the intervention of public sector in the case of for example national defence and education. They undoubtedly bring public benefits, even if there is some debate over to which extent. However, considering something like public transportation, it is not as easy to justify state intervention. Access to public transportation cannot be considered a "human right", nor is public or mass transportation of any kind a public good. The transportation is provided by a market-based company, even though it might be owned by a public sector entity. There is a cost to use public transportation, therefore being an excludable good and the access to consumption of public transportation is not limitless, therefore being rivalrous.

Air traffic therefore cannot be a public good, and neither can an airport. Green (2007, pp. 93–94) however does describe airport runways as impure quasi-public goods, to the point they are congested and therefore become rival in consumption. In this case airport runways are somewhat similar to highways, which also pass as impure public goods before the number of users congests them and the non-rival part is lost (e.g. Tuomala, 2009, pp. 75–77). In terms of justifying public expenditure the search for valid justifications must go further than just defining if air transportation is a public good or not. Chapter 3 discusses the theoretical framework of regional economic development, proceeding to show the key points air traffic should impact in order to be considered effective accelerator of regional economic development. Therefore, also shedding light on the legitimacy of publicly funding air traffic; if there is no relative impact from an airport for regional economic development found, the impact should not be used as a justification of allocating public money into air service.

The issue with public expenditure on airline traffic includes more than just the subsidies paid for airline operators. Most of the commercial airports around the world are state-owned and investments are made with public money. In Finland all but one commercial airports are operated by Finavia, which is a 100% state-owned company (Finavia, 2023a). Similar arrangement is in place in Norway and Sweden (Avinor, 2023; Swedavia, 2023). One of the world's busiest airports, Singapore Changi Airport, is owned by a public entity as well (Changi Airport Group, 2023).

Airport costs occur from everyday operations such as security checks, luggage handling and air traffic controls, as well as from long-term investments such as runway maintenance, terminal expansions, and development (e.g. Bottasso & Conti, 2017). From 2019 to 2022 Finavia invested approximately 17,5 million euros to runway and runway area maintenance in different airports (Finavia, 2023b). Before COVID-19, all Finavia-operated regional airports (excl. Helsinki-Vantaa) were unprofitable (Finavia, 2022, p. 5). However, the maintenance of runways is a matter of fulfilling safety requirements and providing sufficient facilities for air traffic, thus it is not optional. Airport cannot be excluded from maintenance work based on thin traffic into the airport, thus not creating enough revenue to cover the compulsory costs. This leads to the issue of distributing funds between airports fairly, and also gives further background on the need of public subsidies in airport entities.

2.3 Environmental issues

The ongoing global climate crisis has forced governments around the world to focus on environmental questions and ways of achieving climate neutrality. In EU an agreement was achieved in 2019 in the form of the European Green Deal; stating that EU would achieve climate neutrality by 2050 (European Council, 2022). Finland has a more ambitious goal for climate neutrality, since the current strategy aims for climate-neutral Finland by 2035 (MoE, 2023). Air traffic as an industry accounted for approximately 2% of the global carbon dioxide (CO2) emissions in 2021 according to the International Energy

Agency (IEA, 2022). Transportation and the development of more environmentally friendly options is an important part of achieving climate neutrality. According to IEA (2022), air transportation emissions have grown faster than the emissions of other modes of transportation. Even though the 2% share of global emissions might not sound that big, it has to be taken into consideration that before COVID-19 commercial aviation activity was growing at a rapid rate and it is expected to return to that growth rate in the next few years (IEA, 2022; Staples et al., 2018, p. 342). As can be seen from Figure 1, the impact of COVID-19 cut the aviation emissions by almost half in 2020. After that though, the levels have quickly started rising again. Other slightly less significant decreasing shock to the emissions can be seen in 2008–2009 following the economic depression.

Decreasing the CO2 emissions of air traffic demand both technical and social solutions. Technical solutions include the development of for example greener airplane fuels and electric air traffic. For example, the FAIR-project (Finding innovations to Accelerate the Implementation of electric Regional aviation) charts and researches the possibilities of electric aviation in certain regions of Finland, Sweden and Norway (Kvarkenrådet, 2022). Staples et al. (2018) analysed the potential of the use of alternative jet fuels and concluded that using them could reduce lifecycle greenhouse gas emissions from aviation up to approximately 68% in 2050. Hu et al. (2022) also finds alternative fuels as one of the most important factors in the carbon emissions of aviation industry. In addition to alternative fuels, improving technology used in aircrafts and manufacturing as well as guiding consumer activity with prices and access to alternative modes of transport also act as important factors (Hu et al., 2022, p. 802). Social solutions demand a change of mindset from consumers in regards with choosing transportation options. However, for people to make choices that contribute to climate neutrality, the governments and the aviation industry must develop the better choices and make them more available, hence connecting both technical and social solutions.

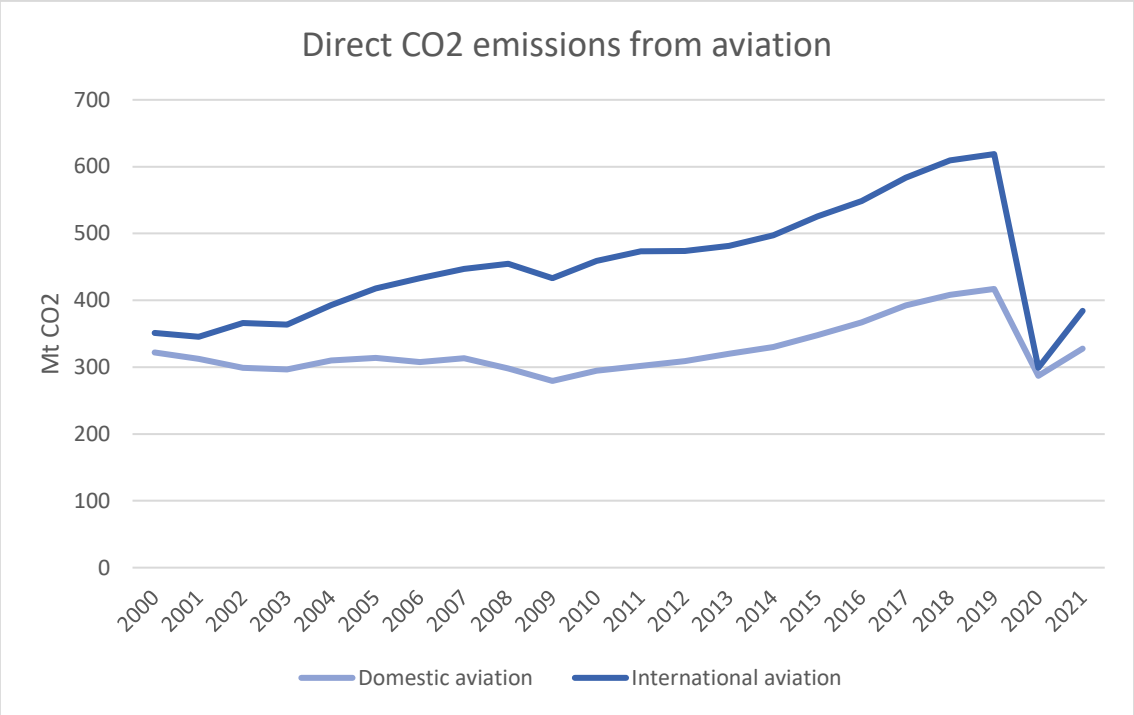

Figure 1. Direct CO2 emissions from aviation between 2000-2021 in megatons (IEA, 2022).

High-speed rail (HSR) can be considered the most important alternative transportation mode for air traffic, especially on domestic routes. The essential strengths of HSR in comparison with air traffic are the locations of railway stations; HSR offers a better access to economic centres and the more effective use of travel time since there is not as many procedures in place before and after embarking in rail transportation (e.g. Román et al., 2007). The impact of HSR to the CO2 emissions has been studied for example in China, which with Japan has the role of a "model country" in railway development. Wang et al. (2019) focused on the impact HSR infrastructure investments in China have on reducing emissions from aviation and concluded that HSR use instead of air transport has positive environmental benefits. However, Wang et al. (2019, p. 187) also state that since China still heavily leans on coal in energy production the whole potential of HSR in reducing aviation emissions has not been harnessed yet. The role of HSR as an alternative mode of transport for air traffic has been studied in Japan and Spain as well (e.g. Bueno et al., 2017; Clever & Hansen, 2008; Pagliara et al., 2012).

Emissions are not the only negative outcomes of air traffic and airports. Airport noise affects both the immediate vicinity and the further suburbs or regions surrounding the airport. Cidell (2015, pp. 1128–1129) mentions airport noise as one of the often-forgotten negative outcome when assessing the economic impact airports produce. This statement refers to the research on how airport noise effects residential property values in the vicinity of an airport. Espey and Lopez (2000) concluded that there is a notable negative relationship between house prices and airport noise; properties in areas with higher noise levels selling for less than similar properties in areas with lower noise levels. A negative relationship has also been found between an announcement of a new airport hub and property values in the vicinity (Jud & Winkler, 2006). The property values have been found to decrease in areas up to 6 miles from the airport (Pope, 2008). Previous three studies focus on airports and regions in the US, therefore leaving a question open if the situation is the same in other countries as well. Lu (2011) calculated economic benefits and negative side effect costs in Taiwan as a case-study, negative effects including emissions and noise, concluding that the benefits are greater than the negative effects. In Poland, Trojanek and Huderek-Glapska (2018) have found a negative association between aviation noise and multifamily building apartment values. Similar findings come from Thailand, as a multiple regression analysis by Limlomwongse Suksmith and Nitivattananon (2015) shows significant negative relationship between noise and property value near the Suvarnabhumi International Airport.

Since there is research on the negative environmental and economic effects of air traffic, there is an even greater crave for solid justifications when publicly funding airports and air traffic routes. Lu's (2011) findings suggest that the positive outcomes of airport operations outweigh the negatives, but it would require further research with broader geographic scope to generalize this finding. However, most of the studies that have found negative relationship between airport noise and property values have focused on international airports or otherwise big airports. Remote airports in rural regions do not have as much traffic and oftentimes also the routes into them are not served with larger multiengine airplanes, therefore the amount of noise is not at the same level and might not

affect property values as drastically. In future, through progress in electric aviation and use of alternative jet fuels, it might be more justified to focus on serving remote, rural and regional airports with plane options that have less environmental impacts. In this case, it would also mean a significant change in the way regional air traffic routes are subsidized.

3 Regional economic development

Vitality of regions is a commonly used argument in Finland when the government and other public entities justify the decisions of subsidizing certain traffic options (e.g. Traficom, 2022a). Even in the EU regulation 1008/2008 which sets the legal guidelines for public service obligations, one criterion for subsidizing air traffic is that the flight route is vital for the region. However, in studies focusing on regional sciences it is stated that instead of vitality of a region the discussion should be about the development and growth of a region (e.g. Jauhiainen & Huovari, 2013, pp. 14–15). Thus, it could be stated that the vitality of a region is the target, which can be achieved by focusing on the development and growth in the region. There is some dissonance on economic growth and economic development used as synonyms of each other; a rich nation is not necessarily well-developed and vice versa (e.g. Grabowski et al., 2003, pp. 5–6). In this thesis regional economic development is understood as also including economic growth, but they are not understood as synonyms. Economic development, more or less, needs economic growth in the region.

The next three sub-chapters introduce the different backgrounds for regional economic development and growth, and also define certain indicators of said development and growth, that will be used as theoretic framework in the analysis of this thesis. The last sub-chapter brings together the framework and presents the indicators in accordance with the regional economic development matrix by Roberts et al. (2002).

3.1 The economic growth of a region

Economically the increase in population can be seen as a positive outcome for a region; first it brings more tax revenue for the municipalities in the region as form of income taxes and secondly it contributes to the consumer activity in the region. On the other hand, an increase in the region's population inevitably leads to an increase in public expenses when the amount of people using public services increases. Similarly, the

employment rate of a region can be viewed from an economic point of view; a municipality with high employment rates benefits from income tax revenues and therefore contributes to the economic activity in the region. Population and employment rate are commonly used as indicators when assessing the economic development of a region (e.g. Roberts et al., 2002; Jauhiainen & Huovari, 2013, pp. 20–27).

In economics the economic growth as a concept has generated a lot of theories striving to explain growth mechanisms. One of the theories is the neoclassical growth theory (Solow 1956) which states that the level of economic production is determined by combining capital goods and labor force. Later studies have however identified the key issue in neoclassical growth theory: it does not explain why there is economic growth, it only contributes to identifying the rate of the growth (Huovari et. al. 2001, p. 13). More recent growth theories have been striving to solve this issue, for example by identifying the human aspect of capital; the knowledge, skills and experience possessed by an individual or a population. In these more recent growth theories human capital is seen as an equally important factor of production as machines and other production tools (Grabowski et al., 2003; Huovari et. al. 2001, pp. 13–14). According to Cuadrado-Roura (2001) the amount of human capital in a region can be considered one of the factors contributing to regional growth and economic success of a region. In addition to Cuadrado-Roura, the meaning of human capital for economic success is also recognized by Huovari et. al. (2001, pp. 6–14). Thus, there is a need for human capital within regions to generate economic activity and success.

Different regions in Finland are focused on different kinds of production, for example shipyards are naturally focused along the coastline. However, the growth theories do not recognize regional factors such as location and history behind the production differences, instead they proceed to explain regional production differences with solely differences in production factors and technological development in the regions. Economic geography however has introduced the concept of geographic concentration of economic activity, which means the concentration of certain economic activity and production into a

certain area or region (e.g. Hanson 2001, pp. 255–256). The regions might seemingly have the same basis for production and economic activity, but the location has an impact (Huovari et. al. 2001, pp. 17–20). Krugman (1991, pp. 4–8) sees the mobility of labor force as a contributing factor to the geographic concentration of economic activity. Labor force follows stronger and bigger consumer markets, where the demand for labor force is higher. This leads to increase in population in the high labor force demand areas since there are available jobs. This creates a loop; increase in population leads to increase in consumer expenditure which leads to increase in production values and then again increase in the demand of labor force and the economic activity in a region. High demand of labor force also contributes to increasing wages and therefore increasing purchasing power in a region which are key elements in economic activity. All these attributes to economic growth are also attributes to the gross domestic product (GDP) of the region since GDP is used to measure economic activity.

3.2 Competitiveness amongst regions

Competitiveness is easily understood when assessing companies and the competition on the market between them. However, competitiveness between regions is a more controversial concept. There of course is competition between the regions, for example for competent workforce and potential new inhabitants, but the reason for the competition is not the same as with competition between companies (see Tiebout, 1956). Companies compete to grow and strive on the market, therefore bringing revenue back to the owners. Regions do not operate on a similar, purely revenue-based market; other region's success and development does not *per se* take anything away from another region nor does it make it impossible for the other region to be successful as well. The contrast between different regions is not as clear as it is between companies operating on the same market.

The concept of competitiveness of the regions has faced criticism. For example, Krugman (1996) has based his criticism on the possibility, that the concept of competitiveness

creates a false and harmful conflict between the regions. To provide a contrast to this, Huovari et. al. (2001, pp. 3–5) on the other hand consider competitiveness of regions as an important and essential concept for the development, growth, and economic success of a region.

Huovari et. al. (2001) does agree with Krugman (1996) on the fact that competitiveness of regions as a concept needs to be distanced from the concept of company competitiveness. When assessing regional competitiveness, it should be seen more as a tool to study the effectivity of a region's actions regarding for example seeking and tempting workforce and other factors of production, rather than a situation to create conflict between the regions (Huovari et. al., 2001). A region that is tempting to factors of production, has capable resources to boost economic activity and also the ability to hold on to these resources can be seen as a successfully competitive region. The resource factor is important and essential when measuring growth, development, and competitiveness with indicators such as population and employment rate. Economic structure, meaning the division of economic activity and workforce to different areas of production, has an important role in making a region competitive. When a region has diverse economic structure, it brings in workforce with a broader scale of capability and knowledge, therefore increasing the number of factors of production. Cuadrado-Roura (2001) considers the diversity of economic structure in a region to be one of the factors behind economic development and success of the region.

3.3 Accessibility of a region

The accessibility of a region is one of the factors in the economic development of a region (e.g. Cuadrado-Roura, 2001). So, accessibility can also be linked to the concept of competitiveness of regions – to gain competitiveness and to maintain it, a region should be accessible both nationally and internationally. One of the earliest definitions of accessibility in relation with land development states that accessibility can be understood as the potential of opportunities for interaction; those being mostly the personal travel

of people such as to work and to shopping for essentials (Hansen, 1959, pp. 73–74). Cuadrado-Roura (2001) has a similar view on accessibility of a region as a broad concept, not focusing only on the physical factors such as location and distances, but also for example on how efficiently accessible the international markets are for the economic operators in a certain region, Kwan and Weber (2008) and Caschili et al. (2015) agree with this definition as well. Historically, the research interest on accessibility comes from theories of economic location, which were established to understand and explain the outlines of capitalism (Ersoy, 2016).

As mentioned before, the distance to international decision-making and market is long in Finland's case. Therefore, it is important to understand the concept of accessibility when studying the competitiveness of regions in Finland and also to understand the means of transportation for example to efficiently make regions accessible. Relationships and interactions, such as business and investments, between regions and nations require accessibility. As mentioned already in the introduction, one suitable example are business entities searching for possible locations for manufacture investments and headquarters. If the region cannot accommodate their needs for regional, national, and international movement due to accessibility issues, it is not likely that the entity would consider the region as an option (see Ersoy, 2016, pp. 648–650).

Different means of transportation are one of the key factors for region's accessibility (e.g. Vickerman, 2015). Long distances mainly require either high-speed railroad connections or air traffic for efficient movement between points of interest. This leads to think that if a flight route is operating to and from a region, it would obviously contribute to regional economic development. However, the transportation must be efficient both to and from and within the region to actually make a contribution to accessibility. Therefore, accessibility is also set as one of the hypothetic indicators of regional development that could be contributed to by air traffic. The next sub-chapter brings together the framework for regional economic development and presents the hypothetic indicators as a compilation.

3.4 The indicators of regional economic development

Roberts et al. (2002, pp. 1–8) states that even though regional research is used to viewing economic development mostly only with quantitative inputs and outputs, there is always the qualitative side as well. As said in the previous sub-chapters, usual indicators of regional economic development are employment rate, population, diversity of economic structure and accessibility. All of these can be measured quantitatively by focusing on regional statistics, the qualitative side on the other hand might not be as obvious. For example, as employment rate increases, it also increases income levels and through that creates wealth, which then again can be linked with increasing quality of life. Roberts et al. (2002, p. 7) present regional economic development as a matrix of qualitative and quantitative inputs and outputs (see Figure 2).

As Figure 2 shows, Roberts et al. (2002, p. 7) understand regional economic development as a combinative process of regional economic process and products. Regional economic products are the effects and outcomes that this thesis is interested in; what kind of effects does the airport produce for regional economic development. The regional economic process however could be the policy to use public service obligations to fund regional air traffic, or the geographic planning of providing infrastructure for airports or the regional strategies of producing economic development for the region. This thesis focuses on the products, which in this thesis are understood as the indicators of regional economic development. The indicators of regional economic development are defined on combining previous research on the matter. The indicators can be seen as a compilation in Figure 3.

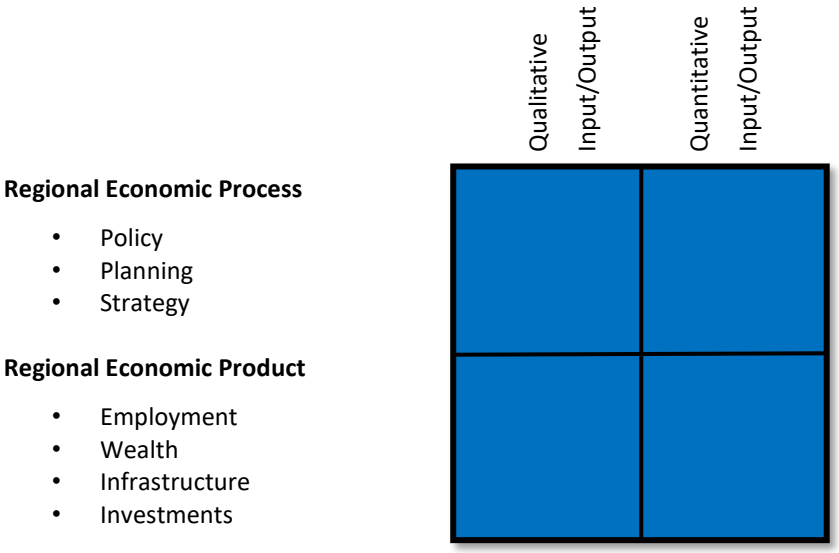

Figure 2. Regional economic development matrix (adapted from Roberts et al., 2002, p. 7).

Employment is a commonly used indicator, as Roberts et al. (2002) and Jauhiainen & Huovari (2013, pp. 20–27) have previously stated. On the matrix, it is mentioned as its own. Human capital and its meaning for economic development is discussed in multiple regional development research (e.g. Grabowski et al., 2003; Cuadrado-Roura, 2001). Human capital and population are not synonyms. Human capital as a factor of production can be defined as the skills and knowledge an individual or a population have (e.g. Gennaioli et al., 2012). Therefore, a rise in population does not necessarily mean a rise in human capital. However, in this thesis, population is chosen as one of the indicators of regional economic development, since as the population increases in a region, so do the possibilities to via policies and processes to educate and therefore create human capital.

The diversity of economic structure in a region is defined as one of the factors of regional economic development and economic success by Cuadrado-Roura (2001). Diverse economic structure also contributes to the attraction of human capital since there are broader possibilities for skilled labour in many areas of expertise. On the regional economic development matrix, diversity of economic structure can be linked with investments in the region and partly also with infrastructure. The last indicator of economic

development in this thesis is accessibility, which is an important part of creating regional economic development (e.g. Cuadrado-Roura, 2001). In the matrix, accessibility is produced by all the mentioned processes and can be understood behind creating wealth, bringing investments, and accommodating for infrastructure.

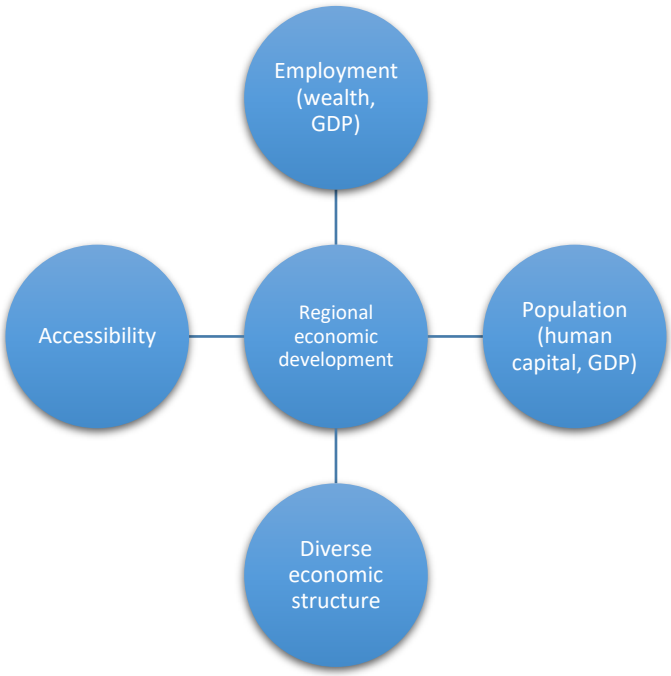

Figure 3. Indicators of regional economic development.

All these four chosen indicators are linked to each other and contribute to each other and to regional economic development in different ways. This thesis proceeds to set a hypothesis, that if an airport or air traffic as whole can contribute to these indicators, it has an impact on regional economic development. The airport as an infrastructure providing for functional air traffic acts as the “process”-part, when looking back a Figure 2 with the regional economic development matrix. The systematic literature review on previous literature on effects and impacts of airports and air traffic will be conducted in chapter 5, the next chapter introduces the research and analysis methods of this thesis.

4 Research methods and materials

The purpose of this thesis is to discuss the legitimacy of publicly funding air transportation from the point of view of regional economic development. The meaning of air transportation has been studied before with various econometric testing methods (e.g. Brueckner, 2003; Green, 2007; Button et al., 2009; Florida et al., 2014). There however seems to be a lack of conducting literature that provides an overview of the previously studied outcomes and effects especially air transportation and airline services have on regional economic development. This thesis proceeds to contribute to the research by conducting a systematic literature review and a theory-based content analysis of the previous studies, therefore providing structured beneficial information on the matter for governmental decision-making as well as for future research. This thesis proceeds to answer to the following research questions:

1) What kind of meaning air traffic has on the economic development of regions?
2) Can the effects and outcomes of air traffic for regions be considered relevant enough to justify public funding of air transportation?

4.1 Literature review as a research method

The purpose of qualitative research is not to produce generalized information in the same way as in quantitative studies (Tuomi & Sarajärvi 2018; Vilkka 2021). The goal is not to achieve statistical generalisations, but rather to critically question formerly produced models and to explain certain scientific phenomenon from different or new point of views (Tuomi & Sarajärvi 2018, pp. 22–33; Vilkka 2021, pp. 122–123). This thesis proceeds to understand the outcomes and effects of air traffic for regional economic development, rather than proceeding to find more causes and effects, therefore a qualitative approach is reasonable.

A literature review is a research method that studies previous research on selected matter and summarises, analyses, and critically reviews it (Salminen 2011, pp. 3–5; Hart 1998, p. 5). Reviewing and analysing is a critical part of conducting a literature review, as a simple list of literature sources and brief discussion of them cannot be considered to be a review. Silverman (2020, pp. 427–428) further describes that a literature review should have an argument within it, rather than just being a describing piece of previous literature. Critically reviewing previous research does not mean criticising it from a negative point of view, but rather having a critical take on what is relevant for the purpose of the study. Literature review is considered to be qualitative research, although in Finnish administrative sciences research it has also been addressed as a mixed method of both qualitative and quantitative (Salminen 2011, p. 4).

Baumeister and Leary (1997, pp. 312–313) have identified five main types of literature review, they call them the five main goals. The first one is to develop a practically new theory on a certain kind of phenomenon. The second goal is not to provide a new theory, but to evaluate an already existing theory and to review the literature that would be valid for the theory. The third goal or type of literature review is to find out existing knowledge and information of a certain subject. The fourth type includes the difficulties, problems or errors on existing theories or previous research, but most often without actually providing useful solutions. A fifth type of literature review is a historical one, which usually chronologically introduces the main points of a certain theory. This thesis is somewhere in between the second and the third type of literature review, since the purpose is to provide an overview and bring existing information together. There still is a certain level of evaluation of a theory and identifying valid literature since there is a need to connect air traffic and the outcomes and effects of it to regional development theories. Thus, this thesis leans to be more of the second type of Baumeister and Leary's (1997) literature review types.

Since this thesis proceeds to bring together the previous research and to provide an overview of the effects and outcomes of air traffic to regional economic development, a

literature review is a good choice of research method. One could argue that a quantitative study on previous research could bring together and provide an overview of the effects and outcomes of air traffic as well, but there would still have to be a qualitative analysis of whether the effects and outcomes are in line with indicators of regional development. Therefore, it is justified to use a qualitative literature review in this thesis. More specifically, this thesis is conducted as a systematic literature review. According to Tuomi and Sarajärvi (2018, p. 138) a systematic literature review is a powerful method in deepening the knowledge of the already existing research. This is exactly what this thesis proceeds to do, so there is another justification for using a systematic literature review as a method.

4.2 Conducting a Systematic Literature Review

In methodology literature, literature reviews have been divided into two types. Traditional and systematic literature review. A systematic review has a specific and articulated purpose and the whole process of conducting the systematic review is more structured than in traditional review (Jesson et al., 2011, pp. 10–12). This does not mean that any literature review with a structured process and systematic point of view can be described as a systematic literature review and vice versa, this does not imply that all other types of literature review are not done systematically. (Jesson et al., 2011, pp. 10–12; Hart, 2018, pp. 99–100.)

Conducting a systematic literature review or a literature review in general consists of four to seven stages, varying by different methodological literature authors. For example, Fink (2020, p. 5) presents a seven-stage model of conducting research with a literature review, those stages are practically the same as Jesson et al.'s (2011, p. 12) six stages, just with minor differences in the precision of each stage. Figure 4 below is an adaptation of the six stages of conducting a systematic review by Jesson et al. (2011, p. 12). This thesis follows theses six stages in the research process. Research questions are set at the beginning of this main chapter, and they guide the research process from the start.

Second stage, designing a research plan, has been done before beginning the writing process when assessing the possible theoretical framework and literature regarding it. Search for literature, as in searching for the data of this research, will be discussed in the next subsection (5.2.1). Inclusion of relevant literature and exclusion of irrelevant literature in answering this thesis' research question is an important part of a literature review (e.g. Hart, 2018, pp. 157–185). These inclusion and exclusion criteria will also be listed in the next subsection.

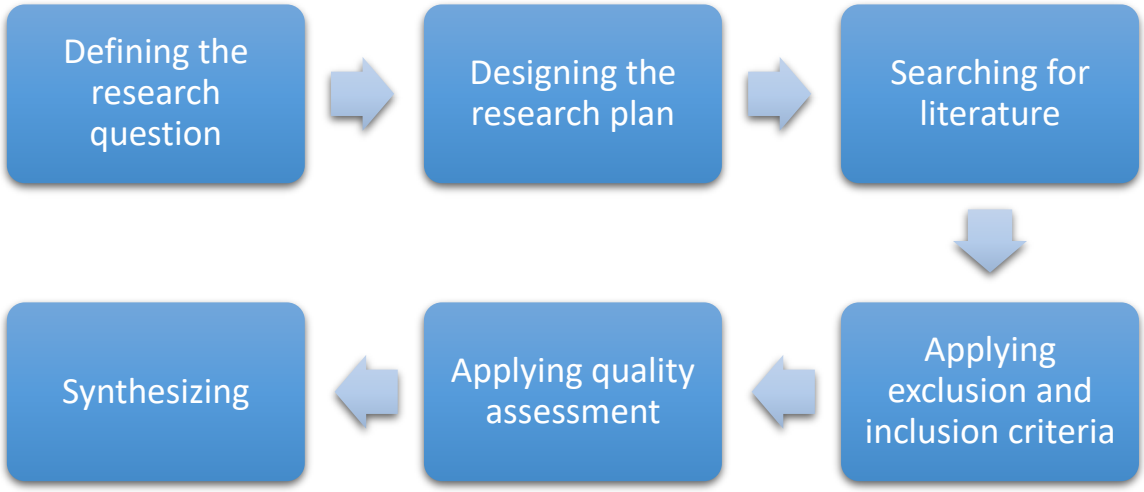

Figure 4. Conducting a systematic literature review (adapted from Jesson et al., 2011, p. 12).

Applying quality assessment aligns with applying the exclusion and inclusion criteria but is still applied on its own stage. Due to set quality criteria a set of searched data would be excluded, for example for being low quality or having an analysis that does not lead to a competent conclusion, therefore not actually providing relevant and useful information (e.g. Hart, 2018, pp. 102–105).

In conducting a literature review, technically there is no limitation on how much or how little amount of literature is enough. Above the amount, the researcher should emphasize the quality of the selected literature (Valkki, 2021, pp. 122–123). Eskola and Suoranta (2014) also mention that the amount of the data is less important than the quality of the interpretations made from it. Both Tuomi and Sarajärvi (2018, pp. 99–100) and

Alasuutari (2011, p. 83) talk about the saturation of data; meaning the point where adding new data would not give any relevant new information for the research. Finding the saturation point is highly dependent on the research conducted, but it provides a guideline for noticing when the data collected is enough. It is also important to keep in mind that this is a master's thesis, and there are set limitations for the length of the thesis and other resource limitations. Therefore, collecting hundreds of articles for review does not make sense and is also not possible regarding the deadlines and other limitations that are given for this work.

Choosing of the search databases was done by first exploring the databases available through the library of the University of Vaasa. Since this thesis heavily leans to economics and social sciences, it is reasonable to choose databases that carry literature from these fields of study. There are 22 databases that carry the previously mentioned fields of study. A couple of test searches were done in the databases and the tentative results seemed relevant for this thesis, so the following five databases were chosen to be continued with: Academic Search Elite (EBSCO), Business Source Premier (EBSCO), SAGE Journals Online, ScienceDirect and Wiley Online Library. They were selected on the basis that they carry e-articles in the chosen fields of study relevant for this thesis and that they returned relevant search results during the test searches.

Precise and well-chosen keywords are important for receiving relevant and good-quality results from the databases. In finding answers for the research questions of this thesis, the following keywords were chosen for tentative test searches: regional development, regional economic development, airports, air traffic and regional airports. It required some attempts before the best order of words and the most suitable Boolean operators could be found. Since in this thesis regional development is understood from the point of view of economic development, it is included in the keyword instead of using regional development and regional economic development as separate keywords. In many articles that emerged in results from the test searches, the word airport was used instead of air traffic, therefore they were both included as keywords. However, the keyword

regional airports was left out, since with the keyword airport also the articles discussing regional airports would come up in the results. The chosen keywords are presented in figure 5 where the darkest blue triangle in the middle represents the results set for this search. Figure 5 also shows which Boolean operators were used in the search and where they were used.

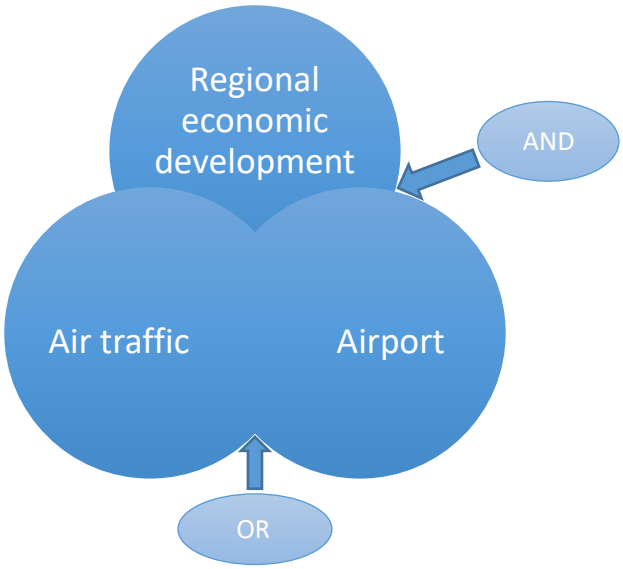

Figure 5. The keywords and Boolean operators used in the search of literature.

A full list of exclusion and inclusion criteria for literature in this review is the following:

- available in English, Finnish, Swedish or German
- the chosen keywords included in headline, text, or keywords
- peer-reviewed articles
- full text available online and accessible through University of Vaasa library
- published between 2000–2019.

The reason for the chosen time limitations on publications is the impact of COVID-19. After 2019 the research regarding air traffic might be affected by COVID-19 since it had a drastic impact on air traffic and airline industry altogether, and the focus of this thesis is not on that impact. In addition, as can be interpreted from the theoretical review on regional economic development in chapter 3, the indicators of regional economic

development have stayed somewhat the same through the decades, therefore the novelty of resulting literature is not that vital for this review. Final screening process is shown in Figure 6 and further explained in the next paragraph.

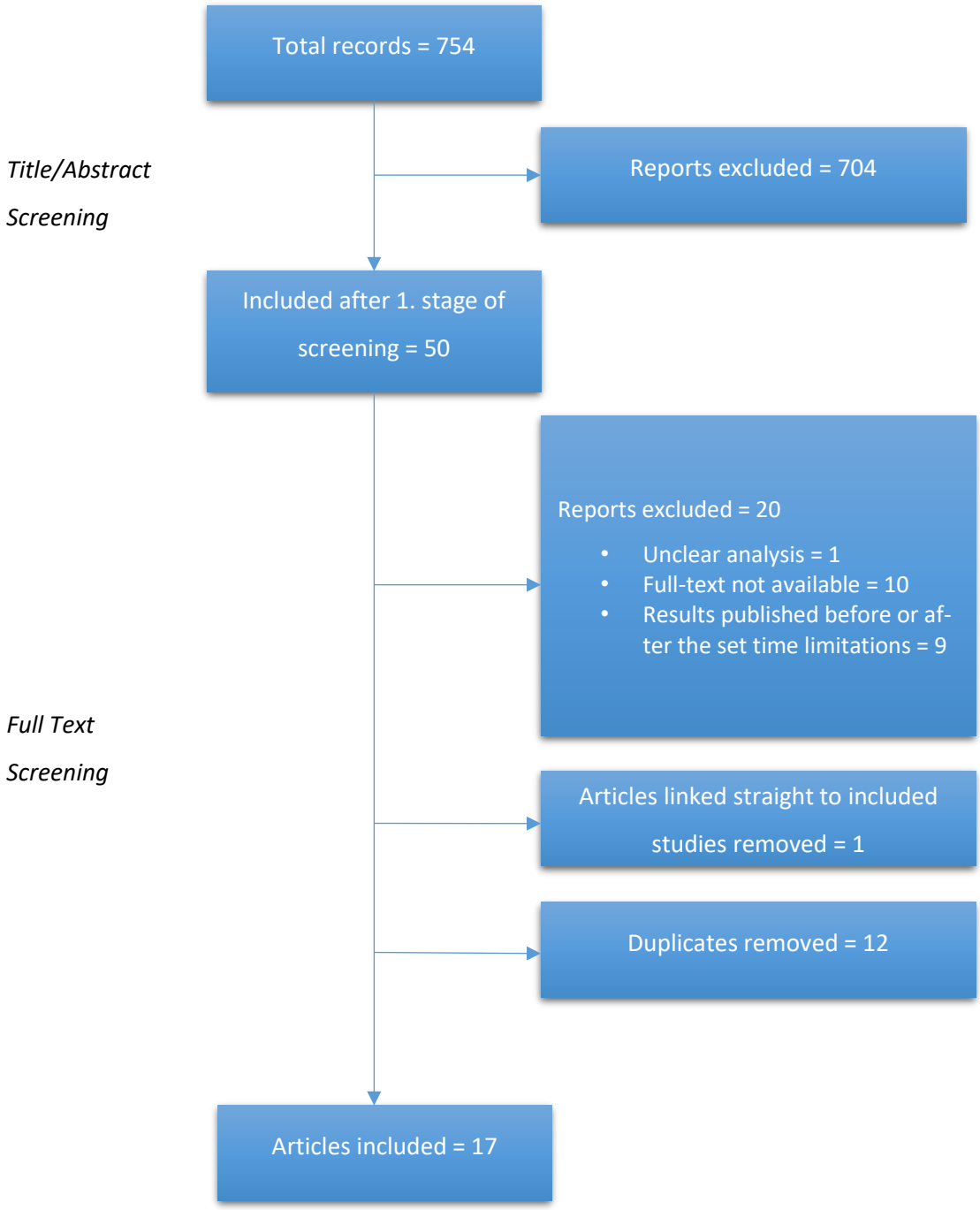

Figure 6. The literature screening process.

The search resulted in 754 articles in total throughout all the databases. The process of screening the literature can be seen in Figure 6. After screening the titles and abstracts of the articles, the number was reduced to 50. At this stage the results were excluded because they were either reports or some other publications, not articles and/or because they did not after all discuss the actual impacts that are the interest of this thesis. The 50 articles were screened more thoroughly and after applying the previously set inclusion and exclusion criteria, the number was reduced to 29 and then after removing duplicates there were 17 selected articles that filled all of the criteria. The selected articles, their methods and most important findings for this thesis are shown in Table 2.

4.3 Analysis method

The framework of this study in the third chapter defines what are the indicators of regional economic development in this thesis. The indicators and the definition of regional economic development are not sought after from the data of this research, the definitions are already known and introduced. Therefore, the analysis method of this thesis is theory-based content analysis (see Tuomi & Sarajärvi, 2018, pp. 132–133). The previous research is combed through to find out if and how the research describes the relationship between regional economic development (employment, population, accessibility, diverse economic structure) and air traffic. This thesis does not use a certain "coding frame" arising from the review, henceforth being theory-based, using already existing theoretical frame for the relationship between regional economic development and air traffic.

In the analysis conducted in chapter six, the indicators of regional economic development are the head categories of air traffic impacts. Under those, this thesis focuses on first if the indicators are mentioned as objects of air traffic impacts and second how the impact of air traffic on the indicators is described. The process of theory-based analysis in this thesis adapts the description of Tuomi and Sarajärvi (2018, p. 132), the head categories act as guiding factors and the analysis proceeds to find expressions that describe

them, eventually leading to a conjunctive factor: air traffic impacts on regional economic development. Mostly this analysis leans on qualitative content analysis, but a quantitative approach is adapted when addressing how many times the regional economic development indicators were mentioned in the previous research. This quantitative approach is taken in order to analyse the legitimacy part of subsidizing air traffic, as in answering the second research question. If a certain indicator is not mentioned or discussed, the use of this indicator in justifying the air traffic impacts on regional economic development has a rather weak basis from this thesis' point of view.

Literature reviews have been criticized for not thoroughly analysing the research material, rather just analysing and discussing the findings. Therefore, this thesis proceeds to analyse the articles as whole, focusing on theoretical frameworks, methods, and discussion of results on top of findings to fully understand the material. (Onwuegbuzie et al., 2011, p. 5.) This thorough take on analysing the selected literature allows to actually understand all the angles an article has and therefore gives more basis on critically reviewing the article, which is the key part of systematically reviewing literature (e.g. Silverman, 2020). Onwuegbuzie et al. (2011) discusses two forms of literature analysis; within-study and between-study literature analysis. Within-study literature analysis includes the process of thoroughly analysing the literature, whereas between-study literature analysis signifies the part where the selected articles are compared and contrasted with each other. In this thesis, these forms exist at the same time, since when thoroughly going through all the parts of articles, they are also compared to the other articles.

5 Air traffic and regional economic development

The fundamental issue recognized in previous research is “the chicken and the egg” -paradox; which was first and which way does the causality between air traffic and economic development run (Baker et al., 2015; Button et al., 2009; Cidell, 2014). There seems to be a strong consensus that the causality between economic development and air transportation is real and actualizes in different situations, but if the causality relationship is uni- or bi-directional is the question that remains (e.g. Baker et al., 2015; Mukkala & Tervo, 2013). Next sub-chapters discuss the scope, theoretical framework, methods, and conclusions of the articles, conducting the content analysis simultaneously as within-study and between-study analysis.

Table 2. The selected data for systematic literature review.

Author(s)	***Article***	***Method***	***Aim***	***Relevant results summarized***
Allroggen, F. & Malina, R. (2014)	Do the regional growth effects of air transport differ among airports?	Empirical, statistical analysis	To study the contribution of air transport to regional development in Germany	Significant difference between airports and their target groups, business-oriented airports contribute to wealth creation in the region.
Baker et al. (2015)	Regional aviation and economic growth: cointegration and causality analysis in Australia	Empirical, econometric testing	Assessing the value of regional (non-metropolitan regional development) aviation, to provide evidence that public support is value for money	Significant bi-directional relationship between remote/regional airports and regional economic growth (GDP), funding should be targeted at airports directly.
Bilotkach, V. (2015)	Are airports engines of economic development? A dynamic panel data approach	Empirical, dynamic panel data method	Impact of the amount of air traffic and number of destinations served with non-stop flight routes on the key indicators of regional economic development	Amount of air traffic has an impact on key indicators of regional economic development, impact is influenced by competition on air service market. Economic significance is modest.
Blonigen, B. A. & Cristea, A. D. (2015)	Air service and urban growth: Evidence from a quasi-natural policy experiment	Empirical, statistical analysis	Estimating the effects of air traffic for employment growth, population and income (GDP)	Increase in air passenger traffic leads to increase in population, income, and employment (growth rates). Service and trade industries benefit the most.

Brueckner, J. K. (2003)	Airline traffic and urban economic development	Empirical, statistical analysis	To provide evidence on the relationship between airline traffic and economic development, happening contemporaneous	Increase in air passenger traffic leads to increase in employment (service-related industry). Population affects amount of air traffic (bi-directionality).
Brugnoli et al. (2018)	The impact of air transportation on trade flows: A natural experiment on causality applied to Italy	Empirical, statistical analysis (estimation)	Estimating the impact of air traffic for international trade (accessibility, diverse economic structure)	Air traffic has positive impact on international trade, thus proving the importance of airports as an infrastructure for the regional development.
Bråthen, S. & Halpern, N. (2012)	Air transport service provision and management strategies to improve the economic benefits for remote regions	Literature review	Finding factors to address to contribute to regional economic development more efficiently	The impact airports have depends heavily on regional size and passenger demands at the airport. Criteria of subsidizing should be thoroughly looked into, issues with interpreting "remote", the level of subsidy, what is necessary?
Button, K. & Taylor, S. (2000)	International air transportation and economic development	Empirical, statistical analysis	To study the impact of quality of international air transportation on economic activity (employment)	Increase in international services (EU market) generates more employment. Both number of international destinations and quality of service act as important factors for employment generation/attraction.
Button et al. (2009)	The role of small airports in economic development	Empirical, econometric testing	To study the relationship between local air transportation and regional economic development	Increase in passenger activity leads to increase in regional per capita income.
Chen et al. (2018)	Do airports boost economic development by attracting talent? An empirical investigation at the subcounty level	Empirical, panel data analysis	To study the linkage from airports to regional talent distribution (human capital) and the effect of talent on regional economic development	The further away a location is from airport (accessibility) the lower its talent share seems to be (human capital), amount of passenger flow in nearest airport (amount of air traffic) contributes to increase in talent share (human capital).
Cidell, J. (2014)	The role of major infrastructure in subregional economic development: An empirical study of airports and cities	Empirical, spatial analysis	To empirically test the claim that airports are the engines of regional economic development	Other pieces of major infrastructure are either better or at least at the same level with airports in creating employment in the area.
Florida et al. (2014)	Up in the air: the role of airports for regional economic development	Empirical, multiple regression analysis	To study the impacts airports have on regional economic development (the meaning of the size and scale of airport activities)	Larger airports have a bigger positive impact on regional development through the "moving people"-factor which contributes

				to increasing economic output.
Graham, B. & Guyer, C. (2000)	The role of regional airports and air services in the United Kingdom	Literature review	Three objectives in analysis of UK regional air transport, important for this thesis: the contribution of air transport to regional economic growth	Regional airports and air services contribute to regional economies in 3 ways: 1) Direct employers >> employment indicator 2) Catalyst for other on-site economic activities (business parks) >> accessibility indicator 3) Regional economic multiplier.
Green, R. K. (2007)	Airports and Economic Development	Empirical, regression analysis	Does the activity at metro airport predict population and employment growth in the region	Passenger activity per capita is a good indicator in estimating population and employment growth (US largest metropolitan areas).
Mukkala, K. & Tervo, H. (2013)	Air transportation and regional growth: which way does the causality run?	Empirical, panel data analysis	To provide evidence on the role airports have in promoting regional growth in different types of regions	Airport contributes to economic development in remote regions uni-directionally, in core regions not.
Percoco, M. (2010)	Airport Activity and Local Development: Evidence from Italy	Empirical, statistical analysis	To focus on the impact of airport services (number of passengers) on the economic development of Italian provinces (employment point of view)	Increase in passenger activity leads to increase in service employment (both in the region and neighbouring regions). Increase in number of flights leads to increase in service employment.
Sheard, N. (2014)	Airports and Urban Sectoral Employment	Empirical, statistical analysis	To estimate the effects of an airport on employment in certain sectors at metropolitan areas	Positive impact on employment sectors that can be defined "tradable", no effect on manufacturing or non-tradable services. 10% increase in air traffic leads to 1650 additional service jobs.

5.1 Geographical and regional scope

The research on air transportation and regional economic development has mostly circled around metropolitan regions in the US and bigger international airports or metropolitan airports (e.g. Brueckner, 2003; Green, 2007), but more recently there has been a focus on regional and remote airports as well (e.g. Baker et al., 2015; Bråthen & Halpern, 2012; Chen et al., 2018). Allroggen and Malina (2014) alongside with Baker et al. (2015) focus clearly on either rural, remote, regional, or small airports whereas for example the

studies of Bilotkach (2015) and Blonigen and Cristea (2015) include both smaller airports serving certain regions and bigger international airports. Button and Taylor (2000) focus on international air transportation, therefore setting the scope on airports serving international routes rather than regional.

The definition of "region" in Cidell's study differs significantly from the others. Cidell (2014) has a strict take on studied areas, since the effects of infrastructure such as airports, are studied in the areas 2,5; 5 and 10 miles from the infrastructure. Other studies address the regions more vaguely in their administrative entirety (e.g. Green, 2007), also including neighbouring regions and districts (e.g. Percoco, 2010). In most of the studies focusing on airports and regions in the US (e.g. Bilotkach, 2015; Brueckner, 2003; Button & Taylor, 2000), the affected region is defined as metropolitan statistical area (MSA). MSA is an area that has at least one urbanized region where the population is more than 50 000 inhabitants (USCB, 2021). However, Allroggen and Malina (2014, p. 2) argue that the economic effects of an airport do not follow administrative regional borders, hence criticising the definition of a "region" adopted by for example Brueckner (2003) and Percoco (2010). They instead parameterize the region ("affected areas") by using criterions on distance from the airport and connectivity of the geographical position of the airport (Allroggen & Malina, 2014).

The geographical location of studied airports varies. Only Mukkala and Tervo (2013) and Bråthen and Halpern (2012) discuss remote northern European regions as well. Baker et al. (2015) focuses in the remote, rural and regional airports of Australia, whereas almost all the other studies focus on either metropolitan or international airports in the US (e.g. Green, 2007; Sheard, 2014), or bigger, also tourism-influenced, airports in Europe (e.g. Allroggen & Malina, 2014; Brugnoli et al., 2018). Therefore, the possible differences in the results of previous studies could be explained with the difference in the definition of region.

5.2 Theoretical framework

Most of the articles (e.g. Brueckner, 2003; Percoco, 2010; Sheard, 2014) adopt the take, that there are four recognized main ways an airport impacts the economy – these ways are identified in the long tradition of airport impact studies (ACI, 2004; Graham, 2003). The four ways an airport impacts the economics of a region are direct, indirect, induced, and catalytic impact. A direct impact refers to the economic activity created by the construction and operation of the airport, for example the building of terminals or flight-control operations, and the commercial activities and cargo moved through the airport. Supply chains of goods and services to and from the airport create the indirect impact. The induced impact comes from the economic activity of the indirect and direct employees in the region. The role of the airport as an economic activity generator and attractor of new businesses for example is the catalytic impact. (e.g. Percoco, 2010, p. 2429, Bråthen & Halpern, 2012, pp. 8–9.) Bråthen and Halpern (2012, p. 9) state that the whole research of air transport effects primarily focuses on the catalytic effects, since they are the effects that show the meaning of air transport growth for economic growth and development.

The definition of regional economic development in the studies leans heavily on literature reviews on previous air traffic impact studies, Brueckner (2003) being one of the first and most effective in terms of defining the concept. Therefore, the definition of development's indicators is first of all not as distinct and second not very versatile. However, employment and employment growth are seemingly the most used indicators of regional economic development, used for example by Bilotkach (2015), Blonigen and Cristea (2015), Brueckner (2003), Graham and Guyer (2000) and Green (2007). Population or some definition of it appears in the studies of for example Baker et al. (2015), Blonigen and Cristea (2015), Chen et al. (2018) and Green (2007). Chen et al. (2018) concludes that the amount of passenger flow in the nearest airport of the region contributes to an increase in the region's talent share, as in human capital.

Accessibility and diverse economic structure are not used as often, but some definitions of them are mentioned in for example Allroggen and Malina (2014), Bilotkach (2015), Brueckner (2003), Brugnoli et al. (2018), Florida et al. (2015) and Sheard (2014). The clearest take on diverse economic structure is done by Bilotkach (2015), who discusses the amount of business establishments as one of the key indicators of regional economic development. Brugnoli et al. (2018) recognize a positive relationship between air traffic and international trade, therefore contributing to the accessibility and diverse economic structure indicators. Both Brueckner (2003) and Sheard (2014) recognize the impact air traffic has on different sectors of employment, therefore also recognizing relationship between air traffic and the economic structure of the region.

5.3 Research methods and materials

Empirical quantitative approach seems to be the research method in most of the previous research (e.g. Allroggen & Malina 2014; Bilotkach, 2015; Blonigen & Cristea, 2015; Brugnoli et al., 2018) but there are also exceptions with the literature reviews and analyses of Bråthen and Halpern (2012) and Graham and Guyer (2000). Even though the methods in empirical approaches are also similar with each other (*panel data analysis*), the scopes of the research differ as discussed in the sub-chapter 5.1. Almost all the studies describe the measuring of airport impacts difficult. It is not completely clear, which impacts which; does airport activity contribute to economic development, or does the causality run the other way around, or is the relation bi-directional in all scenarios. Therefore, previous studies have adopted different approaches as to which kind of variables to use for instrumenting the level of endogeneity in air traffic impacts.

Both Blonigen and Cristea (2015) and Brugnoli et al. (2018) approach the measurement issue with a quasi-natural experiment, choosing an exogenous event impacting the region studied to rule out the possible endogeneity issue with air traffic and their chosen regional economic development variables. In Blonigen and Cristea (2015) the exogenous event is the U.S. Air Deregulation Act from 1978, Brugnoli et al. (2018) use Alitalia

abandoning Milan Malpensa Airport as a hub airport in 2008. Blonigen and Cristea (2015) is seemingly the first study on the matter to adopt this kind of approach to the measurement issue. Criticism is shown for example to Brueckner (2003), in the choice of variables (e.g. hub status of airport), since the hub status could be endogenous as well; a region is expected to grow and an airline chooses to focus its activity to a certain airport in that region, thus making it a hub airport (Blonigen and Cristea, 2015, p. 129).

Most of the studies exploit panel data in their econometric estimations and analyses (e.g. Allroggen & Malina, 2014; Chen et al., 2018; Mukkala & Tervo, 2013). The timespan of the used datasets varies only slightly, with most of the studies using data from approximately 10-year timeframe (e.g. Brugnoli et al., 2018; Green, 2007; Percoco, 2010). Baker et al. (2015) uses a timespan extending for 28 years, Bilotkach's (2015) data spans 16 years and Blonigen and Cristea's (2015) as well as Mukkala and Tervo's (2013) data is combined from approximately 20-year period. Blonigen and Cristea (2015, p. 135) and Baker et al. (2015, p. 143) reason their choice of timespan with availability of data while other studies do not clearly provide a reason for their chosen data timespan. It is highly likely though, that the reason for a certain timespan is due to data availability in other studies as well since the statistics are mostly provided by governmental institutions and they have certain timetables of reporting key statistics.

The amount of passenger movements is the most used variable in measuring airport activity. Some form of passenger movements is used as a variable in 11 of the 17 articles. From the remaining 5 articles in 3 the approach to the relation between airport activity and regional economic development differs so that passenger movement does not act as a useful variable (Allroggen & Malina, 2014; Brugnoli et al., 2018; Cidell, 2014). In the other 2 the approach is not econometric but qualitative, thus no variables are used in the same way as in the other articles (Bråthen & Halpern, 2012; Graham & Guyer, 2000). In most of the cases passenger movements are measured in total annum passengers (e.g. Bilotkach, 2015; Percoco, 2010), but slightly different takes are also adopted. Florida et al. (2015, p. 201) combine the number of flights and passengers, and metric tons of cargo

into one variable describing airport activity whereas Mukkala and Tervo (2013, p. 1512) use the expected development in the number of passengers as a variable.

In addition to difference in the geographical scopes there are also difference in the baseline of the estimated outcome in econometric studies. Brueckner (2003) assumes that the level of air traffic influences the employment rate of the region contemporaneously, whereas Green (2007) as well as Blonigen and Cristea (2015) assume that the effect accords with a lag, as in the following years from the actual increase in the level of air traffic. All three studies conclude that the estimation would be correct, so either the level of air traffic actually influences employment rates both contemporaneously and with a lag, or these studies contradict with each other.

5.4 Conclusions and discussion

Both uni- and bidirectional relationships are found between air traffic and regional economic development (Baker et al., 2015; Blonigen & Cristea, 2015; Green, 2007). It is clear that the research on the relationship has developed through the years, and that the works of Button and Taylor (2000), Button et al. (2009) and Green (2007) can be considered as kind of steppingstones of the research on this matter. Many of the more recent studies use the same methodology as the three older studies, or in contradict justify the use of different methodology with restraints in the previous studies, as discussed in subchapter 5.3. The difference of chosen scope of study or slight difference in methodology does not seem to affect the actual results, since all the studies seemingly agree on the fact that there is an actual linkage between air traffic and regional economic development. The only detail differing is the definition of a region, and scale and significance of the impacts.

One exception from the pure agreement in the linkage between air traffic and regional economic development occurs. Cidell (2014) concludes that other pieces of major infrastructures are actually either better or at the same level with airport in creating

economic development, from the point of view of employment. For example, wastewater treatment plants and shopping malls contribute to generating employment in some cases more than an airport (Cidell, 2014, pp. 1132–1138). This is somewhat opposed to other research on the positive effects of air traffic on employment (e.g. Button & Taylor, 2000; Blonigen & Cristea, 2015; Brueckner, 2003; Chen et al., 2018). However, keeping in mind the difference in regional scope of the studies, the results might not be as opposing to each other, since as Cidell (2014, p. 1141) states, the role of the infrastructure in boosting economic development will occur both in immediate vicinity of and across the region.

Key point in defining the effect of airports and air traffic is the significance of the results. Statistical and economic significance are discussed most critically by Bilotkach (2015) and Florida et al. (2015), both stating that overall, the size of airport contribution to actual economic growth is modest at best even if their estimations produce statistically significant results. Blonigen and Cristea's (2015) findings are contradicting, since they conclude that increase in air traffic has both statistically and economically significant effects on regional economic growth and development. This might be explained by the fact that Blonigen and Cristea (2015) use growth rates of employment, whereas Bilotkach (2015) uses total employment as a number, which could influence the final results and the interpretation of them.

Considering "the chicken and the egg" -paradox only Mukkala and Tervo (2013) provide evidence that in certain western European core regions the causality is only unidirectional from economic growth to increased airport activity. However, they also conclude that the evidence from their Granger causality test is "more indicative than confirmatory", therefore still leaving the question open (Mukkala & Tervo, 2013, p. 1516). Baker et al. (2015) concludes that the relationship between taxpayer income and number of passengers is bi-directional, describing the results robust since the causality is found significant in both short and long run testing. Other studies do not provide further evidence on the causality issue in their testing, but use certain variables – such as the age

distribution of population, climate in the region and share of population with a higher-level degree – which are meant to tackle the issue of causality measurement (e.g. Brueckner, 2003; Button et al., 2009; Cidell, 2014). Both Cidell (2014) and Graham and Guyer (2000) describe the case of the airport averting economic development in the region. This could occur if the airport-related economic activity is diverted from somewhere else in the region, thus it would not be creating "new" development *per se* but rather distributing existing activity differently within the region.

6 Findings

The majority of airport effects on regional economic development happen through employment, as some definition of it is mentioned as the result of air traffic effects in 14 of the 17 articles, as in approximately 82% of the selected literature. Population, accessibility and diverse economic structure or some definition of them are all at a similar level, population mentioned 5 times, accessibility 6 times and diverse economic structure 4 times, all building up to 20–40% individual shares of the selected literature. The coding frame used in categorizing these expressions of indicators of regional economic development can be seen in Table 3.

The indicators act as head categories as described in the methodology chapter of this thesis, through them the articles were analysed and expressions relating to the indicators were gathered. Since employment or some definition of it was mentioned so many times, the expressions were further categorized to correspond the theoretical framework more clearly. As the table suggests, there is some overlap with the expressions and their categorizing. For example, the expression “frequent airline service to many destinations attracts new employers” mentions new employers, hence implying it could be categorized under employment. However, the idea in the expression is to describe the effect airline service has on accessibility and therefore attracting business establishments, therefore being categorized under accessibility. The next sub-chapters discuss the findings further per each indicator of regional economic development.

Many of the articles (e.g. Baker et al., 2015; Button et al., 2009; Florida et al., 2015) discuss the fact that airports and air traffic add to economic development by moving people, therefore contributing to employment, income and population growth. But if the increase in employment, income and population comes first boosting the demand for air services or if the airport is the engine of the region’s economic growth remains an issue requiring further research. Most of the studies do assess the direction of causality, and these takes on causality are discussed in the following sub-chapters as well as the conclusions of this thesis.

6.1 Employment

Employment is sub-categorized into employment creation and wealth creation in this thesis to correspond better to the theoretical framework. The previous research addresses employment as both numbers of total employment and income per capita as well as growth rates of employment and also income. On top of these, employment is discussed from the point of view of different sectors of employers, such as manufacturing and service. Also included in the employment category is the often-used variable GDP and GDP growth, the categorizing of GDP under employment is justified in the theoretical framework of this thesis.

Table 3. The coding frame for regional economic development indicators.

Regional economic development	***Sub-categories***	***Codes***
Employment	*Employment creation*	Total employment, local employment, sectoral employment, employment in manufacturing sector, employment in service sector, employment growth, airport as an employer, employment generation, new economy employment, total non-farm employment, employment in the metropolitan area, goods-related employment, service-related employment, total number of jobs
	Wealth creation	Average weekly wage, economic output, GDP, real GDP growth, income, income growth, income per capita, income per worker

Population		Annual growth rate of population, population in the metro area, human capital, talent share, total population
Accessibility		Total trade, increase of international destinations, distance to airport, economic benefit of easy access to and from other regions, on-site economic activity catalyst, attracting business by accessibility, frequent airline service to many destinations attracts new employers
Diverse economic structure		Number of business establishments, employment effects by sector, number of professional service establishments

6.1.1 Employment creation

Airports and air traffic contribute to employment creation through the number of passengers, number of flights originating from the airport and the number of destinations available. These are the most often used variables in measuring airport and air traffic effect. Increase in both the number of passengers and the number of flights is found to lead to increase in total employment or employment growth depending on which variable the study uses. However, when going deeper into the findings in the studies it can be interpreted, that the economic significance has to be taken into consideration. Bilotkach (2015) and Florida et al. (2015) address the significance issue more than the other studies, stating that the meaning for economic development is very modest.

For example, Brueckner (2003) concludes that a 10% increase in the number of passengers yields to a 0,9% increase in total employment in the region. Blonigen and Cristea (2015) conclude that a 50% increase in the number of passengers on average leads to a

2,7% increase in employment growth rate. Considering for example Finland, the change in number of passengers in Finnish airports altogether has stayed under 5% almost every year from 2010, excluding years after 2020 where the lift of COVID-19 restrictions affects the numbers (Finavia, 2023c). It cannot be considered reasonable or realistic that there suddenly would be a 50% increase in the number of passengers altogether throughout the Finnish airports, at least not all at once. However, for certain regional airports it could be possible and realistic with new routes, since the number of passengers and routes available is low to begin with. But it is not realistic to base justifications of public funding on these numbers emerging from previous research. The airport and its activity most probably have an effect on total employment and employment growth, but as can be interpreted from Bilotkach (2015), the statistical significance does not yield economic significance automatically. It also must be noted that the results from certain regions cannot be straightforwardly moved to a location with different features, since differences between regions inevitably affect the estimations (Button et al., 2009, p. 11).

There is a consistency in the previous research on which sectors air traffic contributes to. Most studies find positive relationship between increase in passenger and flight numbers, and service and trade-related employment, but no significant effects are seen for manufacturing industries (e.g. Blonigen & Cristea, 2015; Brueckner, 2003; Percoco, 2010; Sheard, 2014). As Sheard (2014, p. 147) points out, manufacturing and non-tradable industries typically produce goods that are consumed at the immediate vicinity or are not practical to be moved for long distances by air, thus the industry also does not benefit from air traffic as much in their activity. However, there still are companies that may be considered a part of the manufacturing industry, but still contribute to international markets and therefore would benefit from functional air service to access foreign customers and suppliers. For example, a poll targeted to companies in the Finnish Satakunta region concluded that 86% of the region's companies need the air service between Pori and Helsinki in their business activities (Hammarberg, 2022). Interestingly, the region of Satakunta heavily leans on manufacturing industry in their strategy (Satakuntaliitto, 2023). This might further emphasize the fact, that research targeted especially to northern

Europe and Finland exclusively is needed, since the economic structures might drastically differ from the one's studied in existing research. The poll was conducted by operators heavily influenced by local entrepreneurs and business establishments, so it cannot be considered objective, but it still suggests an anomaly from previous research.

The number of destinations available from the airport is an interesting factor in creating employment. Bilotkach (2015) concludes that a new destination in a MSA airport leads to 98 new jobs in the region. Button and Taylor (2000) find that an increasing of routes to Europe from 3 to 4 generates approximately 1760 new jobs. In Button and Taylors work, the jobs are concentrated in "new economy"-sector: industries that are geographically mobile, on the contrary with traditional industries such as mining and shipyards which are geographically fixed at a certain location. Examples of this kind of employment are IT software and services, biotechnology, and electronics, and according to Button and Taylor (2000, p. 213) employees in these industries fly 1,6 times as much as employees in traditional sectors of employment.

The work of Button and Taylor is already quite old but can still be considered relevant, since the definition on new economy employment still holds up. Some recent additions to it could be the employment created from blockchain industries and social media-related companies for example. The reason for employees in these sectors flying more than in traditional sectors is the bigger need for face-to-face contacts with customers and suppliers, since the products or services provided are not necessarily consumed in the same region (Button & Taylor, 2000; Brueckner, 2003). From this point of view, the economic structure of regions is an important factor as well. If subsidies to air traffic are justified with accommodating local business activities, it might be reasonable to understand if the regional economic structure leans to the so-called new economy employment or if it is mostly still dependable on more traditional sectors of employment. If the region has representation of new economy employment, it might also suggest a greater need for air transportation – especially if the companies are international or their activities are directed to international markets. However, as Button and Taylor (2000)

conclude, the additional international routes do not endlessly generate more jobs for a region. The more destinations the airport has in the beginning, the more the number of generated jobs diminishes. For example, an increase from 20 to 21 international routes only contributes to employment with 440 new jobs. So additional destinations are not a never-ending producer of economic activity.

6.1.2 Wealth creation

Considering income and average wages, the same variables of air traffic that were found to be important for total employment and employment growth rates seem to be the accelerators here too: number of passengers and flights, and number of destinations available. Number of destinations is only mentioned by Bilotkach (2015) and the contribution is described statistically significant, but economically the effect is modest: a 10% increase in destinations yields a 0,2% increase in average wage in the region. Other studies do not use or mention the number of destinations in relation to income and wages. The power of adding new destinations in creating employment is discussed in more than one study, but in creating wealth it's mentioned only once.

Assessing the meaning of adding a new destination might give light to this difference. New destination might mean easier access to customers, suppliers and international markets for local businesses. This could further accelerate their activity and lead to the need of more factors of production, thus also creating jobs and accommodating employment growth. But the relationship to income and wages is not as linear, since more jobs and higher employment rate does not necessarily yield a rise in wages. Either this idea prevents more researchers from using the adding of new destinations as variable of airport activity in regional economic development studies or it is not seen important for some other reason. Nevertheless, the fact that Bilotkach (2015) conducts a relationship between new destinations and average wage might suggest the need for more studies using the variable to generalize the usefulness of it.

Allroggen and Malina (2014) categorize airports to three different classes, first- second- and third-tier airports, by the number of passengers in the airport. They discuss the impact adding new destinations or increasing service to existing destinations has on economic development of the region, concluding that the impact is positive only on first- and second-tier airports. Bilotkach (2015) uses MSA airports without further categorizing them by size or number of passengers, thus not partaking in the same discussion as Allroggen and Malina. Bigger airports, first- and second-tier airports that is, also serving international routes accommodate business travel according to Allroggen and Malina (2014), whereas third-tier airports are more important for low-cost airlines and regional travel. Low-cost airlines accommodate mostly leisure travel, which does not contribute to regional economic development since it diverts the money flow away from the region with tourists travelling to different locations to spend their money. This is an important finding, because even though for example Finland does not have enough difference between airport size to classify them as first-, second- and third-tier airports, there are differences in how much of the air traffic is business related and how much leisure travel. Grasping this concept and including it in further research on Finnish airports could give important information on the character of an airport, thus also giving evidence on if the traffic the airport accommodates is contributing to the economic development of the region or maybe preventing it.

Number of passengers and flights are defined to have a statistically significant positive impact on average wage and income growth in more than one article (Baker et al., 2015; Bilotkach, 2015; Blonigen & Cristea, 2015; Button et al., 2009). According to Button et al. (2009) doubling of passengers could lead up to a 4% increase in a region's per capita income. The other studies are in line with the magnitude, although Blonigen and Cristea discuss growth rates instead of total income, but the magnitude of growth rates is similar to the other studies. Difference between the studies discussing air traffic and income relationship occur in Baker et al.'s (2015) work, where the relationship is found to be bi-directional instead of ruling the causality to run from air traffic to income growth. It seems reasonable to assume, that with an increase in income level in the region, also

spending to travel might increase thus affecting passenger numbers. The other studies do not exclusively rule out bi-directionality but use different control variables to rule out the simultaneity issue of other factors effecting regional economic development, thus concluding that air traffic effects income growth and wages, but not vice-versa.

6.2 Population

Population might be the most interesting indicator in regards to the direction of causality. While it seems obvious that a region with a larger population would have more air traffic than a region with less population, the other direction of causality does not come forward as obviously. Population, which is understood by the definition of human capital in this thesis, follows labour markets as is established in the theoretical framework. In the previous sub-chapters the meaning of employment for regional economic development was discussed, and air traffic seemingly has a positive impact on employment in regions. Thus an assumption could me made that population benefits from increasing air traffic as well and according to existing literature this assumption would be quite reasonable.

There is more dispersion of how airports and air traffic impact population, than there is with employment and wealth creation. Number of passengers seems to hold up in this case too, but also the distance to the nearest airport in the region is found to affect the amount of human capital (Blonigen & Cristea, 2015; Button et al., 2009; Chen et al., 2018; Florida et al., 2015; Green, 2007). Blonigen and Cristea (2015) conclude that a 50% increase in the number of passengers would lead to a 1,55% increase in population growth rate. This effect is very slightly larger than in Green's (2007) findings, but otherwise in line with it. There is a strong consensus that air traffic has a positive and significant impact on population, but yet again the direction of causality is proven to be an issue difficult to robustly conclude. Brueckner (2003) concludes that a 1% increase in population yields a 1% increase in the number of passengers, implying the causality runs from population changes to air traffic changes – which, as established before, is easier to comprehend. Brueckner discusses the population with a higher level degree and also concludes

that highly educated inhabitants are more likely to work in industries that require more frequent business travelling, hence increasing air traffic. This is in line with the new economy employment -idea which was discussed with the employment indicator as well.

Chen et al. (2018) conclude that the distance to airport affects the region's talent share, as in the number of human capital. According to them, the number of population with a bachelor's degree increases the closer the region is to an airport. This finding however is contradictory to Florida et al.'s (2015) findings, since they conclude that there is no significant relationship between having an airport in the region and the amount of human capital. Florida et al. (2015) explain this by reminding that the bigger the population is to begin with, the more likely the region is to have an airport as well. Since major airports are huge infrastructure projects, they are not built up quickly. Thus the majority of studied airports have already existed for decades, and the amount of human capital today would not affect if the region has an airport or where it is located. Chen et al.'s (2018) findings therefore just imply that human capital is focused closer to an airport, which might suggest either concentration of possible employers in the vicinity of the airport or that inhabitants with higher level degrees appreciate a shorter distance to the airport and it's services.

6.3 Accessibility

Accessibility is both an accommodator for the three other indicators as well as an indicator itself, benefitting from the airport and the air traffic activity. As concluded when discussing population and employment, adding of destinations has a positive impact. Adding of destinations gives access to a broader network of activities considering both business and leisure travel, increasing the accessibility of the region and thus making it a more attracting location for human capital and business activity altogether (Chen et al., 2018). The overlap between the indicators makes it again difficult to define the causality and level of significance airport has on accessibility but nevertheless, the more accessible the region is, the more it can accommodate economic growth and development.

Brugnoli et al. (2018) discuss the relationship of trade and air traffic by studying the impact a ceasing of air traffic in an airport has on the region's total trade. They conclude that air traffic volume has a significant positive effect on international trade, hence implying that the accessibility of the region is an important factor in properly accommodating local business activity. The de-hubbing of a certain airport and ceasing important routes leads to significant decrease in manufacturing trade (Brugnoli et al., 2018). This again is a bit contradicting with the employment sector findings, since manufacturing sector was seemingly the one sector where air traffic does not affect employment rates. This contradiction might yet again be explained by regional differences, since the study of Brugnoli et al.'s focuses on a certain trade-invested region of Italy and the other studies mostly on bigger metropolitan regions with different economic structures. This further supports the idea that air service is important for the accessibility of the region and its possibility to accommodate international trade.

Whereas Cidell (2014) discusses the so-called "airport city"-phenomenon critically, for example Graham and Guyer (2000) emphasize the meaning of airport as the catalyst for on-site economic activity. Airport city -idea focuses on developing business parks in the immediate vicinity of the airport, for example the Aviapolis area in Vantaa, in vicinity from the Helsinki-Vantaa international airport. The airport has an important role as a hub for international trade and business activity, thus gathering different operators to the nearby areas and establishing a role as a generator of economic growth. Even though Graham and Guyer (2000) seemingly support the idea of airport as the economic engine, they also criticise the "business parks" with similar arguments as Cidell (2014): the economic growth happening at the vicinity of the airport is taken from somewhere else in the region, thus not adding value to the total economic development of the region, rather just directing it to a different location.

Mukkala and Tervo (2013) and Chen et al. (2018) become to similar conclusions about the distance-factor in airport impacts. Mukkala and Tervo (2013) define accessibility as

the travel time to other European regions, whereas Chen et al.'s (2018) take is the distance to the nearest airport in the region. Both conclude that the distance factor, hence accessibility, contributes significantly to regional economic development. The travel time to other European regions defining accessibility could be a very important variable in further research focusing on Finnish regions since Finland is quite far away from the political and business centres of the EU for example. The more accessible a region would be from other European regions, the more it would prevent obstacles in international governmental collaboration and trade as well.

6.4 Economic structure

Diversity of economic structure builds from both diversity of employers by sector but also from the number of business establishments in the region. Air traffic has an effect on the so called new employment sector, more than traditional sectors of activity such as manufacturing for example. This is already established in the discussion of the employment indicator, but it still is worth a mention here as well since it naturally contributes to diversity of economic structure just as much.

Blonigen and Cristea (2015) conclude that a 50% increase in air traffic leads to a 2,7% growth increase in the number of business establishments. However, Bilotkach (2015) concludes that there is no statistically significant relationship between an increase in number of passengers or flights and the number of business establishments. These are the clearest contradicting findings in the existing literature. Cidell (2014) partakes in this discussion from a different point of view by concluding that the number of professional service establishments does not seem to be affected by the vicinity of an airport. So by far from the indicators the airport impact on diversity of economic structure is the only one that does not yield in robust and credible results. Even though the other indicators face criticism from this thesis' point of view as well, diversity of economic structure is by far the weakest justification that can be used in defining the legitimacy of publicly funding air traffic.

Overlap between employment and economic structure leads to the question if the employment generated by air traffic activity happens because of increasing production at existing establishments or if it is caused by the opening of new establishments. Existing literature would suggest to increase in production, since there is no strong consensus on if air traffic activity actually leads to new establishments opening in the region. Increase in number of passengers or flights cannot be ruled a strong predictor of new business establishments, but the addition of new destinations does seemingly affect the number of business establishments. Bilotkach (2015) concludes that adding a new destination at a MSA airport, with every other detail staying the same, would lead to 4 new business establishments in the region. There are no contradicting findings to Bilotkach on the impact of adding new destinations, therefore yielding a little more credibility to the economic structure argument. Nevertheless, diversity of economic structure can still be ruled out as a robust justification of regional economic development caused by air traffic activity.

7 Conclusions

This thesis has proceeded to discuss the legitimacy of publicly funding air traffic by studying existing literature on the relationship of regional economic development and air traffic. First, as public funds continue to be a limited resource provided mainly by taxpayers, there is a need to credibly justify the use. Second, there are a number of causes needing public funds, therefore reasonable motives must exist to justify the use of money somewhere and denying the use somewhere else. Regional economic development in this thesis is defined through four indicators: employment, population, accessibility, and the diversity of the economic structure. Through the systematic literature review and content analysis this thesis proceeded to find how and if air traffic influences these indicators of regional economic development. These effects define the legitimacy of publicly funding air traffic.

In conclusion it has to be stated, that the airline industry is after all a business. Airlines make their decisions on routes based on the markets and profits – with the vitality and success of their company in mind, rather than the vitality of the region they are flying from and to. Publicly subsidizing certain unprofitable flight routes seems to be the only efficient way for governments and regional decision-makers to influence the availability and continuity of flight routes, otherwise the decisions are made solely from business points of views by the airline operators. The views of airline operators and governmental authorities differ from each other so significantly, that it is not reasonable to even consider that they could reach an understanding without something like PSOs in place. However, transparency in the process of issuing PSOs and tendering them could lead to more airline operators partaking and offering their services. Norway has had issues in the past with the tenders because there has only been one or two offers, which does not lead to a very cost-effective tendering process. A critical review of demands, rights and responsibilities set for airline operators to take part in tenders could lead to a more effective and transparent process, thus also leading to more transparent use of public money.

In the future, subsidizing air traffic might still be necessary, but as can be concluded from the previous research there is a need for further research and scientific evidence on air traffic effects on regional economic development to justify the use of public money. Especially in northern Europe and Finland specifically, there is a need for empirical statistical estimations conducted with Finnish airports and the economic development data of the regions they serve. The results of existing literature are from different and bigger regions than any region in Finland, thus making the results not fully transferable. Excluding Helsinki area in Finland, none of the regions pass as metropolitan regions, thus differing from previously studied regions significantly. Since there is seemingly no research on the relationship between air traffic and regional economic development in Finland, it would be reasonable to begin with estimations following the previous literature to first have scientific evidence if the estimations are applicable in Finland or not. This would establish the need for further research and give a direction for it.

It is highly likely, that especially considering shorter regional flights, electronic aviation and efficient alternative jet fuels are the future. The development and shift from fossil fuels to greener options is slow, and might need encouraging from governmental level in the form of subsidies. Thus it would be reasonable for governments to consider subsidising technological development of aviation, since when the availability of alternative jet fuels increases and electronic aviation becomes a possible option, airline operators might look at regional routes differently. Since electric aviation, at least for now, is directed to shorter routes as a more cost-effective option, airline operators might be increasingly interested in operating these shorter regional routes without subsidies in the future. This is of course heavily dependent on if electric aviation can be made commercial, but since governments seek carbon neutrality and greener options in everything else, why not aviation as well. In Norway, a goal has already been set for aviation to be free from fossil fuels by 2050, and airline operators such as SAS and Norwegian, as well as government authorities have committed to this goal (Solvoll & Sandberg Hanssen, 2022, p. 13).

7.1 Findings and the collective meaning of them

In existing literature, a clear relationship is established between air traffic and employment – with several articles concluding a both statistically and economically significant relationship. The other three indicators, population, accessibility and diverse economic structure are also mentioned in literature but not as often as employment. On average, a 50% increase in air traffic growth would yield 1–2% increases in growth rates of all the indicators except diverse economic structure. Blonigen and Cristea (2015) do conclude a relationship between air traffic and diversity of economic structure, but the findings of Bilotkach (2015) are entirely contradicting, thus weakening the robustness and making diversity of economic structure not a good argument. Even though employment is mentioned and used as a variable most often, air traffic does not seem to statistically affect it more than the other indicators. Thus, the incidence of employment as a variable might be explained just with the fact that it is a very commonly used variable when discussing economic development of any kind, rather than it being drastically more important in air traffic impact studies.

The consensus in existing literature is that airports and air traffic have an effect on regional economic development, but a full exclusive conclusion of the direction of causality is not found. Thus, the causality relationship between air traffic and regional economic development might be bi-directional in some cases as well, slightly weakening the credibility of using regional economic development as an argument in justifying publicly funding air traffic. Many of the studies have proceeded to tackle the causality issue with different control variables and measurement methods, resulting in finding uni-directional relationship between air traffic and regional economic development. However, some have also found bi-directional relationships with similar methods, proving that the measurement of regional economic development and what causes it, is difficult.

This thesis and the findings are important both for science, and for regional and governmental decision-making. This thesis brings together previous findings on the

relationships between airports and regional economic development, thus providing a good starting point for further empirical research in regions that previously have not been researched thoroughly. This thesis acts as a critical and thorough review and analysis of the existing literature on the matter, thus also providing information on what kind of difficulties exist in the research and how certain errors in estimations could be avoided in the future.

Considering regional and governmental decision-making, this thesis suggests a need to revisit the justifications used when allocating public funds to air traffic. The findings show a critical issue where the meaning of airports is used as a universal truth rather than focusing on existing scientific evidence. The findings are not purely negative since there is a proven positive relationship between air traffic and regional economic development. This thesis rather suggests a need for governments and regional level authorities to consider funding and encouraging research focusing on the meaning and effectiveness of air traffic for regional economic development as well. In light of this kind of research the subsidies paid would become more transparent since the effects for actual regional economic development could be seen.

7.2 Reliability and limitations of the thesis

The purpose of this thesis is to discuss the legitimacy of publicly funding air traffic from the point of view of regional economic development. The chosen methods and materials do a good job in partaking in the discussion, however the regional scope of the available literature inevitably prevents the discussion from including northern regions of Europe as much as metropolitan regions in the US for example. If the focus of this thesis would have more heavily been on peripheral and remote regions, this issue might not have occurred. However, the time and resources available for this thesis were limited and therefore certain choices on the magnitude were made.

Assessing the reliability of this thesis, repeatability of the method is an important factor. The research methods and materials are thoroughly explained and justified, and the process is described both in text and as a figure (see Figures 4 and 6). This is done to the best capability of the author to make the process as transparent, understandable and repeatable as possible. Selection bias is possible in the literature screening process, and it might even suggest a selection bias in the publishing of literature on the relationship of air traffic and regional economic development since there are no studies concluding an obvious negative relationship between the two. The selection bias might therefore affect the available literature and therefore also the final selected material and findings of this thesis. The selection process is still nevertheless thoroughly explained and made repeatable to tackle possible errors.

In terms of defining regional economic development, the defined indicators are widely used in regional sciences and therefore their use in this thesis is validly justified. However as discussed in the findings, there is significant overlap between the indicators. This makes the interpretation of the findings a more complicated process, nevertheless still yielding clear results for science and further research. This issue with overlapping could be avoided in future research by defining regional economic development with only one combined indicator, or more precisely making a clear difference between all the indicators used. The diverse economic structure indicator resulted in the weakest findings and if it would be used in future research, it definitely should be more precisely defined to actually have a beneficial role as an indicator.

7.3 Future research possibilities

As mentioned previously, statistical estimations of Finnish airports and regions are needed to acquire transparency in the use of public funds on air traffic. However, this matter provides other interesting directions for future research as well. The quasi-natural experiments conducted by Blonigen and Cristea (2015) and Brugnoli et al. (2018) could be the base for studies in Finland as well. Since the routes of regional Finnish

airports have seen end of airline services numerous times, there are many possibilities to conduct empirical research using the exogenous event of ceasing services as the beginning point. COVID-19 also provides an interesting ground for research focusing on regional air traffic before and after the pandemic, and maybe even a follow-up study on how the regional air traffic recovers in the coming years.

A qualitative study conducted with interviews or questionnaires could also provide interesting information on the meaning of airport in a region. However with interviews the problem of choosing the right target groups might be difficult, as Button and Taylor (2000, p. 214–215) indicate. All point of views, from business world to regional authorities, are subjective, thus it could be challenging to get general robust knowledge from the interviews. One idea could be to first conduct interviews in local entities and regional development experts, and secondly conduct a statistical analysis of the region's economic development data, thus giving light on if the views of local operators and the actual data are in line or not.

One factor interesting for future research could also be the relationship between rail and air traffic. For example the cases of Vaasa and Jyväskylä in Finland could be fruitful, since both are approximately a 4-hour train ride from Helsinki, but Vaasa has market-based air traffic to Helsinki and Jyväskylä needs publicly funded air traffic to keep the routes continuing. What are the key differences between the regions that the other can accommodate market-based air traffic and the other one cannot? And what could be the result if subsidies were directed into developing faster rail connections or more capacity in rail traffic? Altogether the possibilities of developing faster rail traffic are interesting, however high-speed rail is probably not realistic in Finland, since establishing networks for HSR would negatively affect the accessibility of smaller regions that are not worth enough to have their own stations.

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