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# **Small States and Knowledge Governance: the Case of Latvia**

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**Declaration:**

Hereby I declare that this doctoral thesis, my original investigation and achievement, submitted for the doctoral degree at Tallinn University of Technology has not been submitted for doctoral or equivalent academic degree.

Lauma Muižniece

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# Väikeriigid ja teadmiste juhtimine: Läti juhtum

LAUMA MUIŽNIECE





# Contents

List of Publications .....	6
Author's Contribution to the Publications .....	7
Introduction .....	8
Abbreviations .....	13
1 Methodology.....	14
2 Changing characteristics of university–industry linkages and the role of the state ....	17
2.1 Changes in approach to science and innovation policy .....	17
2.2 University technology transfer.....	19
2.3 The Triple Helix model and its implications for universities .....	21
3 Knowledge governance challenges in the context of a small, catching-up country ....	26
3.1 Knowledge governance approach.....	26
3.2 Constraints of small states .....	28
3.3 Contextual factors influencing knowledge governance in CEE countries .....	30
4 Development of the knowledge governance system in Latvia .....	35
4.1 Structure of economy and domestic needs .....	35
4.2 The landscape and governance of R&D and innovation .....	36
4.3 Impact of contextual factors on governance mechanisms for facilitating university–industry linkages .....	40
5 Knowledge governance structures and mechanisms and their impact on university–industry linkages .....	44
6 Conclusions and directions for further research.....	47
List of Figures .....	50
List of Tables .....	51
References .....	52
Acknowledgements.....	66
Abstract.....	67
Lühikokkuvõte.....	69
Appendix .....	71
Curriculum vitae.....	169
Elulookirjeldus.....	170

## List of Publications

The list of author's publications, on the basis of which the thesis has been prepared:

- I Muizniece, L. (2020) University Autonomy and Commercialization of Publicly Funded Research: the Case of Latvia. *Journal of the Knowledge Economy*. <https://doi.org/10.1007/s13132-020-00681-x> (1.1.)
- II Muižniece, L.; Cepilovs, A. (2018). Disregarding History and Context: Innovation Policy in Latvia Post 1990. *New Challenges of Economic and Business Development – 2018: Productivity and Economic Growth. Proceedings*, 474–487. Riga, Latvia: University of Latvia. (3.1.)
- III Muižniece, L.; Cepilovs, A. (2017). Supporting University Technology Transfer – Struggles and Barriers in Latvia. *Economic Thought and Practice*, 1, 321–342. (1.2.)
- IV Cepilovs, A.; Muižniece, L. (2016). Latvia after EU accession: weathering the storm? In: L. Briguglio (Ed.). *Small States and the European Union: Economic Perspectives*, 87–110. Routledge. (3.1.)

## **Author's Contribution to the Publications**

Contribution to the papers in this thesis are:

- I The publication was single-authored by the author of this thesis.
- II Author of the thesis was the lead author formulating the research problem, structuring the research design, conducting data collection and analysis, writing a major portion of the paper and coordinating correspondence.
- III Author of the thesis has contributed equally with the co-author as the main idea for the paper was developed jointly. The author of the thesis was responsible for the overall research design, collection of data, correspondence and coordination.
- IV Author contributed to data collection, analysis and participated in write-up of the chapter, while correspondence, coordination, research design was the sole responsibility of the other author.

## Introduction

Movement towards an increasingly knowledge-intensive economy and society has put the governance of knowledge at the centre of policy debate for at least the last three decades. Knowledge is a recognised driver of growth, and a region's ability to develop economically and socially is linked to its ability to produce and utilise knowledge (Schmitz et al., 2017). Facilitating production, diffusion, and appropriation of knowledge are key priorities in policymaking. This means ensuring a steady supply and finding the most efficient ways for the supply and demand sides to meet and interact (OECD, 2011).

Universities have played increasingly important roles in these processes – as key providers and diffusers of knowledge. They have become more and more relevant to the debate through institutional changes (though these changes have taken place in different countries during different time period<sup>1</sup>)—first, when research was integrated with teaching (i.e., the move from a teaching college to a research university) and second, in the shift from research universities to an entrepreneurial universities that also translate the knowledge created into economic benefits (see e.g., Etzkowitz, 1990, 2003b). Starting in the United States, policy aspirations to strengthen science–industry linkages and diffusion of knowledge produced in universities have also been legitimised and enforced through facilitation of a wide range of technology transfer activities. The overall emphasis on fostering dynamic government–science–industry relations in the European agenda significantly increased in the early 1990s when the European Commission raised the issue of the apparent struggle to transform the results of technological research and skills into innovations and competitive advantages, known as the “European Paradox” (European Commission, 1995). Policies in the European Union (EU) were already strongly directed towards increasing science and technology linkages (Sachwald, 2015), and a more active role in technology transfer was encouraged for universities through structural changes and support incentives (Grimaldi et al., 2011). Meanwhile, universities have welcomed this trend due to the potential for large revenues from research commercialisation and the possibility of contributing to economic and regional development (Link et al., 2007; Stephan, 2012).

Many catching-up countries have gone through this transformation during the last decades. Latvia, a small post-Soviet country, went through this transformation very rapidly after regaining its independence in 1991. It had to restructure all domains of its economy, including knowledge creation and diffusion processes, as these processes in the USSR were very different – with a separation between teaching, basic research, and applied research. As Latvia moved towards and eventually joined the EU in 2004, significant external (EU) funding for these transformations became available to facilitate the catching-up process. During this process, the policy rhetoric shifted from a “science and technology policy” towards an “innovation policy,” and the EU has acted as a key variable influencing innovation policy evolution in Central and Eastern European (CEE) economies since the late 1990s (Karo, 2011; Suurna & Kattel, 2010; Varblane, 2007). The impact of the EU on the national level is reflected through the establishment of long-term strategic documents and policies related to innovation and research and development (R&D), through strengthening the role of the public sector and through

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<sup>1</sup> Etzkowitz (1990, 2003b) discusses two academic revolutions – first taking place in the 19<sup>th</sup> century when universities integrated research as a function in addition to teaching and the second academic revolution originating from the US in the 20<sup>th</sup> century; however, in the case of Latvia, these changes took place after the collapse of the Soviet Union.



funding. EU funding became the major source for research and innovation policies, including institutional transformation of universities. Still, despite the influence and accompanying funds, local idiosyncrasies affected the implementation of European policy ideas and guidelines (Karo, 2011; Lepori et al., 2009; Radosevic & Lepori, 2009; Suurna & Kattel, 2010; Veugelers, 2016).

Statistics and research show that Latvia and other CEE countries have had limited success in capitalising on their science base since regaining independence (Arnold et al., 2014; Kravtsova & Radosevic, 2012; Meske, 2004; Radosevic, 2006; Veugelers, 2016). Latvia's aims and targets in science, technology, and innovation for the more recent 2014–2020 period have been addressed in multiple documents. The National Development Plan 2020 foresaw an increase in R&D funding, reaching 1.5% of Gross Domestic Product (GDP) by 2020,<sup>1</sup> emphasising the cooperation of higher education, science and the private sector, university–industry technology transfer, and research commercialisation. The main aim of Latvia's science, technology, and innovation policy was to increase the competitiveness of Latvian science and innovation and to facilitate its contribution to the national economy and society (Ministry of Education and Science of the Republic of Latvia, 2013). As a sub-target it also foresaw strengthening in the innovation capacity of the private sector, resulting in business expenditure in R&D reaching at least 48% of total investments in R&D (fact – 24% in 2019), an increase in the percentage of innovative companies – 40% of total number (fact – 32.9% in 2018), as well as an “increase [in] the return on investment of scientific institutions in research and development, creating a more efficient transfer of knowledge and technology environment” (Ministry of Education and Science of the Republic of Latvia, 2013, p. 40).

One of the targets of Latvia's science, technology, and innovation development policy, which was fulfilled in 2016, was for Latvia to reach the group “Moderate innovators” (with an overall innovation performance below the EU average) in the European Innovation Scoreboard (EIS) – an annual report comparing the innovation performance of European countries and regional neighbours. However, some areas in Latvia's innovation performance (e.g., “linkages,” “private co-funding for public R&D,” and overall R&D expenditure), both for the overall economy and that of the business sector, have struggled to substantially improve despite the policy commitments, significant funding flows, and periods of relatively high economic growth and with science–industry linkages continuing to be a focus of innovation policy. Additionally, while according to OECD (2019), Latvia fares better in research excellence than many other CEE countries such as Slovenia, Lithuania, Hungary, Czech Republic, Slovak Republic, and Poland, it still lags behind the OECD average and performs worse than its Baltic or Eastern European peers in the share of small and medium-sized enterprises (SMEs) engaging in collaboration with research institutions and international collaborations in research.

To investigate the causes of this and propose policy recommendations, this thesis uses a “knowledge governance” approach as a framework. The approach was proposed by Burlamaqui (2010, p. 562) as a better way to understand the issues of knowledge production, appropriability, and diffusion. However, knowledge governance is not the first approach to look at knowledge production, diffusion, and appropriation systemically. Three periods for how science and innovation processes were viewed

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<sup>1</sup> The National Development plan foresaw an increase in R&D funding to 1.5% of GDP during the period of 2014–2020 (from 0.69% in 2014), and during the same period, Latvia went through a period of relative prosperity; however, R&D funding was still a worryingly low, at 0.64%, in 2019.

theoretically and approached by policymakers are distinguished (Schot & Steinmueller, 2018; Smits & Kuhlmann, 2004). The first period focused on science and technological development as one of the main drivers of economic growth (Kuznets, 1973), which resulted in the facilitation of a linear approach in innovation and increases in active government funding for R&D (Schot & Steinmueller, 2018). The second period saw the rise of the systems approach and the emergence of concepts like the National Innovation System (NIS) that emphasise knowledge flows and the interaction of different actors as key to fostering innovation and put more emphasis on facilitating dynamic government–science–industry relations (Freeman, 1987; Lundvall, 1992). However, as Burlamaqui et al. (2012) and Kattel (2012) argue, NIS-related research strands emphasise linkages and interactions among the actors but do not focus on the need to coordinate these processes. Meanwhile, knowledge governance encompasses intellectual property rights, innovation, and competition policies and looks at how supervision, rulemaking, regulation, policy prescriptions, and institutional coordination influences knowledge processes (Burlamaqui, 2010; Burlamaqui et al., 2012). The need to govern these processes is all the more important as the approach to science and innovation is changing yet again. Smits and Kuhlmann (2004) argue that science and technology should be understood as opportunities rather than ready-made solutions and can be adapted and implanted through various types of learning. That changes the role of the government from builder and sustainer of innovation systems to facilitator of such learning processes. Meanwhile Schot and Steinmueller (2018), Mazzucato et al. (2020), Borrás and Edler (2020), and others describe the emerging focus on socio-economic challenges such as climate change and poverty, questioning how science can be used in tackling these challenges and how such use can be stimulated by the state taking an active role through science and innovation policy measures. Addressing the grand challenges is a difficult task not only for policy but for science, technology, and innovation actors and requires bringing these actors together, providing an opportunity for them to transform and facilitate emergence of new ones as well (Kuhlmann & Rip, 2018). This highlights the need to evaluate the ability of universities to contribute and build the capacity of the public sector to govern all the related processes and design and implement a wide variety of appropriate policy measures that go beyond the dominating financial instruments (Smits & Kuhlmann, 2004).

Because of significant attention by the policy makers on directing funds to R&D and the commercialisation of research, this thesis combines a knowledge governance approach with research on “triple-helix” academic–industry–government relations (see Etzkowitz & Leydesdorff, 1995, 1997; Leydesdorff & Etzkowitz, 1996) and the “entrepreneurial university” (Etzkowitz, 2003b, 2013; Etzkowitz et al., 2000) to address the transformations taking place at universities – to what degree universities have transformed since Latvia regained its independence, what governance mechanisms have been used to facilitate universities fulfilling their role in a knowledge-based economy with the changing characteristics of government–university–industry relations, and if these mechanisms correspond with the transformations needed.

While the idea of the entrepreneurial university is embraced in EU policy rhetoric, it is also critiqued as a model designed on the successful case of the Massachusetts Institute of Technology that works poorly when applied to more average universities and regions (Cooke, 2005). Grimaldi et al. (2020) argue that there is currently a fixation on cutting edge technologies and there have been remarkably few studies on how universities can contribute to the growth of companies in traditional sectors, which is also relevant for

Latvia. Still, it has been widely used and referenced when designing policy measures in countries like Latvia. Therefore, this thesis aims to contribute to the debate and investigate whether this approach is justified and whether universities have transformed and become “entrepreneurial.” It also aims to investigate if and how the chosen policy measures have addressed local needs and capabilities (such as mismatched knowledge supply and demand and innovation absorption capacity of the local industry) and if the chosen policy mix is justified to address the emerging science and innovation framings (such as focus on grand challenges and key tendencies in public policy influencing knowledge governance).

However, among other factors, the size of the country can influence policies and the process of making them (Thorsteinsdóttir, 2000) and is a source for a variety of constraints (Armstrong & Read, 2003). That also includes the realm of knowledge governance; however, previous research has not focused on what role the size of the country plays in knowledge governance. Size-related challenges (discussed in more detail in the Section 4.2) affect the ability of these countries to deal with broader emerging policy governance issues and are the focus of this thesis. Latvia provides an interesting case as a country where path-dependency and need for rapid changes have caused significant challenges in the realm of knowledge governance but where capabilities are significantly limited due to it being both a small and a catching-up country. This thesis aims to contribute to a wider understanding of knowledge governance by addressing a gap in the literature on knowledge governance related challenges in a small state context – how do small state-related constraints influence knowledge governance processes? What impact do the capabilities of the public sector have on the ability to respond to new approaches to science and innovation policy? How does that, the small domestic market, and the direction of the private sector affect science–industry linkages, wide diffusion of knowledge, and the ability of universities to contribute to economic growth?

The following research questions are addressed:

1. What knowledge governance mechanisms have been used to facilitate effective government–university–industry interactions and more specifically the emergence of entrepreneurial universities?
2. What contextual factors have affected knowledge governance and university–industry linkages in Latvia?
3. How have universities in Latvia responded to the knowledge governance mechanisms implemented in Latvia?

The challenges described above are echoed in most other CEE countries. The findings of this thesis could be useful for other catching-up economies, especially the small states among them. However, as statistics show that even EU countries with a far better innovation performance are stagnating, a discussion about rethinking the ability of universities to generate sufficient income as well as evaluating whether that is in line with the shift in policy rhetoric would be beneficial, and this thesis aims to contribute to that discussion.

The main arguments of the thesis are laid out in four original articles that discuss processes and circumstances that have influenced the design and implementation as well as the success of policy measures for strengthening science–industry linkages. First, the chapter “Latvia after EU accession: weathering the storm?” (**IV**) in the book *Small States and the European Union* edited by Lino Briguglio (chapter co-authored with Aleksandrs Cepilovs) looks at Latvia’s EU accession by referring to the economic structure and performance of the Latvian economy, covering three broad periods: the period

beginning at the country's independence (1918–1940), the Soviet period, and the pre–EU-accession years. This chapter also discusses Latvia's specific opportunities and constraints as a small country. Second, the article "Disregarding History and Context: Innovation Policy in Latvia Post 1990" **(II)**, co-authored with Aleksandrs Cepilovs, explores changes in Latvia's innovation and research policy along with changes in the economy after the collapse of the Soviet Union and discusses the approach that has been used to improve the country's innovation performance. The article "Supporting University technology Transfer – Struggles and Barriers in Latvia" **(III)**, co-authored with Aleksandrs Cepilovs, discusses the existing government policy measures in Latvia that are aimed at fostering science–industry linkages and university technology transfer and their management on the government and university level. A more in-depth analysis on how funding incentives and their sources affect the autonomy of universities and how that shapes and affects the implementation of support incentives is carried out in article "University autonomy and commercialisation of publicly funded research: the case of Latvia" **(I)** by looking closer at a specific funding incentive.

## Abbreviations

CEE	Central and Eastern Europe
DUI	Learning-by-doing, by-using, and by-interacting
EIS	European Innovation Scoreboard
EU	European Union
FDI	Foreign direct investment
GDP	Gross Domestic Product
NIS	National Innovation System
NPM	New public management
OECD	Organisation for Economic Cooperation and Development
RIS3	Research and Innovation Strategies for Smart Specialisation
R&D	Research and Development
SME	Small and medium-sized enterprise
STI	Scientific and technologically-based innovation
TRIPS	Agreement on Trade-Related Aspects of Intellectual Property Rights
TTO	Technology transfer office
WTO	World Trade Organisation

# 1 Methodology

The main goal of this thesis is to investigate what specific challenges a small and catching-up country faces in terms of knowledge governance in order to improve university–industry linkages and promote involvement of universities beyond the role of teaching and research.

To allow an in-depth exploration of organisations and processes, seek causal relationships among them, and provide an explanation of occurring issues, the single case-study method was chosen. The case-study method is the preferred method when “how” or “why” questions are being posed about a contemporary phenomenon within a real-life context over which the investigator has little or no control (Yin, 2017).

Latvia is a typical case in different contexts. First, it is a typical case among CEE countries that are EU member states – despite favourable conditions for improving innovation performance (influx of EU funding, focus on this policy area), with a few exceptions, most of them have struggled to improve their performance. While there is a large degree of heterogeneity among CEE countries and not all are small states, statistical records show that various indicators are similarly stagnating and slowing the catching-up process. Additionally, similar policy measures are used to facilitate commercialisation of research.<sup>1</sup> However, in some features, Latvia is not a typical case in the EU context but rather in the catching-up context – the case of Latvia could therefore contribute to the debate about how universities can facilitate economic growth when traditional sectors are dominant and supply and demand of knowledge is mismatched. The findings could be used by both small states and catching-up economies, as both contexts are considered in the thesis. The thesis aims to find out how these contexts affect knowledge governance and whether are the reasons for the policy failure. Latvia was also chosen due to the author’s personal professional interest and engagement in the country’s innovation policy making and implementation as well as a long-term engagement in university technology transfer activities.

Within this single-case study, multiple embedded sub-units are analysed. The overarching unit of the case study is universities. The variables that are investigated are the changing role of universities in knowledge governance policy, the preconditions for them to transform into entrepreneurial universities, the implemented policy instruments and policy and administrative capacity. The geographical focus of this case study is Latvia (see Figure 1).

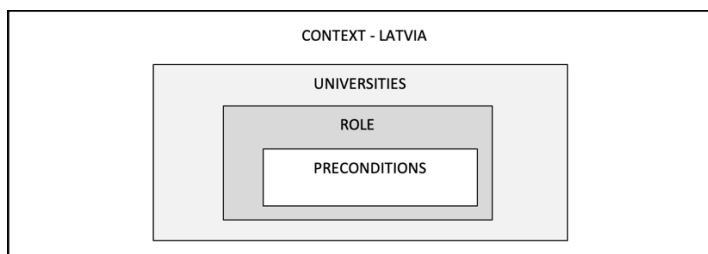


Figure 1. Case design (source: author’s construction)

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<sup>1</sup> Similar policy instruments are, however, used in both the more- as well as the less-advanced EU member states or regions.

The policy makers' perspective is left out in this thesis, providing a potential for bias. However, the aim is to go into more depth with universities and their transformations; therefore, the focus is on the contextual factors that affect that process. These sub-units need to be examined as they provide additional context and reveal rich information on the processes taking place. Path-dependency and context influence these processes, and it was necessary to understand the conditions to explain the outcomes.

There are certain limitations of this approach such as the majority of influencing factors being restricted to time, location, specific history etc. However, Flyvbjerg (2006) emphasises that case studies are particularly well suited to producing context-dependent knowledge. Case studies are generalisable to theoretical propositions and provide a possibility for analytical, rather than statistical, generalisation (Yin, 2017). Yin (2017) further argues that the lessons learned can help define new research or be applied in reinterpreting the results of existing studies.

Case studies rely on multiple sources of evidence (Yin, 2017), and to ensure validity of the data, data triangulation was used with the sources, including documentation, archival records, and statistical records and interviews. Documentation and statistical records were collected from publicly available sources including reports, policy documents or legal acts, regulations for funding programmes, lists of approved projects etc. Specific sources for research carried out in this thesis are as follows:

- For theoretical background, three main directions of academic literature were explored: 1) literature on public policy instruments for stimulating university–industry linkages; 2) research strands discussing university–industry linkages to understand how they have changed over time – triple helix relations, NIS (I, II); and 3) university entrepreneurship and tools that are used to facilitate it (I, II, III). Additionally, paper IV drew from the literature on small states and previous studies on Latvia discussing different periods of time, including the collapse of the Soviet Union, Latvia's EU accession, and the period after the crises period.
- To describe the economic structure of Latvia and its changes, statistical records on various economic indicators such as exports and imports and industrial production were used (for more details see IV).
- Statistics (e.g., patent and publication data, R&D expenditure, number of researchers) and performance reports (such as EIS) were used to describe the R&D landscape in Latvia (for more details see I, II and III).
- To investigate the landscape of support instruments, policy documents, project calls, and regulations for funding programmes were explored (for more details see I, II, and III). This allowed the collection of information about variations in funding allocation rules and sources. Additionally, legal documents were investigated to track changes in legislation such as the Law on Scientific Activity, ownership of intellectual property, etc.
- It was crucial to understand the underlying issues of implementing the support instruments and the challenges of establishing effective technology transfer processes from the perspectives of universities. Publicly available annual reports and published mid-term strategies of universities were investigated, which provided insight on formal priorities and goals for universities and insight into how entrepreneurial activities and technology transfer fit among them. To discover the motivation and concerns related to the implementation of public support instruments, the development of

internal ones, and the organisational processes within universities, 11 semi-constructed interviews were conducted with university staff and a foreign expert in innovation policy and development of support instruments. The interviews focused on the funding sources for R&D at the respective research organisations and the interviewees' experiences with available funding instruments (for more details see I).

As path-dependency plays an important role in the development of innovation systems and related processes, statistical data and policy documents were explored during various periods of time to illustrate changes in the economy and discuss crucial decisions by policy makers that have influenced knowledge governance processes.

This thesis also benefitted from the author's personal professional experience – experience gained as a project manager and technology transfer specialist at the University of Latvia (2010–2017) has provided an in-depth understanding about various processes taking place at universities and their governance as well as motivation for technology transfer of different groups (e.g., researchers and administration). From her current role as Director of the Technology department at the Investment and Development Agency of Latvia, the author has gained an understanding of issues related to policy making and implementation – challenges in designing support incentives, monitoring the progress and auditing the implementation.

The introductory part of the thesis is constructed as follows. First, changing characteristics of university–industry relations as well as the changing role of universities in economic development is described. After that, the knowledge governance approach, overall emerging policy issues, and other issues related to knowledge governance that are specific to the context of a small, catching-up country are discussed; this section looks at the existing literature and serves as background information for the case study. Further, the case of Latvia is discussed in more detail, and the last section presents conclusions and describes directions for further research.



## **2 Changing characteristics of university–industry linkages and the role of the state**

### **2.1 Changes in approach to science and innovation policy**

Facilitation of economic growth calls for investigation and understanding of its sources; hence, there has been interest from both policy makers and scholars in the subject, and a vast amount of literature has been dedicated to it. While innovation is universally acknowledged as a driver for growth, views on how innovation should be facilitated have evolved, causing changes in innovation theory and the policy measures responding to those changes.

Schumpeter (1947, 1949), for example, focused on the entrepreneur – their role and ability to innovate. Later on, following World War II, the focus shifted to a greater role of technological developments in facilitating economic growth and modernisation of industry as well as an increased role of the state (also by funding mission-oriented research targeting specific areas). This shift resulted in increased funding for research and development (R&D) from the state and development of applications of research outputs by the private sector – an approach that stimulated linear thinking of innovation and basically defined innovation as a commercialised invention (Schot & Steinmueller, 2018). Policy instruments developed because of this understanding included implementing tax incentives; strengthening intellectual property regimes; and facilitating a supply of researchers in science, technology, engineering, and mathematics through education. These instruments were intended to motivate companies to direct a share of their investments to technological innovation. Additionally, both public and private expenditure in R&D became indicators by which countries were compared (Schot & Steinmueller, 2018). However, when applied to a catching-up country, this approach failed to stimulate convergence with higher income countries (with exceptions such as Finland; (Ornston, 2012b), contradicting the view that scientific and technological knowledge is a good that is available to everyone. Instead, an understanding of factors such as absorption capacity (Cohen & Levinthal, 1990) and the role of path-dependency in technological development emerged (Arthur, 1983; David, 1975).

Thus, the ways in which policy was rationalised and used changed (Fagerberg & Hutschenreiter, 2020). While modified policy practices from the previous period were still used, the focus shifted to knowledge flows and interaction of different actors as key to fostering innovation and put more emphasis on facilitating dynamic relations between the state, research organisations, and the private sector. There were differentiations to this approach – Metcalfe (2005) defined it as a system of interconnected institutions which contributed to the creation and diffusion of new technologies both individually and jointly. Systems thinking aimed to encompass a wide array of determinants of innovation (Edquist & Johnson, 1997) including the surrounding infrastructure, human resources, and institutional structures on different levels. While some authors discussed the national aspects of such systems (Freeman, 1987, 1988; Lundvall, 1988; Lundvall, 1992) discussed the national aspect of such systems, others distinguished systems within different technology fields (Carlsson & Stankiewicz, 1991) or specific sectors (Malerba, 2002). The systems approach departed from the previous emphasis on the state’s role in innovation development and linear thinking and moved towards an interactive model, building alliances and coordinating interactions among the actors, but still shared the view that science and technology are necessary to maintain a country’s competitiveness

(Schot & Steinmueller, 2018). Innovation was perceived as the driving force of a long-run economic change (Fagerberg & Hutschenreiter, 2020).

Gibbons (1994) discussed similar arguments in their research on modes of knowledge production, distinguishing two modes, Mode 1 and Mode 2, of knowledge production. Mode 2 emphasised institutional links and interactions. Another related research strand is the Triple Helix model of interaction and changing roles between universities, companies, and the government sector and the necessity for universities to become “entrepreneurial” (Etzkowitz & Leydesdorff, 1997) discussed in more detail in Section 3.3). A diverse set of policy practices have been used to facilitate the evolvement of such systems and interactions through the development of technology parks and science hubs, conditioning funding on the requirement that the project involves interaction among a variety of partners, and building different organisations’ absorption capacity through education and training among other strategies (Schot & Steinmueller, 2018). Another approach that has had a significant impact on EU member states’ innovation policies, which requires strong networks and communication among the actors of innovation systems, is the introduction of the concept of Research and Innovation Strategies for Smart Specialisation (RIS3; (Foray et al., 2009). RIS3 was proposed as a tool to identify “the research and innovation domains in which a region can hope to excel” (Foray et al., 2009, p. 2) through the process of entrepreneurial discovery – an inclusive, interactive bottom-up process involving policy makers, companies, and academia to identify potential opportunities that may arise from utilising knowledge distributed among these sectors and assessing the outcomes of pursuing these opportunities (Foray, 2015; Hausmann & Rodrik, 2003).

However, the approaches discussed previously erroneously assumed that faster catching-up and reduction of inequality between higher and lower income countries was possible through investing in R&D and building national systems of innovation. It was assumed that innovation is positive and an important driver for growth; however, the currently established path is not viable for continued growth, as benefits from economic growth have not been distributed evenly (Fagerberg, 2019; Fagerberg & Hutschenreiter, 2020). Therefore, transformations towards sustainability should take place, and questions arise about whether investing in R&D will help in tackling pressing social and environmental challenges (Borrás & Edler, 2020; Mazzucato et al., 2020; Schot & Steinmueller, 2018). Schot and Steinmueller (2018, p. 9) further argue “existing R&D and national systems of innovation frames for science, technology and innovation policy are unfit” (p. 9) to address such challenges – instead a focus on directionality in socio-technical systems and the use of more participatory and inclusive approaches are needed. Additionally, there is a need to not only think about economic growth but also address transition to sustainability and distribution of benefits (Fagerberg, 2019). Thus, this shift marks an emerging third period of how science and innovation are framed and what policy measures are used.

In summary, there have been distinct periods in how science and innovation was framed or perceived and what policy instruments were used; however, the approach is changing yet again towards solving grand challenges through mission-oriented policies. Given that the existing approaches to science, technology, and innovation policy are not sufficiently effective, rethinking the role of universities and how their influence can play in is necessary – how can universities ensure the widest diffusion of the knowledge they produce? How is this ability affected by the knowledge governance mechanisms used? How should knowledge and technology transfer processes be adjusted?

The next sections revisit the rationale for technology transfer as well as the concept of the entrepreneurial university as it has been conceived in the political agenda for both advanced and catching-up economies, with a significant emphasis on framing the role of universities and related support instruments.

## **2.2 University technology transfer**

Overwhelming evidence shows that technology drives economic growth (Audretsch et al., 2002); therefore, it is not surprising that both the public and private sectors are concerned about the different ways in which technology is diffused and appropriated and what influences them. “Technology transfer” and “Technology diffusion” and various aspects of these processes have been increasingly discussed in literature for a few decades.

Many different definitions are provided for technology transfer in the literature, and they vary according to the discipline and purpose of the research (Bozeman, 2000). Technology transfer, which can generally be defined as “the application of information into use” (Rogers, 2002, p. 326), has been used to increase competitive advantage on many levels – supra-national, national, regional, and organisation levels; thus, it is of concern to various academic disciplines, policy makers, and decision-makers (Reisman, 2005; Zhao & Reisman, 1992). Academic disciplines that deal with technology transfer include, for example, economics, anthropology, sociology, and management. The economics literature explores the micro- and macroeconomic aspects of technology as well as the flow and content of technology (see e.g. Arrow, 1969; Dosi, 1988); anthropology research takes a cultural, institutional, and geographic perspective; the sociology literature takes on the institutional perspective and also discusses the nature of technology (see Rogers, 1962; Rogers & Shoemaker, 1971); while management research (e.g. Teece, 1977) explores ownership and control and the nature, modality, and phases of technology transfer and tends to focus on transfer between sectors and the connection between technology transfer and strategy (Reisman, 2005; Wahab et al., 2011). Before the 1980s and the introduction of the Bayh-Dole Act in the United States, research on technology transfer mostly focused on cross-national transfer; however, later it shifted to exploration of domestic transfer, especially to the dynamics of transfer within universities and among U.S. scholars (Bozeman, 2000). This led to discussions around the entrepreneurial university (Clark, 1998; Etzkowitz, 2003b, 2013; Etzkowitz et al., 2000), channels for university–industry technology transfer (Lockett et al., 2005; Phan & Siegel, 2006; Siegel et al., 2007), and the role of various actors such as technology transfer offices (TTOs) (Geoghegan et al., 2015; Osenga, 2007; Siegel et al., 2007; Siegel et al., 2003) or individual researchers (Jensen & Thursby, 2001; Thursby & Thursby, 2007).

While the focus on increasing R&D expenditure and bridging the private and research sectors had been on the European agenda since the early 1990s (Sachwald, 2015), the transition into a “knowledge economy” seemed to have been more successful for the United States (Soete, 2002). Much of this success has been attributed to the Bayh-Dole Act and the subsequent establishment of TTOs, and the increase in licensing activities in universities facilitated viewing the commercialisation of publicly funded research as a remedy for insufficient innovation performance, which inspired other countries to “borrow” this approach (Link et al., 2007; Mowery et al., 2001; Mowery & Sampat, 2004; Stephan, 2012).

However, enthusiasm about the Bayh-Dole Act and the following focus on formal technology transfer has been criticised on various fronts. Patenting activities and the creation of TTOs have been taking place at universities before the Act was passed, and while it accelerated these activities and changed the way universities managed their intellectual property, solely crediting the Bayh-Dole Act is an oversimplification (Mowery & Sampat, 2004; Stephan, 2012).<sup>1</sup>

The Bayh-Dole Act drew focus to “formal”<sup>2</sup> means of technology transfer through the licencing or acquisition of technology; however, there are various other types of media through which technology can be transferred. Moreover, studies show that publications, conferences, collaborative research, networking, informal interaction, and consulting play more important roles in most industries, and technology transfer channels rated by R&D managers rarely include patents and licensing (Cohen et al., 2002; Mowery & Sampat, 2004). They also argue that patents (especially those coming from university laboratories) have varying importance depending on the industry and technological fields – in some fields, patents are important, but the inventions come from non-academic research. This factor is especially prominent in fields like physics and mathematics where, in academic research, there is significant lag in getting applications to market.

Still, because of its potential to serve as another revenue stream, universities have welcomed formal technology transfer channels (licensing agreements, joint ventures, and university-based start-ups), and a considerable amount of literature has been dedicated to the topic (Bozeman, 2000; Link et al., 2007),<sup>3</sup> especially to formal technology transfer mechanisms. Meanwhile informal interactions are more difficult to capture and study (Grimpe & Hussinger, 2008; Link et al., 2007).

Despite insufficient empirical evidence and vast differences between the situation in the United States and elsewhere, a number of OECD countries including Latvia have tried to emulate similar instruments,<sup>4</sup> and the EU has provided significant means for its member states to direct funding for strengthening university–industry linkages, often through formal technology transfer (I, II, III). Therefore, this thesis focuses particularly on in-depth analysis of policy instruments implemented to stimulate formal technology transfer and investigates what particular reasons have prevented these policies from acting as accelerators of technological development and economic growth in Latvia.

The next section gives an overview of the Triple Helix model, which is the dominant approach to university–industry linkages. Though it is widely used among policy makers

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<sup>1</sup> Others (see So et al., 2008) further argue that the contribution of the Bayh-Dole Act has been overstated and point out that while patents are a source of revenue for some universities, they are concentrated at a few successful ones and the total revenues are small overall. Other lines of criticism include the impact of university patenting activities on developing countries and their effect on technology diffusion and catching-up processes (Hemel & Ouellette, 2017) and the impact on basic research (for a discussion see e.g. Thursby & Thursby, 2011).

<sup>2</sup> Types of technology transfer that result in a legal instrumentality and are focused on allocation of property rights (licensing, joint ventures, etc.) are considered “formal,” while “informal” ones diffuse knowledge through communication processes and the associated obligations are more normative than legal (Link et al., 2007).

<sup>3</sup> Much of the literature explores the case of the United States and the effects of the Bayh-Dole Act, paying far less attention to how similar approaches have affected other countries (Grimaldi et al., 2020).

<sup>4</sup> However, Mowery and Sampat (2004) argue that the actual instruments implemented in some European countries focus on things other than those that were the main aim of the Bayh-Dole Act.

in both developed and catching-up countries, it does not sufficiently consider the catching-up context or the size of the country, which both affect the implementation of the approach. Therefore, the next section discusses the approach, its shortcomings, and its relevance for small, catching-up countries with the aim to provide a new theoretical contribution to understand the university–industry relationship through knowledge governance perspective.

### **2.3 The Triple Helix model and its implications for universities**

Systematic university–industry interaction as such is not a recent phenomenon and can be traced back to the second half of the 19<sup>th</sup> century (Leydesdorff & Etzkowitz, 1996). How this interaction takes place, however, has changed, with a shift taking place from a linear approach to innovation to dynamic interactions. The focus on interactions between institutions of fundamental research “on the supply side” and corporations has been reflected not only in technology policies but also in technology studies. Evolutionary models that analyse network developments have superseded linear models of “demand pull” or “technology push” (e.g., Dosi, 1988; Leydesdorff & van den Besselaar, 1994; Nelson & Winter, 1982). Non-linear dynamics have provided us with co-evolutionary models: How do technologies and institutions co-evolve (Nelson, 1994)? Under which conditions do they “lock in” (Arthur, 1989; David, 1985)? When can a “lock in” be deemed part of an emerging infrastructure, and when should it be avoided (cf. David & Foray, 1994)? And over time: How is the social infrastructure adjusted to cycles of emerging techno-economic developments (Barras, 1990; Freeman & Pérez, 1988)?

Systems thinking became the dominant approach in the 1980s, moving the focus to different actors and to the interaction and knowledge flows taking place between them. Based on empirical findings from developed industrialised countries throughout the 1970s and 1980s (Lundvall, 2007), the National Innovation Systems (NIS) concept (Freeman 1987, 1988; Lundvall 1988, 1992), which focuses on the national-level aspects of these interactions, emerged and quickly took centre stage in policy discussions and academic work (Arocena & Sutz, 2000). The NIS approach is based on the notion that innovations are the result of complex national-level relationships between actors and institutions, such as universities, companies, networks, government organisations, the surrounding infrastructure, human resources, and the available incentives (OECD, 1997), and almost all of the literature on the NIS emphasises the importance of the connections among the actors (Arocena & Sutz, 2000). Interactive learning as a driver of economic development also became a central focus (Fagerberg & Sappasert, 2011). The NIS approach facilitated the implementation of incentives that allowed for network building, interactions, and learning, and that inspired international comparisons as well as a search for best practices that could be used. The questions asked are as follows: “What kind of innovation policies are my neighbours, partners, rivals or ‘models’ devising and implementing? Which of these policies could possibly be applied at home, and at what cost?” (Arocena & Sutz, 2000, p. 56).

As a source of knowledge, universities play an important role in the NIS approach. The NIS approach emphasises the shift from universities as “ivory towers” to universities as important institutional actors in facilitating economic growth (Mowery & Sampat, 2006). This turned the focus to effectively linking universities with other actors within the NIS and ensuring knowledge flows.

A NIS-related approach likely to be a key component of any national or multi-national innovation strategy in the late 20<sup>th</sup> century is the Triple Helix model of

university–industry–government relations. The Triple Helix model emphasises the role of universities in innovation in contrast to firms (Etzkowitz & Leydesdorff, 2000). Specifically, it calls attention to the need for the government to foster an environment where the industry taps into the knowledge of universities while universities take a more entrepreneurial approach and seek economic benefits from their research outputs. The role of universities within government–university–industry relations has changed over time, first, through the integration of research and knowledge production, and second, through entrepreneurial activities involving the knowledge produced and the Triple Helix model of innovation (Etzkowitz & Leydesdorff, 1995; Leydesdorff & Etzkowitz, 1996). Furthermore, an increasing shift has taken place toward “open” or “networked” and “distributed” innovation as a response to the private sector’s need to access and use external knowledge (Scarbrough & Amaeshi, 2009). This knowledge includes both tacit knowledge and codified knowledge<sup>1</sup>.

The Triple Helix model has been embraced in countries with strong innovation performance as a model with optimal conditions for innovation. It is also promoted among policymakers in the countries that are trying to catch up to them (Cai, 2014). Etzkowitz and Leydesdorff (2000) differentiated among three Triple Helix model configurations/ policy models, with the most desirable being a configuration with overlapping institutional spheres that each take the role of the other. Incentives often implemented to reach this configuration include strategic investments, the facilitation of an intellectual property exchange through joint university–industry research, the establishment of cooperative research centres, strategic alliances, incubator facilities, and the facilitating of university spin-offs (Etzkowitz, 2003a).

An integral part of this model is the “entrepreneurial university” that goes beyond producing and disseminating knowledge by exploiting it to generate economic benefits. Understanding innovation as an evolutionary process involving various sectors (Rasmussen et al., 2006), and considering the increasing expectation for universities to commercialise their research (Etzkowitz, 1998), universities have had to adjust to these new directions and ultimately evolve beyond the traditional missions of teaching and research. They must now closely interact with both the industry and the government (Etzkowitz, 2003a). However, according to the Triple Helix model approach as well as the technology transfer literature, a number of prerequisites need to be met and challenges overcome for them to take on this new role.

Universities need to have some control over their strategic directions and relationships (Clark, 1998). They must then increase their technology transfer and commercialisation activities while simultaneously coordinating them with other core activities (Rasmussen et al., 2006). Technology transfer activities should be recognised as a priority and should be supported through the necessary infrastructure, resources, and accompanying procedures (see e.g. Maicher et al., 2019; McCutcheon, 2019; O’Shea et al., 2005).

Both formal and informal support mechanisms can come from the public sector “top-down” or emerge “bottom-up” from within universities (Goldfarb & Henrekson, 2003; I; II; III). The intellectual property ownership regime plays a significant role in facilitating technology transfer (Rasmussen et al., 2006), and as previously mentioned,

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<sup>1</sup> Still, as discussed previously, the focus is often (and also in the case of Latvia) on formal types of linkages, such as licensing and the acquisition of technology, which is an important element of the Triple Helix model research (Schot & Steinmueller, 2018).

significant reforms including changes in the legislation concerning university intellectual property rights took place in the United States with the enactment of the Bayh-Dole Act. While in the United States this process emerged “bottom-up”, it was implemented “top-down” in Europe with many countries adopting similar legislation to various degrees of success (Baldini, 2009; Baldini et al., 2006; Goldfarb & Henrekson, 2003; Grimaldi et al., 2011). Besides changing the intellectual property regime, other common measures include establishing TTOs and business incubators, introducing motivational programmes for students and researchers, facilitating access to venture capital, and facilitating university spin-offs (Siegel et al., 2007). Additionally, capacity and skills regarding managing intellectual property, which has been found to be an issue in almost all European countries (Directorate-General for Research and Innovation, 2013), need to be developed. Capacity and skills also plays an important role in dealing with multiple technological fields and developing commercialisation strategies at universities (Osenga, 2007). Sometimes implementing joint pursuits by various actors to reach critical mass is also important to strengthen this area (Commission, 2008).

Universities in various EU member states have implemented a wide array of activities. Best-practice cases were recently collected in an EU-funded project called “Progress-TT” and were discussed in detail in Torrisi (2019). These cases include technology scouting among university faculties and departments to identify ideas with commercial potential; mentorship for scouts from companies; trainings for researchers to increasingly establish spin-off companies; and increasing the number of invention disclosures, patent applications, and research agreements; and boosting collaboration between partners (Torrisi, 2019). Universities often also have to deal with technology transfer in a broad range of technological fields, which requires specific knowledge that is difficult to have with a limited number of staff (Osenga, 2007). This can be tackled by implementing joint activities with government-funded business development centres that are part of the university but have a certain degree of independence. This allows for focusing on specific technological fields and developing the skills and business knowledge of the research groups linked to them (Torrisi, 2019).

Another important incentive for universities is to reduce complexity and uncertainty in intellectual property rights negotiations (Baldini et al., 2006; I). This can be done by developing a national-level framework for research commercialisation and by providing guidance on expected norms for universities and other public research organisations when giving access to state-funded research (I).

Despite the wide use of the triple helix approach, scholars argue that this approach could prove difficult in various countries and that it does not consider various contextual (including specific national) settings that would influence the ability to sufficiently apply it (Cooke, 2005; Saad & Zawdie, 2005; Saad & Zawdie, 2011; Shinn, 2002). The concept of such relations has been developed based only on the experience of advanced economies, and insufficient empirical and analytical evidence exists regarding how attempts to implement and operationalise it have taken place in differing national contexts (Abd Razak & White, 2015; Cai, 2014). The government’s role is to provide viable incentives to motivate these types of collaboration while also considering path dependency and local context (So et al., 2008), especially taking into account specific constraints – for example, those of small states.

Regardless of the above, the common enthusiasm about the model combined with the insufficient analysis of contexts can be seen when one looks at the homogenous support incentives that exist among EU member states regardless of their very different

levels of development and domestic needs (Izsak et al., 2015; Karo, 2010; Veugelers, 2016). This often makes the incentives inefficient for achieving the states' goals (I, II, III). Mowery and Sampat (2006, p. 3) argued:

Universities fulfil broadly similar functions in the innovation systems of most industrial and industrialising economies, the importance of their role varies considerably, and is influenced by the structure of domestic industry, the size and structure of other publicly funded research performers, and numerous factors. (p. 3)

Additionally, the success of facilitating technological innovation depends on the proportion of publicly funded research and its focus (basic vs applied), the capabilities of industry partners, R&D funding, and the nature of university–industry linkages (So et al., 2008). This can be problematic for CEE countries, as most companies in the region rely on process innovation through, for example, acquiring new equipment (Kattel et al., 2010). This makes it more challenging for universities to accomplish their “third mission” in the local context due to the already small markets and limited demand there.

Additionally, even with the wide array of instruments used to develop “entrepreneurial” universities and to implement a dynamic triple helix model, the question of whether that has actually happened beyond policy rhetoric remains. Statistical data (see, e.g., Eurostat; OECD) show that despite these efforts, the proportion of university revenue from the private sector remains small and is actually declining (Stephan, 2012). Stephan (2012) argued that from the total R&D funding that universities have received, the share coming from the industry in the United States peaked in the 1980s (contributing approximately 7.4%). Similarly, many EU countries face either stagnation or declines in this indicator, suggesting that the efforts to establish R&D funding from the industry as a significant source of revenue has not been widely successful.<sup>1</sup>

To conclude, the analytical frameworks that come from the NIS and the triple helix approach can help with understanding the different roles of universities in driving economic growth. However, they do not offer much help with developing policies (Mowery et al., 2001). The NIS approach has been developed on the basis of advanced economies, and in this context, it has been used as an ex-post concept. It has not been used for system building to the same extent. Meanwhile, for developing economies, it is used as an ex-ante concept and implies best practices that could be transferred and used in developing NIS (Arocena & Sutz, 2000; Lundvall, 2007), disregarding the fact that the policy prescriptions it facilitates tends to favour developed economies. Both the NIS and the triple helix literature provides a number of uniform policy prescriptions – for example, an emphasis on building networks, establishing joint research activities and other types of collaboration, strengthening the capacity of university technology transfer activities through the establishment of TTOs, and the establishment of favourable intellectual property rights regime, among others. However, specific constraints exist when it comes to implementing these incentives due to a country's size or stage of development.

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<sup>1</sup> According to statistical data that the OECD collected (included in the OECD Main Science and Technology Indicators), the percentage of higher education R&D that the business sector has financed overall in OECD countries has slightly increased (from 5.51% in 2013 to 6.18% in 2018), and the same is true for in the EU (from 6.73% in 2013 to 7.32% in 2018). However, some countries, including such innovation leaders as Finland, Denmark, Sweden, and Germany, have experienced declines or stagnation, and only a handful of countries have seen increases (e.g., Ireland, Greece, Italy).



The NIS and the triple helix approach should be adapted to the situation if it is to be used in system building (Lundvall, 2007).

Although the NIS and the triple helix literature discuss the actors, the types of interactions that take place between them on different levels, and their roles, they do not discuss how a specific context, such as catching up, and the small size of a country impact these interactions, as well as how this impact should be mitigated. This thesis is aimed at addressing this gap in literature and proposing a knowledge governance approach for doing this.

## **3 Knowledge governance challenges in the context of a small, catching-up country**

### **3.1 Knowledge governance approach**

Addressing the changing perspectives on science and technology calls for a re-evaluation of the respective policies – their role and the instruments they encompass. Moreover, new forms and types of organisations are emerging in the process of knowledge diffusion. Thus, the role of the state in involving and coordinating existing and new actors, defining priorities, designing policies, and shaping markets for these organisations to develop is becoming more and more significant. However, this is a complex policy arena involving multiple policy areas, such as innovation, research, and competition policies, as well as the intellectual property rights regime. Thus, the knowledge governance approach was proposed in an effort to bring together public governance mechanisms (such as policy prescriptions, institutional coordination, rulemaking, regulation, and supervision) as well as knowledge production, diffusion, and appropriation.

Knowledge governance is an analytical framework “that cuts across the fields of public policy, economic supervision and regulation, knowledge and organisation management, and innovation, competition and competitiveness analysis” (Burlamaqui et al., 2012, xix). It is a broad concept that emphasizes the role of public policy and discusses the use of governance mechanisms in the creation, protection, and diffusion of knowledge (e.g. What is the role of the state and funding for innovation? What knowledge governance structures should be established, and what competences and capabilities does the public sector need to possess to do this? How should governance mechanisms be coordinated?) (Burlamaqui, 2010). Whereas the NIS literature (see, e.g., Freeman, 1987, 1988; Lundvall, 1988, 1992; OECD, 1997) focuses on the need for various actors to interact and form networks for innovation to arise, and whereas the triple helix model literature focuses on the different and changing roles of these actors, the knowledge governance literature discusses how these relationships should be governed.

At the core of knowledge governance is the market features approach (Burlamaqui, 2010, 2012) and its counterpart – the market-shaping policy perspective (see e.g. Mazzucato et al., 2020) – whose aim is to achieve the broadest diffusion of knowledge through promotion and regulation. Knowledge governance policies should establish priority areas and then shape them and their respective markets through institution building, legal change, and administrative guidance to facilitate diffusion (Burlamaqui, 2010, 2012).

Different sets of knowledge governance mechanisms have been used and have changed together with the varying approaches to science and innovation policy thinking. Table 1 summarises the knowledge governance mechanisms corresponding with each approach.

Table 1. Knowledge governance mechanisms corresponding to varying approaches to science and innovation policy thinking (source: author's construction)

Linear approach	NIS and related approaches	Missions approach
<ul style="list-style-type: none"> <li>• Investments in R&amp;D through priority setting for government funding</li> <li>• Tax incentives</li> <li>• Strengthening of the intellectual property regime and creating varying regulations for university-industry technology transfer</li> <li>• R&amp;D indicators for measuring and benchmarking performance</li> <li>• Priorities in education to supply researchers in key areas</li> </ul>	<ul style="list-style-type: none"> <li>• Coordination mechanisms, such as the Entrepreneurial discovery process</li> <li>• Priority specialisation areas</li> <li>• Joint research ventures and experimenting with various types of collaborations and funding mechanisms</li> <li>• Networks through establishment of clusters, technology parks etc.</li> <li>• Funding priorities shifted to facilitate collaboration</li> </ul>	<ul style="list-style-type: none"> <li>• Inclusive coordination mechanisms providing effective-feedback loops</li> <li>• Cross-cutting governance structures</li> <li>• Coordination of R&amp;D activities and patent pools to facilitate the development of prioritised areas</li> <li>• Mechanisms for defining and prioritising grand challenges/missions</li> <li>• Varying intellectual property rights regimes</li> <li>• Public subsidisation for developing standards</li> <li>• Joint mission-oriented research ventures</li> </ul>

Based on historically successful development experiences, three ideal-typical knowledge governance regimes are proposed (Kattel, 2012):

- The common knowledge governance regime is aimed at facilitating domestic linkages, the use of knowledge and absorption capacity, the creation of a shared knowledge pool, and the building up of linkages and capacities in the private sector through a lax intellectual property rights regime. It also focuses on domestic trade and development funding while also maintaining a long-term view on policymaking.
- The dynamic knowledge governance regime is aimed at using the established linkages and capitalising on the knowledge generated. It focuses on building activities with increasing returns on top of the established linkages, as well as reinforcing these through short-term monopolies (e.g., through standards, regulations, intellectual property rights), managing foreign direct investment (FDI) flows to and within sectors, facilitating new actors (e.g., organisations emerging from the industry) and gradually opening trade, while maintaining a mid-term view on policymaking.
- The social knowledge governance regime is aimed at maturing industries' activities and upgrading, as well as capitalising on the linkages and knowledge base. It focuses on promoting exports, skill development, tax incentives for R&D, and liberal trade and antitrust policies.

These three regimes also highlight the need to apply a different regime for different industries depending on their stages of development and the market for knowledge, thus indicating a need for developing countries to be able to coordinate different regimes at the same time and to develop various types of policy capacity (Kattel, 2012). These aspects also need to be considered when one is defining the priority areas and shaping the markets – are the defined areas and their actors/ respective industries on the same maturity level? If not, does the state have a sufficient policy capacity to deal with these differences? How can the widest dissemination be achieved through policy and institutional design, especially if the supply and demand sides are not aligned?

The current literature on knowledge governance does not sufficiently discuss these elements.

Thus, this thesis's aim is to fill this gap. It will (a) look at the dynamics between knowledge governance mechanisms and contextual factors that impacts their implementation, as well as how to enable the contribution of university-generated knowledge through knowledge governance mechanisms, such as setting national-level priority areas and industry standards, implementing incentives for R&D and design, and establishing and coordinating institutions and organisations that regulate and monitor the production and diffusion of knowledge, the intellectual property rights regime, and its enforcement. The thesis will also look at whether the focus on the entrepreneurial university concept and on formal technology transfer is justified considering the economic structure and demands of the private sector.

### **3.2 Constraints of small states**

As discussed previously, knowledge governance is a broad concept cutting across a number of fields. The knowledge governance literature mostly discusses general problems with knowledge processes and how governance mechanisms can influence them. Still, among a variety of factors, the size of the country is a source of a variety of constraints and can influence policies and the process of making them (Thorsteinsdóttir, 2000). Knowledge governance processes have been discussed in the literature on innovation systems as an important part of them, as well as in the small-state context – for example, in Freeman and Lundvall (1988) and Edquist and Hommen (2008) – but these works mainly deal with general innovation system problems and do not particularly discuss size-related difficulties (Kattel et al., 2010). This thesis's aim is to address this gap in the literature and to look at how the common constraints of small states have influenced the knowledge governance process.

No consensus exists on a single definition of what a small state is; rather, multiple definitions exists based on size, military power, the ability to influence supra-national processes, and other aspects (Thorhallsson & Wivel, 2006). However, Baldacchino and Wivel (2020) proposed a synthesised working definition, emphasising that a small state is one that (a) has political, economic, and administrative systems with limited capacity, and (b) is a weaker part of the asymmetric relationships that they cannot change on their own.

The literature on small states lists a number of common constraints that such countries face and that have an impact on knowledge governance processes.

Small states are exposed and vulnerable to external factors beyond their control (Baldacchino, 2019; Briguglio, 2016). Responses to these factors, such as global market conditions, generate political decisions that heavily impact the development and sustainability of a productive labour force and the production of goods (Baldacchino, 2020). Globalisation has had a double-sided effect on small states: Although it has offered an opportunity to boost trade, it has also facilitated migration and brain drain (resulting in a loss of productivity; (Baldacchino & Wivel, 2020; Crossley et al., 2009). Migration and brain drain have negatively impacted the already small pool of students and specialists, as well as the ability to provide diverse learning opportunities. This impacts the ability to provide the necessary number of professionals to the emerging skill areas (Crossley et al., 2009).

Additionally, path dependency heavily influences small states (Maass, 2020). In contrast to global challenges, this constraint can be turned around with flexibility in

governance and strategic planning (Baldacchino, 2019; Baldacchino & Wivel, 2020). Nonetheless, this might be challenging to do in the realm of knowledge governance, especially in small states with lower levels of development (Kattel et al., 2010; Walsh, 1988) due to the complexity of the policy arena and insufficient administrative capacity (the skills of running the state and the number of civil servants in the central administration; (Thorhallsson, 2006)). Developing administrative capacity is a challenge for small countries, where it is often limited and, in some cases, further weakened by chosen political, economic, and administrative reforms (Kattel et al., 2010; Randma-Liiv, 2002). Decentralisation, fragmentation, reduced coordination among policy arenas, as well as weakened administrative capacity impact the development of a well-coordinated knowledge governance system (Burlamaqui et al., 2012).

However, despite the limited resources (human resources as well as small domestic markets of ideas and commodities) (Baldacchino & Wivel, 2020), small states still need to perform the same number of functions as large states, and this tends to cause multi-functionalism on the levels of individual officials and entire public organisations (Sarapuu & Randma-Liiv, 2020). Although multi-functionalism creates a better understanding of various processes and policy realms (see the “big picture”), it prevents sufficient specialisation and in-depth expertise (Crossley et al., 2009; Sarapuu & Randma-Liiv, 2020), thus impacting both the realm of education and governance.

Small states also run into various governance paradoxes (Sarapuu & Randma-Liiv, 2020) that also concern diversifying their economies to make them less dependent on international trade while still being able to specialise to effectively use their already limited resources. Both small states and catching-up economies need to exploit foreign knowledge and technologies, as well as combine them with the local ones (Fu & Soete, 2011; Radosevic & Ciampi Stancova, 2015). With insufficient resources (including the fiscal strain under which the public sector has been operating in many countries, particularly since the crisis in 2009), the need exists to prioritise and specialise to gain the critical mass. This causes a dilemma for small countries, as they need to balance between addressing local R&D needs and still being able to participate in global value chains. For universities in small states, there is a risk of either focusing on international demand and losing relevance to local companies or becoming too focused on local needs and thus becoming isolated from the international community (Thorsteinsdóttir, 2000). A small country’s inability to diversify scientific activities requires the use of foreign knowledge and technologies. For this reason, participation in the international science community is crucial. Furthermore, the size of a country also plays a role in what types of innovation take place in the private sector, and innovation policies should be built using a bottom-up logic that, in turn, requires administrative stability. This is already difficult for small countries and is further exacerbated by new public management (NPM) reforms (Kattel et al., 2010), which are discussed in more detail in the next section.

To conclude, the constraints arising from the small size of a country impact the implementation of policy instruments based on the NIS, the triple helix approach, and knowledge governance approaches. Although using these approaches as analytical frameworks can provide some guidance, it is important to also consider this impact and how it has changed the course of policy implementation. Table 2 summarises how the size-related constraints relate to the implementation of the NIS, the triple helix model, and knowledge governance-based policy instruments.

Table 2. Impact of size-related constraints on NIS, triple helix approach, and knowledge governance (source: author's construction)

	Exposure and vulnerability to external factors	Limited resources and small domestic markets	Migration and brain drain, resulting in insufficient human capital	Vulnerability to path dependency
NIS and triple helix approach	<ul style="list-style-type: none"> <li>• Need to follow research directions enforced by supra-national funding schemes, which might be mismatched with the local demand, challenging the possibility of establishing university–industry linkages</li> </ul>	<ul style="list-style-type: none"> <li>• Affects the ability to produce knowledge</li> <li>• Due to path dependency, the needs of domestic companies might be mismatched with what universities are offering, as they also need to fit into the international research arena.</li> <li>• Dependency on foreign knowledge</li> </ul>	<ul style="list-style-type: none"> <li>• Difficulty of developing excellency in multiple technological fields and types of research (fundamental and applied)</li> </ul>	<ul style="list-style-type: none"> <li>• Inability to change the structure of the economy, and switch to a different innovation mode</li> </ul>
Knowledge governance	<ul style="list-style-type: none"> <li>• Facilitation of uniform policy approaches, as well as governance mechanisms</li> </ul>	<ul style="list-style-type: none"> <li>• Makes it difficult to specialise to gain critical mass and to be integrated into international value chains on which small states are often dependent</li> </ul>	<ul style="list-style-type: none"> <li>• Weak policy and administrative capacity to ensure adequate ability to navigate the complex policy arena</li> </ul>	<ul style="list-style-type: none"> <li>• Reduced flexibility is developing strategies.</li> </ul>

This highlights the inter-relatability of various constraints and the impact they have. Previous research on both the NIS and knowledge governance has not focused on these aspects. However, it important to discuss the dynamics in more depth to develop a more elaborate insight into how the effects could be tackled.

However, small size is not the only factor influencing knowledge governance processes. They are also impacted by emerging global tendencies, the catching-up context, and, in the case of Latvia, specific historical developments echoed among CEE countries, which are discussed in the next section.

### 3.3 Contextual factors influencing knowledge governance in CEE countries

The knowledge governance approach draws attention to changes in how knowledge is governed and how a number of tendencies in public policy have impacted it. For example, Burlamaqui et al. (2012) argued that these key tendencies have negatively impacted the field of knowledge and innovation:

- Emergence of homogenised policy reform prescriptions also implemented in catching-up countries, thus diminishing the domestic policy space;
- Rise of the NPM approach, leading to a number of practices, such as the “marketisation“ of governance, out-contracting public services, and agencification;

- Difficulties with coordinating complex policy arenas, such as higher education and others dealing with knowledge generation and diffusion due to the aforementioned issues.

The homogenisation and convergence<sup>1</sup> of policies are seen as taking place due to generic events, such as globalisation (Karo & Kattel, 2010), and can also be facilitated by international organisations, such as the WTO or the EU (Burlamaqui et al., 2012). For example, the transition period after the collapse of the Soviet Union brought forth a number of reforms in Latvia and other CEE countries, as they needed to both develop and restructure their core institutions and introduce new policies. Most CEE countries focused on adjusting to the Washington Consensus policies and implemented a standard set of reforms, as they “were considered by many CEE countries as *the* implicit innovation and industrial policy measures, and in essence, there were no other policy initiatives in the 1990s” (Suurna & Kattel, 2010, p. 650). Additionally, through voluntary transfer, these countries sought external expertise on, for example, assessing their research systems and giving policy recommendations. Later, for some of the countries, the EU became the new source of reforms in the area of research and innovation, and some elements of coercive transfer were used by tying funding mechanisms for member states to certain preconditions, such as the RIS3 strategy (II). Additionally, international organisations have set targets and indicators that require voluntary or conditioned action, and these targets and indicators have influenced domestic policies (Borras & Radaelli, 2011). Economic and innovation policy, and public policy and administration were the two key areas where these countries received the advice (Karo & Kattel, 2010).

Policy learning and policy transfer can be effective mechanisms for developing and improving policies. However, strong policy and administrative capacity has to be in place, as the process requires evaluation, analysis, and appropriation so that the changes serve local needs and implementation is effective. This is especially important due to the complexity of contemporary policy problems (Wu et al., 2015).

As Wu et al. (2015) summarised, policy capacity is a set of skills (competences) and resources (capabilities) needed for policymaking (see also Gleeson et al., 2011; Gleeson et al., 2009). Moore (1995) pointed out three types of key skills comprising policy capacity on different levels: analytical, operational, and political skills on the individual, organisational, and systematic level. These refer to (a) the ability to receive evidence and

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<sup>1</sup> Bennett (1991) referred to policy convergence as the movement of policy goals, policy content, policy instruments, policy outcomes, and policy styles to a common point, where they become alike, and proposed four processes that cause it: emulation, elite networking and policy communities, harmonisation, and penetration. The different mechanisms through which policy convergence can take place are discussed in various literature strands. The policy learning and “lesson drawing” literature explores the rational evaluation of a set of actions experienced elsewhere that can be used to solve domestic problems (Rose, 1991, 1993). The policy transfer literature (see Dolowitz & Marsh, 1996; Dolowitz & Marsh, 2000) includes a wide spectrum of mechanisms, such as voluntary transfer (e.g., seeking advice from international experts to solve problems), as well as direct coercive (where supra-national institutions have a key role) and indirect coercive transfer (caused by, e.g., interdependence, technological development, or international consensus). Meanwhile, the Europeanisation literature (see e.g. Knill & Lehmkuhl, 2002; Radaelli, 2003) explores how the EU impacts domestic policymaking and discusses the entire spectrum of mechanisms of policy change. Since the early 2000s, this research strand has increasingly explored new EU member states and candidate countries (for a review see e.g. Sedelmeier, 2011), as negotiations for EU accession have affected, among other aspects, the process of policymaking and intra-governmental relations in CEE countries (Grabbe, 2006).

to use it by having access to high-quality information, skills, and technical capabilities; (b) the development of managerial skills (the training of individual managers, the relationships between public sector organisations, and the ability to coordinate efforts among them to address challenges); (c) understanding key actors and their interests, and establishing a dialogue (Wu et al., 2015). Regarding innovation policy, “policy capacity refers to the ability of the political system to decide or compromise on the best approach (what is ‘desirable’ and what is ‘feasible’) to innovation and development” (Karo & Kattel, 2010, p. 171).

Regarding public policy and administration, as Randma-Liiv (2008) pointed out, due to a lack of strong civil service traditions and experience with evaluating risks and uncertainties, CEE countries implemented a mix of changes from different origins. At the time, the public administration paradigm was NPM (Randma-Liiv & Drechsler, 2017) – the application of business principles and techniques to the public sphere and decreasing any public activities (Drechsler, 2005). A practice within the NPM toolbox (Drechsler & Randma-Liiv, 2015) – agencification – has added to the decentralisation and fragmentation of government administration (Randma-Liiv, 2008).<sup>1</sup>

CEE countries in particular have had a specific trajectory of agencification. This is true in the sense that it has been a comparatively recent trend (Randma-Liiv et al., 2011; Thiel, 2011). In addition, many are ranking among the most “agencified” countries in the world (Randma-Liiv et al., 2011) and have delegated a notable amount of executive and regulatory tasks to various agencies due to a rapid agencification process (Drechsler & Randma-Liiv, 2015). Pollitt (2004) pointed out that in Latvia, this rapid agencification during the first decade of the independence process was more on an ad hoc basis, and in many cases, the overseeing ministries did not meet the prerequisites for successfully steering them, such as possessing sufficient information, appropriately skilled staff, and authoritative levers. Europeanization – influence of EU on domestic policy making, policies and institutions – was also a significant factor that impacted the innovation policies in CEE (Börzel & Risse, 2000) and contributed to agencification. Influx of EU funding required the establishment of domestic organisations to administer these funds. Europeanization also pressured development of normative policy documents and policy mixes that strongly reflected EU-level objectives and priorities (Suurna & Kattel, 2010). The effects of Europeanization in Latvia can be seen in further exacerbation of mismatch between the domestic demand and supply in R&D (I), choice of support incentives (II, III) and fragmentation among government organisations.

For countries in transition – such as CEE countries, with their limited administrative capacity to monitor changes and evaluate uncertainties, and with insufficient legal and regulatory frameworks, decentralisation, fragmentation, and deregulation – NPM further weakens the policy and administrative capacity (Randma-Liiv, 2008)<sup>2</sup>. It also negatively impacts knowledge governance, for which a strong policy capacity is necessary to coordinate the complex and interconnected arenas of research, education, and innovation. Burlamaqui et al. (2012) emphasised that NPM led to a one-size-fits-all

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<sup>1</sup> Agencification refers to the creation of semi-autonomous public organisations to carry out public tasks, such as service delivery and policy implementation/regulation (Pollitt et al., 2004). Although agencies have existed before, NPM has influenced the motives behind the establishment of such organisations (Verhoest, 2018).

<sup>2</sup> However, cases have existed where traditionally low-tech economies defied these patterns and successfully confronted disruptive economic challenges. For a discussion on Finland, Ireland, and Denmark, see Ornston (2012b).



approach to the privatisation of public services and resulted in more fragmented and uncoordinated policy arenas, with the key steering mechanism being cost-effectiveness. This also stemmed from the policy reforms that the WTO suggested to developing countries because they promoted the implementation of universal rules and institutions, thus decontextualising domestic policymaking (Kattel, 2012). For example, inspired by foreign success stories and influenced by international organisations, many catching-up countries direct their innovation policies to strengthening university–industry linkages. However, they often lack both dynamic private sector actors and policy capacity to successfully implement them (Kattel, 2012). Their policy mixes should instead be based on the local requirements, customised to address the real challenges related to the activities of the innovation system (Borrás & Edquist, 2013). These are, in turn, based on analysis and defined strategic priorities/goals, also taking the country's distance to the technological frontier into account (Izsak et al., 2015). The implemented policy reforms eventually caused double fragmentation in CEE EU member states. Fragmentation and a divide among the actors in the innovation system, and fragmentation among education, research, and other policy arenas make coordination, policy design, implementation, and evaluation very difficult (Karo & Kattel, 2010).

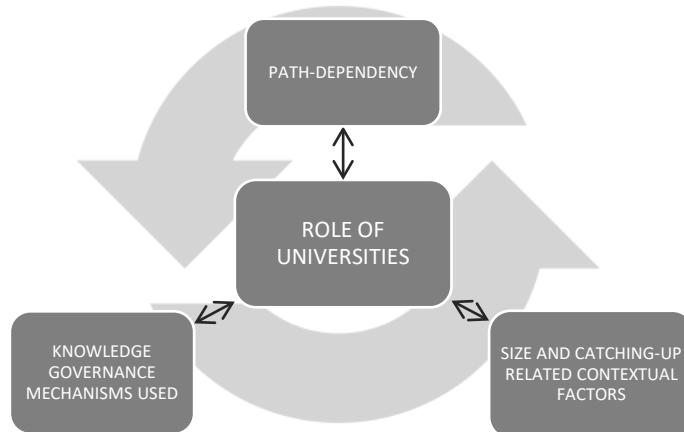
Another factor that impacts both institutions and organisations is path dependency. The ideas of path dependency that evolutionary economists - for example, David (1975, 1985) and Arthur (1989) – originally developed provided insights into locking processes. However, social scientists later modified them for usage in the institutional area and in comparative politics (e.g., North (1990) Pierson (2000)). The basic notion of every path dependence argument is the significance of past actions for future actions and the idea that past decisions can restrain future choices. In addition, self-reinforcing processes can act as major drivers in accumulating a specific path (Schreyögg & Sydow, 2010). At the base of path dependency is the notion that both smaller and bigger events can act as critical junctures or triggering events that set the direction of a specific path to a wide range of possible outcomes (Pierson, 2000). Additionally, once the particular course of action is introduced, it is almost impossible to reverse (Pierson, 2000). Path dependency is one of the key concepts of historical institutionalism that examines the development of institutions over time, with the aim of explaining particular institutional choices (Christiansen & Vanhoonacker, 2008). Critical junctures can trigger institutional change and instability, sending countries on different paths that constrain the further evolution of institutions (which happens in response to changes in environmental conditions and politics; Thelen, 1999).

To sum up, after regaining independence, CEE countries needed to introduce new policies and change the structures of their institutions. However, the paths that many chose due to the homogenisation and convergence of policies weakened the capacity of the public sector, thus causing difficulties with coordinating complex policy arenas, such as education, research, and innovation. The public sector's capacity in small states is typically limited. Thus, this further exacerbated the issues in the small states among the CEE countries.

The government plays a crucial role in facilitating interaction between the various actors of innovation systems. This is a role that requires understanding the changes and needs within the systems, as well as the capacity to implement solutions. In Latvia's case, a multitude of factors have strongly impacted the choice of knowledge governance mechanisms, their implementation, and their success. These factors include the constraints stemming from the country's small size, as well as historical developments,

path dependency, and the catching-up context. These contextual factors are inter-dependent and need to be explored as a whole.

To fill the aforementioned gaps in the NIS, triple helix approach, and knowledge governance literature, this thesis is aimed at bringing them all together and exploring the case of Latvia using the framework shown in Figure 2.



*Figure 2. Analytical framework for the exploration of the role of universities in the knowledge governance system (source: author's construction)*

Within this framework, the intent is to highlight the issues arising from all of these contextual factors, as well as the reduced possibility of implementing such concepts as the NIS, triple helix relations, and the entrepreneurial university. The thesis's aim is to show that countries whom these types of constraints affect need to re-evaluate the role of universities and pursue a different path to facilitate scientific contributions to contemporary challenges.

## 4 Development of the knowledge governance system in Latvia

### 4.1 Structure of economy and domestic needs

After regaining its independence in 1991 (*de facto*) and during the subsequent transition period, Latvia, just like other former Soviet republics, found itself in an environment that did not allow for a gradual transition process, so it had to transform rapidly (III, IV). Latvia focused on adjusting to the Washington Consensus policies and implemented a standard set of reforms, but the rapid transformation set Latvia on a path that restricted policy choices in the future (IV).

Latvia has had to reshape its economy multiple times. During the interwar period, Latvia was a predominantly agricultural economy, and textiles and food processing, timber, and mechanical and electrical engineering, metallurgy, and chemicals were areas in which Latvia specialised (III, IV). After annexation by the Soviet Union, Latvia went through a gradual integration into the Soviet economy and was transformed into a predominantly industrial economy (while retaining some of the developed manufacturing capabilities). After the dissolution of the Soviet Union, Latvia had to transform its economy again; with the previous suppliers and consumers gone, Latvia opened up its markets almost instantly, which did not allow for a gradual transformation and sustainability of the manufacturing capabilities it had developed, causing the proportion of GDP constituted by manufacturing to drop significantly (IV). Active privatisation took place, and many capable industries diminished due to brain drain and further fragmentation.

Just like the rest of the economy, the research and innovation system had to go through transformations – the same as other CEE countries, not only in terms of funding, but regarding the instruments and actors as well (Radosevic & Lepori, 2009). Although Latvia was a part of the massive and overall inefficient Soviet research system, it had strong industrial research capacities (European Commission, 1999). However, after the dissolution of the Soviet Union, there was excess R&D capacity in Latvia that exceeded the needs of the small country and its local industry. It was necessary to adjust and develop the innovation system, which was done by involving foreign experts (e.g., the Danish Research Council in 1992, regarding research) to analyse and evaluate the existing infrastructure and provide recommendations on how to proceed. The main concerns at the time were providing at least the bare minimum amount of funding horizontally across fields (priority areas were therefore broad and inclusive, and no decisions towards specialisation were made), as well as integrating research and higher education, which were operating separately within the Soviet system (III). However, these concerns drew focus away from other issues that small and catching-up countries should face – dealing with the need to prioritise and specialise to gain critical mass and developing policy and administrative capacity to develop appropriate innovation policy.

The de-industrialisation that took place impacted the realm of knowledge governance significantly – manufacturing is essential for the development of high-quality knowledge-intensive services (Reinert & Kattel, 2007), and industries with high added value (which declined during the transition period) is the natural partner for R&D and technology transfer (III, IV). Investments in R&D (see Table 2 for some economic indicators) and the pattern of collaboration between companies and the research sector in Latvia suggest that the dominant type of innovation among companies is process

innovation – innovation based on learning by doing, using, and interacting (DUI). The DUI mode is an experience-based mode of learning opposed to the science, technology, and innovation (STI) mode based on production and use of codified scientific and technical knowledge (Jensen et al., 2007), making formal technology transfer (often targeted through research funding) irrelevant to the majority of companies in Latvia (I, III). Despite understanding and acceptance of the two different types, policy makers remain biased towards considering innovation processes to be connected mainly to formal R&D processes, resulting in, for example, emphasis on strengthening university–industry linkages and training researchers in bio- and nano-technology, benchmarking variables related to STI, and so on (Jensen et al., 2007). Similar bias and a mismatch caused by that can be seen in Latvia, despite the fact that the country’s competitiveness has been based on low costs, which has impacted attraction of FDI. Attraction of FDI was one of the priorities after regaining independence; however, in manufacturing, it went into relatively resource-intensive low-tech industries (IV).

Therefore, the main priorities during the last decade have been to increase the overall innovation capacity, increase the competitiveness of Latvian science, increase R&D expenditure, develop human capital, increase the proportion of medium and high technologies, and optimise science management. Additionally, there is an emphasis on returning investment in university research projects through technology transfer, as well as increasing the absorption capacity of the private sector and creating demand for science and innovation (Ministry of Education and Science of the Republic of Latvia, 2013).

*Table 3. Latvia: some economic indicators (source: Central Statistical Bureau of Latvia)*

Parameter	Value
Population (2020)	1 907 675
Area	64 589 km <sup>2</sup>
GDP (2019)	€30.5 billion
GDP per capita (2019)	€15 928
Expenditure on R&D (all sectors), % of the GDP (2019)	0.64
Business sector expenditure on R&D % of total expenditure on R&D (2019)	24%
“Basic” funding for research (2019)	23.4 mil. EUR
Number of research organisations (2019)	69
Number of research organisations eligible for “basic” funding (2019)	22
Patent filings (resident filings, filings abroad, including regional; 2018)	175

## 4.2 The landscape and governance of R&D and innovation

For Latvia as well as other EU member states, policymaking has transformed through emerging supra-national policies and national adaption of these (Trondal, 2002). As Adamson-Fiskovica et al. (2011, p. 134) pointed out, establishing and developing university–industry linkages is a “relatively new phenomenon in Latvia with far less experience accumulated compared to many developed countries”. Therefore, innovation policy documents and policy mix in Latvia, just as in other CEE countries, were formulated rather recently, largely because of the pressure from the EU. Therefore, they reflected EU priorities in R&D and innovation through implemented activities and targets set for funding programmes (Borras & Radaelli, 2011; Suurna & Kattel, 2010). Both voluntary

and coercive policy transfer could be seen during the early transition years, as well as later, when Latvia was on the path of joining the EU, and even after that. A variety of incentives similar to what other EU member states were implementing were launched, with significant focus being also on improving university–industry linkages (Veugelers, 2016; II; III). Figure 3 shows some of the main events, with a more detailed review below.

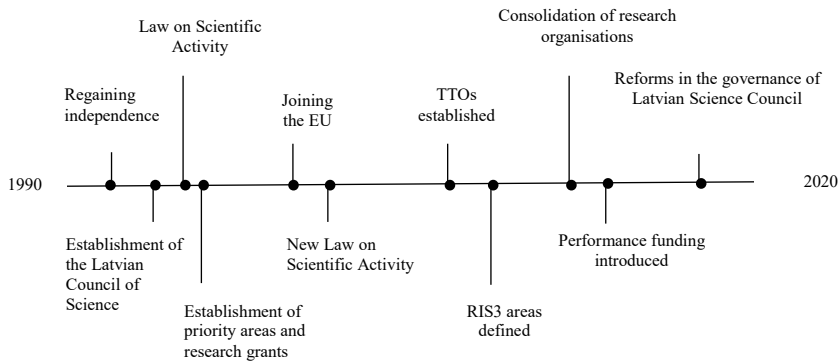


Figure 3. Critical events concerning research commercialisation activities in Latvia (source: author’s construction)

The first major challenges Latvian policy makers faced in the early 1990s were integrating research with teaching and adjusting the research system to a market economy and competition-based funding (III). A Law on Scientific Activity was enacted in 1992, and it formulated the main organisations involved in developing and coordinating processes in the research system. Over time, the landscape and the roles of these organisations have changed significantly (II, III), with, for example, the Latvian Council of Science and Academy of Sciences not acting as significant government advisers anymore but rather, respectively, fulfilling the roles of a funding agency and a promoter of research, technology, and innovation. The fragmented landscape has also changed due to the influx of EU funding and its heavy use in research and innovation policy (Directorate-General for Research and Innovation, 2018).

As Latvia joined the EU, the process of integration imposed on national policy makers a range of issues, along with the general commitment to the goals of the EU, and required active coordination and support measures. A new Law on Scientific Activity was adopted in 2005, and a number of other changes took place:

- A register of research organisations was established for both private and public research organisations – organisations that met the criteria to register were eligible for receiving competition-based government funding.
- Competition-based government funding was available for basic and applied research, and a separate programme was envisioned for market-oriented research to promote university–industry linkages.
- Public research organisations, including universities, became eligible for the aforementioned annual “basic” funding to ensure research activities.<sup>1</sup>

<sup>1</sup> Although these changes were very important for the integration process, they caused several issues with coordination and fragmentation. As it was relatively easy to establish a public

- Research activities were now an obligation for higher education institutions.
- To ensure continuity of research activities, a substantial part of EU funding was directed towards both generating knowledge (R&D activities and infrastructure) and strengthening knowledge governance at the university level (I, II, III).
- Although the Law on Scientific Activity foresaw that research institutions did not own the intellectual property they developed with state funding up until 2013, EU regulations set different rules within EU-funded programmes; therefore, it was possible to exploit the economic benefits of outputs generated with their support (with some challenges; I).

Although priority research areas were established in the early 1990s, the task to specialise was also necessary because of Latvia's accession to the EU. The EU and its funding incentives supported introduction of various innovation policy instruments – that, as well as expert advice and benchmarking, facilitated both voluntary (e.g., lesson drawing or imitation) and coercive policy transfer. To facilitate a more focused approach to research and innovation policy, the EU introduced an overall framework – RIS3 – that had to be implemented in the member states as a precondition for research and innovation funding in the latest planning perspective (2014–2020). The previous laissez-faire approach to research and innovation policy (which was disadvantageous to Latvia at the time because strong coordination and dialogue between organisations was needed to develop targeted incentives, develop capabilities, reduce fragmentation, and gain critical mass), and use of horizontal policy instruments could have also been addressed by this approach. However, this approach that calls for a bottom-up identification of priorities involving both entrepreneurs and the public sector with the aim of using the existing regional advantages and diversifying the local economy into industries with higher value added (Coffano & Foray, 2014; Landabaso, 2014; II) had to be implemented in a short period. Additionally, the concept of entrepreneurial discovery that is the basis of setting the priorities requires strong coordination skills and dialogue between the public and private sectors. The insufficient timing and lack of existing coordination mechanisms resulted in a formal dialogue between the sectors and dominance of academic interests (e.g., focus on high technology; (Karo et al., 2017; III). As Karo et al. (2017) further argued, in all Baltic states, including Latvia, the process of entrepreneurial discovery has not focused on the need to support experimentation, search, and discovery but rather been understood as a process of public–private coordination. The formal dialogue and insufficient policy capacity in Latvia resulted in a broad selection of specialisation areas that included almost all industrial and research areas. Latvia is a small country; therefore, a concept for regional specialisation was created on a national level, showing how the smallness of a country again impacts knowledge governance – determining the “right” priorities is challenging; therefore, policy makers fear pointing out specific sectors or industries, as there is a possibility of choosing the wrong ones (II, IV). Broadly defined priority areas with limited funding available prevent gaining the critical mass necessary for producing high-level research outputs and developing the required industrial R&D capabilities at universities. By losing their local

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research institute (only five PhDs needed) and guaranteed annual “basic” funding that allowed a certain level of autonomy was available, there was an increase in research organisations. For a small country with already scarce funding, that was a negative effect and exacerbated issues with coordination and fragmentation. Only in 2015 did eligibility for “basic” funding become more demanding, and the EU-funded consolidation of research institutions took place.

relevance for the private sector, universities became dependent on the state budget and mainly funding from the EU (III).

R&D expenditure has been fluctuating (see Figure 4 on data since 2000). Although at the beginning, the main elements of research funding system were various national grants, “basic” funding (impact visible since 2004) was later introduced, and EU financial instruments for candidate countries or potential candidate countries became available. European funding in the form of Structural and Investment funds and the Framework Programme eventually become the main sources of R&D funding (I, II, III).

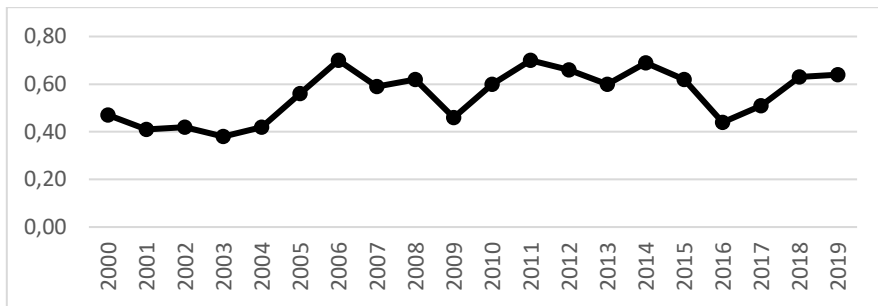


Figure 4. R&D expenditure, % of GDP (source: author’s construction based on the data from the Central Statistical Bureau of Latvia (2020))

Overall, R&D funding was increasing a few years before the recession, but then it dropped and again recovered mostly due to the influx of EU funding (Figure 5).

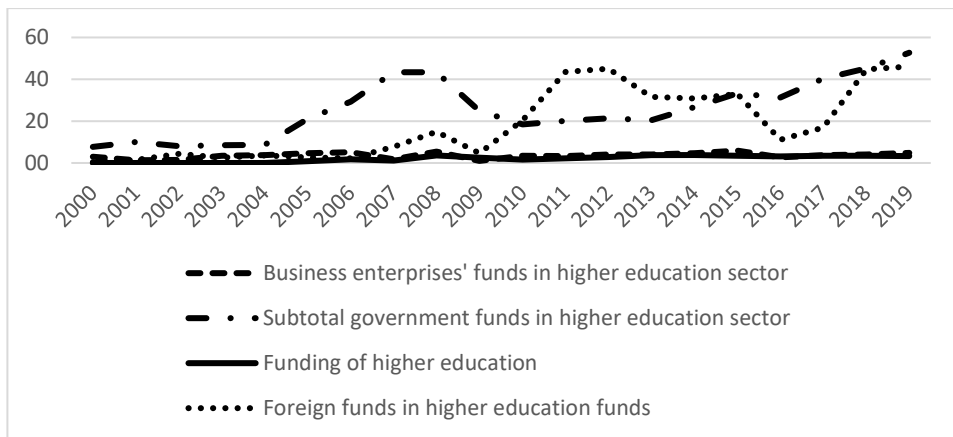


Figure 5. Expenditure on R&D in the higher education sector (mln euro; source: author’s construction based on the data from the Central Statistical Bureau of Latvia (2020))

Over time, it became apparent that the fragmented knowledge production system with many research organisations was preventing effective use of the already scarce funding, and consolidation of research organisations was suggested through external evaluation (Arnold et al., 2014). Consolidation was later carried out by reducing the amount by roughly half. Additionally, a new, three-pillar model for financing higher education and research was introduced and replaced the previous input-based one with

one including performance-oriented components (Directorate-General for Research and Innovation, 2018).

To sum up, the main knowledge governance mechanisms implemented in Latvia on the system level include establishment of a regulatory framework and governing bodies for research and innovation, establishment of priority/specialisation areas, developing monitoring mechanisms (specifically for RIS3 and research performance-based funding), launching incentives for R&D and technology transfer, and facilitating establishment of structures within universities to improve university–industry linkages.

Besides system-level changes, universities had to transform as well to be able to use the support given to them. The transformation of universities took place with a set of activities (I, II, III):

- To ensure that the outputs could be exploited economically, TTOs were developed at public universities. However, TTO activities are largely tied to EU funding and targets set for this funding. The targets and uniform approach in support measures do not reflect the domestic situation.
- TTOs were given a task to initiate changes in procedures and routines related to intellectual property management at research organisations.
- A number of universities established business incubators or other measures involving students in entrepreneurial activities.
- Procedures for facilitation of contract research were established.
- Production of economically relevant knowledge and development of linkages with the private sector were established as priorities in their development strategies.

To sum up, the main knowledge governance mechanisms implemented in Latvia on the university level include prioritisation of technology transfer activities, internal procedures for technology transfer processes, developing capacity-building initiatives, and developing structures to facilitate and manage university–industry linkages, such as TTOs and business incubators. These mechanisms were largely designed and implemented in a “top-down” manner, with varying impact and success (for more details and examples, see I, II, III). As discussed previously, there are multiple contextual factors arising from a country’s size and level of development that affect the implementation, and this impact, drawing from the case of Latvia, is discussed in more detail in the next section.

### **4.3 Impact of contextual factors on governance mechanisms for facilitating university–industry linkages**

With the EU emphasising the significance of strong university–industry linkages in fostering innovation and economic growth, a significant amount of funding has been available to intensify commercialisation activities at universities in Latvia. As the previous section shows, universities were given means through funding (via specific incentives) and a legal framework allowing them to not only engage in research activities and generate knowledge but also to diversify the diffusion processes and seek economic benefits.

Some of the mechanisms have had a positive impact, such as consolidation of research organisations to enable building critical mass and research excellence in prioritised areas and reducing fragmentation of the research system (I, II), as well as the introduction of performance-based funding as an addition to the annual “basic” research funding that



enabled the development of smaller-scale, experimental funding programmes arising bottom up from universities (I). Still, some other mechanisms fell short – funding for R&D technology transfer activities has not generated an influx of funds from the private sector, and envisioned changes in R&D expenditure and overall innovation performance also have not come to fruition.

There are multiple reasons for that – the governance mechanisms have not always been implemented with sufficient coordination, monitoring, and evaluation, and in some cases not at the right time (I, II, III, IV). Additionally, path dependency and local context have been insufficiently addressed<sup>1</sup>, and certain size-specific issues and the catching-up context have shaped the implementation (I, II). A summary of how the existing knowledge governance structures and mechanisms in Latvia and the small state and catching-up context affect one another is provided in Figure 6.

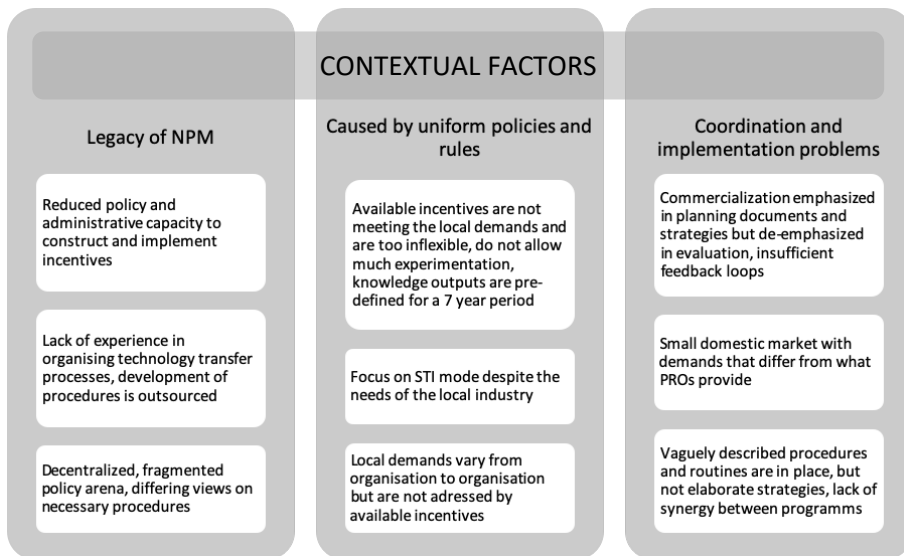


Figure 6. Problems with existing knowledge governance structures and mechanisms (source: author’s construction)

A significant constraint has been the insufficient policy and administrative capacity to construct and implement incentives (I, II), affected negatively by the high fragmentation and large pool of involved organisations with limited cooperation, a general lack of commitment among policy makers, and differing views on necessary procedures (Directorate-General for Research and Innovation, 2018; Ministry of Education and Science of the Republic of Latvia, 2013; Smidova, 2015). The policy and administrative capacity is also important for policy learning and transfer to be effective, as emulated or transferred policies call for evaluation and appropriation so that they fit in the local context. It has also affected the delivery of guidance for universities and development of procedures, routines to ensure seamless university–industry interaction on the university level (I). Institutionalised cooperation in developing new supply-side resources and typical patterns of cooperation present in corporatist countries (such as engaging

<sup>1</sup> Path dependency is not necessarily negative; however, this thesis focuses particularly on the negative aspects.

the industry in venture capital and pension funds, placing less emphasis on employment protection in favour of collaboration in skill formation, and placing less emphasis on state aid and state-owned enterprises but increased private–public and interfirm cooperation in research) can help countries respond better to disruptive economic shocks (Ornston, 2012a). However, it is also important to note that the fragmentation and insufficient capacity of the public sector have affected the ability to establish mechanisms that would allow a dynamic and inclusive dialogue between various sectors. This was seen during the development of RIS3 in Latvia. Establishment of smart specialisation areas through the process of entrepreneurial discovery prompted improvements in the weak coordination of domestic policy; however, coordination mechanisms ensuring dynamic feedback loops and evaluation of various incentives are still mostly absent in Latvia.

The commercialisation system within universities in Latvia is fragmented, with individual mechanisms funded by different sources, thus causing insufficient flexibility and ability to experiment and coordinate – they often lay out very specific requirements for results and rules for what activities are funded; however, that does not always match the needs of research organisations whose capacity in commercialising research is sometimes very different. Complicated implementation rules also shift the concern of following the procedures rather than contributing to the economic development (I). EU funding has in many ways facilitated commercialisation of research and improving the commercialisation system by requiring the development of internal structures and procedures in universities. However, the differences between incentives and their requirements make the procedures different, thus making internal rules fragmented and processes difficult to coordinate. Lack of experience and capacity in both the public sector and universities made these processes even more difficult as, for example, university TTOs were not equipped with sufficient knowledge for constructing the procedures, and no guidelines were available from those who designed the incentives (I).

Fragmentation, while reduced because of consolidation efforts, can be seen among research organisations as well, further exacerbating issues caused by limited funding and increasing the need for prioritisation and specialisation. Not only is there still a high number of regionally dispersed research organisations, but there is also a high number of funding programmes from different sources (the majority still from the European funds) managed by different organisations, and there is a mismatch in research topics pursued by the public and private sectors (Directorate-General for Research and Innovation, 2018; Kujikovskis et al., 2018; Ministry of Education and Science, 2020).

In small states, local universities need to build capacity to be able to integrate into international networks and supply knowledge to international partners. On the other hand, they also need to think about maintaining local relevance. Although research capacity has been addressed in Latvia through various uniform EU funding mechanisms and smart specialisation, the funding mechanisms implemented are targeted at a linear model of innovation by supporting research and expecting commercialisation activities afterwards rather than collaboration and joint innovation activities. Funding sources facilitate development of areas such as nanotechnology, biomedicine, and photonics, which do not meet the existing need of traditional sectors dominant in Latvia. Domestic industry in Latvia is dominated by low-tech sectors and micro and small-sized enterprises that do not have a sufficient R&D funding capacity. This has limited the domestic relevance and opportunities for local university–industry linkages, as the innovation patterns in local industry show that companies do not necessarily require knowledge and technology transfer from universities, especially in a formal way, for example, through

acquisition of IP rights. Development of university–industry linkages has been a rather recent focus for Latvia, and the private sector development has not been that long, so both universities and companies are still developing skills in managing their collaborations (Adamsone-Fiskovica et al., 2009). Additionally, significant focus has been put on developing procedures related to management of codified knowledge and a technology-push approach, but not to ones that regulate means of commercialisation of tacit knowledge available for universities (with the exception of contract research), such as academic spin-offs, collaborative research, ad-hoc consultations, or participation in networks with practitioners (Dahlborg et al., 2017). Considering that the majority of companies in Latvia engage in the DUI mode of innovation, this also impacts establishment of frequent university–industry linkages.

The contextual factors discussed above need to be considered when designing some other knowledge governance mechanisms that have mostly not been addressed but are crucial for the current transformation to emerging mission-oriented and market-shaping policies and enabling universities to contribute to solving societal challenges. Such policies require coordination, alignment of cross-cutting policies (e.g., R&D, FDI, trade) on different levels, and capabilities within the government to coordinate, as well as development of governance structures responsible for that. That also includes coordination of other realms, such as research and production of knowledge and development (and facilitation) of standards within the prioritised areas to facilitate their growth. It is also necessary to define performance indicators of these areas and respective missions/challenges that should be addressed. To do so, establishing mechanisms to involve various actors and facilitate the emergence of new ones is crucial, as that would allow for more efficient feedback loops, monitoring, and analysis.

## 5 Knowledge governance structures and mechanisms and their impact on university–industry linkages

As seen from the information discussed in the previous sections, the case of Latvia can give insights into how the contextual factors arising from the size of the state and those of the catching-up context, as well as the use of knowledge governance mechanisms and path dependency, can impact each other and eventually shape university–industry linkages and the particular role of universities – a topic this thesis aims to explore deeper.

*Table 4. Impact of contextual factors, path dependency, and university-industry linkages on implementation of knowledge governance regimes (source: author's construction)*

	Size- and catching-up-related contextual factors	Path dependency	University–industry linkages
The common knowledge governance regime	<ul style="list-style-type: none"> <li>Impacts the ability to establish linkages because of the mismatch between the supply and demand sides</li> <li>Insufficient policy and administrative capacity impact the abilities for long-term policymaking and designing effective support mechanisms for demand and supply sides to meet</li> </ul>	<ul style="list-style-type: none"> <li>Path dependency can exacerbate the constraints to establish linkages</li> <li>Impacts the ability to successfully implement the mechanisms and prevents flexibility</li> </ul>	<ul style="list-style-type: none"> <li>Specialisation of universities influences the domestic collaborations and development of a shared knowledge pool</li> <li>Focus on formal university-technology transfer impacts the ability to generate interest from the domestic industry</li> <li>Skills of staff at universities need to be developed to address insufficiencies on the university level</li> </ul>
The dynamic knowledge governance regime	<ul style="list-style-type: none"> <li>Causes a need to balance between domestic needs and international value chains</li> <li>Insufficient policy and administrative capacity impact the ability to implement cross-cutting policy instruments and coordination to establish standards, develop regulations, address intellectual property rights, manage FDI flows, facilitate new actors</li> </ul>	<ul style="list-style-type: none"> <li>The choice of past governance mechanisms and support instruments such as funding programmes or specialisation areas impacts the ability to capitalise on the knowledge if mismatch has not been addressed</li> </ul>	<ul style="list-style-type: none"> <li>Existing university-industry linkages impact the ability to capitalise on the knowledge generated, if there is a mismatch, poor coordination, different maturity levels</li> <li>The abilities of universities' staff to manage the intellectual property and develop seamless procedures for technology transfer can impact the frequency of university-industry linkages</li> </ul>
The social knowledge governance regime	<ul style="list-style-type: none"> <li>Insufficient policy and administrative capacity impact the ability to coordinate maturing industries' activities and upgrading, and identify the knowledge pools that should be developed</li> <li>Also impacts the ability to identify priority areas that match the industries' interests and capabilities</li> </ul>	<ul style="list-style-type: none"> <li>Insufficient knowledge-based activities impact the industries' ability for exports and participation in international alliances, consortia</li> </ul>	<ul style="list-style-type: none"> <li>Existing linkages impact the universities' ability to identify the directions for development of skills</li> <li>Existing linkages also impact the ability to understand and match the development interests with the industry</li> </ul>

Section 3 discussed three knowledge governance regimes based on historically successful development experiences – the common knowledge governance regime, the dynamic knowledge governance regime, and the social knowledge governance regime (Kattel, 2012). Table 4 summarises the findings from the case of Latvia by looking at the impact of contextual factors and path dependency on the implementation of these regimes, and their interplay with university–industry linkages and the role of universities.

One of the main aspects of the common knowledge governance regime is the establishment of linkages, development of common knowledge pools, and development of domestic trade. As creators and diffusers of knowledge, universities play an important role – providing knowledge that would be beneficial for the local industry so that cooperation is possible. However, size- and catching-up-related contextual factors, path dependency, and the existing set of knowledge governance mechanisms impact the ability of universities to play that role.

The mismatch between the supply and demand sides results in limited interest by domestic companies to tap into the knowledge available at universities. Additionally, micro, small, and medium-sized companies that dominate the economy often cannot afford services offered by universities or do not have the necessary absorption capacity (IV). This situation calls for mechanisms that facilitate the creation of linkages. However, the small size and insufficiencies in the administrative and policy capacity affect the ability to design and coordinate these mechanisms (I, II, III). Inappropriate choice of instruments can exacerbate the impact of contextual factors; for example, focus on the STI mode, supply-side instruments, and formal technology transfer can prevent sufficient diffusion of knowledge and improvements in university–industry linkages. Demand-side instruments have so far been insufficiently explored (II, III). The choice of knowledge governance mechanisms can also set a specific course for development that impacts the current possibilities and the possibilities for path creation in the future. For example, the priority areas were defined when implementing smart specialisation not to exclude any of the important industries (I, II). FDI policy impacted skill development on the company level, leading to diminished absorption capacity (focus on low-wage, low-skill, and low added value industries) (IV), which affects the possibilities to implement certain support measures. The establishment of fragmented governance structures with reliance on EU funds limits flexibility and the possibilities for effective coordination (I, II, III, IV).

Linkages and knowledge pools are essential for implementing the dynamic knowledge governance regime aimed at using the established linkages and capitalising on the knowledge generated. Therefore, it is important to address the causes of insufficient cooperation. As the case of Latvia shows, the incentives aimed at facilitating the entrepreneurial role of universities have had lacklustre results due to a linear view on innovation, focus on formal technology transfer, unclear procedures on both government and university level (I). These issues can also prevent effective management of intellectual property and export of knowledge.

Meanwhile, the social knowledge governance regime is focused on maturing industries' activities and upgrading and focuses on promoting exports, skill development, tax incentives for R&D, and liberal trade and antitrust policies. Implementation of activities to promote these areas calls for cross-cutting coordination, effective feedback loops, and analysis of potential areas of collaboration.

Countries may need to combine elements from all of the regimes at the same time (however, challenging because of limited administrative and policy capacity), but it is important that linkages are established as a basis for implementing either and universities

have a significant role in that by a) addressing the local needs for collaboration; b) creating demand by facilitating university incubators and spin-off companies; c) exploring the existing linkages for collaboration opportunities; and d) providing seamless transactions and procedures for collaboration ensuring effective management of their intellectual property.

These findings emphasise the struggle of small and catching-up countries to facilitate approaches such as NIS and triple helix and direct universities to become entrepreneurial. Although there are solutions that can be implemented to improve that, the design and implementation are still impacted by many factors and path dependency, thus raising the debate on whether the types of university–industry linkages and the role of universities should be re-evaluated.

The emerging knowledge governance approach and the market features approach, with the emphasis on wide knowledge dissemination and the ability of universities to contribute to addressing grand societal challenges, as well as governance mechanisms for local knowledge dissemination, need to be implemented. In the case of Latvia and small, catching-up countries, that means implementation of mechanisms that consider the needs of the domestic industry and establishing linkages as well as mechanisms that facilitate the ability of universities to be able to disseminate knowledge relevant to international value chains, such as boosting organisation-level intellectual property management skills and participation in international networks.

## 6 Conclusions and directions for further research

The case of Latvia highlights the impact that contextual factors arising from the size of the state and the catching-up context can have on knowledge governance. It also highlights the interrelated dynamics between knowledge governance, the size of a country, the catching-up context, and path dependency. The impact of the contextual factors and knowledge governance mechanisms on university–industry linkages and the role of universities brings forth a number of challenges but also gives insights into what kind of solutions might be needed to overcome these challenges.

The case of Latvia emphasises several shortcomings of small states and how they have impacted the process of designing and implementing various initiatives to facilitate the emergence of the “entrepreneurial university”. The case shows that an increase in funding and inspiration from foreign success stories is not enough to navigate and develop the complex research and innovation policy arena.

To answer the first question posed – “What knowledge governance mechanisms have been used to facilitate effective government–university–industry interactions and more specifically the emergence of entrepreneurial universities?” – the thesis shows that a wide array of knowledge governance mechanisms typically used elsewhere have also been implemented in Latvia since the country regained its independence. The choice of mechanisms has been heavily affected by external factors and supra-national policies, largely due to Latvia joining the EU. The mechanisms included establishment of new governance structures, changes in legislation, establishment of support structures and procedures within universities, as well as incentives to motivate researchers to participate in technology transfer activities. However, despite the prioritisation of university–industry linkages and the funding allocated to this area, universities in Latvia have failed to significantly increase collaboration with and revenue from the private sector. This leads to the second question posed in the thesis: “What contextual factors have affected knowledge governance, university–industry linkages, and universities in Latvia?” The thesis shows that knowledge governance, university–industry linkages, and universities in Latvia have been affected by contextual factors arising from the size of the country, catching-up context, and path dependency, such as the following:

- Limited policy and administrative capacity (also due to the legacy of NPM) – this impacts the ability to design, implement, and evaluate mechanisms. There is insufficient administrative capacity on the level of both policy makers and implementers as well as universities.
- The limited capacity leads to limited capability to design flexible governance mechanisms and experiment with incentives, facilitating uniform policy approaches and governance mechanisms that do not sufficiently address the domestic needs and context.
- Uniform policy approaches originating from advanced economies complicate introduction of appropriate knowledge governance mechanisms in catching-up economies. In the case of university–industry linkages, introduction is caused by a mismatch between what is supplied by the local universities (following research directions enforced by supra-national funding schemes) and what is demanded by the domestic industry.
- Difficulty developing excellency in multiple technological fields and types of research (fundamental and applied) and the need to specialise impact the frequency and types of university–industry linkages and the relevance of

universities to local companies, as well as international value chains and research communities.

- Path dependency and vulnerability to it affect the choice of knowledge governance mechanisms used and the possibility to later modify the mix, reducing the flexibility in developing strategies.

The interrelated dynamics between these factors make it very difficult for a country such as Latvia to implement the same range of instruments that advanced economies frequently use to facilitate university–industry linkages. Although not all the factors arise from Latvia being a small state (as the small size can also be an advantage in some cases), there are factors arising from the catching-up context as well. Eventually, as the case shows, these contextual factors in many cases exacerbate the negative effects from each other, making it crucial to understand and consider these dynamics if viable incentives were to be provided and at the right time.

To answer the third question posed – “How have universities in Latvia responded to the knowledge governance mechanisms implemented in Latvia?” – the thesis shows that universities have responded to various knowledge governance mechanisms by establishing corresponding procedures and support structures and have formally prioritised facilitation of technology transfer; however, they have failed to significantly increase revenue from the private sector. Universities have also been cautious in seeking economic benefits from their research outputs due to the lack of a unified framework for the procedures and unclear requirements of intellectual property management, highlighting the significance of institutional coordination. As the case of Latvia shows, many issues are exacerbated by a high fragmentation among governance structures and diverging agendas among policy makers. As a result, this complicates the possibility to carry out activities such as monitoring and ensuring dynamic and frequent feedback loops critical for designing knowledge governance mechanisms. Both are important for evaluating the approaches used and understanding their shortcomings. This is also important for experimentation with incentives and ensuring flexibility of the support programmes.

To sum up, the case of Latvia emphasises the need for elaborate coordination, as well as improved capacity addressed on multiple levels – on both the policy makers’ and implementers’ level, as well as among and within universities. This could be addressed by cross-cutting governance structures involving various actors of the innovation system, implementing feedback loops and monitoring mechanisms to better capture context-related issues, and designing the appropriate governance mechanisms to overcome such issues.

Additionally, the case of Latvia highlights the need to evaluate and perhaps reconsider the role that universities can play in the economy of a small and catching-up country. Universities in Latvia have failed to significantly increase revenue from the private sector despite numerous support incentives aimed exactly at that. The focus on formal technology transfer and supply-side instruments largely copied from advanced economies and less attention to development of skills, tacit knowledge, and implementation of demand-side instruments has impacted universities’ ability to sufficiently diffuse knowledge. Eventually, the incentives aimed at facilitating technology transfer have actually limited it. This indicates that a more nuanced and context-sensitive conceptual understanding of the possibility of entrepreneurial universities needs to be developed, especially because wide dissemination of knowledge is crucial for the recent shift towards solving grand challenges and implementing mission-oriented policies.



Therefore, through the lens of university–industry linkages and the role of universities, this thesis addresses a gap in the literature by highlighting the shortcomings of the NIS and triple-helix approaches when applied to small and catching-up countries. The thesis explores aspects that NIS and triple-helix, as well as knowledge governance literature, have so far not focused on – the role of size in implementing knowledge governance mechanisms to facilitate university–industry linkages and the emergence of the “entrepreneurial university”.

However, as the research focuses on one country, it would benefit from a cross-case analysis to develop a more nuanced understanding of the dynamics between the size of a country and knowledge governance mechanisms. A cross-case analysis would give insights into what other relationships between the factors can be observed and show how and why they differ between countries. This research would also benefit from investigating these issues from the lens of policy makers and the industry, as it now focuses particularly on universities – that would provide a more encompassing view of the different roles of each of these elements and how they fit with the changing approach to science and innovation policy. As the case of Latvia shows, these roles are impacted by various interrelated contextual factors that must be considered in developing mission-oriented and market-shaping policies.

## List of Figures

Figure 1. Case design (source: author's construction).....	14
Figure 2. Analytical framework for the exploration of the role of universities in the knowledge governance system (source: author's construction) .....	34
Figure 3. Critical events concerning research commercialisation activities in Latvia (source: author's construction).....	37
Figure 4. R&D expenditure, % of GDP (source: author's construction based on the data from the Central Statistical Bureau of Latvia (2020)).....	39
Figure 5. Expenditure on R&D in the higher education sector (mln euro; source: author's construction based on the data from the Central Statistical Bureau of Latvia (2020))....	39
Figure 6. Problems with existing knowledge governance structures and mechanisms (source: author's construction).....	41

## List of Tables

Table 1. Knowledge governance mechanisms corresponding to varying approaches to science and innovation policy thinking (source: author's construction) .....	27
Table 2. Impact of size-related constraints on NIS, triple helix approach, and knowledge governance (source: author's construction) .....	30
Table 3. Latvia: some economic indicators (source: Central Statistical Bureau of Latvia) .	36
Table 4. Impact of contextual factors, path dependency, and university-industry linkages on implementation of knowledge governance regimes (source: author's construction)..	44

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## Abstract

### Small States and Knowledge Governance: The Case of Latvia

Movement towards an increasingly knowledge-intensive economy and society has put the governance of knowledge at the centre of policy debate for at least the last three decades. Facilitating the production, diffusion, and appropriation of knowledge is a key priority in policymaking, and universities have played increasingly important roles in these processes. They have become more and more relevant to the debate through institutional changes made when research was integrated with teaching and through a shift from research universities to an entrepreneurial universities that translate the knowledge created into economic benefits.

Many catching-up countries have gone through this transformation during the last decades. Latvia, a small post-Soviet country, went through this process very rapidly after regaining its independence in 1991. EU funding became a major source of funding for research and innovation policies, including for the institutional transformation of universities. However, statistics and research show that Latvia and other Central and Easter European (CEE) countries have had limited success in capitalizing on their science base since regaining independence.

To investigate the causes of this and propose policy recommendations, this thesis uses a “knowledge governance” approach as a framework. Because of significant attention from policy makers on directing funds to research and development and the commercialisation of research, this thesis combines a knowledge governance approach with research on “triple-helix” relations and the “entrepreneurial university” to address the transformations taking place at universities – to what degree universities have transformed since Latvia regained its independence, what governance mechanisms have been used to facilitate universities becoming “entrepreneurial,” and how the country’s size-related constraints and other contextual factors have affected the implementation of policy instruments aimed at facilitating this transformation. It also aims to investigate if and how the chosen policy measures have addressed local needs and capabilities and if the chosen policy mix is justified and addresses the emerging science and innovation policy trends.

Latvia provides an interesting case, as it is a country where path-dependency and need for rapid changes have caused significant challenges in the realm of knowledge governance but where capabilities are significantly limited due to it being both a small and a catching-up country. This thesis aims to contribute to a wider understanding of knowledge governance by addressing a gap in the literature on knowledge governance related challenges in a small state context. The challenges described above are echoed in most other CEE countries. The findings of this thesis could be useful for other catching-up economies, especially the small states among them.

To allow an in-depth exploration of organisations and processes, seek causal relationships among them, and provide an explanation of occurring issues, the single case-study method was chosen. Latvia is a typical case in different contexts. First, it is a typical case among CEE countries that are EU member states—despite favourable conditions for improving innovation performance (influx of EU funding, focus on this policy area), with a few exceptions, most of them have struggled to improve their innovation performance.

The thesis shows that a wide array of knowledge governance mechanisms typically used elsewhere have also been implemented in Latvia since the country regained its

independence. The choice of mechanisms has been heavily affected by external factors and supra-national policies, largely due to Latvia joining the EU. However, despite the prioritisation of university–industry linkages and the funding allocated to this area, universities in Latvia have failed to significantly increase collaboration with and revenue from the private sector. The thesis shows that universities and university–industry linkages in Latvia have been affected by path-dependency and such contextual factors arising from size of the country and its catching-up context like limited policy and administrative capacity, a small domestic market, and a mismatch between supply and demand, among others. The inter-related dynamics between these factors make it very difficult to implement the same range of instruments that advanced economies frequently use to facilitate university–industry linkages. The case of Latvia highlights the need to evaluate and perhaps reconsider the role that universities can play in the economy of a small and catching-up country. This indicates that a more nuanced and context-sensitive conceptual understanding of the possibility of entrepreneurial universities needs to be developed, especially because wide dissemination of knowledge is crucial for the strategies needed for the recent shift towards solving grand challenges and implementing mission-oriented policies.

## Lühikokkuvõte

### Väikeriigid ja teadmiste juhtimine: Läti juhtum

Liikumine üha teadmistemahukama majanduse ja ühiskonna poole on seadnud teadmiste juhtimise vähemalt viimase kolme aastakümne jooksul poliitilise arutelu keskmesse. Teadmiste loomise, levitamise ja omandamise hõlbustamine on poliitikakujundamise peamine prioriteet ja ülikoolid on neis protsessides etendanud üha olulisemat osa. Need on muutunud arutelu jaoks üha olulisemaks institutsionaalsete muudatuste tõttu, mis tehti teadusuuringute integreerimisel õppetöoga, ning teadusülikoolidelt ettevõtlusülikoolidele ülemineku tõttu, mis muudavad loodud teadmised majanduslikuks kasuks.

Paljud järelejäädvad riigid on viimaste aastakümnete jooksul selle muutuse läbi teinud. Läti, väike Nõukogude Liidust vabanenud riik, tegi pärast taasiseseisvumist 1991. aastal selle protsessi väga kiiresti läbi. EL-i rahastamisest sai teadus- ja innovatsioonipoliitika, sealhulgas ülikoolide institutsionaalse ümberkujundamise peamine rahastamisallikas. Statistika ja uuringud aga näitavad, et Läti ning teised Kesk- ja Ida-Euroopa (KIE) riigid on pärast taasiseseisvumist saavutanud oma teadusbaasi ärakasutamises piiratud edu.

Selle põhjuste uurimiseks ja poliitiliste soovitude andmiseks kasutatakse selles väitekirjas raamistikuna "teadmiste juhtimise" lähenemist. Kuna poliitikakujundajad pööravad märkimisväärset tähelepanu rahaliste vahendite suunamisele teadus- ja arendustegevusse ning teaduse kommertsialiseerimisse, ühendab see väitekirja teadmiste juhtimise lähenemisviisi uurimustega kolmikheeliksi suhete ja ettevõtlusülikooli teemal, et käsitleda ülikoolides toimuvaid muutusi: millisel määral on ülikoolid pärast Läti taasiseseisvumist muutunud, milliseid juhtimismehhanisme on kasutatud ülikoolide ettevõtlusülikoolideks muutumise hõlbustamiseks ning kuidas on riigi suurusega seotud piirangud ja muud tausttegurid mõjutanud selle muutumise hõlbustamiseks mõeldud poliitiliste vahendite rakendamist. Samuti on selle eesmärk uurida, kas ja kuidas on valitud poliitikameetmed vastanud kohalikele vajadustele ja võimalustele ning kas valitud poliitikakombinatsioon on õigustatud ning käsitleb tekkivaid teadus- ja innovatsioonipoliitika suundumusi.

Läti kujutab endast huvitavat näidet, sest see on riik, kus raja sõltuvus ja vajadus kiirete muutuste järele on püstitanud teadmiste juhtimise valdkonnas märkimisväärseid väljakutseid, kuid kus võimalused on oluliselt piiratud, sest tegu on nii väikese kui ka järelejäädva riigiga. käsitledes teadusjuhtimise väljakutseid kajastavas kirjanduses esinevat lünka väikeriikide konteksti kohta, on selle väitekirja eesmärk on kaasa aidata teadmiste juhtimise laiemale mõistmisele. Ülalpool kirjeldatud probleemid kajastuvad enamikus teistes KIE riikides. Selle väitekirja järeldused võivad olla kasulikud ka teistele järelejäädvatele majandustele, eriti väikeriikidele.

Organisatsioonide ja protsesside põhjalikuks uurimiseks, nende vaheliste põhjuslike seoste otsimiseks ja olemasolevate probleemide selgitamiseks valiti üksikjuhtumi analüüsi meetod. Läti on tüüpiline näide erinevates kontekstides. On tegu tüüpiline näitega KIE riikidest mis on EL-i liikmesriigid: hoolimata soodsatest innovatsiooni tulemuslikkuse parandamise tingimustest (EL-i rahaliste vahendite sissevool, keskendumine sellele poliitikavaldkonnale), välja arvatud mõned erandid, on enamik neist oma jõudluse suurendamise nimel pingutanud.

Väitekirja näitab, et alates riigi taasiseseisvumisest on Lätis rakendatud mitmeid selliseid teadmiste juhtimise mehhanisme, mida tavaliselt kasutatakse ka mujal.

Mehhanismide valikut on tugevalt mõjutanud välistegurid ja riigiülene poliitika, peamiselt tingituna Läti ühinemisest EL-iga. Kuid hoolimata ülikoolide ja tööstuse vaheliste seoste prioriseerimisest ning sellesse valdkonda eraldatud rahalistest vahenditest ei ole Läti ülikoolid suutnud koostööd erasektoriga ja sealt saadavaid tulusid märkimisväärselt suurendada. Väitekiri näitab, et Lätis on ülikoolide ning ülikoolide ja tööstuse vahelisi seoseid mõjutanud rajasõltuvus ning sellised riigi suurusest ja järelejäudmise kontekstist tulenevad tausttegurid nagu näiteks piiratud poliitika ja haldussuutlikkus, väike siseturg ning pakkumise ja nõudluse vaheline mittevastavus. Nende tegurite omavahelise dünaamika tõttu on väga keeruline rakendada sama instrumendivalikut, mida arenenud majandused kasutavad sageli ülikoolide ja tööstuse vaheliste sidemete tekkimise hõlbustamiseks. Läti näide toob esile vajaduse hinnata ja võib-olla uuesti läbi mõelda ülikoolide roll väikese ja järelejäudva riigi majanduses. Ettevõtlike ülikoolide võimaluste kohta tuleb luua nüansirikkam ja kontekstitundlikum kontseptuaalne arusaam, eriti seetõttu, et teadmiste laialdane levitamine on ülioluline käimasolevate suurte probleemide lahendamise ja missioonile orienteeritud poliitikate elluviimise jaoks.

## Appendix

### **Publication I**

Muizniece, L. (2020) University Autonomy and Commercialization of Publicly Funded Research: the Case of Latvia. *Journal of the Knowledge Economy*.  
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**Publication II**

Muižniece, L.; Cepilovs, A. (2018). Disregarding History and Context: Innovation Policy in Latvia Post 1990. New Challenges of Economic and Business Development – 2018: Productivity and Economic Growth. Proceedings, 474–487. Riga, Latvia: University of Latvia.



**Publication III**

Muižniece, L.; Cepilovs, A. (2017). Supporting University Technology Transfer – Struggles and Barriers in Latvia. *Economic Thought and Practice*, 1, 321–342.

**Publication IV**

Cepilovs, A.; Muižniece, L. (2016). Latvia after EU accession: weathering the storm?  
In: L. Briguglio (Ed.). *Small States and the European Union: Economic Perspectives*,  
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