Designing Smart Specialisation Strategies in less advantaged regions: Evidence from two case studies in Latin-America

Designing Smart Specialisation Strategies in less advantaged regions: Evidence from two case studies in Latin-America

Dissertation submitted in part fulfilment of the requirements for the degree of Doctor of Philosophy in Business and Territorial Competitiveness, Innovation, and Sustainability of University of Deusto (European PhD Degree).

Universidad de Deusto
Deustuko Unibertsitatea
University of Deusto

Designing Smart Specialisation Strategies in less advantaged regions: Evidence from two case studies in Latin-America

Dissertation submitted in part fulfilment of the requirements for the degree of Doctor of Philosophy in Business and Territorial Competitiveness, Innovation, and Sustainability of University of Deusto (European PhD Degree).

San Sebastián 20 de abril 2023

PhD Candidate:

Ana Carolina Iga César

Supervisor:

Edurne Magro Montero

Doctoral Programme in Business and territorial competitiveness, innovation, and sustainability

To my family. Especially to my parents who encouraged me to continue in hard times and to my son, Leandro, who was born during my studies and who has inspired my life since then.

Table of Contents

List of Acronyms

ACI: Cooperation and Investment Agency of Medellin.

AMVA: Metropolitan Area of the Aburra Valley. *Área Metropolitana del Valle de Aburrá.*

CCMA: The Chamber of Commerce of Medellin for Antioquia. *Cámara de Comercio de Medellín para Antioquia.*

CECIF: Corporación Centro de la Ciencia y la Investigación Farmacéutica.

CEDEZOS: Centres of Business Development by Areas

CIB: Corporación para Investigaciones Biológicas.

CIDET: Corporación Centro de Investigación y Desarrollo Tecnológico del Sector Eléctrico.

CONACYT: The National Council of Science and Technology (Mexico)

CRA: Constructing Regional Advantage

CTA: Science and Technology Center of Antioquia. *Centro de Ciencia y Tecnología de Antioquia*.

CUEE: University-Government-Industry Committee (Colombia)

DANE: Administrative National Statistics Department. *Departamento Administrativo Nacional de Estadística.*

DUI: Doing, Using and Interacting.

ECSIM: Fundación Centro de Estudios en Economía Sistémica.

EDP: Entrepreneurial Discovery Process

EEG: Evolutionary Economic Geography

EPM-UNE: Public Medellin Enterprises. *Empresas Públicas de Medellín.*

ERDF: European Regional Development Funds.

ESIDET: Resarch Technological Development Survey.

FDI: Foreign Direct Investment

FOMIX: Fondos Mixtos (innovation policy instrument, Mexico)

GDP: Gross Domestic Product

GEA: Business Group of Antioquia. *Grupo Empresarial Antioqueño.*

GERD: Gross Domestic Expenditure on research and development

GPN: Global Production Network

GPT: General Purpose Technology

GVC: Global Value Chain.

HEI: Higher Education Institutions.

ICIPC: Instituto de Capacitación e Investigación del Plástico y del Caucho.

IAI: Instituto Antioqueño de Investigación.

ICT: Information and Communications Technology. Tecnologías de la Información y Comunicaciones.

INEGI: National Institute of Statistics, Geography and Informatics (Mexico)

INTAL: Instituto de Ciencia y Tecnología Alimentaria.

IT: Information Technology

MNE: Multintional Enterprises.

MNEs: Foreign Multinational Enterprises

NAFTA: North America Free Trade Agreement

NIS: National Innovation System.

NDP: National Planning Department (Colombia). *Departamento de Planeación Nacional.*

OECD: Organization for Economic Cooperation and Development.

PECiTI: Special Program for Science, Technology and Innovation (innovation policy instrument, Mexico)

PEI: Program of Innovation Stimuli (innovation policy instrument, Mexico)

PND: National Development Plan (Mexico)

PROSOFT: Program for the xrganizatio of the Software Industry (innovation policy instrument, Mexico).

RENIECYT: Technological Institutions and Companies (Mexico)

RIS: Regional Innovation System.

RIS3: Regional Innovation Strategies for Smart Specialisation

R&D: Research and Development

RDI: Research, Development and Innovation

SEDECO: Ministry of Economic Development (Mexico)

SIA: State Innovation Agendas

SLP: San Luis Potosí

SME: Small and Medium Enterprises.

SNCTI: National System of Science, Technology and Innovation (Mexico)

STI: Science, Technology and Innovation.

SWOT: Strengths, Weaknesses, Opportunities and Threats.

S3: Smart Specialisation Strategies

TFP: Total Factor Productivity

Acknowledgements

Throughout my studies, many people have left a mark on my path and I would like to express my gratitude to them. First, I would like to thank the support of my supervisor, Edurne Magro Montero, who has not only guided me academically but also showed support in tough moments. I also would like to thank CONACYT for financing the first years of my studies and to my mentor in Mexico, Dr. Cecilia Costero Garbarino. The University of Deusto has also supported me in different ways to continue my studies and remain in Spain. I would like to thank especially Iñaki Peña, coordinator of the CETIS program, who was always willing to listen, give his advice and helped me to be at this point today. From the professors in Deusto, I will mention Jon Mikel Zabala, who helped me a lot before the Conference I needed for the Academic file. Another knowledge institution I would like to thank is Cardiff University, that accepted me for the International Stays. Professor Kevin Morgan, thank you for your support and orientation.

There are also companies I would like to recognise for making this dissertation possible; the consultancy firms that carried the S3 strategy in the studied regions; Indra and Idom, who helped me to reach respondents and orientated the interview processes and conclusions. I am also grateful to all the respondents who dedicated their times for this research.

A good place to work is always a necessary condition, and I would like to thank Orkestra for providing me a place to work, but beyond that, for giving me a nice environment and making me feel part of the group. Academically, I would like to thank Marijo Aranguren and Mikel Navarro who supported me during my supervisor´s leave. Personally, I am honoured to have met some of my best friends, Maite, Amaia, Maider and Ainhoa; who have always encouraged me to continue and were my psycologist throughout the process. In the last years of the process, Ibermir

Hispania, the company I currently work for has offered me that place to work and support to finish my studies. Thank you, Santiago for believing in me.

The path is always easier with supportive colleagues, thank you Marta, my sensei, for inspiring me to get enrolled in the program, and to all the other colleagues with whom I shared more than a common Ph.D. program. I would also like to thank Idoia Irigaray, who became my family in San Sebastian.

Last, but not least, I would like to thank my family, who were always my pillar and who helped me to continue when I wanted to give up. My family was very important in the process especially considering that during my studies I experienced a pregnancy process, becoming a mother, a pandemia in a foreign country, legal and financial issues to remain in the country and a divorce. Thank you for pressing me to finish and for always seeing the best in me and for never losing faith in me. I dedicate this to you.

Abstract

Smart Specialisation Strategies (S3) have shaped the academic debate in regional innovation policy. This dissertation empirically investigates the academic and practical implications of adopting such strategy in non-European contexts. The importance of studying non-European regions relies on two main facts: first, it sheds light on the elements that foster or hinder the process of S3 from regions with different contextual challenges. Second, it provides evidence on regions that are barely explored, but that are included in the group of intermediate regions for which S3 is expected to make more sense (Foray, 2019).

A multiple case-study approach compares the large metropolitan regions of Medellin, Colombia and San Luis Potosí, Mexico. Both of which have embraced the S3 strategy to shape their innovation policies. Those regions are similar in hard economic and structural data but different in softer elements, such as the previous experiences and institutional arrangements. A variety of data collection procedures are used, including in-depth interviews with 33 relevant actors from the triple helix, that participated in the S3 design process and the discovery process of regional specialisation activities.

This document contributes to the literature in different ways: first, identifying the regional scope that makes more sense for regional policy in large metropolitan regions; for which the scope of city-region is suggested; second, highlighting the importance of soft regional elements such as sense of ownership, previous experiences and institutional arrangements, innovation system, and leadership as a connective mechanism; third, a recognition of the importance of considering both a systemic and evolutionary perspective for adapting S3 to different regions. A systemic perspective is useful in bottom-up strategies that deal with a wide range of stakeholders, but also a less-explored evolutionary perspective to manage novelty and break path-dependencies, not only

in industrial activities but also in the way participatory policymaking processes take place; finally, the case studies provide evidence on the uses that S3 has in intermediate large metropolitan regions in non-European context in regions with limited financial funds and innovation capabilities; where the approach has a more productive perspective. Finally, this work argues that the third S of S3 which corresponds to the word “strategies” receives less attention in S3 literature and therefore, provides an analysis of the process from a strategy perspective.

Chapter 1. Introduction and Research Motivation

Chapter 1. Introduction and Research Motivation

1.1 Personal Motivation

After studying the MUCI program at the University of Deusto, which was a Master of Competitiveness and Innovation. I realised that competitiveness and innovation had a territorial dimension due to my previous background in business. When I finished the master and went back to my country, I realised how important it was to incorporate that knowledge in the region. Therefore, I had meetings and interviews with different regional stakeholders and put on the table some of the topics I had learnt. Smart Specialisation Strategies (S3) captured the interest of the people I met. Some of them had participated in 2014 in the process of the State Innovation Agendas, which used S3 philosophy, but told me that in practice it was different to what I was telling them, based on the theory. I was motivated to do my research in a topic that could be relevant for my environment, so I went back to the University of Deusto, to continue my studies and understand better how regional innovation strategies developed in Europe could contribute to regions like mine; which is one of the case studies presented in chapter 5.

1.2 Academic Motivation and Gaps to be Addressed.

In 2008, the concept of the Research and Innovation Strategies for Smart Specialisation (S3) emerged in Europe (Foray et al., 2009) as a regional strategy approach for prioritization at territorial/ regional level on those sectors/ technologies (Jucevčius & Galbuogienė, 2014) and economic activities (Foray et al., 2009; Foray & Rainoldi, 2013), scientific areas and technology domains (Del Castillo et al., 2012) that have the potential to compete in international markets (Del Castillo et al., 2012; Jucevčius & Galbuogienė, 2014). The prioritization should be an outcome of entrepreneurial discovery process (Blazek et al., 2014) that reveals the unique characteristics, expertise, and assets in the region and that requires the participation of the regional stakeholders

(Blazek et al., 2014, Barroeta et al., 2017). S3 was quickly adopted by international organisms (Morgan, 2015). The particularities of the approach are threefold; first, the vertical logic of prioritisation based on related variety (Frenken et al., 2007); second, it's bottom-up character, which means that the different innovation stakeholders participate and that the opportunities; and third, that those opportunities are revealed as an outcome of the Entrepreneurial Discovery Process (EDP).

S3 is a clear example of policy running ahead of theory, where the concept is not tight enough as academic (Foray,2011); therefore, theory and practice co-evolve (Aranguren et al. 2017b) which opens a window of opportunity for research. Especially for exploring the EDP which is the core of S3, has been argued to be fuzzy[1] and under-conceptualised (Aranguren et al., 2017, 557; Benner, 2020; 1679; Capello & Kroll, 2016: 1398; del Castillo et al., 2015) which leads to confusion with other policy approaches (Periañez Forte & Wilson, 2021). Apart from the need for better conceptualisation, the switch from a planning to process perspective (Aranguren et al., 2015) is not reflected in the set of steps suggested for S3 and EDP (i.e. Periañez Forte et al., 2016) which somehow assumes a methodological one size fits all logic (Benner, 2020); in contrast, the success of EDP has been found to be context-dependent and affected by the culture, stakeholders engagement and the trajectories in innovation policy (Periañez Forte & Wilson, 2021).

The context specific elements that shape S3 and the EDP are related to the general context and structure, such as the structural and economic aspects; but also, with the regional innovation capabilities and the type of regional innovation system (Tödtling & Trippl, 2005). In addition, from a process perspective, history plays an important role, especially for learning from the past

[1] See Markusen (1999) for a better understanding of what is meant by fuzzy concept.

(Morgan, 2013: 107). Therefore, the industrial trajectory (Květoň & Blažek, 2018) as well as the previous experiences with place-based policy approaches (Aranguren et al., 2019; Valdaliso et el., 2014) matter for designing S3. Finally, the systemic perspective plays a key role by suggesting the engagement of key regional stakeholders in regional strategy (Carayannis & Grigoroudis, 2016). Therefore, the quality of government (Charron et al., 2014) and institutional capabilities (Farole et al., 2011a; Rodríguez Pose et al., 2014) are expected to shape the process.

Thus, the applicability of S3 to has been questioned in the literature for regions that are less favoured according to their structural and economic characteristics (i.e. Blazek et al., 2014b; Jucevčius & Galbuogienė, 2014); and for those that are less favoured in terms of innovation capabilities and their innovation systems (Květoň & Blažek, 2018). Hassink and Gong (2019) argue that S3 is not for all regions; to which Foray (2019) argues that S3 is more suitable for intermediate regions, which may have thick innovation system but still have low innovation capabilities and missing organisations (Trippl et al., 2019). Those intermediate regions, however, contain at the same time urban and less developed rural areas in which S3 does not really function (Torre et al., 2020).

In fact, Viotti (2002) suggested to understand less developed systems 'learning systems', leaving the concept of 'innovation systems' are for more developed areas. The smart specialisation literature suggests that developing regions are capable of innovating on the co-invention of GPT developed somewhere else (Foray, 2012; Foray & Goenaga, 2013; Foray et al., 2009, 2011; David et al., 2009). The issue is that developing regions are advised to be good/quick followers (Foray, 2012; Foray & Goenaga, 2013; Lundvall et al., 2009) instead of leaders[2]. However, the transition

[2] Middle-income countries have been suggested to specialise in short-cycle technologies and niche markets, where the regions may aspire to a leadership position (Lee, 2017).

from an emergent system to a mature system is an unexplored topic (Chaminade et al., 2009, 14), it is not clear on whether S3 contributes to such transition. Indeed, it is not clear to which extent developing regions should aspire to have a mature system as if there were only one path to development, imitating those of more developed territories (Delvenne & Thoreau, 2017).

Although not all innovation systems are mature, and not all regions perform R&D activities; the reinforcement of regional innovation systems initiatives and decentralisation in policymaking (Rodríguez Pose & Gill, 2003) have taken place in Europe promoted by the European Commission (i.e. European Commission, 2013; 2015) and S3 emerges as an ex-ante conditionality for innovation related funding under the structural funds. However, the interest in the concept was spread to other continents, attracting in particular developing regions (i.e. East Asia, South-Africa, and Latin-America) for three main reasons. Firstly, due to the efforts of the European Commission to diffuse the concept and find international collaboration opportunities (Barroeta, Gómez Prieto, Paton & Palazuelos, 2017); secondly, some scholars (for example David, Foray & Hall, 2009, p.1) stated that the strategy is crucial for those regions that are not at the major science-technology frontier, and thirdly because developing countries are concerned with transformation and need to catch up with the developed world (Lundvall et al., 2009, p.7).

Despite the adoption of S3 philosophy in Non-European regions, the value of concepts like smart specialisation and related variety for regional policies in different contexts is understudied (Villarreal González et al., 2017: 2-3); most of the literature and experiences are based in Europe, with few exceptions (i.e. Barroeta et al., 2017; Bosch & Van Ortas, 2019; Guimon, 2018; Iga-César, 2020; Lorentzen et al., 2011; Zacca González et al., 2018). Furthermore, the evidence on the EDP is limited (Del Castillo et al., 2015) and still in the European context (i.e. Periañez Forte et al., 2016).

Even within the European context, Tödtling and Trippl (2005) argue that innovation systems face different failures and explore peripheral regions, metropolitan regions, and old industrial regions. The challenges of peripheral regions and old-industrial regions are well documented from early experiences with S3 (i.e. Martins, 2016; Camagni & Capello, 2013; Pugh, 2018) while exploring the experience of metropolitan regions is less frequent with few exceptions (i.e. Vas et al., 2015). Finally, intermediate regions for which S3 is argued to be more accurate remain understudied.

1.3 Research Objectives and Introduction

This research aims to develop a Conceptual Framework of Smart Specialisation for Developing Regions considering the main contextual elements that shape the S3. This study was designed with four main goals. The first is to contribute to the understanding of the Entrepreneurial Discovery Process from a processual perspective, including systemic and evolutionary approaches; second, to explore the role and power of actors for the determination of regional strategies and priorities. Thirdly, to shed light on the regional innovation system characteristics that affect the design of S3. Finally, to add evidence on intermediate large metropolitan regions from a non-European context.

For meeting those objectives, the following research question is addressed:

How can Smart Specialisation Strategies be designed to support less favoured regions to become competitive based on their hard (economic and structural) as well as soft (institutions and capabilities) characteristics?

For doing so, the following subquestions shape the research:

1) How is the role of actors that participate in the strategy formulation?

a. How are their roles, and therefore, EDP dynamics affected by the context?

2) How is the design of S3 affected by the innovation potential and regional innovation system configuration?

For solving those questions intermediate metropolitan regions in Latin America will be used to shed to provide novel evidence from unexplored contexts.

The research is framed on the literature covered until 2020, year in which the Horizon-2020 under which the concept of Smart Specialisation was developed and because the studied regions used the literature that was available until before the strategy was performed (2014 in SLP and 2017 in Medellin). The remaining chapters are divided as follows:

First, chapter 2 present two streams of literature that frame this research: strategy and Evolutionary Economic Geography (EEG). First, strategy concepts are expected to shed light on the fuzzy concept of EDP. Second, EEG has three main contributions to the S3 analysis: (1) the evolutionary perspective as an alternative of the neoclassical thinking (Nelson & Winter, 1982) in which the context is acknowledged to play an important role for competitiveness, (2) the spatial dimension of innovation due to agglomeration economies that are expected to generate knowledge spillovers (Asheim & Isaksen, 1997; Audretsch, 1998; Porter, 1996), (3) the uniqueness of regions (Tödtling & Trippl, 2005). Therefore, chapter 2 will explore these two streams of literature that are considered to be the roots of S3; it concludes that the strategy perspective has been less studied in the S3 literature, especially to better understand the dynamics of the EDP and that although a systemic and evolutionary perspectives are considered in EEG, the human factor has been less explored; for which leadership is important both, for engaging regional stakeholders and promote change.

Chapter 3 is devoted to dig into the S3 approach, which has been considered as an example of 'policy running ahead of theory' (Foray et al., 2011) and the 'largest innovation policy experiment in the world' (Radosevic & Ciampi, 2015). Therefore, this chapter describes the theory and reflects on the comparison of S3 with other concepts such as cluster policy, industrial policy and Constructing Regional Advantage (CRA). It also compares the Entrepreneurial Discovery Process with the self-discovery process proposed by Rodrik and Hausmann (2003). Finally, it mentions some conceptual challenges during the period covered in this research. The conclusions of this chapter include the identification of those factors that are expected to shape the S3 process according to the literature and previous experiences.

One of the challenges of S3, was the application to regions with different disadvantages for S3; those disadvantages have been distinguished for geographical factors such as geographical location (peripheral regions) and size (small regions); economic factors such as the level of development (developing regions or regions in transition), level of income (small or medium-income regions); level of development of their Regional Innovation System (RIS); industrial structure (old industrial regions, industrialised regions, regions in industrial transition); and their distance from the technology frontier (regions far or further the technology frontier). Chapter 4 closes the theoretical chapters and concludes that although the regions can be in more than one classification, large metropolitan regions have been less explored in the literature.

Chapter 5 explains the research methodology, for which large metropolitan regions in Latin America were selected. The rationale for the selection of the case studies includes that both regions share hard economic and structural characteristics but differ in softer aspects such as institutional arrangements, past experiences with participatory approaches for policymaking, and the centralisation of the decision to implement S3. The cases selected were San Luis Potosi, Mexico

and Medellin, Colombia; in both cases, the sources of information included an analysis of secondary data about the region and the results of the strategy and interviews to key actors of the highest governance levels and the external consultancy firms in order to determine the dynamics of the process.

Chapter 6 describes the two case studies, the information presented comes from both inductive and deductive reasoning. The first, used to generalise conclusions from the scenarios studied from bottom-up; the second, deductive reasoning comes from the literature review and organises the information from top-down. The case studies are organised as follows: an introduction of the case study, a description of the context of the case, which includes the history, industrial trajectory and a brief description of the regional innovation system. Then, the experience with S3 is described based on the interviews. The section closes with conclusions that compare both case studies.

From the findings of the literature review, and the empirical research, Chapter 7 closes this work with discussion and conclusions. This section includes policy implications and further research and makes the conclusions according to the research objectives. Overall, this work sheds light on the process of S3 and the factors that shape the strategy design in the studied regions. Institutions, the centralisation of the decision to implement the strategy, the sense of ownership and the past experiences with similar approaches are among the most important factors; therefore, leadership capabilities are important to engage stakeholders and to break with the inertia in policymaking. A regional leader is not who holds a power position within the economy or who is a formal authority; instead, regional capabilities are understood as systemic, specifically "…a regional innovation system's ability to effectuate actions, steering the processes and resources of the system in the desired direction and avoiding harmful lock-ins." (Harmaakorpi, 2006: 1088).

The conclusions include challenges that the studied regions face and that may be different of those from EU-regions.

Chapter 2. Strategy and Evolutionary Economic Geography

Chapter 2. Territorial Strategy and Evolutionary Economic Geography

2.1 Introduction

This chapter aims to explain theories on territorial strategy and evolutionary economic geography (EEG) that frame this research. Smart specialisation strategies have been widely studied under the lens of EEG given the place-based character of the approach as well as the focus on science, technology, and innovation for regional development. The first part of this chapter stresses the importance of also considering literature on strategy which has been more neglected in the smart specialisation literature (Sotarauta, 2018: 2). The lens of strategy, offer a deeper understanding on S3 approach and to position the concept in the strategy literature. The strategy concept was imported from war language into business about the end of World War II, stimulated by resource scarcity (Ghemawat, 2002: 39-40) and by 1990s, the concept of strategy was also applied at territorial level (Navarro et al., 2014; Bryson et al., 2010). The adoption in the territorial field was fostered by several reasons such as the quick changes in globalization and technology (Sotarauta, 2004), the search for inexpensive solutions to complex problems (Eadie, 1983), a criticized public administration (Kaufman & Jacobs, 1987) and the need for a shared vision (Albrechts, 2004). Therefore, this chapter deepens into strategy concepts that are helpful to better understand the dynamics of S3 and the EDP as well as those that have been adopted in the territorial field.

The second part of the chapter explains concepts from evolutionary economic geography; stream of literature in which some concepts have been found to resemble the specialisation philosophy (Kroll, 2015; Grillitsch, 2016).

Foray (2019) has argued that S3 was based on innovation economics and macroeconomics; however, regional economists improved the approach. Thus, the evolutionary economic geography section focuses on the importance of an evolutionary and systemic perspective for regional innovation development as well as an emphasis in the importance of regions for the formation of agglomeration and knowledge spillovers. It also explains the role of related variety as a strategy for path renewal and emphasises the idea of the uniqueness of each region and the mismatch with one-size-fits-all strategies.

The remaining of the chapter is structured as follows: first, literature on business strategy and studies on the application of certain concepts to the territory are introduced, specially those that are considered relevant for the understanding of smart specialisation. Second, the concepts of evolutionary economic geography that are related to the S3 concepts are explained, stressing the role of regions and proximity and including ideas from the literature on innovation systems. Finally, the conclusions of the chapter match together the concepts on strategy with those of EEG to develop a unique framework for smart specialisation strategies.

2.2 From Business to Territorial Strategy

2.2.1 Business Strategy

Strategy is a concept that was been widely used in different fields. Despite the wide use of the term, there is still no one single agreed definition of strategy (Navarro et al., 2014; Sotarauta, 2004). The complexity of defining strategy is reflected by researchers such as Henry Mintzberg who found ten different schools to analyse strategy[3] (Mintzberg, 1998) and defined strategy in five different ways: as a plan, as a pattern, as a position, as ploy and as a perspective; and the

[3] Aranguren and Larrea (2015) considered that learning, power and cognitive schools contribute the most for analysing territorial strategy.

interrelation between them, arguing that strategies typically employ more than one (Mintzberg, 1987). Strategy as a plan, position and pattern will be developed below. Those three were selected because those are more relevant for defining regional strategy in the next section.

Most definitions in business strategy, are more related to strategy as a plan. According to White (2004), Ansoff was probably the first known author focused on control and planning (see Ansoff 1965, 1980). More recently, strategy has been defined as "a coordinated series of actions which involve the deployment of resources to which one has access for the achievement of a given purpose" (White, 2004) and "system of finding, formulating, and developing a doctrine for the long-term success" (Kvint, 2009: xxv). McKeown (2001) argues that Mintzberg was probably the author that mocked planning obsessions of the 80s (see Mintzber, 1994). Tools such as the SWOT analysis help the planning process through the analysis of internal strengths and weaknesses as well as external opportunities and threats. For strategy as a plan, analytical skills are required as well as strategic thinking (Mintzberg, 1994) which stresses the importance of creativity in the definition of strategy (White 2004, McKeown, 2011). Therefore, the concept of strategic intent (Hamel & Prahalad, 1989) becomes important, in which the goals or ambitions of the company are sustained and require both, a vision and a sense of reality to avoid what they call 'strategic misfit'.

Strategy as a position was strengthen by researchers like Porter (1980, 1985, 2011) and Harrigan (1981). For instance, Porter (1980: xxiv) states that "competitive strategy is a combination of the ends (goals) for which the firm is striving and the means (policies) by which is seeking to get there. The competitive advantage (Porter, 1980) concept becomes relevant when a firm occupies a higher position than those of competitors. There are two main approaches from the business strategy literature to obtain and sustain a competitive advantage. First, the resource-

based view (Rumelt, 1984, 1991; Barney, 1991; Hamel and Prahalad, 1989) which is an endogeneous view on the firm in which resources, capabilities[4] and core competencies are under the firm's control and an advantage position is obtained when the strategic assets are valuable, rare, imperfectly imitable, and sustainable (Amit and Schoemaker, 1993). The second is a more exogenous perspective, also called the competitive strategy, in which the importance of the environment in which the firm is embedded is highlighted (Porter, 2008). The exogenous perspective is nurtured by tools such as benchmarking; in which company's search for best practices to incorporate internally and reach an advantage position. Therefore, '…strategy is the creation of an unique and valuable position, involving a different set of activities' (Porter 1996: 68).

Mintzberg, emphasized the importance of defining strategy as a pattern; he argues that when strategy is analysed as "a pattern in a stream of decisions" (Mintzberg 1978: 934) to recognise that there are strategies that are intended but others that are realised either they were intended or not; therefore, strategy formation is not necessarily formulation. In other words, he argues that it is possible to differentiate those deliberate strategies that are the result of an intended plan, and those that take place in an emergent manner (Mintzberg & Waters, 1985). The author reflects that most strategies, however, are not entirely one kind or another, but in between (Mintzberg, 1994:1996).

The definitions of strategy as a plan, position and pattern are aligned with the meanings of Wittington (2001) who classifies the strategy in four. The first, is the classical meaning, which proposes the traditional seek for profit maximization through a rational process (strategy as a plan

[4] For Javidaan (1998) capabilities in a corporation are defined as the 'ability to exploit resources' (p. 62).

and position) based on the idea of rational planning; the second is an evolutionary meaning, which considers strategy as the outcome of the market´s behaviour (strategy as a pattern); the third is the processual meaning, which is more pragmatic than the classical one and recognises the constraints of strategy making (strategy as a plan and pattern); finally, the systemic meaning considers social systems, attitudes, values, and behavioural patterns (strategy as a pattern).

According to Whittington (2001), the classical approach is rooted in planning, and therefore several phases can be defined from formulation to implementation, which is a consequence of the deliberate strategies formulated. The processual approach has increasingly gained importance (Mintzberg, 1978; Pettigrew, 1973, 1985). When the process is seen as a pattern, the impact of an evolutionary perspective in the strategy process has been emphasized. On one hand, to consider the impact of history and the context in strategy making and the fact, strategies are not always intended (i.e. Balogun & Johnson, 2005; Burgelman, 2002; Pettigrew 1973, 1985, 1987) and on the other, to understand the risks of lock-in and inertia (Burgelman, 2002). In addition, the systemic perspective is shown in literature by stressing the importance of considering different actors in strategy making (Mintzberg et al. 1978), and can be taken by individuals and groups (Jarzabkowski, 2008). Similarly, for Burgelman (1983), entrepreneurs at the lowest levels of the organisation shaped the strategy from bottom-up; especially when their managers were able to conceptualise the implications of their initiatives. For those initiatives to flourish, the role of leadership is important to commit employees to the general strategy (Balogun & Johnson, 2005; Kotter, 1995). Furthermore, transformational leadership is assumed to facilitate employee innovation (Watts et al., 2020) which, together with the dynamic capabilities available at the organization (Teece, Pisano and Shuen, 1997; Eisenhardt and Martin; 2000; Teece, 2007) are expected to lead to change. Therefore, Strategic and visionary leaders (Whittington, 2001)

combine the leadership and commitment with a clear sense of direction or vision that comes from strategic thinking.

2.2.2 Application of Business Concepts in Territories

Although territorial strategy remains underconceptualised, the translation of the strategy concepts to the territorial field took place around the 90s. Jacobs (1989) recognised that the strategic planning framework provides a more result-oriented analysis for territories and a competitive vision. Bryson and Roering (1987:1996) identify the business approaches that have an application in territories. Navarro et al. (2014) and Ketels (2015) provide a conceptual framework to make use of the strategy concepts from the business field to the territorial and policy analysis.

Navarro et al. (2012, 2014) argue that business and territorial strategies differ in three main aspects: the objectives (what for), the content of the strategy (what) and the process of the strategy (how) (See table 1).

Table 1.

The three main differences between business and territorial strategy

Aspect	**Business strategy**	**Territorial Strategy**
Objectives (what for?)	Maximize value (profit)	Wellbeing
Content (what?)	Porter (1985) propose to decide on whether to follow a cost or differentiation strategy. Porter (1993) propose to answer the following questions: 1. What is the subset of an industry´s products or services	Navarro et al. (2014) propose to answer the following questions: 1. What are the main economic activities (industries or clusters) or S&T fields in which regions are meant to excel? 2.What are the unique assets or resources that the region

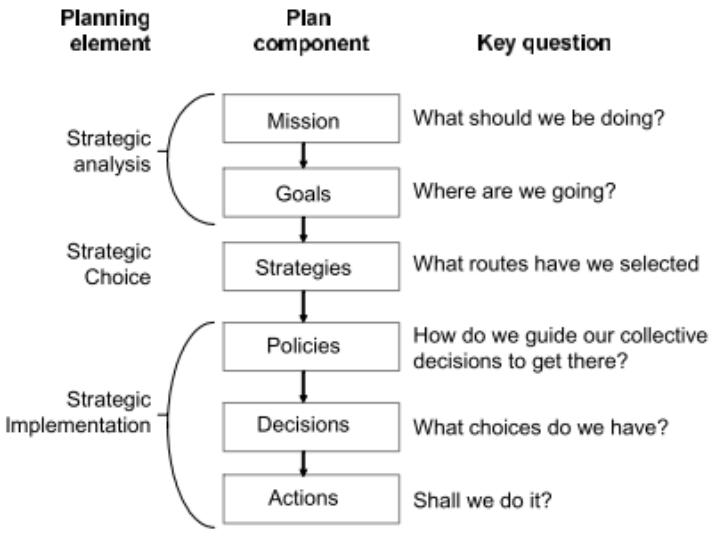
Aspect	Business strategy	Territorial Strategy
	that the firm is going to produce? (variety-based) 2. What are the needs of a particular group of customers that the firm is going to meet? (needs-based) 3.What is the configuration of activities that the firm is going to use to reach the segmented customers (access-based)	will possess or develop to succeed in those activities and S&T fields? 3.Who are the actors targeted by that strategy, and who are the actors who will carry out the strategy? 4.What relationship is the region developing with other territories and external agents? 5.What type of internal articulation is sought in the region?
Process (how and by whom?)	Compulsory Deliberate or emergent Stakeholders are those related to the firm.	Not compulsory for private agents Deliberate of emergent Stakeholders are different organizations in the region. Governance layers (OECD, 2001).

Note: Adaptation from Navarro et al. 2012, 2014.

Sotarauta (2004) summarises a classical perspective in the strategy process in which three phases are recognised: strategic analysis, strategic choice and strategic implementation (see figure 1). Those phases are aligned with the proposition of Navarro et al. (2014); where strategic analysis is used to define the *what for*, strategic choices for the *what* and the implementation of the strategy is related to the process which answers *how* and *by whom.*

Figure 1.

A simplified exemplary model of classical strategic planning process



Note: Sotarauta (2004: 20)

The strategic analysis includes the definition of mission and goals. The competitive perspective has been applied to the territories to define competitive advantage as one of the goals for territories in comparison to others (Porter, 1990), an approach that has been criticised by researchers such as Lundvall and Tomilson (1992) and Krugman (1994) for whom comparison between territories tend to miss important features and may lead to dangerous strategies. Although the international dimension remains important, the uniqueness of the territories has been emphasized in the literature (e.g.; Barca et al., 2012; Boschma, 2014[a]; Ketels, 2012; Camagni and Capello, 2013; Navaro et al., 2013; Tödtling & Trippl, 2005). Therefore, the analysis may be built based on the assumption that territories are characterised for a set of resources[5] and capabilities.

[5] Sotarauta (2004), analyzed a territorial perspective and grouped resources into: information and knowledge, physical, firms, human resources, living environment-based resources, financial and connections.

For the strategic choices, Navarro et al. (2014) provide a review on how the economic literature deals with prioritisation, emphasising the importance of choices in strategy. The authors recognise that territorial debate on prioritisation goes around priorities in S&T areas and activities; priorities in functional actors; and priorities regarding actors, external relations and internal articulation. Therefore, other approaches such as the systemic approach can be present when choosing, although the articulation of the strategies to address those goals is based on planning. When strategy is considered as the outcome of a system, regional strategy is 'the result of priorities and processes carried out in different layers of the hierarchical position' (Navarro et al., 2014: 537).

For strategic implementation, Magro and Nauwelaers (2015) argue that a problem that lies behind the fact that many policies do not deliver the intended results is the disconnection between strategy (understood as regional and involving several actors to set the goals and directions) and the policy (which is about deploying public means to serve the strategy). The decision on the policies to serve strategy should be place-based and may solve either market or system failures. Thus, strategy implementation must be considered in a systemic manner, involving communication to translate strategic thinking into operative actions (Magro & Nauwelaers, 2015: 77). For territories in general, and place-based policy in particular the conversion process from designing the strategy to transformational roadmap is the most difficult one and it cannot happen if the direction of change is not known (Foray, 2019: 5).

Sotarauta (2004) states that regional development policies had been largely based on the classical approach (i.e. Albrechts, 2004; Kaufman & Jacobs, 1987; Poister & Streib, 1999).

Although strategic planning provides policymakers with good tools and thinking patterns[6], regional strategies using the methods drawn from classical strategic planning too often neglect the multidimensional nature of regional strategy (Sotarauta, 2004: 21). Hence, policymakers and strategic planners often face the problem related to questions on why the intentions were not realised as planned (Sotarauta, 2018: 5).

Sotarauta (2004) proposes to analyse strategy from the process point of view and brings Mintzberg's vision on strategy as a pattern to the territorial level. For the author, the strategic process is seen as a continuous learning where strategies develop constantly and if they are only focused on the long-term they are unlikely to get realised. There are other authors emphasising the importance of a more process-oriented perspective for policymaking (Laranja, 2022) and for territorial strategies (Aranguren et al., 2015). The analysis of strategy as a process, takes place once the strategy is realised, and the emergent strategies are identifiable. Therefore, in territories, the evaluation of the policies is highly important given the pressures to evaluate the impacts of such means, and in particular, an understanding of evaluation as a learning process where different stakeholders are involved is considered of especial relevance in territorial strategy (e.g. Magro & Wilson, 2015; Magro & Nauwelaers, 2015).

From a systemic perspective, place-based approaches take into consideration a variety of stakeholders and their relationships. In fact, there are models such as the "triple helix" (Etzkowitz & Leydesdorff, 2000) which relates to university-industry-government relations in which regional actors get involved in territorial decisions. The theory has evolved to include other helixes such as the "quadruple helix" (Carayannis & Campbell, 2009), which adds the public as a fourth helix,

[6] See Tomilson & Lundvall (2001) and Navarro et al. (2011) for applications of benchmarking.

consisting on the media and civil society; the aim of the quadruple helix is to bridge innovations with the demands and needs of the civil society.

From an evolutionary perspective, a key concept to explain that each territory has different history and trajectories is 'path dependency' (Valdaliso et al., 2014, p. 2). Path-dependency affects the strategy process and requires action to avoid lock-in. In the last decades, place-based leadership has played an important role. Bailey et al. (2010) describe 'place-renewing leadership' as a leadership that copes with path-breaking adjustments (p. 460), and avoid 'harmful lock-ins' (Harmaakorpi, 2006: 1088).

In territories, leadership is understood from a processual point of view (Aranguren and Larrea, 2015; Larrea et al., 2017) and, a result of an interactive process, that is often confused with the governance process (Sotarauta, 2018). It goes beyond the formal leadership played by the government heads, in the leadership of place, any individual or organisation can take a leadership position which makes it 'difficult to say a priori who will take a leadership position' (Sotarauta, 2014, p. 30). Although effective leadership is expected to 'explain how and why some localities are able to adapt and exploit the opportunities afforded by the complex and rapidly changing social and economic circumstances of the modern world' (Colligne et al., 2010: 267); Sotarauta (2004) argues that the consideration of more stakeholders in strategic planning, makes strategy less flexible, and asks how is it possible to be flexible and fast to react? Which is especially important in the changing environment experienced by territories.

The stakeholders in the territories are determined by the geographical and political scope, therefore, the regional boundaries and the dynamics within them have been widely studied in the

evolutionary economic geography, which considers the processual, systematic and especially evolutionary perspective to analyse the regions and will be developed in the next section.

2.3 Regions for Innovation and Development

Since the seminal work of Nelson and Winter (1985), researchers have been preoccupied on how the firms and industries change over time. Evolutionary Economic Geography (Boschma & Frenken 2006, 2011), emerged as a discipline that focuses on the evolution of firms, industries, networks, regions, and cities in a specific geographical context and their trajectories over time (Boschma & Frenken, 2011: 295). The importance of regions as key drivers of innovation has been strengthen through research on industrial districts (Becattini, 2017), clusters (Porter, 1990), regional innovation systems (Cooke, 2001) and learning regions (Asheim, 1996, 1997, 2019), in which innovation responds to geographical boundaries (Durán, 1999).

2.3.1 Innovation and Innovation Systems

According to the Oslo Manual (OECD, 2018), Innovation in business can be understood either as an activity, or the outcome of the activity. Therefore, the following definitions are provided (p.20):

> ***Innovation activities*** *include all developmental, financial, and commercial activities undertaken by a firm that are intended to result in an innovation for the firm.*
>
> *A* ***business innovation*** *is a new or improved product or business process (or combination thereof) that differs significantly from the firm's previous products or business processes and that has been introduced on the market or brought into use by the firm.*

The manual also distinguishes between product (both goods and services) and process innovation. A key feature of innovation that is emphasised in the manual is that the products should

be in the market and the processes in use. That is, in fact, a difference between invention and innovation.

Innovation is itself a strategy and the outcome of a strategy, which in fact affects a firm's position in the market, as well as the market itself through processes of 'creative destruction' (Schumpeter, 1934) in which new technologies replace the old ones, leading to economic development. The Schumpeterian school also distinguishes radical innovations that lead to disruptive changes from those incremental innovations which are slighter improvements to the previous products or processes.

Following a classical philosophy, innovation is understood in a narrow sense, as a deliberate outcome of R&D that takes place in a linear way. However, the evolutionary perspective applied to innovation (Nelson & Winter, 1982) recognises that is a path-dependent process (Dosi, 1982).

In addition, systemic and evolutionary perspectives are emphasised in the systems of innovation literature (Freeman, 1987; Lundvall, 1992; Nelson, 1993; Edquist, 1997) in which innovation is understood as the result of interactions in time, knowledge as the most important resource, and learning, as the most important process. In words of Tödtling and Trippl (2005) 'Traditional concepts like linear model of innovation or the Schumpeterian view of firms innovating in isolation have been replaced stressing the systemic character of innovation' (p. 1205).

The actors that participate in interactive learning processes at innovation systems can be considered in a narrow or broad sense. The former, includes organisations and institutions involved in searching and exploring while the latter, includes all parts and aspects of the economic structure

as well as the institutional set-up that affects learning (Lundvall, 1992: 12). In fact, the importance of institutions for innovation is stressed in the innovation systems literature (Johnson, 1992). Farole at al. (2011a) argues that for economic growth, there is a need to balance the formal institutions of the society that are normally set at a national level and those informal institutions that are found at the regional levels.

According to Cooke (2005), the consideration of the importance of the role of cultural factors led to the development of the regional innovation systems literature (Cooke, 1997). The next section will deepen into the importance of the geographical boundaries for innovation, and regional development as the ultimate goal.

2.3.2 The Importance of the Regional Scope.

Regions have gained interest in economic research and are recognised as the more natural economic zones (Cooke, 2001b, p.4) and the units of analysis that reveal the economic reality (Scott & Storper, 2003, p. 589). Regions are understood as geographical areas that share commonalities (see Table 2 for definitions on regions and their characteristics).

Table 2.

Definitions of regions and city-region

Authors	**Territorial level**	**Definition of regions**
Cooke et al. (1997: 480)	Regional scope	"Territories, smaller than their state, possessing significant supralocal governance capacity and cohesiveness, differentiating them from their state and other regions".
Cooke (2001: 5)	Characteristics of Region	"…is homogeneous in terms of specific criteria; it can be distinguished from bordering areas by a particular kind of association of related features; it possesses some kind of internal cohesion. Regions

		can change, new regions can emerge and old ones can perish".
Scott and Storper (2003: 580)	Regional scope	"Any area of subnational extent that is functionally their geographical expression as regional growth centres organized around some internal central pole"
Rodríguez-Pose (2008)	City-Region	"...core city linked by functional ties to a hinterland".

Note: Own elaboration based on Cooke et al. (1997), Cooke (2001); Rodríguez-Pose (2008); and Scott and Storper (2003).

The reason why the regions are so important, is that the geographic concentration of innovation activity is promoted by the tacit knowledge that is shared in proximity (Asheim & Isaksen, 1997; Audretsch, 1998; Feldman and Audretsch, 1999; Scott & Storper, 2003, 2007) and is ought to generate knowledge externalities (Haussmann & Rodrik, 2003). One externality are knowledge spillovers picked by companies that did not pay for the acquired knowledge (Glaeser et al., 1992); therefore, they are understood as unintended knowledge leakage[7] that takes place in a specific territory (Fu et al., 2011; Smeets & de Vaal, 2006).

There is an unsolved debate about whether spillovers take place within an industry or among different industries (Glaesser et al., 1992; Van der Panne, 2004). In the former option, specialisation, or MAR[8] (Marshall-Romer-Arrow) externalities take place vertically (Glaeser et al., 1992). Therefore, pieces of knowledge are spread to competitors (i.e. through labour mobility), employees (i.e. spin-offs and related entrepreneurship) suppliers and customers; a problem with the evidence on these studies is that they typically do not differentiate unintentional spillovers from other types of vertical linkages such as formal technology transfers (Lall, 1980). By contrast, in

[7] Audretsch (1998) emphasised the appropriability problem of knowledge spillovers, which can only be appropriated to a limited extend by the firm that generates the knowledge.
[8] The acronym is based on the theories of Alfred Marshall (1890), Kenneth Arrow (1962) and Paul Romer (1986).

the latter, diversification is argued to generate spillovers (Jacobs, 1969; Feldman & Audretsch, 1998; Porter, 2003; Kugler, 2006; Jordaan, 2008) in which the knowledge from one industry is expected to be useful in different industries.

The concept of "related variety" (Frenken et al., 2007; Content & Frenken, 2016) has gained importance in this debate by suggesting that spillovers take place among different sectors that share a common knowledge base as the new knowledge can be absorbed and utilised in that way. Therefore, the type of changes possible in the region would depend on the existing knowledge (Dosi, 1982) and the degree of absorptive capability (Cohen & Levinthal, 1990) understood as the capability of a region to apply new knowledge.

The degree of relatedness between sectors in the economy is a helpful tool to understand the development opportunities of regional diversification into new and related industries, which sheds light on how industries transform and restructure their economies over time (Martin and Sunley, 2006). Therefore, when a new variety is rooted in related activities in the region, there is a process of "regional branching" (Boschma & Frenken, 2009). Adding to the specialisation/ diversification debate, regional branching depends on the industry maturity. Mature industries are likely to benefit from specialised localisation economies; while younger sectors benefit from diversification spillovers (Neffke et al., 2008).

The degree to which the related variety concept can generate radical changes in the economy has recently been put in question. Grillitsch et al. (2018) argue that unrelated variety or combinations of dissimilar knowledge promote diversification. A way to foster unrelated diversification is to encourage institutional entrepreneurship, which related to new activities based on different capabilities than existing ones (Boschma et al., 2017). Nevertheless, diversification

based on related variety is more common than diversification from unrelated variety (Neffke et al., 2011; Boshcma, 2016).

Regional diversification has been explained following different classifications. Among relevant classifications is that on path extension, renewal and new path creation (Simmie, 2012; Asheim et al., 2013; Isaksen, 2015; Isaksen & Trippl, 2016); path importation, modernisation or path upgrading (Grillitsch & Trippl, 3016; Isaksen et al., 2016); mixes between the previous two classifications (e.g. Květoň and Blažek, 2018); path replication, transplantation, exaptation and saltation (Boschma et al. 2017) and finally path retooling, extending, emerging and cross-sectorial paths (Navarro et al., 2012; COM, 2010). Hassink et al. (2018) argue that the understanding of industrial path development requires to offer broader views in inter-path developments as well as develop a multi-actor and multiscalar approach. Table 3 shows different classifications of path development trajectories present in the evolutionary economic geography and smart specialisation literatures ordered according to the degree of relatedness with previous knowledge bases.

Table 3.

Path diversification options from related to unrelated knowledge bases.

Path trajectory	**Description**
Synergestic diversification or extension	Incremental product and process innovations
Retooling, redesign, or modernization	Existing or traditional sector that applies a GPT based on current capabilities determine by productive and technological contexts.
Replication[9]	Adoption of a technology institutionalized in a global regime.
Exaptation[10]	New applications for existing knowledge or technology.

[9] For Boschma et al. (2017), this is the most conservative diversification logic in which a region develops related industries.

[10] Innovation by exaptation has received considerable interest lately (Andriani & Cattani, 2016; Andriani & Cohen, 2013)

Path trajectory	Description
Upgrading	Changes of position of regional companies within GPN through process, product, functional or inter- sectoral upgrading.
Saltation	Innovation that is not only new to the region but new to the world. Break-through innovation.
Renewal	Move to different but related industries through regional branching or unrelated knowledge combinations.
Cross-sectoral	Combination of sectors that generate innovating ideas for new products and services mainly through cooperation.
Transition, Shifts between paths or Emerging	New domain from existing industrial commons with co-emergence of R&D and a related business activity.
Diversification	Discovery of synergies between an existing and new activities.
Extending or Niche development	Discovery of a new niche through scope economies exploitation through R&D infrastructure.
Radical foundation	Distinct domain founded with no direct link with existing structures.
New path creation	New firms in novel sectors or firms with new products, processes and business models often R&D driven.
Transplantation or Importation	Adoption of technology from the global system

Note: own elaboration based on Asheim et al., 2011; Asheim et al. 2013; Isaksen, 2015; Isaksen and Trippl, 2016; Simmie, 2012; Grillitsch and Trippl, 2016; Isaksen et al., 2016; Květoň and Blažek, 2018; Boschma et al. 2017; Navarro et al., 2012 and COM, 2010; Dew et al., 2004; Del Catsillo et al., 2015; Foray, 2014.

The access to foreign knowledge and technologies has proved to be important for path development (e.g. Boschma, 2017; Nefke et al., 2018). Industries that are embedded in Global Value Chains (GVC), are more likely to get access to foreign knowledge (Rakhmatullin et al., 2016). External sources of knowlesge are especially important for diversification in less-favoured places resources (Varis et al., 2014; Dawley et al., 2015; Isaksen and Trippl, 2017) while endogenous regional path development is found in metropolitan and technology core regions (Isaksen and Trippl, 2016). Therefore, geographical proximity is not conductive to learning and innovation in isolation because it could fall in the risk of lock-in, and other forms of proximity

such as cognitive proximity play an important role for external knowledge to be absorbed (Boschma, 2005).

To summarise, in a global economy, regions are far from losing relevance; by contrast, their relevance is acknowledged due to the dynamics that take place in geographic concentrations. In addition, each region has an own history, capabilities and system which shapes the regional strategy. The role of institutions in regional dynamics is very important, although difficult to translate in written plans (Rodríguez Pose, 2013).

2.3.2.1 The Role of Institutions. The concept of institutions has been blamed to be 'not very clear, controversial and thus, difficult to operationalise' (Rodríguez-Pose, 2013:1037). Several researchers have stressed the role of institutions in economic geography[11] (Boschma & Frenken, 2009a, 2011; Haussmann & Rodrik, 2003) especially when economic geography meets innovation studies[12] (Morgan, 1997, Morgan, 2015; Rodríguez-Pose & Di Cataldo, 2015; Farole et al., 2011b). Therefore, a good institutional context is expected to contribute to innovation and economic development, a fact that has been stresses in the systems of innovation literature.

There are two main dimensions to study institutions. The first dimension differs formal and informal institutions. Formal or hard institutions are "universal and transferable rules" (North, 1990) which are compulsory in a society. On the contrary, informal (also called tacit or soft) institutions refer to "recurrent patterns of behaviour" in a society (Morgan, 1997: S149). A second-dimension studies the robustness of the institutions, where the concept of 'institutional thickness'

[11] Boschma and Frenken (2009a, 2011) distinguish between evolutionary economic geography and institutional economic geography and argue that integration between them occurs when institutions are considered as conditionals instead of determinants of firm behaviour and territorial development.

[12] Institutions are expected to impact economic growth together with foreign technology (Hausmann & Rodrik, 2003: 603) and are also a key force to know the regional position with respect to the technology frontier (Farle et al., 2015).

(Amin & Thrift, 1995) is explained as the presence of institutional interaction and synergies among multiple and diverse regional bodies[13]. Zukauskaite et al. (2014) differentiate between an organisational and institutional perspectives on institution. The first, studies the number of stakeholders in the regional economy[14]; while the second is about the presence or absence of formal and informal institutions. Similarly, Grillitsch (2016) distinguishes institutional diversity (like the organisational perspective) and institutional integration, which captures the extent to which institutions promote or constraint interactions.

Institutions are thought to shape the regional social environment; therefore, they contribute to reduce problems such as picking winners, rent-seeking, corruption and even lock-ins; which are associated with place-based policies (McCann & Ortega-Argilés, 2014; Grillitsch, 2016, Rodrik, 2004). On the contrary, institutions are ought to foster trust relationships and place-based leadership (Colligne & Gibney, 2010) through both formal and informal institutions.

Rodríguez-Pose (2013) argues that especially informal institutions are difficult to prove due to their intangible character. Therefore, policy makers may face a dilemma to include institutional dimensions in the policy, although they are hard to measure, which difficult policy intervention (Grillitsch, 2016). The next section will deepen into the regional policies and the processual perspective on regional policy.

[13] Institutional thickness is not a synonymous of good regional performance, Asheim et al. (2013) describe institutional failures in regions due to the excess or absence of either formal and informal institutions that may be prejudicial for innovation and development (p.7).

[14] According to Etzkowitz and Klofsten (2005) the three major institutional spheres are academic, industrial, and political, and if one is missing, the actor is substituted by another that fills the gap (p.254).

2.3.2.2 Policymaking Processes in Regions. In the last decades, there has been an emphasis in economic geography about the importance of place-based, tailor-maid policies (Barca, 2009; Grillitsch & Asheim, 2018; Tödtling & Trippl, 2005) according to the regional context and aspirations. It has led to different attempts to classify regions, which vary from hard structural characteristics such as industrial activities (Grillitsch & Trippl, 2016) and the level of sophistication of the companies (Chaminade & De Fentes, 2015); and softer aspects such as the innovation capabilities and innovation patterns (Etzkowitz & Klosfsten, 2005, Camagni & Capello, 2013). Most of those classifications add a reflection on the policy implications in the different regional realities, however there is criticism on classifications because despite the similarity of challenges between region, regions still require tailored policies according to the regional realities (Boschma, 2014a).

Tödtling & Trippl (2005) provide a more processual perspective in their classification of regions according to the failures in the innovation system. For the authors, the regions in the periphery experience organisational thinness (few nodes of the system); the old industrial areas, a lock-in in the same industries; and metropolitan regions; fragmentations of their innovation system. Uyarra and Flanagan (2010) argue on this, that the use of metaphors such as the innovation systems can be misleading in terms of regional policy. The reason is that it can lead to give for granted that a system exists, and to the view of regional economies as closed systems, neglecting some considerations such as the importance of the multilevel[15] and multidomain policy mix that act upon these overlapping spaces. Nevertheless, the authors find important the regional scope because regional actors are targets of policy action and play roles in the process of policymaking and policy implementation. In a similar vein, there have been studies that claim for further

[15] See also Hooghe and Marks (2001) for the importance of multilevel governance and how it adds complexity to policy design.

reflection on how regional innovation systems and other concepts from EEG can contribute to policymaking (Asheim et al., 2013; Coenen et al., 2017, Uyarra et al., 2017) through a ore process-oriented perspective into policy (Laranja, 2022).

In order to incorporate an evolutionary perspective in regional policy, it is important to understand that the problem of path-dependency also applies to the policy-making processes (Metcalfe, 1995, Mytelka and Smith, 2002; Flanagan et al., 2011); therefore, the role of leadership gains importance in regional innovation policy (Sotarauta and Mustikkamaki, 2015) to avoid 'harmful lock-ins'(Harmaakorpi, 2006: 1088). Therefore, leadership is expected to 'play an amplifying role in economic development policy' (Stough, 2003: 199). Apart from leadership, Aranguren et al. (2017a) argue that evaluation and experimentation play a transformative role in learning; both in theory and practice. Policy evaluation has also been understood as a process, in which different agents participate in a systemic and evolutionary context (Magro, 2011).

2.4 Conclusions

The options of cross-fertilisation of literatures from strategic management in regional matters is well-known in the regional policy literature (i.e. Navarro et al. 2014; Bailey et al., 2019). Concepts such as benchmarking (Navarro et al., 2011b; Tomilson & Lundvall, 2001), competitive advantage (Boschma, 2013) and value capture (Bailey et al., 2019) have been used in economic geography. The understanding of strategy from different perspectives is helpful to visualise it beyond a written plan; but a process which is only partially intended.

In the view of strategy as a process. It could take a classical planning perspective as a set of linear steps or seen as a pattern, in which the systemic and evolutionary perspectives nurture the process. The first, emphasising that strategy depends on a wide array of actors either as targets

and designers of the strategy. In territories, the multiple helix models and the systems of innovation perspective are based on this premise. The second, understanding the importance of path-dependency and the existence of lock-ins. In both perspectives the importance of institutions is highlighted, which are ought to reveal a great part of the regional context in which innovation and policy are expected to take place.

Leadership is one concept that has gained relevance in place-based strategies (Colligne et al, 2010; Sotarauta, 2014) and policy (Sotarauta and Mustikkamaki, 2015). It is shaped by and contributes to regional institutional settings in which innovation can emerge (Beer & Clower, 2014; Horlings et al., 2018; Morisson & Panetti, 2020).

Innovation is one regional strategy, the view of innovation has switch from a classical and narrow perspective in which innovation was intended and typically the result of R&D activities to incorporate the systemic and evolutionary perspectives (Whittington, 2001).

The awareness of the processual character of place-based strategy calls for reflection to policy makers, who face the challenge of going beyond linear plans. In the same line of thought, regional innovation policy is argued to be a product of both academic research and practice (Aranguren et al., 2017b); therefore, monitoring and evaluation to adapt the policy to the emergent regional dynamics and opportunities plays an important role (Kleibrink et al., 2016; Magro, 2011) in which they become a continuous learning process and require experimentation.

Smart specialisation strategies (S3) are the best example of a policy that is focused on supporting variety through specialising in a set of activities that foster innovation and structural changes. This approach has acquired relevance because it has been growing hand by hand with the practice and nurtured by academics and policymakers, and has been understood as a ‘massive experiment in

regional policy' (Radosevic et al., 2017: xxvi). Therefore, it has raised debates, especially in EEG. The next chapter will deepen into this strategy.

Chapter 3. Smart Specialisation Strategies

Chapter 3. Smart Specialisation Strategies

3.1 Introduction

This chapter aims to explain the concept of smart specialisation strategies (S3) understood as "a virtuous process of diversification through the local concentration of resources and competences in a certain number of new domains that represent possible paths for transformation of productive structures" (Foray, 2014: 493-494). The importance that it has acquired through its policy form RIS3 (*Research and Innovation Strategies for Smart Specialisation*) in Europe is also explored. Then, the chapter compares smart specialisation strategies with other approaches that are considered to be similar like clusters (Porter, 1998; Aranguren & Wilson, 2013; EC, 2013; Saha et al., 2018) and Constructing Regional Advantage (CRA) (Asheim et al., 2011; Boschma, 2013). Similarly, the Entrepreneurial Discovery Process, through which regions "reveal" the domains where they see potential for innovation (Periañez-Forte et al., 2016:15) is explored and compared with the self-discovery approach (Hausmann & Rodrik, 2003). Then, the expected role of different actors especially in the design phase of S3 is explained, stressing the importance of institutions for a successful design and implementation of the strategy.

As smart specialisation is considered to be an example of "policy running ahead of theory" (Foray et al., 2011: 1) and a "massive experiment in innovation and technology upgrading policy" (Radosevic et al., 2017: xxvi) the concept has been discussed in both, academic and political spheres (Capello, 2014; Foray, 2014) and thus, practical and academic challenges are exposed in this section. Finally, conclusions are oriented towards the use of the strategy literature to understand smart specialisation strategies in general, and the entrepreneurial discovery process in particular and the definition of factors that affect the performance of smart specialisation according to the literature.

3.2 An Overview Through Smart Specialisation Strategies

In 2007, Foray and Van Ark, members of the "Knowledge for Growth Expert Group"[16] defined smart specialisation in an integrated research area as a possible response to several challenges faced by Europe regarding R&D. Those challenges included the fact more R&D was internationalised outside of Europe and at the same time, it was difficult to attract R&D; thus, the creation of European centres of excellence was seen as accurate to benefit from agglomerations and avoid duplication of resources in similar R&D activities across the European regions (Foray & Van Ark, 2007). Another challenge that fostered the concept was a growing productivity gap between United States and the European Union (Boschma, 2013: 4) which called for rethinking the R&D strategy in Europe.

The General Purpose Technology (GPT) concept (Bresnahan, 2010; Bresnahan and Trajtenberg, 1995), is also considered for S3. A GPT is understood as "a single generic technology, recognisable as such over its whole lifetime, that initially has much scope for improvement and eventually comes to be widely used, to have many uses, and to have many spillover effects" (Lipsey et al., 2005, p. 98). Therefore, Foray et al. (2009) state that regions at the S&T, or leader regions may invest in core GPT, while less advanced regions, have an option in the "co-invention" of applications of such GPTs. In fact, most often GTPs do not offer complete innovate outcome but are combines with other technologies for innovative solutions (Korzinov & Savin, 2018). Therefore, the consideration of the co-invention makes S3 crucial for those follower regions.

By 2009, with the publication of *Smart Specialisation: the concept*; Foray, David and Hall explained S3 as a bottom-up approach to prioritisation of domains, which means it is a place-based

[16] The Knowledge for Growth group was created in 2005 in order to provide high level advice on the role of knowledge to sustainable growth and link it with the policy implications. The group would meet every three years in a forum way. The outcome is a report complemented with a policy brief.

approach in which the context shapes the strategy. The knowledge is spread among regional stakeholders (Barca, 2009; Barca et al., 2012); therefore, the quadruple helix is expected to participate in the design and implementation of the strategy, contributing to the 'what' (Navarro, 2015) or the definition of regional priorities for innovation.

The approach has a vertical non-neutral logic, given that is about prioritisation under the philosophy that regions cannot do everything in Science, Technology and Innovation (STI) mainly due to resource restrictions, which forces the selection of activities or domains (Foray, 2017). Indeed, Hausmann & Rodrik (2006) had stated years before that "It is not that choices are desirable, they are simply inevitable" (p.25). To select, regions need to promote and prioritise the elements that make their knowledge bases unique and superior especially in domains with potential for scale, scope and spillovers (Foray et al., 2011). Thus, the approach is not about specialisation per se but specialised diversification (McCann & Ortega-Argilés, 2015). Such specialised diversification resembles the concept of related variety (Frenken et al., 2007). Foray (2019) argues on this respect, that possibly the term "smart specialisation" does not reflects the specialised diversification logic of the strategy and could be confusing.

The activities or domains in which a region is expected to specialise is expected to be revealed through the evidence-based Entrepreneurial Discovery Process (EDP) the key differentiating factor of S3 (Periañez Forte et al., 2016). A challenge with the concept was a lack of a clear explanation about how to perform the process (Capello and Kroll, 2016). The difficulties about the S3 rely on its processual character (Aranguren et al., 2015). First, involving a systemic perspective in which governance methods are required for the participation of the different regional stakeholders (Aranguren et al., 2018) for which institutions (i.e. McCann & Ortega-Argilés, 2014;

Rodríguez-Pose & Di Cataldo, 2014, Grillitsch, 2016), and governance structures (i.e. Estensoro & Larrea, 2016; Morgan, 2017, Aranguren et al., 2018) play a key role.

Second, and perhaps more challenging, the evolutionary perspective, in which the process is perceived as a continuous activity, which is experimental, self-correcting[17] (Kleibrink et al., 2016, 2017; Foray, 2017: 43-44) and path-dependent (Kveton & Blazek, 2018; Moodysson et al., 2016; Morgan, 2013; 2018; Tsipouri, 2017). Therefore, the process starts with the identification of priorities from smart specialisation, and extends to the implementation of the strategy, where priorities are refined and adapted (Foray et al., 2011; Marinelli & Perianez-Forte, 2017). Hence, the EDP continues after the priority area choice (Foray, 2019). Therefore, the emergent regional opportunities need to be realised and reflected in the regional innovation policy. In fact, Periañez-Forte & Wilson (2021) argues that the novelty of the EDP relies in the formalisation of the dynamics of the process as an explicit policy process.

The Smart Specialisation Strategies approach was adopted by the European Commission as an ex-ante conditionality for the regions that aimed to access the European Regional Development Funds (ERDF) in the period comprehended between 2014-2020. To assist the regions with the design of their RIS3 (*Regional Innovation Strategies for Smart Specialisation*), the EC published a guide that defined a six steps process: (1)Analyse regional context and potential for innovation; (2) Governance: Ensure participation and ownership; (3) Elaborate an overall vision for the future; (4) Identify priorities; (5) Define policy mix, roadmap, action plan and (6) Integrate monitoring and evaluation mechanisms (Foray et al., 2012).

[17] Weick (1969: 4) argued that strategic literature should "become stingy in their use of nouns, generous in their use of verbs, and extravagante in the use of gerunds". His point was to emphasize that the changing environments could not be treated as static, thus, strategy would become a process of "strategizing".

Differentiating features of the approach were stressed in Foray and Goenaga (2013) who explain the principles that should shape the strategy; those principles included a correct understanding of the granularity level (activities instead of sectors); the experimentalist character of S3; the importance of the inclusiveness of the quadruple helix; the logic of the entrepreneurial discovery and the concentration in the transformation of structures. The transformation of structures or structural changes, through spillovers, is argued to be the ultimate goal of this specialised diversification strategy (e.g. Gianelle et al., 2016).

Foray (2016) defines as the main '*raison d'être'* of the strategy, those actions that are undertaken by regional actors to achieve a competitive advantage. The actions towards that shift in position require a transformation of the economic structures and building capabilities in new fields (Foray, 2012, 2014, 2017). Therefore, the specialisation refers to the accumulation of competencies and institutions that facilitate knowledge recombination (Grillitsch et al., 2018:260).

Foray (2014) recognise four different logics of structural transformations: (1) Transition, as the emergence of new domains from existing industrial commons; (2) modernisation, which refers to applications of GPTs in an existing sector; (3) diversification, which applies to synergies between an existing activity and a new one; and (4) radical foundation, where a new domain is founded with no direct link with existing structures.

Hassink et al. (2018) argue that only few studies identify more than one path taking place at a time while, the regional dynamics tend to hold more than one path branching opportunity. However, the inertia and lock-ins may put in question te extent to which path dependencies can be broken (Kroll, 2017). On that, Morgan (2016) argues that "smart specialisation has the twin task of building on the past and breaking with the past" (p.1545).

Path dependencies are not the only challenge for structural changes, the problem with a strategy that is narrowed down to regional policy; is to take the wrong decisions. Foray et al. (2011) argue that the emphasis on EDP may reduce the scope of policy intervention and hinder the transition from an initial discovery to a new innovative domain. Therefore, policy making capabilities and the engagement of regional stakeholders are relevant for S3.

In summary, S3 is a strategy that has a vertical logic but differs from other vertical strategies because it is about specialised diversification with the objective to reach structural changes. In addition, is a bottom-up place-based strategy in which the participation of different stakeholders is necessary for an accurate strategy. The core of the strategy and the main differentiating feature is the process of Entrepreneurial Discovery, is an evidence-based process that reveals the specialises diversification opportunities for the region, and which differentiates the strategy from other approaches.

The following section will explore the differences between S3 and other similar approaches such as cluster policy, CRA and industrial policy.

3.3 S3 Policy and Differentiating Elements

S3 strategies have practical implications in regional policies. Although the strategy is expected to be alive, a statical picture of the reality, including the evolutionary and systemic view is landed in paper[18] and nurtured by continuous monitoring (Kleibrink, 2016).

[18] Benner (2020) emphasises the problem of overemphasising the paper over the process.

The vertical logic, bottom-up character, rationale of intervention as well as other characteristics of S3 are shared with other regional approaches. Table 4 shows a comparison between S3 and some related approached to regional policy.

First, CRA (Asheim et al., 2011) shares the importance of related variety and the importance of knowledge and innovation for a regional advantage. Boschma (2014) compares the two policy concepts and identified the process of priority selection as the main difference.

Second, clusters policy has often been a subject of confusion approaches (e.g. Aranguren & Wilson, 2013; European Commission, 2013; Foray et al., 2011; Hassink & Gong, 2019; Foray, 2019; Konstantynova, 2019; Saha et al., 2018) due to the importance of concentration and spillovers in both approaches; and especially given process similarities with bottom-up cluster policies (Fromhold-Eisebith & Eisebith, 2005). The differentiation between these concepts is important because one failure for S3 is to recycle existing cluster policies (Foray, 2015:82) and because clusters are considered to be either building blocks for S3 or the outcome of the strategy (Foray, 2019).

Finally, given the importance of the structural changes and the importance of the industrial structure, S3 is differentiated from old industrial policies the features shared with industrial policies is that before, horizontal or sector-neutral policies dominated at regional level to avoid preferential interventions. Horizontal policies were based on generating favourable conditions for the whole system. However, especially in less advanced and transition economies, choices are not desirable but inevitable (Rodrik, 2006:25) and the vertical logic for policy intervention was stressed. In fact, Foray (2016) positions S3 within the innovation and industrial policy space. The main difference is that old industrial policies have a sectoral focus and can target old-industrial

sectors, while S3 focuses on STI priorities. However, as noted by Morgan (2013) when traditional stakeholders participate in defining S3 priorities, they tend to frame innovation narrowly as industrial innovation. Therefore, it is important to maintain an innovation focus throughout the strategy.

Table 4.

Comparison between similar approaches in regional policy

Dimension	**S3**	**CRA**	**Cluster Policy**	**Old Industrial Policy**
Rationale of the approach	Replication in resource allocation among European Regions and slowdown in productivity in Europe.	Dissatisfaction with Technology and Innovation Policy	Improve linkages and the generation of knowledge spillovers	Foster industrial sectors with high potential.
Goals				
Economic transformation	Yes	Yes	No. based on improving existing structures.	No. based on improving existing structures.
Competitive advantage for the region.	Yes	Yes	Not necessarily. More about sectors and cross-cutting activities.	Not necessarily. Is more sectoral.
Process				
Logic of prioritisation	Vertical	Vertical	Both horizontal and vertical	Vertical
Sources of knowledge for decisionmaking	Bottom-up	Bottom-up	Tends to be top-down	Tends to be top-down (picking-winners)
Specialisation/ Diversification logic	Specialised diversification based on related variety	Diversification based on related variety	Specialisation	Specialisation

Focus on STI areas and activities	Yes	Yes	Not necessarily	Not necessarily
Limited number of priorities	Yes	Nor necessarily. The focus is not prioritisation.	Nor necessarily. The focus is not prioritisation.	Nor necessarily. The focus is not prioritisation.
Types of failures addressed	Systemic, Market	Systemic: Identification of bottlenecks for prioritisation.	Systemic: the main focus.	Mainly market failures.
Experimental nature	Yes	No	No	No
Well defined regional boundaries	No. Missing geographical wisdom for EDP	Yes	Yes	No
GPT Framework	Yes	No	No	No
Includes social dimension	Yes	Not necessarily.	No	No
Includes environmental dimension	Yes, recently	Not necessarily	No	No

*McCann & Ortega-Argilés (2011) argue that S2 miss geographical wisdom for the nature of EDP and regional possibilities.

Source: Own elaboration based on Aranguren & Wilson, 2013; Aranguren et al., 2017b; Boschma (2014a); Foray et al. (2011); Foray (2016); Foray, 2019; Hassink & Gong, 2019; Haussmann & Rodrik (2006), McCann & Ortega Argilés, 2011.

The key differences between S3 and other regional approaches is the inclusion of social innovation in the prioritisations, its experimental nature and the process of entrepreneurial discovery. The EDP has attracted the interest of researchers that seek for best practices in order to contribute to the literature and policy-making processes (e.g. Kroll, 2015; Periañez Forte et al., 2016; Kyriakou et al., 2017). Although the process has been blamed for being fuzzy and under-conceptualised (Capello & Kroll, 2016: 1398; Aranguren et al., 2019: 451) the next section will

deepen into the existing definitions and features of the process and its differentiating elements when comparing with similar approaches.

3.4 Entrepreneurial Discovery Process and Differentiating Elements

The EDP is the core of S3. Therefore, the understanding of the concept is crucial to comprehend the dynamics of the strategy. The process has been explained as those ideas in specialised areas that shed light on the future economic value of a possible structural change (Foray, 2012: 8, Foray & Goenaga, 2013:5, Foray, 2014: 495, Foray, 2015: 24). Other explanations of the concept emphasise that is about prioritisation of investment based on evidence-based opportunities identified by stakeholders (Gianelle et al., 2016).

By defining the words embedded in the concept a closer understanding to the process could be achieved. First, its "entrepreneurial" nature. Schumpeterian entrepreneurs at the firm level company are important for S3, however, the S3 process understands entrepreneurs in a broad sense, who are in the best position to discover the opportunity domains (Foray et al., 2011; Foray & Goenaga, 2013); therefore, entrepreneurs can be individuals or organisations (institutional entrepreneurs) that have either technical or scientific knowledge as well as knowledge about the viability and market potential (Foray et al., 2011). Asheim (2019) includes also place leadership at the regional level to have capacity to discover domains.

Second, "discovery" means the finding of evidence-based domains and innovative activities through the strong involvement of actors (Foray, 2016), especially because there is an understanding that constraints to growth are not known a priori and need to be discovered (Radosevic, 2017). The discovery is about identification of diversification opportunities, which

stress the experimental nature of the process and the skills required to transform those opportunities into roadmaps.

Thirdly “process” encompasses a classical perspective for example that of the four steps process proposed by Foray (2017): (1) Formal analysis combined with contextual knowledge and with insider experience: this includes evidence-based practices and analysis. (2) Combination of different types of knowledge so, priority areas will emerge. (3) Action plans with their respective investment. (4) Support the emerging transformative activities. However, the experimental nature of the process and the understanding of EDP as a continuous process is not represented in those four steps process (Marinelli & Periañez Forte, 2017). However, the literature does stress the influence of different factors along the process period and the importance of the systemic and evolutionary perspectives. Asheim (2019) argues EDP avoids the pitfall of ignoring the systemic nature of innovation as interactive learning involving diverse stakeholders.

Although it is a novel concept, the entrepreneurial discovery process shares characteristics with previous approaches like “self-discovery” (Hausmann & Rodrik, 2003) which emphasises the learning processes through which a region determines the patterns of specialisation. Different studies have mentioned the similarities between EDP and self-discovery (e.g. Boschma, 2014a; Carayannis et al., 2015: 25) and speculated on whether the latter inspired the former. Foray (2019) clarified on this the notions of smart specialisation strategies were performed without previous knowledge on self-discovery; however, recognises that self-discovery shared the core of what EDP wanted to transmit. However, as both approaches were developed independently similarities and differences can be identified.

First, both approaches aim to benefit from information externalities for proliferation of entries into new activities (Hasumann & Rodrik, 2003; Foray & Rainioldi, 2013). Therefore, both approaches require action and claim to be different than "laissez-faire philosophy" (Hausmann & Rodrik, 2003: 607; Foray et al. 2011: 8) that would lead to underinvestment and a lack of effort especially when it comes to research and innovation. Second, both stress an experimental nature, because the outcomes of the selection are not known ex-ante, and the goals may change throughout the process, which requires in both approaches, important monitoring mechanisms (Kuznetsov & Sabel, 2017; Gianelle & Kleibrink, 2017).

The main differences identified are twofold. First, self-discovery stresses the importance of learning what the region is good at producing, while S3 considers that analysis as an input but the focus is on transformation. Second, the role of government. Although both approaches are bottom-up and consider different stakeholders for developing regional policy and the governments take a more coordination role (Gheorghiu et al., 2017: 322); self-discovery depends more on administrative and governmental capabilities to foster both information and coordination externalities[19]. For Rodrik (2004) diversification is unlikely to take place without directed government action (p.8). The focus in EDP goes beyond, to identify those emerging sectors to avoid path-dependence that take place with or without policy action in which the government takes a more passive role; then, transform it into policy roadmaps (Periañez Forte et al., 2016).

Such as the role of government in both approaches, the role of other stakeholders may be clearer for some than for others (Gheorghiu et al., 2017: 326). The following section explores the

[19] Hausmann and Rodrik (2003) distinguish between information and coordination externalities. The former is about market failure that starts the process of self-discovery. Coordination externalities are about new activities that require huge investments in the surrounding environment which are not likely to be provided by the private sector.

expected role of the different actors of the quadruple helix in smart specialisation (Carayannis & Grigroudis, 2016; Carayannis & Rakhmatullin, 2014).

3.5 The Role of the Quadruple Helix Stakeholders in S3

Including the quadruple helix in smart specialisation is a challenge especially when it comes to involving the society in the strategy. The society is crucial as it encompasses the end users of most innovations (Carayannis & Grigoroudis, 2016; McCann & Ortega-Argilés, 2016a). In addition, S3 literature has stressed the importance of considering social innovation within the strategy, because social innovation, understood as "new ideas (products, services and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations" it is ought to create new business opportunities and help the modernisation of the public sector (Foray et al., 2012: 112). Therefore, the society becomes a target of S3 but also one of the helixes that are meant to participate in policy definition. One option is to directly target the society to participate in policy design[20] and the other is the participation of organisations such as social NGOs.

A second challenge is the expected role of the government. S3 departs from the idea that governments do not know ex-ante what regional opportunities are, therefore, require the involvement of other regional stakeholders. In addition, especially in traditional regions, the problem of picking-winners or favouring national champions demands more bottom-up approaches to regional strategy and policy (Foray et al., 2009, 2011). At the beginning, Foray (2009:4) defined three main responsibilities for the government throughout the S3 process: (1) Supply incentives to encourage entrepreneurs and other organizations to become involved in the

[20] Gheorghiu (2017) provide an example of Romania in which the society participated through surverys.

discovery of the regions' respective specialisations[21]; (2) evaluate and assess effectiveness in the use of resources; and (3) identify complementary investments associated with the emerging specialisations. Later, Foray (2012) argued that their role should also affect the direction of the discoveries ad determine the structural changes to be achieved as a goal of the strategy. Therefore, Aranguren and Wilson (2013) identified a debate on the extent to which government should play an active role according to the circumstances and when there is a capability (p.130). In a similar vein, Rodríguez-Pose et al. (2014) state that the policy measures to support S3 depend on the capability of governments to coordinate and facilitate interventions. In addition, governments face the challenge of coordination of different governance levels, in which cross-border collaboration as well as cross-regional collaboration needs to be considered (Nauwelaers et al., 2014a).

The role of knowledge institutions such as universities and research centres is important in S3, given the STI focus. Kroll (2015) identified those main drivers of EDP from early evidence in Europe and in fact, universities were ranked one as the drivers of the process. Diverse studies support this finding in which this helix plays an important role in the EDP (European Commission, 2014; Foray et al., 2012; Kempton et al., 2013, Kroll, 2017; Marinelli & Periañez-Forte, 2017), which is argued to be even more important in regions with less developed research and innovation systems (e.g. Vallance et al., 2017). Such as with the other helixes, universities are both targets and inputs of the strategy (Santos & Caseiro, 2015). Therefore, the capabilities of the universities will foster or hinder the strategy because they are likely to get deeply implicated (Vallance et al., 2017).

[21] The entrepreneurial discovery process that is expected to be bottom-up "depends on local ownership" (Kroll, 2017b: 118) which is achieved through certain stability that takes place together with local commitment of actors (Foray, 2012).

Finally, the role of firms and entrepreneurs, is the "centre of gravity" of the smart specialisation strategy (Foray, 2015: 84). On one hand, firms are aware of domestic capabilities and foreign technologies in their specific fields and are the natural strategist with visions that together with the visions of other firms and different actors are capable of providing important insights for the smart specialisation strategy. Business entrepreneurs, who are expected to lead the innovation process (Van der Ven, 1999), the challenge of EDP is that it may, on one hand, encourage imitative entry in order to foster agglomeration externalities and spillovers while on the other hand, incentive entrepreneurs that end up with incomplete appropriability (David et al., 2009/2016; Foray et al., 2011; Foray, 2012). According to Foray and Rainioldi (2013) the entrepreneur who makes a discovery will not be able to capture a significant value of the innovation, and actually should not be able to do so. The type of business determines the degree of engagement, for example, in the study of Kroll (2015), firms and firms organisations get involved in the strategy, especially clusters and other intermediary organisations; followed by SMEs and large domestic firms. However, start-ups and subsidiaries of multinational firms get tend to get less involved in the process. In general, business participation tends to be weaker and uneven (Radosevic, 2017: 348). A challenge with the participation of business is that they will have deeper knowledge in the sector they belong to and may tend to protect their own interests which may limit the impact on economic development and efficacy of policies for which the institutional environment plays an important role (Rodríguez-Pose and Crescenzi, 2008).

In fact, institutions have argued to be crucial in S3[22], especially for policy implementation (Foray, 2014; Rodriguez-Pose, 2013; Radosevic, 2017). Moreover, institutions are expected to avoid some of the challenges of smart specialisation design like rent-seeking behaviour, picking

[22] Grillitsch (2016) argues that the role of institutions for S3 remains an open question.

winners, corruption, and lock-ins (Boschma, 2013; McCann and Ortega-Argilés, 2013; Rodríguez-Pose et al., 2014). Thus, an important challenge is to overcome weak institutional capabilities (Kuznetsov & Sabel, 2017) and to select the priorities with "the best matches with institutional capabilities" (Crespi et al., 2014: 29) On this, Lee (2017) argues that "numerous public initiatives fail because of design or capability failure" (p.217)

Capabilities are embodied by individuals, in S3, it is important to consider that the participation is about individuals. The consideration of the human factor in regional studies has led to literature about leadership. In regional development it is not usual to identify one single leader or organization; it requires collective responsibility (Sotaraura, 2004.19). For smart specialisation in general, and the Entrepreneurial Discovery Process in particular (stressed by Periañez Forte et al., 2016), the need of "collective entrepreneurship" (Morgan, 2016) or "collaborative leadership" is suggested as a form of governance in order to design and implement the smart specialisation strategy (e.g. Aranguren et al., 2015; Saha et al., 2018; Sotarauta, 2018). The collaborative leadership was defined by Foray et al. (2012:179 as "efficient innovation systems as a collective endeavour based on public-private partnership (quadruple helix)" thus, this type of leadership is agreed to be a key feature of smart specialisation (Gianelle et al., 2016). Similarily, Charles et al. (2012) stresses that collaborative leadership has proved crucial for innovation strategies[23], which requires integration with domestic strategies programs and regional consensus. Aranguren et al. (2015) analyse the leadership implications of S3 when considered from a processual perspective and concluded that there are diverse types of leadership taking place throughout the strategy: systemic leadership typically taken by the government to place the

[23] For example, Asheim (2014) identified that in North Denmark region, the collaborative leadership that took place corresponds to the recommendations of the RIS3 Guide (p.19) and Morgan (2016) finds that collective entrepreneurship was key to the success of the Basque Country Region.

conditions to engage stakeholders; process leadership and content or knowledge leadership. The authors argue that the source of leaders is likely to vary significantly region-by-region.

Understanding the importance of the human factor in S3, a key question is the type of actors that should be included, because they should have the capabilities to design and perform the strategy (Morgan, 2013). Participatory approaches and joint private-public committees are engaged in the task of engaging essential regional stakeholders in the strategy (Estensoro & Larrea, 2016), however, it is also important to pick those content leaders who possess the entrepreneurial knowledge, beyond those that only represent an institution/ helix. Beyond the challenge of finding the right participants for the strategy with the necessary knowledge, the concept faces difficulties because of its experimental character. The following section will explain those conceptual, operational and political challenges.

3.6 The Triple Challenge of S3

Smart specialisation has been object of discussion at both political and academic level (Capello 2014; Foray 2014). The takeover of a sectoral concept into a regional strategy took place in a hasty manner (Kroll, 2015) time for reflecting and finding the best ways to communicate the concept were limited. Moreover, it became a case of policy running ahead of theory (Foray et al., 2011) were the speed of translation from theory to practice left room for exploration (Aranguren & Wilson, 2013: 128). Thus, the complexity of a new academic framework that was still in process made it difficult for policymakers to design and implement (EC, 2013:4).

In addition, the Entrepreneurial Discovery Process may be seen as a black box which is expected to reveal the technology upgrading paths for a region, which is complicated to reach and understand apart from being too general for different contexts and distances to the technology

frontier (Radosevic et al. 2017:349). Thus, the concept requires concrete elaboration in order to be a hindering factor (Capello & Kroll, 2016).

Morgan (2013) identifies a triple challenge of S3. First, the conceptual challenge, which implies the meanings of the concepts and what it implies to the theory and practice of regional innovation policy. Second, the operational challenge, which explains the complexity of following the six steps processes. Thirdly, the political challenge, or how to ensure that the multi-level polity is mobilised to meet the process. Based on this classification, the following section will deepen into the challenges identified in the literature.

3.5.1 Conceptual Challenges

Smart specialisation literature has faced conceptual challenges throughout its trajectory (see Boschma, 2013; Foray, 2016) Although conceptual development of smart specialisation is mainly built by researchers that advice the European Commission (e.g. Foray and Van ark, 2007; Foray et al., 2009, Foray, 2009; David et al., 2011; Mc Cann & Ortega-Argilés, 2011) it has been argued to be "far from complete" (Kroll, 2017b:102). As it has been explained, the speed at which the approach was put in practice left no time for reflecting and exploring the policy implications and the links with already established policy initiatives (Nauwelaers et al., 2014a; Kroll, 2015). On the one hand, the relevance of smart specialisation for both researchers and practitioners leverages the possibilities of theory in practice (Nauwelaers et al., 2014a; Soulard & Lardon, S., 2019). On the other hand, the lack of consistent and shared concepts (Kroll, 2017b) with vague conceptual ideas of S3 and the Entrepreneurial Discovery Process (Karo et al., 2017: 288) have increased the difficulties on the practical use of smart specialisation, which are based on a "complex academic framework that has to be translated into policy practice" (EC, 2013:4).

The conceptual challenges affect the overall strategy in general, and in particular, the design phase, which is expected to be more theoretically based (Landabaso, 2014; Capello & Kroll, 2016). This section will explain four concepts that have been put in question and clarified afterwards.

First, the "specialisation" concept that is used in S3 because it follows a vertical logic; which is expected to lead to scale, scope and spillovers. Therefore, the need for prioritisation is important because regions can't do everything in science and technology (Foray & Goenaga, 2013). However as structural changes are expected, the strategy is more about diversification, therefore the term could be misleading (Kroll, 2015b; Hassink & Gong, 2019). In fact, Foray (2014) has defined S3 as a 'virtuous process of diversification' (p.492) and has been defined as diversified specialisation (Asheim et al., 2017). Foray (2019) admits that the strategy is more about diversification than specialisation and the fact the concept could lead to misinterpretations of the strategy goals.

Second, Mäenpää & Teräs (2018) argued about the need to clarify the meaning of the "domain" concept which is qualified as vague. Different papers have expressed what is understood by domains in different ways, some examples include: sectors/ technologies (Jucevčius & Galbuogienė, 2014); economic activities (Foray et al., 2009; Foray & Rainoldi, 2013); as the areas based on R&D or innovation that possess a distinctive knowledge (Mäenpää and Teräs, 2018); and cross-sectoral, at the interfaces of technologies and economic activities (Foray, 2009). Kroll (2015b) criticised the strategy for being over focused on a technology-push perspective on STI while some regions could profit more from specialisations in services or low-tech industries. What has been explained, in the level of granularity are warnings especially regarding to the risks of sectoral prioritisation mainly because a too narrow area will result in excluding some actors who

were ready to be involved in some kind of transformation and thus in concentrating resources and efforts on a too small number of predetermined champions[24] (Foray, 2017,2019).

Third, the concept of the entrepreneur, which is opposite to that of the entrepreneurial school of Mintzberg et al. (1998) in which an entrepreneur possesses all the knowledge and takes decisions in a top-down way; and different to the entrepreneur that start-up a business. In the S3 literature, entrepreneurs are understood in a broad sense, including the variety of regional stakeholders that are expected to possess "entrepreneurial knowledge" which beyond knowledge about science and techniques related the STI knowledge with market growth potential and other inputs that are required for launching the activity (Foray, 2012).

Finally, what is understood as "innovation" in S3 is in ST domains or innovation in a broad sense is not clear. Some papers argue that S3 has an excessive R&D technology-push focus, while neglecting demand-led innovation (Radosevic, 2017:24) and an over-focus on STI (Hassink & Gong, 2019). In addition, the Oslo manual, which is the reference in terms of what is generally understood as innovation changed in 2018, after the S3 concept were built (OECD, 2018).

It is important that stakeholders share a common understanding of S3, which is not only challenging in theory but there is a risk of misleading the strategy when it is bring down into paper and policy design, therefore, the following section explains the operational challenges associated with the S3 process.

[24] Sector prioritization generates distortions. There is no point in supporting all firms of a given sector. The point is rather to support new activities and projects at a finer level of granularity (Foray, 2016).

3.5.2 Operational Challenge

The S3 is based on the following six steps process, however those five steps have evolved and changed along the years as a result of the evidence from early experiences with S3.

Table 5.

Steps for the S3 process

Year	Process
2012	(1) Analyse regional context and potential for innovation; (2) Governance: Ensure participation and ownership; (3) Elaborate an overall vision for the future; (4) Identify priorities; (5) Define policy mix, roadmap, action plan and (6) Integrate monitoring and evaluation mechanisms (Foray et al., 2012).
2013	(1) Macro-analysis to identify clusters and related trends; (2) an experimental phase in which diverse actors participate and that would include an allocation rule for resources to enhance capabilities, entrepreneurship and emerging activities in sectors were these new activities are required and will not develop spontaneously (3) the selection of priorities at the micro-level with specific roadmaps and projects.
2019	(1) Identify thematic priority areas; (2) translating these priorities into transformational roadmaps; and (3) implementing the transformational activities with an action plan.

Note: own elaboration based on Foray (2012); Foray and Rainoldi (2013) and Foray (2019).

For understanding the operational challenges, this document will base on the three steps defined in 2019. On these three steps, the author argues that S3 design involves two logics of policy action: a planning mode (especially for priorities selection) and a self-discovery mode, which affects the two following steps and is highly influenced by the EDP. Hence, the initial phase is about setting the objectives of a continuous learning process[25] (Foray, 2019).

[25] The understanding of EDP in the implementation phases was something new, before, Foray (2016) identified as mistakes of EDP that the planner believes that he knows what to choose; the mistake of sectoral prioritization and the mistake of believing that choices on priorities are made forever (Foray, 2016). Therefore, EDP was clearly about priority setting.

The first phase, identification of priorities is the outcome of the design stage. According to Nauwelaers et al. (2014a), "design includes the definition of scope and the identification of key actors; the adoption of a joint vision, conducting studies, consultations, debates, creating scenarios, which result in the identification of priorities and role of public action" (p. 8). The challenge for this stage is to define who should participate in the strategy, which would depend on the regional institutional context to avoid problems such as capture of the process by certain groups or stakeholders, as well as the use of power for rent-seeking (Foray et al., 2012: 21; Morgan, 2013).

The second phase, consists on the translation from a priority area to a transformational roadmap and policy frameworks is arguably, the most difficult part of the process (Kroll, Müller, et al., 2014; Foray, 2019; Nauwelaers, 2014a, b). The implementation phase involves the translation of broad objectives into more detailed goals, the identification of stakeholders in charge of the implementation, and the decision about budgetary sources (Nauwelaers et al., 2014a). The third phase, implementing transformational activities with an action plan, is narrowing down the findings from the second phase into action. The challenge with these two phases is that they are supposed to be sourced by the evidence-based EDP, while the need to place in paper and action plans a strategy that is alive requires capabilities that should not be given for granted.

These identification of phases does not explicitly explain the importance of monitoring and evaluation, nor they are defined steps, because the policy process is expected to be cyclical. Therefore, monitoring reverts findings on the relevance of goals and actions, reverting both to the design and implementation stages (Nauwelaers et al., 2014a). The importance of continuous monitoring mechanisms has been emphasised in S3 literature (Kleibrink et al., 2016, 2017; Gianelle & Kleibrink, 2017). S3 is expected to be revised at any time according to the feedback from first experiences as well as the emerging new opportunities and potential (Foray, 2017: 44).

The operational challenges are mainly related to the difficulty to translate concepts into practice and the "lack of substantial previous experiences" (Gheorghiu et al., 2017: 320) which is especially relevant for those regions with less previous experience in participatory approaches and innovation policy. Although those regions may face more challenges, the scope for improvement is also larger. For example, some central European countries showed that the main institutional change brought by S3 was an improvement in policy communication and coordination (Kroll et al., 2014; McCann & Ortega-Argilés, 2016a), because that was something new.

The operational challenge lead to some political challenges as well, especially regarding multi-level governance and the need to choose.

3.5.3 Political Challenge

The political challenges identified are two. First, the challenge of aligning S3 to the strategy at other governance levels (Aranguren et al., 2019; Tsippouri, 2017) especially when regions lack of financial autonomy.

Second, the need to choose, which implies that some regional actors gain while others lose (Grillitsch, 2016). This problem is stressed by the experimental nature of the approach in which governments need to recognise that not all chosen domains will pay off (Foray, 2012) and because the evaluation is backward looking and tends to assign guilt for revealed mistakes while S3 require forward looking identification of issues to resolve (Kuznetsov & Sabel, 2017:52). In addition, the self-correcting character of the strategy is difficult when domains reflect the benefits in the long run, and the monitoring is focusing on finding early mistakes (Kuznetsov & Sabel, 2017: 53; Radosevic, 2017).

3.7. Conclusions

S3 and EDP are both taken from a processual perspective, which reflects the dynamics of the strategy (Aranguren & Larrea, 2015). Therefore, the importance of understanding the strategy as a combination of emergent and deliberated strategies that are realised (Mintzberg, 1978). The EDP is about the recognition or discovery of those emergent opportunities in order to become part of the intended strategy. Therefore, strategies that are formed become formulated; where strategy formation feeds back to formulation and becomes a cyclical process. This argument is stressed by Foray (2014), who identifies that smart specialisation may take place without policy intervention, and gives some examples of regions where the strategy occurred in an spontaneous (or emergent) way.

Those emergent strategies can be either based on a related-variety logic or unrelated (e.g. when FDI takes place in a region because of location advantages). Therefore, the focus of the specialised diversification process should not depart from existing capabilities but from the business and innovation activities taking place in the region. Nevertheless, the need to translate that process into priority selection and a roadmap is challenging.

The key differentiating features of EDP are the focus in the identification of domains that would generate structural changes, the STI focus of such domains and the experimental nature of the process. However, experimentation is costly and not all prioritisations will pay off; therefore, the challenge of priority selection for S3 is more difficult in those regions with disadvantages such as low income for these types of initiatives. The following section will deepen into the experience of regions with disadvantages in S3 with the aim to shed light on operational and political challenges faced by those regions.

Chapter 4. Smart Specialisation Strategies in less advantaged regions

Chapter 4. Smart Specialisation Strategies in Less Favoured Regions

4.1. Introduction

Although S3 has different traps in diverse regions (Sotarauta, 2018), this chapter will deepen into Smart Specialisation literature in regions in which the literature recognises disadvantages for designing and implementing S3. As a place-based approach and with roots on economic geography theories, the point of departure is the recognition of the uniqueness of each region for which S3 should balance the uniqueness of the regions with a universally applicable approach avoiding methodologies that are expected to work for every region (Benner, 2020; Kristensen & Pugh, 2022). In fact, the applicability of S3 has been questioned due to the lack of capabilities and networks to benefit from S3 (McCann & Ortega Argilés, 2015; Morgan & Marques, 2019), in contrast, it seems that S3 in practice considers less developed regions as the main targets. For instance, the European Commission devotes more funds to such regions especially due to the weakness of their RIS and institutional characteristics (Gianelle et al., 2020)

A research problem identified is that the literature tends to generalise challenges that apply to similar regions; classifying them according to different criteria such as size (i.e. Jaffe, 2015), level of income (i.e. Lee, 2013) and innovation system (i.e. Tödtling & Trippl., 2005). Despite the recognition that ‘less favoured regions are hard to classify in the global context’ (Tsippouri, 2017: 126); there have been different attempts to identify the challenges that regions with diverse characteristics face. Therefore, one region may fit in more than one of those characteristics; for example, one region can be small and peripheral (i.e. Georghiou et al., 2014) or peripheral and developing (i.e. Zacca González et al., 2018).

Less favoured regions tend to be identified according to their structural and economic characteristics. Therefore, S3 is expected to be shaped by the level of development (Barzotto et al., 2019; Belussi & Trippl., 2018; Healey, 2016; Krammer, 2017; Kveton & Blazek, 2018; Morgan & Marques, 2019; Muscio et al., 2015; Lee, 2017, Papamichail et al., 2019); the industrial structure (Dąbrowska, 2017; Martins, 2016; Tris et al., 2013); the level of income (Varela et al., 2019); the geographical size (Piekkola, 2018, Georghiou et al., 2014); the degree of urbanization where different challenges are faced by core metropolitan regions (Lorentzen et al., 2011; Monsson, 2014; Vas et al., 2015); and peripheral regions[26][27] (Dziemanowicz, 2017; Evangelista, 2018; Pugh, 2018) such as rural (Aleksejeva et al., 2018; Spilova et al., 2017) and sparsely populated regions (Dubois et al., 2017).

The cognitive distance from the technology frontier also affects the strategy. Therefore, leader regions are differentiated from those follower regions, and the strategy is expected to be shaped by innovation capabilities (Camagni & Capello, 2013; Camagni et al., 2014; Foray et al., 2009; Foray, 2012, 2017; Lopes et al., 2018). Finally, from the RIS perspective, S3 is shaped differently in regions with less developed and emerging innovation systems[28] (Jucevicius et al., 2016; Ranga, 2018; Vallance et al., 2018).

Understanding the challenges of less favoured regions is an opportunity to make use of advanced theoretical models (Lundvall et al., 2009). In addition, at the beginning S3 was argued

[26] On this, Camagni & Capello (2013) call researchers to overcome simplistic dichotomies like core and periphery, especially by suggesting that core regions may generate GPT, and periphery co-invention like in S3.
[27] Pugh and Dubois (2021) find challenges in the use of the term peripheral in regional studies and provide some solutions.
[28] The usefulness of the innovation systems approach for developing countries was questioned by (Lundvall et al. 2009). In addition, there is still a disagreement on whether systems of innovation in developing regions are inexistent (Viotti, 2002; Park & Park, 2003) or in process of being developed (Lundvall et al., 2009; Chaminade et al., 2009; Tödtling and Trippl, 2005). Delvenne & Thoreau (2017) criticises the use of IS framework as it seems that there is a path for an ideal innovation system without considering the complexity of each region; which is also in contrast with the very basics of an evolutionary perspective.

to be crucial for those regions that were not at the STI frontier (Foray et al., 2009) which attracted the interest of researchers beyond the EU boundaries despite its European origin and focus (i.e. Barroeta et al., 2017; Bosch & Van Ortas, Guimon, 2018; Zacca González et al., 2018). However, the practice shed light on difficulties of less favoured regions and led to conclude that "it is clear that less advanced regions will have great difficulties in acquiring the minimum of entrepreneurial and institutional capacities necessary for the implementation of the concept" (Foray, 2019, p. 10). Hence, the strategy is not accurate for all types of regions; and some regions are more likely to benefit from S3 than others (Belussi & Trippl, 2018).

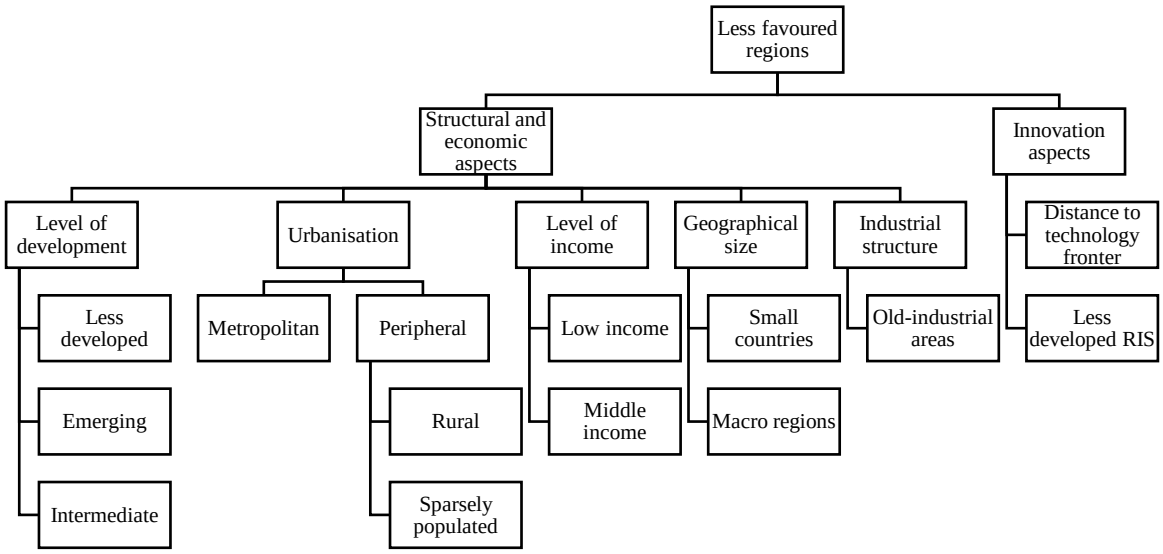
The next section will deepen into the most frequently cited types of less favoured regions as well as the challenges they face and the policy implications. Then a summarising table is developed.

4.2 Less Favoured Regions and Common Classifications

In Europe, S3 is an ex-ante conditionality to access de ERDF Funds from the European Commission. Therefore, most regions have implemented the S3 philosophy in their regional development and innovation plans. Nevertheless, the capabilities for S3 have been questioned in different regions, especially regarding three dimensions: governance and institutions (Farole et al., 2011a, 2011b), industrial structure (Hassink et al., 2018; Xiao et al., 2018) and innovation capabilities (Muscio et al., 2015; Oughton et al., 2002). Figure 2 shows the general classifications abovementioned, which will be used in this section.

Figure 2.

General classifications of less favoured regions for S3



Note: Author's elaboration

4.2.1 Regions with Disadvantages Due to their Structural and Economic Aspects

These regions depart from a disadvantaged position due to aspects that are related to their level of development; degree of urbanisation and distance from the core regions; level of income; geographical size and industrial structure.

First, according to the level of development, S3 has been questioned in lagging regions (Boschma, 2013) and developing regions (D'Adda et al., 2018; Prichett et al., 2013); while intermediate and advanced regions are expected to benefit more from S3 (Belussi & Trippl., 2018; Foray, 2019; Trippl et al., 2019). Intermediate regions are understood as those regions that are owe wider institutional factors or overall economic performance in comparison with advanced regions.

(Trippl et al., 2019). In terms of development, there are some economies that are in a transition period in which governments tend to be interested in achieving structural changes towards innovation-based structures (Kotnik & Petrin, 2015: 86). Thus, there are S3 studies based on those, known as catch-up economies (Papamichail et al., 2019), emerging regions (Bosch & Van Ortas, 2019; Guimon, 2018) and transition economies (Gebhardt & Stanovnik, 2016).

Table 6.

Less favoured regions according to the level of development

Type of region	**Governance and institutions**	**Industrial structure**	**Innovation capabilities**
Less developed/ less advanced/ Developing/ lagging/ third world	-Weak organisational and support structures. -Inappropriate institutions (corruption, clientelism, rent-seeking). -Political inefficiency -Inertia in policy making due to weak design and implementation capabilities. -Weak and Fragmented RIS. -Lack of experience and capabilities on collective policies. -Pressure of interest groups -Lack of collaboration between different stakeholders. -Scarce/ young intermediate organisations.	-Domestic firms in low value-added activities. -Dominated by SMEs. - MNEs dominate in regions with geographical and labour force advantages. -Lack of high-quality services and infrastructure. -Lack of diversity and connectedness. With several barriers to pathways. -Presence of some clusters, especially in industries that are embedded in GVCs. -Lower tier suppliers in GVCs. -Jobs are performed with secondary and primary education levels.	-Weak innovation capabilities. -Lack of technological capabilities and networks. -Low social capital. -High institutional barriers for innovation. -Relevance of non-technological innovation. -Low demand for R&D activities. -Important DUI mode of learning. -Firms innovate in isolation.

Type of region	Governance and institutions	Industrial structure	Innovation capabilities
	-Missing regional coordination. -Lack of government proactivity. -Lack of abilities/ interest of private actors to get involved.		
Transition/ catching up/ emerging	-Lack of experience governing innovation policies. -Policies tend to mimic advanced regions. -Institutionally weak environment. -Low coordination capabilities.	-Manufacturing industries in the process of switching towards service-oriented activities. -Presence of MNEs. -Standardised products with high low-cost pressures. -Entrepreneurs in low-tech fields. -Difficulty of innovation-based structural changes due to institutional restrictions.	-Limited extent and quality of innovations. -Some innovation capabilities. -Lack of absorptive capability for university knowledge. -Clusters are important to foster innovation.
Intermediate regions	-High degree of institutional thickness. -Organisational deficiencies. -Lack of cooperation leads to fragmentation of RIS. -Previous experiences governing stakeholder inclusion. May have problems of vested interests and political priorities.	-Strong traditional economic activities. -Specialised economic structure reduce the opportunity for cross-industrial path development. -Dominance of few industries.	-Limited STI capabilities. -Absence of basic research organisations. -Focus on broad sense innovation.

Note: Author's elaboration based on Asheim (2019); Barzotto et al. (2019); Blazek et al. (2014a ,b); Boschma, 2013; EC (2015); Farole et al., 2011b; Csank et al. (2013); Gonchar et al. (2017); Healey (2016); Intarakumnerd and Chaminade (2011); Kleibrink et al. (2017)Krammer (2017);

Lee (2017); McCann and Ortega-Argilés (2011); Radosevic, (2017); Rodríguez-Pose, (2013); Rodríguez-Pose et al. (2014); OECD, 2011; Papamichail et al. (2019); Trippl et al. (2019)

When the regions are classified according to the level of development, the policy recommendations for less developed regions focus on building institutional capacity to avoid problems such as corruption and rent-seeking (Blazek et al., 2014b; Gonchar et al, 2017; EC, 2013, Healey, 2016; Muscio et al., 2015; Rodríguez-Pose et al., 2014); foster cross-regional collaboration and learning (Barzzotto et al., 2019, Gonchar et al., 2017; Nauwelaers, 2014a; Rodríguez-Pose et al., 2015); and linkages with better performing regions (Nauwelaers et al., 2014; Morgan, 2017); address the societal challenges (Kroll, 2017) and foster universities, which are expected to have a crucial role as institutional stakeholder (Blazek et al., 2014b, Kempton et al., 2013; Kroll, 2017; OECD, 2013; Vallance et al., 2017). However, S3 challenges are argued to be especially high in those regions (Belussi & Trippl., 2018; Foray, 2019; Morgan & Marques, 2019). For intermediate regions, in addition, narrower domains of prioritisation are suggested; as well as work on deficiencies in the institutional environment (Trippl et al., 2019). For transition economies, the recommendations tend to be more innovation-centered; therefore, vertical policies are argued to work better for them (Foray, 2014, 2016, 2017; Tsippouri, 2017); especially in niche markets (Foray, 2014; Lee, 2017) and foster decentralization of policymaking in order to build regional capabilities in that field (Kleibrink et al., 2017).

According to the degree of urbanisation, the main challenges are found in peripheral regions. Peripheral regions are those far from most academics and decision makers, and have been widely studied in economic geography, even without a clear understanding of the concept (Pugh & Dubois, 2021). The core-periphery paradigm is mainly constructed according to two main issues

identified by Pugh and Dubois (2021), agglomeration and power asymmetries. In S3, peripheral regions have been identified as the most complicated cases (Balland et al., 2018: 12) besides those regions have been "eclipsed" with place-based and S3 concepts (Morgan, 2013). Peripheral regions experience different challenges. First, in terms of governance and institutions; weak institutions and administrative capabilities prevail (Asheim, 2019; Balland et al., 2018, Grillitsch, 2016); especially in terms of collaboration between different regional stakeholders, which tends to take place in closed power networks (Boschma, 2013). Second, their industrial structure tend to miss elements, be specialised in traditional sectors and dominated by SMEs. Therefore, few large players dominate the industries and lead to inertia and lock-in problems (Tödtling & Trippl, 2005; Boschma 2014; Grillitsch, 2016). Finally, innovation capabilities are modest, with few incremental innovations with a lack of domestic demand for technology and low absorptive capabilities (Asheim, 2019; Liagouras, 2010, Morgan, 1997).

The policy recommendations for peripheral regions stress the importance of connectedness, especially with related activities outside the region to promote diversity (Asheim et al., 2017; Balland et al., 2018; Boschma, 2013; Grillitsch, 2016) and upgrade traditional sectors (Asheim, 2019); increase education and skills (Georghiou et al., 2014; Fellnhofer, 2017; Tödtling & Trippl., 2005); investment in STI (Kominos et al., 2014); improve institutions and government effectiveness (Rodríguez-Pose et al., 2014) and strengthen capabilities to commercialise and exploit social challenges (Kroll, 2017). For sparsely populated areas, development of other types of proximity is suggested (Dubois et al., 2017).

The level of income is another factor argued to shape S3; the S3 literature focuses on middle-income regions, because those are expected to benefit from S3 to overcome the 'middle income trap' (Lee, 2013a, b; 2017). In those economies, accumulated knowledge skills are argued

to allow them to generate intermediate innovation and benefit from the investment in such technologies (Fu et al., 2011). For these regions investment in short-cycle technologies is recommended although the granularity level is different to that suggested in S3 (Lee, 2017); the international dimension is also important to benefit from spillovers and catch-up (Kokko, 2001; Fu et al., 2011) however, the technology imported should be appropriate to avoid an increasing gap with the north (Fu et al., 2011: 1209). Finally, extra-regional collaboration is suggested for middle-income regions (Varela et al., 2019).

Another classification of less favoured regions is by geographical size, where the usefulness of S3 has been questioned in small countries, due to the lack of internal regions (Charles et al., 2012: 43) to which, Foray et al. (2012) argued that national economies are a good framework for the case of small countries. However, the challenges include some inertia in the policy system (EC, 2013) and a limited number of activities that can be prioritised which difficults the consensus (Charles et al., 2012). In addition, it is difficult to generate a critical mass of companies with international recognition, therefore, most companies are SMEs and R&D is typically done in small scale (Jaffe, 2015). Finally, there is a small domestic market. Therefore, the policy recommendations include prioritisation in export-oriented activities (Piekkola, 2018) and enhance skills and competences to offer higher value-added products and services (Georgiou et al., 2014). A second challenge found in the literature regarding size, is that of macro-regions which are based on metropolitan areas and rural peripheral areas (Di Bella et al., 2018), however the study focuses on the rural periphery which is aligned to the economic structure classification.

The last of the challenges related to structural and economic matters is the industrial structure, especially in those old-industrial regions, which tend to have lock-in problems (Tödtling & Trippl, 2005) and require structural changes to overcome inertia. Therefore, the policy

recommendations are focused on developing industries aligned with the regional comparative advantages (Lin, 2017); through strategies such as focusing on demand-side experimental innovation (Coenen et al., 2015) and attracting complementary FDI to be combined with existing knowledge.

Innovation capabilities are certainly an issue in most of the regions described in this section. The literature also identifies specific classifications for those regions that have disadvantages based on their innovation performance and the type of innovation system that exists. The following section will explain the challenges faced by those regions.

4.2.2 Regions with Disadvantages Due to their Innovation Capabilities

In the literature two main challenges were recognised: the distance from the technology frontier and the maturity of the innovation system.

First, the importance of considering the distance from the technology frontier is expected to shape regional policies (Aghion & Howitt, 2005; Aghion & Howitt, 2006; Aghion et al., 2011) because those regions closer to the frontier tend to have innovation-based strategies while those further tend to adopt those technologies (Acemoglu et al., 2006). Similarly, S3 differentiates leader and follower regions[29] (e.g. Foray et al., 2009; Foray, 2012, 2017). Leader regions are those that 'master the technology frontier' (Foray, 2017:48) and generate GTPs while followers are focused on catching up. Therefore, those regions far from the frontier are advised to co-invent in the application of GPTs generated at regions that are closer to the frontier; and leader those co-inventions (Foray et al., 2009; Foray & Goenaga, 2013).

[29] Banner (2013) has criticized such distinction as the author considers the difficulty to identify follower regions while a region could be generally a follower but also a leader in specific technologies.

Second, the innovation systems have been a commonly used framework to identify challenges and failures to be addressed through regional policy. Tödtling and Trippl (2005) identified system failures such as organisational thinness (typically found at peripheral regions); lock-in (typically in old-industrial regions) and fragmentation (normally in metropolitan regions) and argue that those failures can be combined (See Květoň & Blažek, 2018 for examples). Table 7 describes the regions according to the failures in their innovation systems.

Table 7.

Less favoured regions according to the failures in their innovation systems

Type of region	**Governance and institutions**	**Industrial structure**	**Innovation capabilities**
Old-industrial regions	-Weak capabilities to break paths. -Powerful groups dominate the economy.	-The demand of SMEs are not met. -Mature industries and firms. -MNEs are controlled outside the region. -Strong clustering effects -Overspecialisation in mature and traditional industries that are not high-tech.	-Limited capacity of interactive learning. -Information of domestic employees is protected and limited spillover effects. -Limited capability for radical innovation.
Metropolitan and urban regions	-Fragmented innovation systems. -Lack of connectivity	-Excessive diversity without related variety. -Existing organisations but not connected	-Deficient knowledge exchange.
Peripheral regions	-Institutions can be thin or thick	-Dominance of SMEs in traditional sectors.	-Lack or absence of absorptive capability. -Limited R&D expenditure.

Note: Author's elaboration based on Blazek et al. (2014a); Tödtling & Trippl (2005).

Another challenge is the degree of maturity of the RIS, in fact their applicability to regions with less-favoured RIS[30] has been questioned[31] due to the low potential to diversify into new industrial structures (Trippl et al., 2015:2). Less developed RIS are characterised by not being well equipped to foster innovations due to the existing industrial and technological paths and the limited capacity to support structural changes over time (Blazek et al., 2014a; Chaminade & Vang, 2006; Trippl et al., 2015). In addition, the capacity for policymaking and governance tends to be weak (Blazek et al., 2014a; Trippl et al., 2015) however, the lack of experience with regional policies avoids the institutional inertia that may be suffered in more advanced regions (Blazek et al., 2014a). In terms of economic structure, less developed RIS tend to have weak or missing knowledge organisations and suffer from branch-plant syndrome, which typically represent a lock-in problem when domestic firms are embedded in the GVC as lower-tier suppliers (Blazek et al., 2014a; 2014b). Due to the lack of endogenous innovation capabilities, and R&D investment, weak RIS tend to copy foreign practices (Blažek et al., 2013). Therefore, policy recommendations are focused on strengthening universities (Vallance et al., 2018); institutional frameworks and innovation support (Jucevicius et al., 2016; Ranga, 2018).

4.3 Conclusions

Less favoured regions face different challenge that difficult the design and implementation of S3; but also, that condition the overall strategy and therefore, have led to different questions about the applicability of the S3 approach in different contexts.

[30] The European Commission (2015:21) argues that S3 is particularly important for RIS that do not yet have depth and breadth of the highly developed systems.

[31] Camagni and Capello (2013) argued that "While the general philosophy behind the smart specialisation argument is widely acceptable, its direct application in regional development policies is questionable" (p.361).

First, there is a lack of experience in policymaking (Gonchar et al. 2017) especially in centralised governance structures, where regions have limited power and governance capabilities (Krammer, 2017; Kroll, 2017b; Trippl et al., 2019). Therefore, to implement S3 diverse regions have outsourced governance practices from consultancy firms, missing the chance to develop in-house inclusive governance capabilities (Trippl et al., 2019). In addition, political reasons have led to the tendency of less favoured regions to define specialisations in a broad and vague way (Karo et al., 2017).

Second, the institutional environment affects the governance and policymaking capabilities, especially in participatory approaches like S3 because weak institutional environments lead to problems such as corruption, picking winners and rent-seeking behaviour (Rodrik, 2004: 17; Pietrobelli & Rabellotti, 2011; McCann & Ortega-Argilés, 2013; Rodríguez-Pose and Di Cataldo, 2015; Grillitsch, 2016; Moodysson et al., 2016: 388). A problem that is more intense in those regions with few key players which capture policymaking processes and lead eventually lead to inertia (Boschma, 2013).

Thirdly, less advantaged regions tend to face an information challenge, especially in peripheral areas, therefore, one perspective emphasises the need to source know-how and technology from elsewere (Brennan & Rakhmatullin, 2017). However, the role of exogenous sources of regional change and the way institutional contexts shape path developments are poorly understood (Trippl et al., 2015; Blazek et al., 2014a). In fact, a different perspective is that internationalisation is not a crucial component in the design of S3, especially considering the dependence on FDI and global value chains (Radosevic & Ciampo, 2015). Finally, outward-looking can lead to mimicking the strategies developed for different contexts; therefore, looking for best matches is more accurate than best practices (Crespi et al., 2014:347).

Finally, the innovation systems do not lead to STI innovations due to organisational thinness, especially regarding lack or immaturity of some or all helixes (Blazek et al. 2014b). The problems here are cognitive and relational as well.

The classifications of the less favoured regions are useful for understanding them from a processual perspective and therefore, develop policies that meet their particular needs. However, the degree to which the context shapes the applicability of S3 depends on the opportunities to develop smart specialisation. In the words of Morgan (1997) "learning is worth little if there are no opportunities to implement what has been learnt" (p. S157). An important factor to consider that a regional context has an opportunity to implement S3, is the capability to do so, in the absence of the required capacities, transnational policy learning is impossible (Nauwelaers et al., 2014a).

Due to the European origin of the concept, most of the literature and experiences are based in Europe, with few exceptions (i.e. Barroeta et al., 2017; Bosch & Van Ortas, 2019; Guimon, 2018; Iga-César, 2020; Lorentzen et al., 2011; Zacca González et al., 2018). Although different contexts may face similar challenges to those explained in this chapter, different challenges arise in non-European less favoured regions which tend to have more important challenges regarding building their innovation system and experience with policymaking (Lorentzen et al., 2011) and different degrees of centralisation in decision making (Barroeta et al., 2017; Guimon, 2018).

Therefore, the study of less favoured regions in non-European contexts represent a research opportunity, which contribute to the understanding of the challenges faced by different types of regions. For instance, diverse regions in Latin America have large metropolitan areas with heterogeneous characteristics and an important proportion of peripheral and rural areas. Therefore,

this study will shed light on those regions through two case studies that will be explained in the next chapter.

Chapter 5. Methodology

Chapter 5. Methodology

5.1 Introduction

In the previous chapters, the smart specialisation concept, the roots of the concept and the challenges for disadvantaged regions were presented. The aim of this research is to provide a deeper understanding on the design phase of the smart specialisation strategy, which in this study comprehends the period from the selection of S3 as the regional strategy to the elaboration of the document in which the priority areas are reflected with their corresponding projects. The focus of the study is on non-European regions, where the context-specific elements and historical paths are recognised to require deeper research in smart specialisation and related variety studies (Villarreal et al., 2017). Studying non-European regions is important especially considering the heterogeneity of places, which is stressed in economic geography. In addition, it has been argued that inadequate strategies may hamper regional growth (Tödtlong & Trippl., 2005; Chaminade et al., 2009: 16).

As the core of the S3 strategies, the way the Entrepreneurial Discovery Process takes place in the studied regions was considered to provide evidence on a process in which the empirical evidence is limited (Del Castillo et al., 2015).

Recent literature places the Entrepreneurial Discovery Process in the implementation phase (e.g. Foray, 2019); however, in an evolutionary perspective, the strategy formation and formulation have blurred boundaries for which the process of discovery is included in the study as in between strategy formation and formulation. Similarly, the literature by the time the empirical study was made positioned the Entrepreneurial Discovery Process as an important design principle especially in the policy process (Coffano & Foray, 2014). Finally, an argument to support the focus on the design phase is that the design has been more related to theory formulation while the

implementation phase has been considered to be more practical (i.e. Landabaso, 2014; Capello & Kroll, 2016). While the design phase depends more on ad-hoc strategies for the regional context; the practical phase involves other regional factors and capabilities that are not in the scope of this research study.

This research aims to develop a Conceptual Framework of Smart Specialisation for Developing Regions considering the main contextual elements that shape the S3. This study was designed with four main goals. The first is to contribute to the understanding of the Entrepreneurial Discovery Process from a processual perspective, including systemic and evolutionary approaches; second, to explore the role and power of actors for the determination of regional strategies and priorities. Thirdly, to shed light on the regional innovation system characteristics that affect the design of S3. Finally, to add evidence on intermediate large metropolitan regions from a non-European context.

The remaining of this chapter is organised as follows. First, the methodological approach chosen to accomplish the research objectives is explained; then, the selection and definition of the case studies considered in this research are explained; after that the selection of information sources and research instruments, the contents of the interview, the description of the analysis and interpretation as well as ethical considerations and limitations of the research are exposed. Finally, conclusions about this chapter are made.

5.2 Methodological Approach

The epistemology for this research, understood as ‘a way of understanding and explaining how we know what we know’ (Crotty, 1998: 3) follows a constructivist position, which implies that truth knowledge embedded in human beings and integrated into the social context through which

knowledge is co-constructed by researchers and the participants. Thus, the study explores a social phenomenon through the study of the experiences and perspectives of people in specific contexts, which leads to an interpretation of the information or an interpretivist perspective estimating that the constructions are not unrelated but instead present commonalities (Stake, 1995). According to Denzin and Lincoln (1994), the interpretivist studies analyse a phenomenon through the meanings that participants associate with it, thus, there is 'no objective truth to be known' (p.54). Reality then, has different perceptions; the reality of the researcher, the reality of those researched and the reality of the readers that interpret the written documents. For that reason, the objective of this study, is not to find a generalizable truth but to provide in-depth and rich description, exploration and understanding of a phenomenon, namely, the Smart Specialisation Strategy process, as it has taken place in two different regions in Latin America: San Luis Potosi and Medellin. To explore the process, research questions were formulated to shape the research. The main question is: How can Smart Specialisation Strategies be designed to support less favoured regions to become competitive based on their hard (economic and structural) as well as soft (institutions and capabilities) characteristics? Them the following subquestions shape the research:

1) How is the role of actors that participate in the strategy formulation?
    a. How are their roles, and therefore, EDP dynamics affected by the context?
2) How is the design of S3 affected by the innovation potential and regional innovation system configuration?

The research questions were performed after a literature review and considering study propositions like the following:

1. The actors that conform the quadruple helix have a key role in designing S3.

2. The regional innovation capabilities shape the accuracy of S3 for the studied regions (strategic fit)

In view of the 'how' research questions, exploratory qualitative research is the most appropriate (Merriam, 1998; Yin, 2009). For that reason, it was decided use case studies as the methodology for this study. (Stake, 1995; Bassey, 1999; Yin, 2009). The methodological selection is supported by two main arguments: first, smart specialisation strategies have been adopted recently, which means that the process of implementing the regional strategy is a contemporary phenomenon; second, S3 is a place-based approach, based on the unique regional characteristics which reinforces the use of case studies, as there are argued to be desirable when a phenomenon takes place in specific contexts. Citing Yin, (2009) a case study approach brings a holistic understanding of a 'contemporary phenomenon, set within its real-world-context especially when boundaries between the phenomenon and the context are not clearly evident' (p.18). The author also stresses that multiple sources of evidence are used in case studies which is the case of this research (more information in 4.4 selection of information sources). Thus, this methodology can provide a 'richly detailed portrait of a particular phenomenon' (Hakim 1987:16) while contributing to the knowledge of individual, organizational, social, and political situation (Yin 1994:2). To summarise, the multiple-case studies methodology suits the research question and objectives to understand a social and political process affected by the context.

5.2.1 The Unit of Analysis within the Theoretical Framework

S3 is expected to be a continuous and learning strategic process that affects regional innovation policies and combine a planning and a self-discovery logic (Foray, 2019). Therefore, for analysing the S3 process a specific period or process stage must be selected and analysed. According to the research objectives, the unit of analysis is the process of smart specialisation

strategies from the rationale to implement them, in which the non-European regions decide that the strategy suits their objectives until the stage in which the priority areas and original roadmap are part of a plan or a policy instrument. That period is considered in this study as the design of the S3 strategy.

In a processual view of strategy, there has been confusion on whether the Entrepreneurial Discovery Process is within the design or implementation phase. From one hand side, the implementation phase is expected to hold the actions that take place to realize the strategies that are both intended and formulated (Mintzberg, 1978) at the design phase, in which, the Entrepreneurial Discovery Process would take place according to the definition of Foray et al. (2009) in which EDP is explained as a learning process of discovery to reveal in which domains a region does best in science and technology. From that perspective, the domain selection considers the emergent and intended strategies in a region in a form of a plan. On the other hand, it has been clarified that EDP does not take place at the step of priority area selection but after the transformative activity is constructed and developed which involves identification, implementation, and evolution of a collection of projects moving in the same direction of transformation and require mentoring and flexibility mechanisms (Foray, 2019); that way the regions discover the real path to transformation. Therefore, an evolutionary view is important to understand an ongoing phenomenon where the boundaries between phases are blurred.

As this research expects to shed light on the Entrepreneurial Discovery Process in non-European contexts, the way the ‘emergent’ regional strategies are identified and incorporated into the original plan is the part that will be analysed.

5.3 Case Selection and Definition (Sampling)

Multiple-case study is substantially important to increase the robustness of the methodology and to enable the generation of theory (Miles & Huberman, 1994; Yin, 2009). In addition, it has been argued that in depth studies are more desirable than superficial synthesis of a larger sample (Pawson et al. 2005, Suri, 2011) which reinforces the idea of using case studies.

The criteria for case selection followed the premise of 'replication logic' (Yin, 2009) in which cases are carefully selected to predict similar or contrasting results for anticipated reasons. The anticipation of results is based on the empirical evidence from designing S3 in regions with similar characteristics. In addition, the research follows purposeful sampling (Patton, 1990). For the latter, the case selection was grounded on a combination of the purposeful convenience sampling with opportunistic sampling and stratified purposeful sampling. First, convenience sampling was applied given that the region where I lived most of my life allowed me to a higher degree of access to information, not possible in other regions. Then, stratified purposeful sampling was used to examine similarities and variations in key factors or dimensions associated to the object of study. Patton (1990) argue that 'any common patterns that emerge from great variation are of particular interest and value in capturing the core experiences and central. shared aspects or impacts of a program' (p. 172).

Aligned with the use of purposeful sampling, there are recent studies about smart specialisation in different contexts that have used purposeful sampling as a tool for case selection (e.g. Morisson & Doussineau, 2019).

The criterion for the cases, from general to particular, was the following: First, the use of intermediate regions, for which Smart Specialisation Strategies concept and implementation are

expected to make sense especially (Foray, 2019); another criterion was to select non-EU regions which have interesting developments that could be incorporated in studies on Science, Technology and Innovation Policies (Delvenne & Thoreau, 2017, p. 40). At a more particular level, the evidence of the interest Latin American policy makers in the concept of smart specialisation and the implementation in different regions (Barroeta et al., 2017, p.1) made this geographical area an interesting focus of research.

Although each region is heterogeneous, it has been suggested to make families of systems according to the common features, which has been argued to make sense for regions like Latin America, where countries share 'structural identities and culture' (Lundvall et al., 2009, p.9; Barroeta et al., 2017, p.16); which refer to the hard and soft characteristics of a region.

Therefore, the cases share on one hand similarities on hard structural data such as the size and structure while other soft characteristics were intentionally searched as opposite. The type of region was one of the structural similarities, for which intermediate large metropolitan areas with economic activities concentrated in the capital cities were selected as they are considered to define a reality in Latin America. In addition, those regions share old-industrial paths (Tödtling & Trippl, 2005) which is considered relevant as S3 is about transformation and such regions have the risk of lock-in; therefore, the diversification and related variety logics embedded in S2 are expected to be beneficial. For the differences, the degree of centralisation on decision making and the institutional context were considered.

Thus, for the country selection, I acknowledged that Mexico is a relevant case for S3, because it is argued to be at important cross-roads in its development trajectory. Looking back, the political strategy seemed to be promising when in 1994 the OECD was joined (Hanson, 2010),

however, the same year the strategy became lock-in specialising in low value-added activities that required little technological capabilities and specialised in labour-intensive production of inputs for the United States (Jordaan, 2008; Hanson, 2010; Villarreal González et al., 2017). Thus, it has been suggested to foster regional competitive advantages, via policy mechanisms based on related variety and smart specialisation (Villarreal González et al., 2017, P.8-9).

For selecting a second country, the analysis was based mainly on the research conducted by the European Commission about innovation and regional specialisation in Latin America (Barroeta et al. 2017). In the study, Colombia showed to be accurate for the research as both countries were found to relate smart specialisation strategies to the cluster strategies that had been followed, with a similar capacity to identify priorities but where governance mechanisms require further development (Barreta et al., 2017, p.34).

There are three main differences regarding governance; the first is related to the experimental approach (as suggested by academics like Rodrik, 2008, Chaminade et al., 2009, 16) that Colombia follows in regards to the S3 strategies at the municipality (city) level with their own management of funds; it contrasts with the actions taken by Mexico which pre-selected 14 priority areas and then demanded States to come up with the smart specialisation strategies (Barroeta et al. Palazuelos, 2017). The second difference concerns the weaknesses which in Mexico are closer to the formation of a shared vision and in Colombia are about the territorial analysis (Barroeta et al., 2017, p.35).A third difference, is that in Mexico the decision was taken by the National government and then States were demanded to come up with their strategies in 2014 while in Colombia the experimental approach has more similarities to the model of the UE (Barroeta et al., 2017).

Once the countries were identified, San Luis Potosi, in Mexico was one of the samples chosen under a convenience sampling. Then, given that Colombia had implemented the strategy in few regions which included Bogota and Medellin; Medellin was chosen in order to compare to another provincial region with old-industrial tradition. For further information on the comparison between the two regions see Chapter 5). (See Table 8).

Table 8.

Comparison between the two case studies

	San Luis Potosí	**Medellín**
Similarities (Hard/ Structural)		
Inhabitants (2015)	Large (2,58 million)	Large (2, 46 million)
Type of region	Intermediate metropolitan, centred in the capital.	Intermediate metropolitan, centred in the capital.
Economic Activities	Industrial	Industrial migrating to services.
Existence of regional Clusters on which S3 was based: (2018)	Automotive, Logistics	Energy, Fashion, Tourism, Construction, ITC, Creativity and Entertainment
Differences (Soft)		
Type of previous strategies: Specialisation / Diversification.	Specialised, focused on automotive industry and related industries.	Both. Analysing the region to choose the clusters on which to specialise.
Approach to S3	Centralised	Decentralised
Institutional environment	Organisationally thick but institutionally thin.	Organisationally and institutionally thick.
Leadership (expected)	Weak	Strong
Other data		
Year of implementation S3	2014 and 2019	2017
Approach to S3	Mandatory to all Mexican regions	Experimental in regions that decided to implement it.
Previous studies of leadership and regional innovation policy.	Solleiro et al., 2020.	Morisson & Doussineau, 2019; Morisson & Panetti, 2020.

Note: The S3 from 2019 was conducted after the interviews; however, it was also considered for this paper because some studies shed light on the regional leadership challenges from both processes in 2014 and 2019.

The sampling activity did not end with the case selection. Within the cases, the selection of participants in each region was carried out differently from those of case selection. Following mainly a 'snowball sampling' in order to find information-rich cases (Patton, 1990). My endeavour was to seek respondents who knew a lot about the smart specialisation process.

The criteria of case selection led to a reflection in relation to the positionality (Louis and Barton, 2002) to avoid 'bias' in the interpretation of the data resulting from first-hand knowledge. One of the two case studies was perfectly unknown territory, this constraining condition forced me to apply techniques in order to gain an in-depth understanding about participants´ thoughts and behaviour grounded in their own context or real life, thus my positionality is categorised as outsider research 'etic' (Stake. 1995; Salmons, 2010). In the other case, the object of study, the process of Smart Specialisation for the first Innovation Agendas was unknown, however, it took place in the region where I was born and have lived most part if my life; thus, some of the actors interviewed as the main source of information, were known before the research, although not in the context of Smart Specialisation. Thus, I am an outsider to the object of study but an insider to the factors that belong to the regional context.

5.4 Selection of Information Sources and Instruments (Method)

The methods for data collection typically include participant observations, interviews and conversations, documents and field notes, accounts, notes and memos (Hammersley & Atikson, 1983; Robson, 1993; Cohen et al.., 2011). For my research I selected to apply three main instruments: 1) Interviews, 2) Observations and 3) Document analysis. The instruments were used to collect data as triangulation and are useful to strengthen the validity of the data obtained. In other words, the perception of the participants are not taken as the truth evidence and is contrasted with other sources.

In case studies, the theoretical framework is recommended to conduct an initial theory building prior to entering the field to collect data in order to have a clue on and paths to 'explore what is to be explored, the purpose of the exploration and the criteria by which the exploration will be judged successful' (Yin, 209: 37).

From the first literature review, codes were found and built the content of the interviews (Boyatzis. 1998). From there, the research questions were developed as well and the interviews designed to solve those questions.

Overall research process:

1) Desk research
    a. Topic of interest
    b. Definition of case studies and research
2) Finding of main issues (codes). From the theory
3) Conversation with key informants
4) Interviews
5) Finding and new codes. 'Code in use'
6) Changes in the theory
7) Conversation with key informants to validate results.

The design of the research was planned in two phases. The first consisted on desk research to capture secondary data as well as performance of in-depth interviews with people related to the process of smart specialisation (key informants). The criteria for interviewees selection was based on the participation on the smart specialisation strategy and followed a 'snowball sampling' rationale.

The transcriptions were made within the two days after the interview.

Desk research: The Smart Specialisation Strategy itself is not rooted in one single theory but derives from different literatures; for that reason a literature review on different disciplines like strategy (including business and territorial perspectives), economic geography (taking the regional perspective), economic growth (with innovation system as a crucial concept) and STI policy that provided insights for understanding the context-specific elements are crucial for the development of a successful Smart Specialisation Strategy first in developing innovation systems and then in Latin America. This research was also performed in the case studies where sources of data include academic articles, regional platforms, and policy and innovation reports and instruments (Presented in theoretical chapters 2,3,4 and a part of chapter 5).

Semi-structured interviews: S3 is about the triple and quadruple helixes. Each helix, and the role of the organisations is however determined by individuals that participate and who shape the strategy. For example, it is not the 'multinational enterprise' that decides on the strategy but the person who represents such enterprise. The motivation of individuals as well as their capabilities are those explored through these interviews.

The interviews were targeted to the key players on the strategy and those who manage the process in order to understand the rationale, the goals pursued with the strategy and their opinions about the elements to consider in order for the strategy to be convenient as well as the difficulties and risks of their implementation. Additional interviews with key informants in each case study took place. These interviews consist of face-to-face, telephone and video conferences. Most of the objectives would be enriched by this method and may also help to make changes to the initial research question (results presented in chapters 5 and 6).

Semi-structured interviews

In San Luis Potosí the interviews targeted those actors who appeared in the State Innovation Agenda to have participated in the Governance of the smart specialisation approach. Before starting the interviews informal conversations with five key informants in the region were performed in order to shape the interviews' structure to address the objectives of the study.

The Governance was divided in three groups, The Management Committee, the Consultive group and the sectorial workshops.

Table 9.

Number of interviews according to the stakeholders' classification.

	San Luis Potosí	**Medellín**
Firms and Firm Organisations: Including public organisations in charge of firms and clusters.	Total: 5 Interview No. 1, 2, 3, 4, 5	Total: 5 Interview No.17, 18, 19, 20, 21, 22, 23, 24, 25, 26.
Knowledge Institutions and public organisations in charge of innovation-related issues.	Total: 7 Interview No. 6, 7, 8, 9, 10, 11, 12	Total: 3 Interview No. 27, 28, 29
Government and public organisations for economic growth.	Total: 3 Interview No. 13, 14, 15	Total: 3 Interview No. 30, 31, 32.
Intermediary (Consultancy)	Total: 1 Interview No. 16	Total:1 Interview No. 33
Total Interviews	16	17

In Medellin, I first contacted the consultancy firm that advised the region for the implementation of Smart Specialisation Strategies. The subsidiary office of the firm that was based on the city allowed me to work from their offices and to have conversations with colleagues that participated in the process. After conversations with key informants from the consultancy firm, it became clear that besides the actors that participated in the higher governance levels, there were

many key actors, especially from the industry, that shaped the process and were classified as 'key actors'.

The governance was divided in three groups which did not include all the companies that participated in the workshops as in the case of San Luis Potosí. The Governance groups were three; the Management Committee, The Executive Committee and the Advisory Council.

Table 10.

Interrviews by type of Stakeholder in SLP

Governance Level	Total Participants	Number of interviewees
Management Committee	4	0
Executive Committee	5	3
Advisory Council	10	5
Other 'Key actors'	18*	8
Consultancy	2	0
TOTAL	36	16
*Key actors accounted are those where the individual actor is not repeated with Governance Levels although institutions may be repeated.		

5.5 Interview Guide

Before the interviews, a provisional list of questions was made to collect the main research topics. The proposal did not imply that the conversation had to be adjusted to such scheme.

Opening phrase: I would like to know about your experience during the smart specialisation strategy in which the region came out with priorities and opportunities in a participatory process.

During the interview, the researcher, more than interrogator is an explorer that allows the free expression of the interviewed to meet new dimensions related with the research objectives. Not really questions but stimuli that tried to be neutral to motivate the interviewed to comment

about the research topic or provide more details. The scheme followed in the conversations can be found in Annex 1.

In occasions, I, as the interviewer reinforced, giving my own opinion, the opinion of the interviewed as a strategy to give fluency to the conversation. At the end of the formal end of the interview the recording was off. As the conversation continued off the record, interesting information was asked to be used and only the one that was authorised was included. (post-interview information). The interviews were programmed to last about 60 minutes, although there were clearly variations from 35 minutes to 92 minutes of official recording, most interviews lasted about one hour.

All interviews were carried out in Spanish and analysed to determine the in vivo codes and to classify the information according to the results. Any quotation in this document is a translation made by the author.

5.6 Description of the Analysis and Interpretation (Coding)

Once the information was collected, the task was to give sense to such information (Álvarez- Goyatu, 2005). As expected by a qualitative and interpretative method, the research process was generally inductive, and the categories and themes of research were discovered through the research (in an emergent way) rather than anticipated a priori. In other words, the information was coded into categories that concentrated the main topics discovered during the research (Rubib & Rubin, 1995) in different colours and re-read several times in order to review the adequacy of labels; the labels included descriptive and inferential meanings (Miles & Huberman, 1994). Then, I put together the text in all interviews that belong to the same category in each region and found sub-categories. After that, I made an excel table to count the number of

quotations by sub-category (frequency) to determine the predominant categories. The process of coding followed a traditional method (without software) to describe the thoughts involved.

Finally, the categories were related between them and with the theoretical foundations. Then, an integrated explanation was elaborated (see Chapter 5). The display of some of the information regarding comparisons between the two regions was based on the analysis made by Aranguren et al. (2015) for comparing Navarre and the Basque Country.

5.7 Ethical Considerations

Due to the nature of interpretivism in research, the issue of ethics plays a vital role to protect and prevent people from any harm arising from the relationship between the researchers and participants (Miles and Huberman, 1994; Tracy, 2010; Hammersley and Traianoi, 2012). The utilitarian or procedural perspectives are closely related to procedural ethics (Tracy, 2010) which deals with the issue of procedures undertaken in the fieldwork in relation to the participants` recruitments. Situational ethics and exiting ethics according to the author:

(1) procedural ethics:

The respondents were made available about all information related to this research through a participant information e-mail, letter of phone call (whatever was the contact way). The e-mail contained the information about this research. The nature and goals of the research were reiterated in each interview.

(2) situational ethics

Attempt to do not interrupt. Respect the culture.

(3) exiting ethics

Before closure I informed participants about how the data collected will be handled.

To preserve anonymity of respondents, the type of helix to which the belong and region was the only information to be disclosed.

To ensure confidentiality all data obtained were strictly protected in a private password protected laptop. The data were only accessed by me and will be destroyed one year after graduation.

5.8 Limitations and Validity

Internal validity of this research was strengthened by interviewing multiple primary sources, triangulation within the cases (Stake, 1995, Bryman, 2012: 390) of information and the choice of two case studies in order to obscure the relation to more particular contexts although is not expected to be generalizable. More case studies are desirable, however, the time limitation (Yin, 1994: 45) has limited the study to two in depth studies instead of more superficial studies. Thus, internal validity.

Regarding desk research, a limitation of this study is the lack of available micro data on some relevant variables for the regions studied to make more comparisons between the two regions.

Regarding the data collection, especially through the interviews, the positionality is another limitation as I am original from one of the regions studied. The limitation was overcome by the move to Medellin City to work within the offices of the consultancy firm that provided rich information and contacts for the research. Moreover, living in the studied region allowed me to observe many contextual factors that were previously unknown; furthermore, living in the region helped to understand ways of communication, meaning of some phrases and other information that

reduced the discrepancies between the participants´ intended meaning and my interpretation of the information (Witcher, 2010).

At the end of the study the eight markers of quality in qualitative research by Tracy (2010) were addressed to review the rigor of the research design and findings, until I considered the data to provide substantiate meaningful and significant claims.

5.9 Conclusions

The empirical aspect of the study will be held in two Latin American regions, as this geographical area has captured the interest of scholars and policymakers for the adaptation of S3 (Barroeta et al., 2017; Del Castillo & Paton, 2016; for Mexico Villarreal González et al., 2017 for Colombia Del Castillo & Paton, 2015). The regions will be San Luis Potosí (Mexico) and Medellin (Colombia). Both regions share similar context-related characteristics; however, as the way of approaching the strategy of smart specialisation has been different (Barroeta et al., 2017), it will be useful for determining the scope and dimension of the approach.

The chosen methodology is multiple case studies. Case studies are a desirable method to solve the questions how and why (Yin, 1994), which characterise the research questions that lead this work. However, to understand the 'how' there are certain 'what's' (mainly those regarding the innovation capabilities) that will be addressed through a survey to the participants of the quadruple helix that have been considered and those that are relevant and did not participate. As Yin (1994) explained, case studies are preferred for contemporary events, include different sources of information, it is highly affected by the context and the aim is to contrast the theory with the different contexts. The latest, was pointed by Villarreal (2015) as the meaning of case studies. Moreover, the questions, as explained earlier, are rooted in theory that led to a set of propositions,

and the objective, is to get closer to the reality of the regions described in this document (developing regions in general and Latin American in particular) which is the purpose of the case-study research (Froylán & Ceballos-Herrera, 2008).

Regions and City-Regions are the units of analysis of this research. Understanding regions as 'Any area of subnational extent that is functionally organized around some internal central pole' (Scott & Stroper, 2007, S192). Cooke (2001) emphasizes the relevance of regions as 'the more natural economic zone' (p.4) and the criteria to define regions includes a determinant size, homogeneity in hard data, they have particular features that differentiate them from other regions, and they possess some internal cohesion (p.5). City-region is a new concept linked to globalisation which has been defined in different ways, but the common denominator is a core city linked by functional ties to a hinterland and those ties include in general retail, travel-to-work, economic and marketing factors (Rodriguez-Pose, 2008, p.1027)

San Luis Potosí and Medellin are both relevant and representative which will allow the results to be 'transferred' (Maxwell, 1998) to similar theoretical conditions (Villarreal, 2015). The two cases are expected to demonstrate similarities and differences between the regions in a similar context in order to contribute to the theory. For overcoming the reliability of case studies, the procedures will be as operational and the findings as descriptive as possible.

The implementation of smart specialisation in the design phase of the strategy from a processual point of view is analysed in the two selected regions. According to Mintzberg (1987), for Rumelt what is strategic depends on where you sit; but it is necessary to also understand when you sit. Thus, aligned with literature on evolutionary economic geography, to understand about what to strategize and the pertinence of strategies like S3; it is important to understand the

trajectory and path-dependency as well as the characteristics of the region. The next chapter offers a descriptive and evolutionary analysis of the studied regions according to their industrial and STI trajectories (when) and is based on the typologies of region from Chapter 3 in order to have a deeper understanding of the regional characteristics at the time of the study (where). Then, the chapters determine the strategic fit of the regions in the particular time when the strategies were taken and provides both a descriptive and inductive analysis on the experiences with S3 based on triangulation between the interviews, available data and observations.

Chapter 6. Case Studies

Chapter 6. Case Studies

6.1 Introduction

The case studies shed light on how the regional reality in large intermediate metropolitan region in Latin America shaped the design of S3. Particular attention is paid to the regional context; in both cases, the countries have a history of import substitution; which changed in the 80s after the so-called Washington Consensus that led to the liberalisation of the economies. The impact of liberalisation was different in both cases; in SLP, Mexico, the geographical location and free trade agreements with the countries of the North have led to specialisation in manufacturing activities in subsidiaries of foreign-owned firms while in Medellin, Colombia; the change in the economic structure was affected, but to a more limited extent and some of the most important companies are still owned by the State. Another phenomenon that is experienced in both contexts is a high rate of informal economy. This economy corresponds to the undeclared works from autonomous workers and entrepreneurs, where a distinction is made between the entrepreneurs that perform undeclared activities as a survival strategy, and those entrepreneurs typically in ICT that start operations in an informal way. Besides the importance of the informal sector to explain the context; in the last decades there has been a raise in the interest on their role for innovation and contribution to the regional innovation system (Charmes & Gaulti, 2018; Fayaz Ahmad Sheikh, 2019; Padilla et al., 2008), and sustainability (Khavol & Burton, 2013) and their role as users of innovation, especially in the ICT sector (Gaglio et al., 2022; Hasselwander, 2022; Senyo et al., 2023). Therefore, if the informal sector is considered as stakeholders of the innovation system instead of subjects of regulation (Prasetyo, 2022) they may shed light on innovation dynamics to solve the problem of the bottom of the pyramid (Senyo et al., 2023) which in turn, may reflect opportunities for social innovation.

The case studies show that two regions, that are typically classified in the same regional categories (see chapter 4) differ in terms of soft assets such as the informal institutions, leadership dynamics and the history. Therefore, the case studies are composed first, by an introduction, where the geographical and structural conditions are explained. Then, an explanation of the industrial trajectory that each region has followed which aims to shed light on path-dependencies and previous experiences. Each case study explains the regional innovation system in order to reflect the regional reality in terms of thickness of the system in terms of the strength of the linkages and the type and number of stakeholders that conform it. Then, desk-research is combined with the interviews in which the perceptions of the stakeholders that participate in designing S3 to understand the dynamics that took place during the process. The cases shed light on the leadership dynamics, the vested interests, the formation of power groups and the commitment of the regional stakeholders with regional matters among others. The findings were contrasted with the published results of the S3 strategy in each region to validate the information. Finally, this section presents some conclusions based on the different ways in which the strategy process took place in each region and the findings on the factors that affect the strategy in the studied regions.

6.2 The Case of San Luis Potosi

6.2.1 Introduction

San Luis Potosi (SLP) is a State-region located in the centre of Mexico that belongs to a cluster of industrial states known as *Bajio* or *Central*. The capital city (municipality) of the State is also called San Luis Potosi which together with the municipality of Soledad de Graciano Sánchez conform the Metropolitan area of the State. The main importance of the region is related to its location; equidistant from the three main cities; Monterrey, Mexico City and Guadalajara as well as from the four main ports; Tampico, Altamira, Manzanillo, and Mazatlán (see Figure X).

Moreover, the State is crossed by the main national highway, which connects Mexico City and the Border with Texas. Apart from the location advantages in logistic terms, around 76 million consumers and 78% of the Mexican GDP are in a 500km radius from San Luis Potosi, which, therefore, outperforms the National average scenario.

Figure 2.

Location of San Luis Potosi in Mexico

Note: Author´s elaboration

The Mexican economy liberalised in the 80s after a period of import substitution, however, the location advantages of San Luis Potosi attracted the interest of MNEs until 2000s. The assembly plants of the automotive manufacturers General Motors and BMW, installed in SLP in 2012 and 2018 respectively, have been engines for regional growth by generating an increase in FDI as well as the arrival of large foreign MNEs that have raised significatively the employment opportunities in the region. Because of the high FDI, the industry structure changed dramatically around the automotive plants; universities started programs to provide engineers and technicians

for the plants; new suppliers emerged especially in low value-added activities; service industries like logistics and industrial parks rose; as well as commerce and manufacturing of indirect materials to supply the new market. Thus, San Luis Potosí experienced a radical structural change based on path importation (see Chapter 1).

Nowadays, the State´s industrial structure is composed mainly by SMEs and few large firms, most of them foreign owned. In figures[32], 99.8% of domestic firms are SMEs (95.3% with less than 10 employees), in contrast, the remaining 0.2% holds 26.61% of the total employment in the city and thus, about 41.09% of the regional income. A similar contrast is found in terms of activities, where most business units are in commerce and services with 47.33% and 40.85% respectively. However, although manufacturing accounts for only 9.93% of the total business units; it holds almost one third of the total regional employment. MNEs are 59.20% of the units with 66.6% of the employment in manufacturing and 87.06% of the income from this activity. Thereby, despite the changes in the political parties, the attraction on FDI has shaped the industrial policy agenda for the last decades.

Despite a clear industrial policy strategy, innovation policy in the whole country has followed a different path and is a far more recent topic. The National Council of Science and Technology (CONACYT) is managed in a centralised way from a country level and is responsible for science and technology policy. Since 2008 the "i" for innovation has been added to the STI programmes and shaped the orientation of policy initiatives.

In 2014 the State Innovation Agendas (SIAs) were launched as an attempt to involve regional actors in determining their economic vocations based on a list of sectors and activities

[32] Numbers handed by the Economy Ministry in summer 2017

identified as important at the national level and imprinted in the National Development Plan. The development of the SIAs were shaped by two conditions established by CONACYT. First, the Agendas had to follow the methodology of the smart specialisation strategies implemented in Europe. Second, the deliverables of the agendas needed to present a project portfolio with concrete actions to be taken.

Despite the awareness of CONACYT that not all regions were capable to advance in terms of innovation, the project was expected to "place innovation in the radar of regions" and to be a "first step towards participatory approaches"[33]. Villarreal et al. (2017) analysed Mexican macro-regions formed by clusters of similar regions and concluded that SLP is among the intermediate-sized regions that are best candidates for smart specialisation as means to economic diversification based on related variety, thereby, preventing the "*middle-income trap*[34]" (Lee, 2013, 2017). In addition, Pilar Pastor (2012) analysed the RIS in SLP and concluded that the existing endogenous capabilities must be exploited and extended to those capabilities necessary to increase the number of competitive companies and sectors. Pastor's conclusions are aligned with the goals of S3. Finally, Dutrénit and Ramon (2012) recognise the importance of fostering the emergence of strategic sectors and competitiveness areas to promote cooperation and balance between regions in Mexico through structural changes that lead to economic growth and development (Haussman and Klinger, 2007). Aligned with the authors´ recommendations, the ultimate outcome of Smart Specialisation Strategies is precisely structural changes based on STI. Therefore, the strategy seemed to be accurate for the region.

[33] Personal communication with the former co-director of CONACYT.

[34] The middle-income trap is a constraint for growth of middle-income countries that are between low-wage manufacturers and high-wage innovators. Wages are usually high but technological capabilities low, for that reason they can´t compete with global leaders. To overcome the trap, innovation capabilities must be strengthen to upgrade the specialization and find their diversification strategies (Lee, 2013, 2017).

Beyond an evaluation of the results of the agenda; in which a sectoral level of granularity was used to favour automotive, food and the energy industries; this case study addresses the challenges for participatory approaches for regional policy in general and smart specialisation strategies, in particular as well as the opportunities of adapting the approach to the regional context. Overall, the case study shows the challenge of regional scope definition, especially reflected in a lack of representative participation because of long geographical distances and the challenge of high heterogeneity within the region because of income disparities and industrial agglomeration in urban areas. Moreover, the case shows the institutional problems related to the sectoral granularity level as well the lack of policy continuity.

The regional scope challenge is especially represented in the case study given that SLP followed a smart specialisation methodology at a State level, a macro-regional level in States with other *Bajio* States to define a set of common projects and a more recent micro-regional level in order to address the problem of regional heterogeneity. The data collected was based on secondary data analysis from academic publications, official documents, statistics as well as from primary data from 16 interviews with participants in the S3 process.

The remaining of this chapter is organised as follows: First an evolutionary perspective is taken to describe and analyse the industrial path and STI policy trajectory in San Luis Potosi and Mexico, given the high degree of centralisation of innovation policy. Then, the regional context of San Luis Potosi is described based on diverse studies on the region to finally analyse the experience with smart specialisation in San Luis Potosi. The chapter ends up with conclusions about the case study.

6.2.2 Industrial Trajectory: Path Importation

To understand the industrial and STI policy trajectories in San Luis Potosí as well as the current configuration of the economy it is important to understand the National context. Strategic decisions that have shaped the economy of all Mexican regions were taken from a country level and in a centralised way, affecting in different ways the 32 State-regions that conform the country.

6.2.2.1 Trade Liberalisation and the Impacts on the Mexican Economic Structure. In Mexico, development has been shaped by foreign direct investment (FDI). The country became independent in 1821 and since 19th century FDI has played a crucial role; concentrated in railroads, mining, and petroleum. A first structural change was made after the Mexican Revolution in 1924, when FDI shifted to the manufacturing sector (Burger, 1999: 120).

A second change was made after the Second World War, in the decades of 40s and 50s when import substitution policy was taken to face the deficit of quality imports and a progressive nationalisation of sectors. In the period between 1940 and 1970 Mexico experienced sustained growth, in fact, the period between 1956 and 1970 is commonly referred to as the "Mexican Miracle" with an endogenous growth in which the dynamism of the industrial sector[35] was the motor of development which according to Kehoe and Meza[36] (2011) was driven by urbanisation, industrialisation and education. However, protectionist policies like the elimination of inflationary cap and devaluation and the relative closeness of the economy ended up with the development of companies with low international competitiveness, limiting the modernisation of the industry. In addition, the industrial production reached it maximum around 1970s when the Mexican society suffered from high inflation and led to an increase in public expenditure. Although, in 1973 a law

[35] The oil industry was developed during this period.
[36] The authors identified growth in the period between 1950-1981 and concluded that it could have been higher with an open economy.

made foreign majority ownership an exception to the rule although in 1965 the Program of Border Industrialization was launched expecting to reduce unemployment in the border through the attraction of FDI especially from United States to be settled 10 miles from the border. In 1976 an important devaluation was suffered in Mexico as a consequence of the import substitution model, in addition, the country experienced a reduction in FDI and an enormous external debt.

A third wave of structural changes started in 1982 with a trade liberalisation strategy, stressed by the Washington Consensus[37] in 1989 which reduced the role of the state in the economy and led to the privatisation of nearly 1,000 state-owned enterprises (Hanson, 2010: 987-988). The trade liberalisation strategy consolidated in 1994 with the North America Free Trade Agreement (NAFTA) with United States and Canada; in the same year, the country joined the OECD as it was considered to be on the road to success and had access to best practices at the international level. The industrial policy focused on those sectors with higher export potential and as noted by Padilla-Pérez and Martínez-Piva (2008) more horizontal policies were taken.

From 1992 to 2012 national exports increased at a rate of 11% annually and the GDP jumped from 13% in 1992 to 31% in 2012. However, although the expectation of catching-up with the other members of NAFTA, the process is not automatic with an open economy (Rodrik & Hausman, 2002: 20-21). In Mexico, catching-up has been conditioned by limited knowledge spillovers and the *maquiladora syndrome* (Ruelas-Gossi, 2011).

Regarding knowledge spillovers, Mexico has attracted the interest of researchers (i.e. (Blomström & Persson, 1983; Blomström, 1986; Blomström & Wolff, 1994; Kokko, 1994; Kokko,

[37] The critics to the Washington Consensus for being too general for developing countries and not meeting the particular characteristics of countries have led to research on new avenues of policy action in a post-Washington Consensus era (i.e. Rodrik, 2006; Dutrénit et al., 2014).

1996) that found positive externalities taking variables like Total Factor Productuvity (TFP). Further studies made a deeper analysis through control of more variables and found that positive spillovers are only found in export markets (i.e. Aitken et al., 1997), a lack of evidence on spillovers (Khawar, 2003) or even found spillovers to be weak and negative (Jordaan, 2005). Later, controlling for the different State-regions, there was evidence on positive spillovers in the border states and negative for the capital city (Jordaan, 2008). One explanation that has been given to this phenomenon is that positive externalities are materialised in function of the absorptive capability and the technology gap (Lederman & Maloney, 2006; Jordaan, 2008, Armas & Rodríguez, 2017).

About maquiladoras, a growth model based on export plants has prevailed in the country since the Program of Border Industrialisation. Maquiladoras are understood as industrial plants that process, manufacture and assemble components for re-export (see Lowe & Kenney, 1999 & Buitelaar & Pérez, 2000). The plants were established under conditions of low linkages with regional and industrial public organisations (Dutrénit et al., 2006; Carrillo 2004, Moran, 2006). Although some maquiladoras have evolved and settled more functions in Mexico and the country progressed from assembling apparel to electronics and auto-parts, it is specialised in labour-intensive processing of inputs for United States with low technological sophistication (Hanson, 2010; López, 2012) and decisions remain at headquarters without special interest on regional development of regional host-economies[38] (Dutrénit et al., 2006) limiting the occurrence of knowledge spillovers. Thus, Moran (2006) explains that the experience of Mexico with maquiladoras offers lessons to developing countries of the "how not to do it" type (p.38).

[38] In fact, Dutrénit et al. (2006) found after analysing three case studies in Mexico that some decisions even affected regions in a negative way (p.176).

Apart from limited conditions for catching-up, the liberalisation policy in general and the NAFTA in particular, impacted the industrial structure with increasing disparities between the Mexican States, as some of the states are more favoured than others[39] (Chiquiar, 2005; Rodríguez-Oreggia, 2005, 2007; Delgadillo, 2008). The problem of disparities has become worse because the skilled human capital is located at the winner regions (Rodríguez-Oreggia, 2005; 2007). In addition, the polarisation of State-regions in Mexico stresses the importance of regional policies, however, one of the key challenges is that Mexico is still taking policy decisions in a centralised way and the criteria of income distribution is not clear and do not solve the disparities problem (Costa-Font & Rodríguez-Oreggia, 2005; Rodríguez-Oreggia & Rodríguez-Pose, 2004).

Besides the negative consequences of trade liberalisation, there are external and internal factors that hinder economic growth. An external factor is that by specialising in low-tech activities, Mexico was exposed to international competition, and the rise of Asian economies especially in the 2000s has affected the comparative advantages of Mexico (Moran, 2006; Hanson, 2010). Internal factors with deep structural impediments include a majority of low-tech SMEs and a predominant[40] and increasing informal economy[41], which reduces the need for skilled labour and constrains the development and accumulation of human capital. (see Portes et al., 1989; Levy, 2008; Webb et al., 2009; Busso et al., 2012; Arevalo et al., 2013).

[39] It actually explains why Jordaan (2008) found positive externalities only in the Border States.
[40] An estimated 65% of Mexican workforce is in the informal sector, which may explain the results of INEGI that show higher productivity per worker than from small companies.
[41] The informal economy prevails in different Latin American regions. Is not a sector per sé but small and typically unproductive enterprises (Hanson, 2010: 995, Busso et al., 2012) that are not formally constituted and remain small to avoid government regulations (La Porta & Shleifer, 2008).It seems that social policies in Mexico have poor outcomes and somehow favour informality (Levy, 2008). The System of Mexican National Accounts, by INEGI estimates 57% of the economy is informal which accounts for about 25% of the total GDP.

In summary, many regions in Mexico are locked-in in what dependency theory describes as dependent development on foreign capital and external markets[42] (Gereffi, 1989) where the industrial structure is around multinational enterprises. Similarly education has centred in a limitation for the statistics is that about 50% of the Mexican economy is in the informal sector

The institutions and people that participate in the innovation programmes launched by CONACYT are typically asked to be registered at the National Registry of Scientific and Technological Institutions and Companies. The initiatives are cantered in raising human capital, reduce unemployment, and therefore, increase GDP and exports. Thus, specialisation activities in the country, follow a path-dependency. Nowadays, industry 4.0, internet of things and logistics are getting stronger.

The Mexican economy is at important crossroads in its development trajectory and policy mechanisms like smart specialisation are key to foster regional competitive advantages (Villarreal et al., 2017). The transition to a knowledge-based economy needs to focus on educational and institutional reform and creating an innovative environment; and to do so, experimental bottom-up approaches are required for testing what works in the Mexican context (Kuznetsov & Dalhlman, 2008).

6.2.2.2 The Industrial Structure of San Luis Potosí. As part of a highly centralised country, the Industrial Structure of San Luis Potosi is a consequence of 1) a strategic location that facilitates logistics and 2) diverse economic policies that have been taken at the National level.

[42] The current exports show a high sectorial concentration of 60% in electric equipment, transport equipment and machinery as well as 80% of exports destinated to one place: United States.

Table 11 shows the economic policies and the economic strategy followed by Mexican authorities since 1940s.

Table 11.

Economic policies in Mexico since 1940s.

Time period	**1940-1980**	**1980-1994**	**1994-2000**	**2000-2018**
Trade policy	Import substitution to foster industrialization **1960s:** Maquiladora export-oriented zones	Trade liberalization and deregulation of FDI **1985:** Washington consensus **1994:** NAFTA, join OECD, other trade agreements	Focus on exports.	Strategic industrial policy efforts.
Overall Strategy	Specialisation in sector-specific industries (many public)	Diversification	Specialisation in industries with export potential	Specialisation in specific industries with programmes to enhance international competitiveness
Sectors of specialisation	-Automobile manufacturing -Computers -Pharmaceuticals	Manufacturing industries in general	Industries with export potential: -Textiles -Automobiles -Electronics -Food	Manufacturing sectors with comparative advantage: -Electronics -Aeronautics -Automobile

Note: Author's elaboration based on Buger, 1999; Rodrik, 2006; Hanson, 2010; Jordaan, 2017; Delvene & Thoreau, 2017

The economic structure in Mexico and San Luis Potosi, is highly defined by FDI. In addition, San Luis Potosí is a Mexican region that has been consistent with the internationalisation strategy although political parties have changed continuously.

The State-region was funded in 1592 given the importance of Cerro de San Pedro, municipality provided with mines, which explains the mining vocation of the region. Given the lack of water in the area, the city of San Luis Potosi was built close to the mines but away from Cerro de San Pedro by Spanish settlers. Mining, a gradual growth of agriculture in ranches and haciendas characterised the industrial structure of that time. The economic importance of the region was fostered by a royal road constructed in the 16th century connecting the region with Mexico City, New Mexico, and other neighbouring States. The region suffered from National Political instability the years after independence in 1821 and the Mexican revolution which ended by 1924.

The 90s, period in which the NAFTA took place, the region was politically unstable, neighbouring States were better position to attract FDI and there was a lack of leadership in local elites (Martínez, 2013: 8). However, towards 1997, the region reaches certain stability and the local environment fostered private investment in services that made the region attractive for foreign companies. The first industrial parks were built towards 1999, five years after the NAFTA, being a late adopter of the FDI strategy.

Delgadillo (2008) found that San Luis Potosi is among the benefited States by NAFTA considering the different impacts in each Mexican State. According to Martinez (2013) San Luis Potosi offers foreign investors a productive labour force at competitive prices comparing with the salaries of other partners of NAFTA, several incentives, and a privileged location; factors that stimulate attractiveness for FDI. Thus, in 2006 GM installed in the capital city and caused in 2007

an inflection point in the trade dynamics with exports at almost 100% comparing with the previous year. FDI allowed the State to increase formal employment, reduce unemployment, increase exports and the GDP among other benefits, however, the impacts on knowledge and technology transfer do not take place in the region (ibid). In 2018 BMW settled an industrial plant[43] and as in the case of GM, diverse foreign multinationals were also settled to supplier the assembler.

Most of the foreign multinational firms that settled in the region were in the automotive sector, which clustered around two Mexican areas, the Bordering States and the Bajio States. Domestic firms offer services around foreign industries such as industrial parks, transport, and logistics. Universities have played a key role in strengthening the new path by offering technical training for employees as well as increasing the number of graduated industrial engineers. Moreover, the automotive cluster of San Luis Potosi was constituted since 2006 (although is not strong). Nowadays the industrial structure is characterised by most SMEs[44], strong dependence on FDI and an informal economy that prevails. The structural change experienced by the region can thus be described in the evolutionary economic geography literature as a path importation.

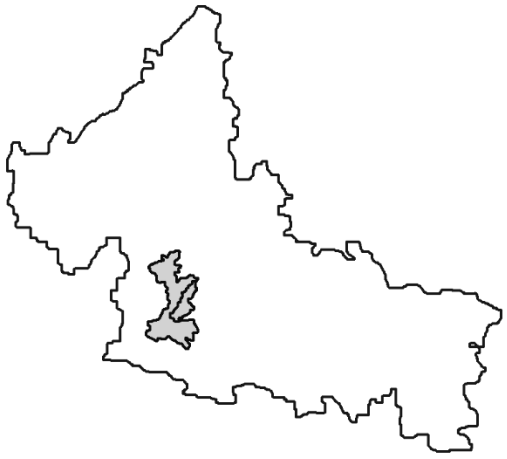
Today, San Luis Potosi has a strong tradition in old industries, especially in metal mechanics, transport equipment and auto parts with the presence of public research centres and centres of technological innovation (Segura et al., 2015: 162). The region has uneven distribution of the population and economic activity which are concentrated in the metropolitan area composed

[43] The last year, the country has experienced an increase in exports but a decrease in FDI because all foreign multinationals were settled, and the assembler started operations.
[44] According to the Ministry of Economy, by 2016, 99.7 per cent of the industry is composed by SMEs which represent 86 283 economic units and 36.6% of the State production with 69.1% of employment considering manufacturing, commerce and non-financial services.

by the homonymous capital municipality, San Luis Potosí and the municipality of Soledad de Graciano Sánchez which holds 40% of the urban population[45](Figure 3).

Figure 3.

Metropolitan Area of San Luis Potosí State composed by San Luis Potosí and Soledad de Graciano Sánchez municipality.



The economic disparities are also caused by the geographical characteristics of the State, it has 65 268 km² and four different natural zones or regions Altiplano, Centro, Media and Huasteca with climates that vary from desertic in the Altiplano region to tropical in the Huasteca region. Thus, economic activities and industrial configuration are diverse; the State Development Plan 2015-2018 describes such differences (Table 12).

[45] 65% of the total State´s Population is urban (INEGI, 2015).

Figure 4.

The four regions of San Luis Potosi.

Table 12.

Regional disparities and economic activities by region in San Luis Potosí.

Micro-region	General characteristics	Economic activities
Altiplano	Population: 362,541 Regional GDP: 6.4% Per Capita GDP: $59,130	Mining, Commerce, Food Protected agriculture, Tourism.
Centro	Population: 1,362,541	Automotive, Metal mechanics

	Regional GDP: 84.1% Per Capita GDP: $206,320	Food, Mining, Commerce, Tourism, Services.
Media	Population: 209,506 Regional GDP: 2.9% Per Capita GDP: $33,025	Protected agriculture, Horticulture, Fruit growing, Tourism
Huasteca	Population: 735,995 Regional GDP: 6.6% Per Capita GDP: $29,572	Agroindustry (sugar cane, citrics, coffee and cattle), Commerce, Tourism.

Note: own elaboration based on the State Development Plan 2015-2021

The development plan of San Luis Potosi 2015-2021 highlights the importance of continuing promoting foreign investment and foster formal jobs. It also recognises the importance of innovation for longer-lasting micro enterprises and SMEs (70% disappear in the first five years) and of linkages with scientific research, technological development and innovation requires to improve the industrial structure and the regional competitiveness for which Martinez (2018) calls for a reflection on the current regional innovation strategy.

6.2.3 The Regional Innovation System

6.2.3.1 The National Innovation System Context: Fragmentation. When analysing the economic and industrial paths of the region, it becomes clear that the Mexican economy needs to increase its productivity and growth. The STI activities are expected to be one element that fosters growth (Dutrénit et al., 2008: 2) and transformation to a knowledge-based economy.

Like in the case of industrial policy in general, STI policies are highly centralised. Mexico´s National Council for Science and Technology (CONACYT) was founded in 1970 and is the institution in charge of coordinating and executing STI national policies; the main objectives of the Council are to foster innovation at the firm level, especially in SMEs; consolidate the

capabilities of knowledge institutions and their links with the productive sector. The Council has strong links with research centres, the government through State Ministries and the State councils (COECYTs). Although the complexity has difficult its articulation, the programs launched by CONACYT have strengthen the linkages among diverse sectors and the triple helix.

Although orientation and activities organisation in CONAYCT have risen in terms of autonomy, the council remains under presidential authority (Aubert et al., 2010: 77). The organism has presence in the States but report back to the capital.

The same happens with research centres which are concentrated around the president "introducing a discretionary character in decision-making while undermining the confidence of several actors in the NIS" (Dutrénit et al., 2008: 1). The advance towards more efficient and less hierarchical forms of governance of the STI system would require deeper and faster transformation in both the behaviour of agents and structure of institutions.

Dutrénit and Suárez (2017) argued that the linear model of policymaking prevails for innovation policies in Mexico, characterised by centralist practices, which represents one of the biggest challenges for innovation in the country. Thus, although since National Innovation System (NIS) has been the focus of innovation policy; the efforts to strengthen the regional innovation systems are rather small. In 1998, there was a regional policy, for which the regions were considered at a macro level, involving different states; San Luis Potosi, for example, belong to the Research System Miguel Hidalgo (SIHGO) but that finished in 2001 with the emergence of an instrument called FOMIX, in which science and technology projects were co-financed by the State governments and the Federal government (through CONACYT).The OECD (2009) also

recommended an adaptation of policies to regional innovation differences and a higher collaboration between national and regional levels.

For the NIS, Dutrénit et al (2008, 2010) and Dutrénit and Ramos (2012), argue that the Science and Technology Laws of 1999 and 2002 as well as the addendums 2009 together with other reforms have introduced favourable institutional changes. Moreover, in the last two decades, the National Development Plan has implemented innovation policy instruments for regional development launched by the National and States´ governments[46] in coordination with CONACYT. Namely, the Special Programme on Science and Technology PECyT 2001-2006 as well as the Special Program on Science, Technology, and Innovation PECiTI 2007-2012 and 2014-2018 for the "i" for innovation was included as well as the shift towards more a more systemic view of innovation.

Since then, one achievement included new actors of the innovation system have emerged. For example, the Advisory Forum for Science and Technology created in 2002 following the Science and Technology law to analyse STI development; the different STI State Councils and in 2009 the Intersectoral Committee for Innovation. A second achievement was an increase in the amount of R&D projects financed by private actors. A third achievement is an increase in linkages between knowledge institutions and companies due to the selection criterion for innovation projects based on collaboration.

While there have been advances; Dutrénit et al. (2008) consider that the assessment of the Mexican STI system in the PECyT 2001-2006 asserted when describing the system as small and resulting from an aggregated but unarticulated public and private organisation. The authors argue

[46] In addition, the Ministry of Economy launched in 2002 the program PROSOFT to promote the development of IT industry to increase productivity and innovation.

that the overall NIS is similar to the one described back then. The diversity of actors and goals difficult their articulation and the limited interactivity remains a structural weakness of the NIS (Santiago et al., 2016) especially regarding the lack of linkages between academia and business (Corona et al., 2014) In addition, there is a lack of coordination between the National and States levels, thus, National initiatives do not typically respond to the particular regional needs, thus the system can be described as centralised and fragmented which are mainly governance problems and limit the participation of actors in public-private projects. Moreover, a linear model of policymaking predominates centred on institutions with negotiating power which are in tension with changes in the legislation limiting the achievement of effective public policies (Dutrénit & Suárez, 2017).

Apart from the governance challenges and the use of knowledge resources, a rationale for public financing is to offset risk-aversion by stimulating private funding. The way resources were allocated in Mexico experienced a radical change in 2009, when the OECD criticised that only few strong actors were benefiting from public funds while other actors required more support. However, Santiago et al. (2016) observed that rent-seeking behaviours and the appropriation of public funding by a select few companies are on the rise. In addition, STI authorities allocate funds to demonstrate there is sufficient demand for funding even when the projects have suboptimal innovation quality. Moreover, the authors argue that the effectiveness of the programs require further evaluation as well as research on complementarity or substitutability of innovation policy to orientate resource allocation in an efficient way and reduce the financial constraints for innovation. In addition, Medina and Villegas (2016) evaluated STI financing for Mexican Regions and concluded that the competitiveness effects of STI funds have not been equilibrated among States, which stresses the problem of regional disparities in STI performance (OECD, 2011) and

thus, in regional growth, provided that states with more innovations have the potential to reach a higher per capita GDP (Torres et al., 2014) which would lead to a faster change towards a higher-value-added economy.

6.2.3.2 The Stakeholders of the Regional Innovation System. According to Pastor (2012) the regional innovation system has a high dependence on public initiatives organisational institutions are unarticulated and with few collaborations. A large problem is that strategies are typically made for six-year periods. Private sector has played a modest role both executing and financing R&D.

Knowledge Institutions and Individuals

The State has about 75 Higher Education Institutions (HEIs) and a dozen of research centres. The knowledge institutions hold over 550 researchers registered in the National Researchers System, which is expected to increase through different instruments like the postgraduate scholarships. According to data published by CONACYT about the Innovation Stimuli Program; the State of San Luis Potosí received in 2017[47] 2.7% of the national postgraduate scholarships with 1,417 students; which is slightly higher than the population proportion of the entity, which represents 2.3% of the Mexican population.

Industry

According to the Ministry of Economic Development of San Luis Potosi, the distribution of companies in San Luis Potosi according to the size and employment is the following:

Table 13.

[47] The 2017 data is used because in 2018 the government has changed, as well as its programs that do not coincide with the reality of the moment in which the study was conducted.

Economic Units and Employment according to size in SLP, 2018

Firm Size	Economic units		Employment	
	Absolute	**%**	**Absolute**	**%**
Total	97 773	100	554 866	100
Micro	92 660	94,8	204 667	36,9
Small	3 995	4,1	81 569	14,7
Medium	853	0,9	92 206	16,6
Large	265	0,3	176 414	31,8

Note: Censos Económicos 2019; Resultados definitivos. INEGI.

Technological Institutions and Companies (RENIECYT). San Luis Potosí has 287 registers among which, about 75% are firms[48]. Which sheds light on the firms that are interested in performing in-house research and innovation activities. In addition, the Research and Technological Development Survey (ESIDET) shows that in San Luis Potosí for about 17,119 companies, the main customers were other companies; the time that the main innovation took to be on the market lasted on average 10 months and to recover the innovation investment an average of 13 months (see Table 14).

Table 14.

Research and Technological Development indicators for San Luis Potosi and Mexico

	SLP	**MEXICO**
Innovation for B2B (no. of companies) 2016	17,119	1290,6521
Time to market main innovation (months) 2016	10,07	13,72
Time for main innovation investment payback (months) 2016	12,95	19,67
Time reduction of main innovation (percentage) 2016	29%	31%
Cost reduction of main innovation (percentage) 2016	23%	26%

[48] There are also repeated registers.

Income distribution from new innovations (percentage) 2016	27%	22%
Income distribution for significantly improved innovations (percentage) 2016	17%	44%
Income distribution for innovations that remain the same (percentage) 2016	56%	34%

Note: INEGI, ESIDET 2016[49]

It is important to recognise here that not all companies that perform R&D activities participate in the national and regional programs. Moreover, within the informal sector, that is a large actor in the economy as explained earlier, is concentrated mainly in traditional sectors, however, due to the complexity to start a new business, many innovative businesses start in an informal way, however, so far, it has been impossible to quantify those actors and to meet their needs.

In addition, the RIS in San Luis Potosi faces the same challenge than the NIS regarding the low levels of private investment as well as in the development of STI activities (Pastor, 2012: 136). The innovation efforts show a higher focus on technology acquisition than other internal learning efforts like other Latin-American regions.

Public non-academic institutions

The public actors play an important role for the RIS in San Luis Potosi, which is based on public organisations that hold both, researchers, and research infrastructure. Thus, besides the limitations of public policy and public organisations, the Innovation Systems of Mexico in general, and San Luis Potosí in particular, have a high degree of dependency on the public sector (Pastor, 2012: 136).

[49] The available data does not allow to identify those companies that are foreign-owned or the patenting activities by States.

For initiatives like smart specialisation the alignment with the State Development Plan (SDP) was important and the key actors are CONACYT, COPOCYT, The Ministry of Economy (SE) and The Ministry of Education (SEGE).

6.2.3.3 Innovation Capabilities. San Luis Potosi has structural conditions to favour innovation; however, the current innovation performance is lower than the potential due to the lack of resource mobilisation to foster innovation (Mojica et al., 2015). Thus, the contribution of innovation to regional development is positive but highly reduced (Mendoza et al., 2008; Rios y Marroquin, 2013; Rodríguez-Pose & Villarreal, 2015).

The Innovation System is highly centralised. With a GERD lower than 0,5% since 1980s which are allocated with disparities among states, which reminds the innovation paradox studied in Europe in which the States that require more resource are less capable of obtaining them.

6.2.4 The Experience with S3.

The SIA is aligned to the objectives of the National Development Plan (PND) and the Special Program for Science, Technology, and Innovation (PECITI). In fact, PECITI has as two of the main objectives strengthening the region and increase the linkages between academia and productive sector (CONACYT, 2014), which were reflected in the SIA. The 32 States of Mexico were divided into four groups, each of them assisted by one of the four consultancy firms responsible for implementing S3. Two of those consultancies were foreign and two Mexican.

In Mexico, the economic activities and growth can be clustered in macro-regions that share territorial proximity and structural characteristics. While the northern States have experienced a rapid growth in recent years given the geographical position neighbouring with United States; the southern states are based on primary activities and tourism. San Luis Potosí belongs to a region

known as *Bajio* together with Querétaro, Guanajuato, and Aguascalientes. Together the four states represent 9.9% of the National population and 9.1% of the Mexican GDP. Therefore, after the generation of the SIAs, CONACYT decided to cluster regions that shared priorities and structure and generated the Regional Innovation Agendas (RIAs) (See figure 5).

Figure 5.

States that participated in the macro-regional Agenda

Annex 2. List of participants by helix, position, type of capital and expected role in auto-parts and automotive industry in SLP

These agendas that address the macro-regional context; show an attempt to join efforts within the country to develop a comparative advantage to other emerging countries in similar industries. The RIAs are expected to become a public policy instrument and advice to the State governments on how enrich their Smart Specialisation strategy in collaboration with other States.

Despite efforts to simplify resources and priorities in macro-regions, the size and heterogeneity of SLP led to an S3 evaluation. Domestic researchers then determined new priorities and project portfolios for each of the four sub-regional areas in SLP. (See Table 15). The main

reason is that about 85% the economic activity is held by the capital city and metropolitan area, therefore, the SIA 'reflects the economic vocation of the capital city' (Interview 14). Thus, a few years after the regional priorities and projects were settled, the State government was concerned with the risk of sharpening existing disparities with other State regions. Solleiro et al. (2019) analysed the micro-regional situation to propose a list of projects to enhance each of the regions.

Table 15.

Summary of the micro-regional characteristic.

Micro-region	**Characteristics**
Altiplano	15 municipalities with economic activities centred in mining and auto-parts and to a lesser extent in textiles, agri-food and livestock. The region holds 10 high education institutions and one research centre, about 8,000 firms, one industrial zone, 17 government entities and 5 chambers of commerce and other organisations.
Centro	11 municipalities and high population density, with strong presence of foreign multinational enterprises, universities, research centres and support organisations. The main sectors are the automotive, food, manufacturing equipment, electronics, and mining industries and more recently, also tourism. The region has key innovative actors, it holds more than 80 educational institutions, a dozen of research centres, over 50,000 firms, clusters for the medical, logistics and automotive industries, 15 industrial areas, 25 government offices, federal and state councils and seven chambers of commerce as well as several civil associations.
Media	12 municipalities where economic activities are focused on the agricultural and food industries especially for orange, chili pepper and tomato. Moreover, cattle and non-metallic mining are common activities as well as tourism, which has raised challenges in controlling pollution from recreational spaces. The region holds 4 higher education institutions, less than 8,000 firms and 25 government entities.
Huasteca	20 municipalities in which agriculture and agri-foods predominate especially for sugar cane, citrus, tomatoes, and peppers; moreover, livestock is a highly relevant economic activity with presence of one of the main customers for livestock in the country. Recently eco-tourism activities have been fostered given the natural resources of the area. The region holds 20 higher education institutions, about 14,000 companies, two industrial zones, six chambers of commerce and 26 government entities.

Note: Based on Solleiro et al., 2019 and Mejia et al., 2019.

The micro-regional agendas were clearly necessary because of the high level of heterogeneity, however, the analysis of Solleiro et al (2019) contributed to other aspects as well. First, a clear technological prospection through technological trends that could be seized with the micro-regional capabilities. Second, it attempted to include the fourth helix, which was not considered in the regional agenda.

The macro and micro regional agendas reflect a challenge of governance, especially in large geographical areas with income disparity, different ecosystems and therefore, different economic activities. The remaining of this section will deepen into the regional agendas and the process of S3 in SLP, which is the object of analysis.

6.2.6.1 The Rationale Behind S3. The decision to implement S3 was taken by the former President of Mexico, Enrique Peña Nieto with the attempt to replicate priority areas selection that was made in Mexico State when he was a governor there. In Mexico State the priorities were selected with the objective to transform the State into an innovation pole, aligned with the regional characteristics. In that moment, becoming an innovation pole was considered a possibility because the region held a high number of scientists, devoted efforts to understand and foster the determinants of innovation, and had some research centres (although there was organisational thinness especially in these actors). The Innovation Agenda for Mexico state included the selection of a concrete roadmap.

When deciding on the parameters for the State Innovation Agendas, S3 was a trend in Europe, and therefore, was selected as a framework of reference. The strategy was translated to all Mexican States, with the awareness that not all regions were in the position to become innovators

due to their capabilities, which led to more innovation-related results in some regions than others. The reason the strategy was implemented in all states was the alignment with some policy instruments like FOMIX and FORDECYT. However, the reason for developing State Innovation Agendas was to define concrete actions with a regional understanding of place-based capabilities. Apart from the heterogeneity, the difference in the results was somehow influenced by the consultancy who led the process, because each consultancy had a different way of doing it, which also difficulted the comparison of the results (Interview 15).

CONACYT and the president decided to base innovation policy in strategies (like S3) adopted in Europe because innovation is pushed by public policy at a higher level than in other advanced economies such as the US. In addition, the bottom-up logic made sense after the experience of failures in projects such as installing a cluster for top-down initiative. However, the differences between European and Mexican regions were evident, and S3 had to be adapted to the reality. The reality of a manufacturing economy with few regions with a weak or fragmented innovation systems and others with inexistent systems.

6.2.6.2 The State Innovation Agenda in San Luis Potosi (SIAs). In San Luis Potosi the process of S3 was led by INDRA, a foreign consultancy firm with subsidiaries in Mexico. CONACYT has regional offices in SLP, however, the public organism in charge of the process was the Ministry of Economic Development (SEDECO). Within SEDECO, is the State Council for Science and Technology (COPOCYT), who were designated to actively participate in the SIA. Therefore, there was confusion on who was the process leader. In fact, two interviewees emphasised that there were no clear responsibilities during the process (Interviews 3 and 7) because 'nobody felt as the owner of the process' (Interview 12).

In San Luis Potosi the process was composed by ten main meetings and several individual interviews. The first step was to designate a Management Committee, which was formed by the leaders of three public ministries, the Minister of Education, the Minister of Economic Development and the director of COPOCYT.

Table 16.

Members of the Management Committee.

Helix	Position	Description	Role
Government: Government Ministry 1	Minister	Public	Governance
Government: Government Ministry 2	Minister	Public	Governance
Government: Government institution 1	Regional director	Public	Governance

Note: Own elaboration based on CONACYT, 2014b.

In the first meeting, The Management Committee decided on the members to be invited to form the Advisory Group, following a triple helix logic. The members of the Management Committee took part in the Advisory Group, in addition, 12 more members were involved:

Table 17.

Additional Members to the Advisory Group

Helix	Position	Description	Role
Knowledge Institution: Research Centre 1	General Director	Public	Representation
Knowledge Institution: University 1	Rector	Private	Representation
Knowledge Institution: University 2	Rector	Public	Representation
Knowledge Institution: University 2	Vice-rector	Public	Representation
Industry: Industrial Organization 1	President	Private	Representation
Industry: Domestic company 1	General Manager	Private	Representation
Industry: Foreign company 1	General Manager	Private	Representation
Industry: Domestic company 2	CEO and Founder	Private	Representation
Government: Government Ministry 3	Delegate	Public	Representation
Government: Government Ministry 3	Secretary of the Ministry	Public	Administrative
Government: Government institution 2	Regional director	Public	Organizer
Government: Government institution 3	State Director	Public	Representation

Note: Own elaboration based on CONACYT, 2014b.

The first was the abovementioned and after, the Advisory Group had a second meeting in which the main concepts of smart specialisation and innovation were introduced and a third meeting in which the priority areas were selected, after that, the priority areas were validated by the Management Committee in a fourth meeting. The priority selection was based on the intersection between a selection criterion suggested by the consultancy firm and the sectors identified as potential at the national level. The areas selected at this stage were four: auto-parts and automotive; food industry and alternative energy and logistics.

The interviews reflected disappointment with the economic areas selected by one third of the interviewed participants, however only two interviewees declared to be satisfied with the selection. The main arguments were that the sectors selected have limited innovation capabilities

(Interviews 5 and 8), and that economic areas with high potential were neglected among which health was mentioned by one half of the respondents[50].

The sixth and seventh meetings were sectoral workshops in which members of the triple helix on each of the selected sectors were invited to participate and to contribute to the elaboration of a project portfolio. The type of actors as well as their roles varied in each of the sectoral workshops. Most of the members of the Advisory Group participated in one or more workshops.

The workshops were important to define the project portfolio for the State. There were few meetings because it was well understood that companies had time restrictions for participating. However, the members of other helixes, including those from organisations that were supposed to bring the S3 project to the city did not attend the meetings or attended only one or two. In fact, 42% of the respondents declared to be there for political reasons (i.e. to maintain a good relationship with the government), and 50% declared that they participated only to accomplish a duty. Therefore, the level of commitment to the project was low and that was reflected in the participant rotation, because some of the participants sent representatives for the meetings.

The participant rotation may be one of the reasons why, most of the interviewees were not familiar with the term *Smart Specialisation Strategies*[51], instead, they referred to it as the process of definition of economic vocation or the process of defining the State Innovation Agendas[52]. Unsurprisingly, the concept of Entrepreneurial Discovery was less diffused. One of the

[50] In fact, one of the members of the government, left the room because health was not selected as a priority, which was considered to question the accuracy of the whole project.
[51] Only the consultancy firm and the Science and Technology Councils were aware of the term Smart Specialisation Strategy.
[52] For some interviewees, the strategy was about funding strategic priorities; for others, an often-mentioned argument was to determine the "economic vocation" of the region; however, it seems that for some that meant current strengths while a couple of interviewees consider that it should be about future opportunities even though prospective exercises were highly limited.

interviewees reinforced this idea when mentioned that ‘at this moment, smart specialisation is not yet understood; experts in the topic would desire to see what can be done for Mexico, which has very industrial regions with a very defined vocation but where niches can always be found as well as the conditions to develop them, (Interview 15).

Although the people that decided to implement S3 in SLP believed in the strategic fit to find niche markets, there was a general awareness that ‘San Luis Potosi is not ready to speak about regional innovation systems’ (Interview 14). Some of the interviewees proposed that regional policy in SLP should focus on education and productivity rather than innovation. In fact, one third of the interviewees emphasised a lack of innovation capabilities as well as the capabilities to manage innovation policy. The main arguments to support the low innovation capabilities were the following: technological extension to catch up with innovation especially in the automotive industry is what the region needs, not to innovate (Interview 16); and that regional innovation capabilities are focused on solutions to practical projects (Interviews 1,5,6 and 9). Another problem for innovation is that dependence on the automotive industry hinders innovation at domestic firms due to the high levels of investment required in machinery and certifications as well as the speed of the industry. In addition, the most valuable human capital is captured by large firms that have the possibility to offer better conditions.

However, through INDRA’s methodology, the conversations led to specific projects according to the industrial needs of the sectors selected. For instance, as the automotive industry requires molds, dies and tools; and imports a great value of such elements, one of the projects is to start a molds, dies and tools cluster, although there is no critical mass of companies specialised on those capabilities. Other projects included a technology transfer centre and a program to foster supplier development for the automotive sector.

The analysis was mainly based on hard data, as constated by one half of the interviewed participants that concluded that the results were ‘obvious’, therefore, they considered inappropriate to refer to it as a discovery, but as inertial results that were known from the beginning. On the opposite, a couple of interviews reflected that for the projects, the opinion seemed to be more relevant than the evidence and ‘the mode rather than the mean’ (Interview 10). Aligned with this argument an interviewee said that the strategy ‘was defined by those who attended more meetings’ (Interview 6) and another that it was ‘defined by those who arrived earlier’ (Interview 5). Finally, there was a ‘lack of reflection environment’ (Interview 12).

From a systemic perspective, the process of discovery was perceived as top-down by one third of the interviewees, another interviewee said that it was top-down only at the beginning and pointed to the fact that the priority sectors were pre-selected at the national level before the regional agendas started.

The interviews also reflected that the projects were mainly focused on the business; neglecting opportunities for universities and the public sector to innovate. The reason given is that universities tend to invent without a market; and the fact the time it takes for a university to come up with an innovation, is longer that for business mainly due to bureaucratic processes and the time they take to learn (Interviews 3, 4 and 7). On the other hand, universities and the people involved in university projects have restrictions to profit from the inventions (Interview 7). The government is not interested in long-term projects because of lack of government continuity; therefore, governors make the plans for the 6 years administration. Those restrictions led the strategy to focus on firm’s needs. However, for some projects like the molds, tools and dies cluster, the universities found the opportunity to produce what was being imported and the government supported the idea. In general, the analysis was on one hand on current economic sectors and

projects to strengthen them and trendy sectors that could be justified somehow (i.e. the renewable energy due to the sun impact in the region) that were proposed from universities with less emphasis on technology prospection, complementary activities or transversality.

A challenge for this participatory approach, was the economic dependence on economic sectors that are dominated by foreign firms such as the automotive industry that acknowledges the power they have in regional policy, which was validated on the interviews. In fact, one of the interviewees perceived that the government acted as a representative of the automotive industry and focused on the projects on the sector. There was the perception that strong businessman are the only ones considered, therefore, they grab the opportunities. In addition, as the level of granularity was sectoral; the problem of vested interests was also present through 'power groups' that voted for specific projects (Emphasised in interviews 2, 10 and 16). The rival mindset was reflected in interviews, one of the interviewees declared that the participation in S3 was motivated to defend the sector to which the company belong (Interview 2).

So far, it is understood that the individuals who participated played an important role; therefore, the selection of those who participated was very important. The interviewees reflected that beyond the lack of interest and the rotation of participants (because the ones expected to participate sent representatives), there was a general perception that the heads of the triple helix (i.e. general manager in a firm, university rector, head of public ministries) are not the right people to take decisions because those at more operational levels (i.e. researchers, workers at innovation, technology or operations departments, policymakers) are more involved in projects and therefore, would come up with more supported arguments for the projects that may lead to real discoveries.

When the conversations led to the participants selection, most of the interviewees (except for two) agreed that the innovation actors were misrepresented. First, entrepreneurs were not able to attend because there were many meetings, and there was no public or private organisation involved to speak for them; second, the spatial and geographical conditions of San Luis Potosi difficulted the participation of those that did not belong to the metropolitan area[53], which missed the regional level to focus only on the capital city and metropolitan area. Some of the interviewees argued that it does make sense because most of the economic activity takes place there; third, not all economic sectors were invited to participate, because a pre-selection was made and only those who belong to the selected areas were invited to define the specific projects in the agenda. Finally, as part of the interview guide, participants were asked about the relevance of the informal sector, formed by those business that are not registered, however, most agreed that the 'garage-type' entrepreneurs are difficult to track, but are scarce, and most of the informal actors are more in survival business which are not in innovation activities; therefore, is a misrepresented actor but beyond the impossibility to find them and invite them to participate, are not so relevant for innovation policies.

One of the problems during the conversations was the lack of a shared vision, with the emergence of power groups and the lack of a regional leader, the consultancy firm, who had the task to bring a deliverable document with the regional projects had to take the emergent leadership, which raised the feeling among participants that the strategy was not decided by the participants and that the conversations were not reflected in the final projects.

[53] There are municipalities for which it takes more than 6 hours to get to the capital city.

From an evolutionary perspective, the experience before S3 were informal participatory meetings where the business leaders were considered to give their opinion from their strategic view. In addition, attempts to consider other actors in policymaking have led to negative experiences with lack of continuity which discouraged actors to participate. The lack of project continuity was argued to be due to the 6-year administration periods but also a lack of a public or private organisation in charge of project continuity.

Four interviewees mentioned the need for leadership overall the process, first to invite participants and foster commitment; for which a regional actor was necessary because there was a perception that leaders of foreign firms and the consultancy firms took the lead and were not considered regional by one half of the interviewees. Second, the leadership was required to avoid the emergence of power groups and to lead the consultancy firm to the regional reality.

The main advantage of the process for SLP was a first formal attempt for a bottom-up participatory approach. In fact, one of the interviewees mentioned that the automotive cluster in SLP has been taking a long time to impact because it was a decision taken top-down (Interview 16). In general, the idea of considering the triple helix was a novelty considered appropriate. However, the perceptions differed in the amount or type of actors who should participate.

6.2.5 Conclusions

In Mexico, it is common to hear the expression "*There are many Mexicos"* which defines the challenging reality of large countries for identifying the regional needs. Therefore, it reveals the importance of translating the innovation policy from a national to a more regional context. For the design of S3, which was used as a methodology for the State Innovation Agendas; the decision to implement the approach was taken at the national level. The case study sheds light on the

importance of regional autonomy to decide which strategies to implement to avoid negative effects in process appropriation such as the experience with the SIAs show.

The lack of appropriation of the process was also reflected in the efforts to engage diverse stakeholders in the process; the key players from the triple helix were invited to participate and the response was limited. Those who responded and attended the meetings defined the strategic sectors as well as the particular projects to foster innovation and economic development. The participation reveals four main problems. First, most stakeholders with knowledge in particular fields were not present. The knowledge was expected to be embodied in the directors of the main universities and research centres; intermediate managers of medium and large enterprises; some business owns; the heads of government ministries and few public administration workers. Second, most of the participants did not keep participation along the meetings; instead, they sent representatives that were not aware of previous reflection processes or the concepts and particularities of S3. Thirdly, the implication of regional stakeholders that work at subsidiaries of MNEs is important because they may foster the demand and production of innovation activities[54] (Dutrénit et al., 2006: 179). However, the dependence of the regional economy on MNEs lead to pressures on the regional policies (Flores, 1998) which shape the policies, showing an example of policy capture (Blazek et al., 2014b: 45) and hindering the opportunities of domestic firms to benefit from those policies. Finally, diverse stakeholders such as entrepreneurs both in the formal and informal sector; clusters and private stakeholders from the services sectors were missing. Apart from that, the scope of the strategy was based on the metropolitan area which was justified in two ways. First, the fact more

[54] However, the materialisation of spillovers conductive to innovation has ben questioned in SLP (Martinez, 2013).

than 80% of the regional economy takes place in the metropolitan area and second, the difficulty of other municipalities to participate due to factors such as the long distances.

The institutional environment also played a role in defining S3 sectors and projects. The process was led by the consultancy firm, which tried to reflect a shared vision in a region with clear conflicts of interests[55]. The conservative elites were pulling the strategy back to previous approaches in which less stakeholders are involved and take the decisions; innovation leaders from the knowledge and business helixes were defending their own interests and the government was perceived to speak on behalf of the interests of MNEs. Therefore, such as emerging concerns (Benner, 2020) S3 was more focused on a paper generation than in the process itself.

Apart from the contextual challenges, the concept of S3 was not known by the regional stakeholders; just a few stakeholders from the public administration that were expected to collaborate with the consultancy for the SIAs project had some insights about the ideas behind S3. In addition, the misfit with the regional reality was perceived (Table 18 summarises the regional reality). First, due to the innovation capabilities. While S3 is expected to support STI activities; SLP has limited basic research; MNEs are in high-tech sectors but perform low value-added activities in the region[56] and domestic firms face restrictions due to the speed at which the demands for innovation take place (i.e. in the automotive sector) and financial restrictions. Therefore, innovations are typically incremental and in processes. There are different instruments to finance innovation projects at a regional and firm level, namely FOMIX, FORDECYT and PEI. However,

[55] The engagement of the triple helix in decision making in SLP has been argued to be nothing more than 'a good wish' (Solleiro & Castañón, 2017: 152).
[56] The importance to differentiate between being embedded in high-tech sectors and the performance of low value-added activities in subsidiaries is stressed by Turok (2016).

more investment is required to promote a full set of capabilities necessary to upgrade existing industries and to diversify into new ones.

A second reason for which a misfit was perceived is the need for more horizontal policies for innovation; in fact, SLP needs to strengthen clusters, create public-private institutions to foster regional innovation; and strengthen the linkages between different regional stakeholders. Finally, SLP suffers from an industrial lock-in in the automotive sector in which it is specialised. The diversification to related sectors (such as the aerospace sector in which regions like Querétaro is aiming to diversify) is not feasible due to the lack of capabilities of domestic firms. Therefore, entrepreneurial activity has taken place in unrelated sectors to attend the demands of the auto-parts industry (i.e. cleaning services, logistics, construction of industrial parks, etc.).

The Entrepreneurial Discovery process that took place was limited by the preselection of sectors at the national level; at a level of granularity that is not suggested by the theory (sectoral). In addition, the 'discoveries' of the activities took place before the SIAs were finished, therefore, it was based in hard data and opinions rather than being an evidence-based process.

In spite of the challenges of S3 in SLP, it was considered to be an interesting attempt to coordinate the different helixes and a learning process from which the strengths could be rescued, as some of the projects that emerged, and what did not work can be eliminated in future processes (Interview 15) which is aligned with findings on S3 as a great starting point for changing the classical top-down policies and reduce mutual mistrust (Trippl et al., 2019: 8).

Table 18.

Regional Reality of SLP from three dimensions.

Governance and Institutions	Industrial Structure	Regional Innovation System
Degree of centralisation/ Autonomy Highly centralised. There are initiatives in which regional and national instruments are combined. State ministries report to the central offices in Mexico City. STI Governance depends on CONACYT (National level). States tropicalise national initiatives. **History of Regional Innovation Policy** Limited experience in policymaking from the regional scope. STI Policy needs to be presented and authorised by the national level, which provides resourced for the regional programs. **Institutional environment** Important institutions are missing (i.e. public-private consortia). Institutional thickness in terms of number of organisations, especially regarding public organisations. Weak institutional environment. Especially regarding informal institutions: levels of trust, cooperation and collaboration. Formal institutions are focused on providing an attractive environment for FDI.	**MNEs** Economic dependence on foreign-owned MNEs, especially in the automotive and auto-parts industry in which 75% of the companies are foreign owned, and domestic firms are at the lowest tiers; with limited incentives to innovate (i.e. the speed of changes vs the time for a domestic firm to learn and innovate). **Domestic firms** Strong domestic industries are missing cluster and representative organisations (i.e. agrifood). Mainly micro enterprises and SMEs. Scholarly level in the state is 8,8 (2015), which corresponds to the second grade of middle-school **Informal Economy** 65% of Mexican workforce is in the informal sector **Degree of specialisation.** Specialisation in low value-added activities. Few key sectors. Industrial lock-in	**Domestic demand for innovation** Lack of domestic demand for innovation. Financial constraints for quick moving. Limited spillovers from FDI due to a process of knowledge accumulation without knowledge assimilation. **Innovation activities** Limited innovation capabilities Process innovation is more frequent than product innovation. Incremental innovations are more common than radical ones. **Collaboration** Limited links especially between industry and academia. Especially due to the different time frames for innovation.

Note: own elaboration

6.3 The Case of Medellin

6.3.1 Introduction

Colombia is politically divided in Departments. Medellin is the capital of the Department of Antioquia and is in a sub-region under the figure of Metropolitan known as the Aburra Valley (AMVA) (See Figure 6). The metropolitan area of Medellin includes other nine cities that together represent the second largest urban agglomeration in Colombia, both in demographic and economic terms. Medellin itself had, by 2018, a total population of over 2.3 million inhabitants, which rises to over 4 million if the whole metropolitan area is considered (DANE, 2019) which represent 67% of the total GDP of the Department of Antioquia and 11% of the economy of Colombia.

Medellin is administratively composed of six zones, which are divided into 16 urban districts called comunas, and five rural townships, called corregimientos. Neighbourhoods represent the smallest territorial unit: there are 249 legal neighbourhoods accepted by the Planning Department (by Decree 346 of 2000) and even more settlements not yet recognized as such (Alcaldía de Medellin 2011).

Figure 6.

Location of Medellin and the Alburra Valley.

Note: Author's elaboration

The economy of Medellin was boosted in the 19th century, after it was designated the capital of Antioquia. The import substitution model allowed the region to grow as an industrial pole specialised in the textile industry; the industrial importance of the region was remarkable not Colombian level but also as one of the largest industrial cities in Latin America. When the economy finally liberalised in the 20th century, the region experienced and important crisis due to overspecialisation in only one sector and the increase of foreign competition. In addition, this period was accompanied by an increase in cocaine trade led, which led to political and social instability; in which a considerable proportion of the textile industry's workforce was fired, which led to frustration and contributed to higher levels of violence.

In addition, Narcotraffic seemed the only solution for unemployed citizens. By the 80s, the city was known as the most violent in the world. The violence and extorsions were suffered especially by the business sector (Sánchez, 2013; Maclean, 2014). Despite the death of the leader of the Medellin Cartel in 1993, the problem continued until the early 2000s, when the Major Sergio

Fajardo was elected[57], supported by the middle-class and business organisations like the Business Group of Antioquia (GEA) and ProAntioquia. The public strategy was based on structural reforms in social urbanism and infrastructure as well as programs to promote education, innovation, and entrepreneurship (Morisson & Doussineau, 2019, p. 109). The region experienced an industrial transformation; first, from low-value added primary activities to sophisticated secondary industries and then from the industrial focus to a service-oriented economy.

Nowadays the economy is led by industries such as textile, food, chemical products, automotive, appliances and a growing software industry. Most of the business in Antioquia are micro enterprises with 88,61% of the business units followed by small enterprises with 8,18% and medium enterprises with 2,4%. In total, the Department has over 195.200 business units.

The economic policy of Medellin has transformed in recent decades, following academic theories. The Chamber of Commerce of Medellin for Antioquia (CCMA[58]), which belongs to GEA, has been at the helm of such changes together with the Town Hall. In 2006, both institutions led an important cluster strategy that marked a growth period. The cluster specialisation strategy was guided by economic geographers such as Ricardo Haussmann and Dani Rodrik. In 2009, the private-public organisation Ruta N was established with the goal of promoting entrepreneurship and the transition towards a knowledge-based economy. By 2011, Ruta N in collaboration with private and public organisations defined three specialisation areas for the region: health, energy, and ICTs, stressing the orientation towards services. The innovation system of Medellin has

[57] Some national reforms supported these changes. For instance, in 1991, Colombia got a new constitution, and the National Spectrum Agency Platform for Learning (PLANEA) oversaw competitiveness.
[58] In Colombia, the chambers of commerce are private. They tend to have a treatment of public because of the public resources they manage. However, they are independent from the Government Ministries and the board is selected by the businessmen.

evolved, engendering institutional thickness, creating several organisations, and building trust among stakeholders.

The STI policy is coordinated at the national level by the National Planning Department (NDP), with COLCIENCIAS as a key player that operates as science ministry, research council and innovation agency (OECD, 2014). However, the strong regionalised nature of the region leads to regional policy efforts. In 2016, CCMA considered that the decade old cluster strategy needed renewal and found S3 methodology valuable to find the new economic wave from bottom-up, which was a logical step according to the previous trajectory of the region. CCMA presented the idea to the Major, together with a reference of positive experiences in implementing S3 in Bogota. Therefore, the strategy was co-financed by the government and the private sector, represented by CCMA. Clearly, having the Major head the project would enable the process to acquire the formality, engagement and mobilisation required for S3.

By the time the interviews took place, the S3 strategy had been implemented in Colombia, first in Bogotá, and second in Medellín, both by the same Spanish consultancy firm, IDOM. Therefore, in Colombia S3 was not mandatory for all departments but in contrast, followed a more experimental approach and it as based on a city-region level.

The case study shows an example of organisational leadership, both formally (led by the major) and informally (with emergent regional leaders) as well as the importance of institutions and the regional sense of belonging to engage participants in regional economic development. It also demonstrates the importance of different regional organisations as enablers of communication.

In 2018, the results of the S3 strategy were re-evaluated and the current regional strategy was based on both the cluster strategy and the S3 project. The need for a second stage relied on the fact S3 was used as a methodology to find the industrial vocation of the region but not necessarily for the regional innovation policy.

The remaining of this chapter is organised as follows: First an evolutionary perspective is taken to describe and analyse the industrial path and STI policy trajectory in Medellin. Then, the experience with smart specialisation in Medellin was analysed based on in depth interviews. The chapter ends up with brief conclusions about the case study.

6.3.2 Industrial Trajectory: Unrelated Diversification

At its origins, the main economic activity of Medellin was mining. In the 1880s, the coffee production increased and constituted another important activity in the region. At the beginning of the 20th century the region was characterised for exports of coffee and gold. In fact, Antioquia produced around 80/90% of the gold in Colombia (Gouëset, 1998) and 23% of coffee exports (Bejarano, 1987). Therefore, Medellin, which contributed the most with both industries was able to accumulate a significant wealth for the region. The region showed a first wave for industrial diversification in that time, the entrepreneurs that found themselves with more money to invest, diversified to different industries (Botero, 1984). In fact, the rapid expansion of coffee production combined with mining profits generated a strong internal demand for agricultural machinery and intermediate goods (Restrepo Santamaria, 2011).

The textile industry emerged when regional visionaries started to produce the uniforms for the mining workers. By 1945 three textile business established in the city represented about 38% of the workforce in the industry: Coltejer (founded in 1907), Fabricato (founded in 1920) and

Tejicondor (Sánchez, 2013). The following years the textile industry was the most important in the region.

Medellin soon became an industrial city. By 1970s it became the economic powerhouse of Colombia and one of the largest industrial regions in Latin America (Caballero Argáez, 2016). The growth was accompanied by protectionist policies such as import substitution.

6.3.2.1 Trade Liberalisation, Social Exclusion and Narcotraffic in Medellin. In the 80s when the Washington Consensus ideas reached developing counties, the liberalisation of the economy led Medellin to a disadvantaged position affecting especially the industries that had been protected so far (Dávila & Daste, 2011). Franz (2017) explains that it was difficult for regional companies to compete with the textiles imported from Asia. In addition, there was a decline on coffee prices which negatively affected the regional economy by 1970s. The consequent deindustrialisation of Medellin was accompanied by a fall in GDP growth rates and high increase in unemployment. Therefore, from being an outstanding region in Colombia, Medellin was suffering from one of the lowest growth rates in the country. The authors also argue that another consequence of liberalisation included a transformation of the political and economic elites which led to a different distribution of power and institutional shifts.

The high unemployment was not the only socio-economic problem that Medellin was facing, since 1950s, the city experienced high migration from rural areas due to the search for better economic opportunities and to find a safe place from the violence that took place in the countryside. Apart from a high urbanization process for which the city was not prepared (Palacios, 2006); the high prices of houses forced them to install self-help housing in the hillside communes which had limited access to services and infrastructure (Sotomayor, 2018). The communes grew and reached about 50% of the regional population with the years (Echeverri & Orsini, 2010). As a

result, the peripheral neighbourhoods experienced weak security and according to Ceballos and Cronshaw (2001) the police lacked legitimacy in such areas and by 1970s gangs took the control.

The 1980s and 1990s marked a terrible period for the socio-economic situation in Medellin, which experienced complex power dynamics and the crime escalated with the emergence of global drug trade. The violence rates rose dramatically affecting business, police personnel and any actor that was against the cartel philosophy (Thoumi, 2002). The peripheral low-income communities suffered especially because young population without income found in organized crime an opportunity (Salazar, 2010).

By 1991, Medellin reached a record of 6349 violent homicides[59], "the highest per capita homicide rate in the history of any city" (Sotomayor, 2018: 44). That was the peak of Medellin's crisis, a region that was known as the most violent in the world, a situation that seemed to have drowned the city.

In a unique makeover, the city transformed in the following years. The transformation was supported by the economic elites represented by the GEA (Antioquia Enterprises Group) and the emblematic public figures they supported such as mayor Sergio Fajardo (2004–07), who led Compromiso Ciudadano[60], a coalition that emphasized the need to overcome the old tyle of policy making (Devlin and Chaskel, 2010: 3) and mayor Alonso Salazar (2008–11). Although the city is characterised for being inward looking, from this period on, the city has actively search for extra-regional knowledge (Morisson, 2018) to solve the regional issues. One organisation in charge of

[59] A comparison between the crime rate in 1991 that represented 375 homicides by 100.000 inhabitants is also made against 52 homicides by 100.000 inhabitants in 2012 when Sergio Fajardo ended it's second term to demonstrate the positive impacts of Fajardo´s government (Franz, 2017).
[60] Compromiso Ciudadano was a broad broad coalition of public actors, academics, nongovernmental organisations, the media, and local economic elite.

promoting growth oriented towards such objectives is Ruta N (Morisson, 2018, Almirall et al., 2016). During the last few years some major successful infrastructure investments have been made, which in fact are the main factor behind the designation of Medellin as Innovative City of the Year 2013 by the Wall Street Journal (Wall Street Journal, 2013), the Urban Land Institute and Citigroup (OECD, 2015). The most representative projects executed are the following:

- Metrocable: A project that started in 2000 under Major Luis Pérez to implement accessible transport to the poorest communities that were located behind the hills with the metropolitan center. The objective was to facilitate family contact, allow the poor work in more distant areas, allow informal enterprises to sell products in richer markets (Bateman et al., 2011). However, the project also provided community pride and increased trust among the region through the belief that the city is improving. The project is an example of innovation in which the city was pioneer in using technology of the ski tracks for public transport. The Metrocable project includes the diffusion of a civic culture 'Cultura Metro' to inculcate solidarity and mutual respect. (Brand and Davila, 2011; Davila and Daste, 2011).
- Metroplus gas-operated bus system have improved the mobility of citizens and substantially reduced CO2 emissions.
- Electric Escalators at Comuna 13: Comuna 13 was one of the poorest and most violent neighborhoods in Medellin. It was isolated and especially in raining periods, it was very dangerous to try to leave the hill. The electric escalators increased the sense of ownership, provided more job opportunities and indeed, allowed the area to have extra income (Cruz, 2012). Nowadays there is a tour at Comuna13 in which Graffiti arts are shown to tourists

as well as the national library and the escalators. Through the rise in tourism, the area also benefits from selling products such as ice creams, packed coffee, and other souvenirs.

- Acquisition of EPM: This energy company was acquired by the government to overcome the low tax rate in Medellin. EPM is mandated to channel 30% of net annual profit into the city administration's budget. Therefore, the city has fiscal space to engage in different projects (Bateman et al., 2011). Indeed, EPM installed a pre-paid energy system to facilitate the access to energy in the poorest houses that otherwise could not afford it.
- Low tax rate In Medellín this problem was solved largely through city ownership and very effective management of the main energy company, Empresas Públicas de Medellín (EPM-UNE), which is mandated to channel 30% of its net annual profit into the city administration's budget. This financial bounty gives the city the fiscal space to engage in economic and social development areas over and above what would otherwise have been possible.
- Medellinnovation district: Planned by Ruta N, this innovation district aims to redevelop 172 hectareas around Ruta N building, EPM-UNE research laboratories, the ViveLab animation learning center, international companies, and international startups. (Morisson & Bevilacqua, 2018).

Other public projects aimed at the inclusion of disadvantaged neighbourhoods include the library parks, the Moravia Cultural Centre, or the Sendero de la Pacificación (Path of Peace).

The initiatives, projects taken and many structural reforms in education, social planning, social inclusion, entrepreneurship, scientific and technologic development, and innovation, have placed the region on the road to transformation into a knowledge-based economy.

Today, the city is known as great example of urban transformation (OECD, 2015). phenomenon known as “Medellin Miracle” (Maclean, 2014) and Medellin’s half miracle (Fukuyama &Colby, 2011). In contrast, there is certain criticism to this ‘miracle’ claim due to limitations on capacity, funding, and institutional sophistication (Bateman et al., 2011) as well as un and underdevelopment rates and high unemployment, which implies that the miracle has not been for all the citizens (Franz, 2011).

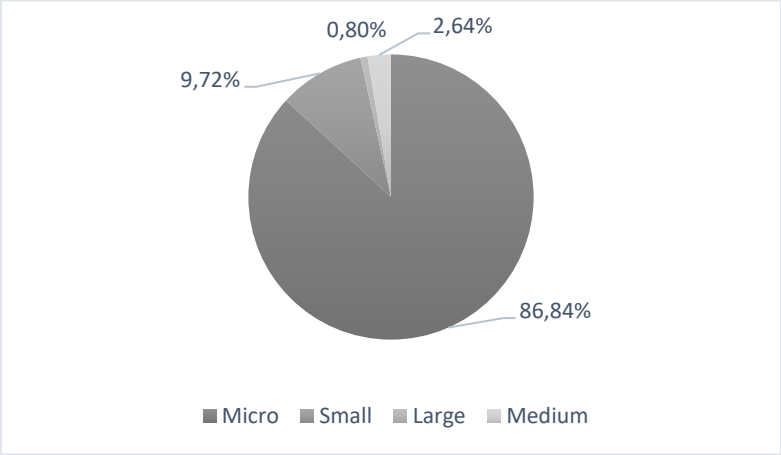
The following section will deepen into the industrial structure of the region to reflect the current situation and the point of departure for the S3 strategy.

6.3.2.2 The Industrial Structure of Medellin. As mentioned in the previous section, the period of liberalization demanded more technology-related activities (Sánchez, 2013). The generation and use of technology in diverse sectors in which the region had productive potential such as technology, energy, construction, not only as manufacturers led to the capability of provide services that required value-added activities and competitiveness. In fact, in 2010 financial services, real estate and other services represented 39% of the GDP from services in Antioquia; which is 24% of the total GDP in Antioquia.

Nowadays the economy in Medellin has a higher diversified economy, beyond the industrial base. The region has attracted valuable human capital, raised productivity and innovation activities which are important for the regional success (Glaser et al., 1992; Duranton & Puga, 2001; Da Silva, Gonçales & Porcile 2010). Medellin is known as an entrepreneurial city that holds 38,5 companies per 10.000 inhabitants. Most of those companies are micro enterprises (86,84%) (see Figure 7).

Figure 7.

Companies distribution in Medellin by size.



Note: Author's elaboration based on Observatorio de Desarrollo Económico

The cluster strategy has defined the economic structure of Medellin. It was defined as a public-private initiative in times of Sergio Fajardo under the program *Medellin, Mi Empresa* to dynamise regional economic development. The CCMA (Chamber of Commerce of Medellin for Antioquia) is the head of the clusters. The definition of the clusters was made with the support of academic experts such as Richard Hausmann and Dani Rodrik. Together, the six clusters represent 31,4% of Antioquia's GDP and 31% of the companies. Since the implementation of the strategy the creation of companies related to those sectors has risen about 21% annually. Apart from the number of new companies created, the sectors have been strengthened through public policies and the installation of different support organisations such as Ruta N, Andi and ProAntioquia that have also fostered the relationships among companies and access to new markets.

After ten years of a successful cluster strategy, the strategy had an evolution in which the clusters were re-defined to include transversal activities and a broad goal of sustainability and

innovation (See Table 19). The change shows the incorporation of ideas from OECD (2015) that suggested both to implement S3 and build the strategy around existing and emerging enterprises in energy, ICT, and health clusters. Therefore, the cluster re-definition is aligned with the smart specialisation strategy implemented in 2017 in which sustainability and entrepreneurship were seen as important goals.

Table 19.

Comparison between the previous and current cluster strategies in Medellin.

First Approach: **Six Cluster Strategy 2006-2017**	**Evolution:** **Seven Clusters Strategy 2018- current**
1. Electric Energy 2. Textile Design and Fashion 3. Construction 4. Tourism, Business, Fairs, and Conventions 5. Health 6. ITC	1. Sustainable Energy 2. Fashion and Advances Manucaturing 3. Sustainable Habitat 4. Business Tourism 5. Medellin Health City 6. Digital Business 7. Antioquian Coffee

Note: Author's elaboration based on CCMA.

Although the cluster strategy and the incorporation of different support organisations have the goal to upgrade the industrial structure towards a more value-added knowledge-based economy, Franz (2017) argues that the activities in which the region is embedded remain at the low-productivity end of the value chain. In addition, the author has found that most companies that outsource part of their business to Medellin do not seem to be interested in upgrading or diversifying their portfolios to include production or assembly (p.11).

Furthermore, the 'miracle' of Medellin transformation has been criticised because the region still holds an unemployment rate of 10,7%; a high informal economy, which is a survival

economy by those low-income citizens that perform economic activities without registration; and the poverty and violence is far from being extinguished (Fukuyama & Colby, 2011).

6.3.3 The Regional Innovation System

Morisson (2019) argues that Medellin has been relatively isolated from the world economy, which has greatly hindered the diffusion of extra-regional knowledge into its RIS. One of the main reasons is the location and geographical dimensions of the city which have fostered an inward-looking culture.

The public and private organizations in Medellin have shown the strong sense of ownership of the region and a willingness to improve the regional innovation system which is overall an institutionally thick system and organizationally thick with numerous innovative actors and support organisations.

Already in the mid-1970s, the ProAntioquia Foundation was created by the private sector as a space for reflection on policies aimed at stimulating business competitiveness, innovation, entrepreneurship, education, and social development.

In the 1990s the Centre for Science and Technology of Antioquia (CTA) was created as a public private entity that is still running and has played an important role in the design and implementation of public strategies in the realm of science, technology, innovation, and education. In that period, a team led by Harvard Professor Michael Porter prepared the Monitor Medellin report (1994), with the aim of evaluating the city's potential. This endeavor gave rise to the cluster strategy that remained in the city until recently, albeit with changes through its evolution, under the coordination of the Chamber of Commerce of Medellin.

In 1996, there were clear efforts to develop a new economic vocation based on entrepreneurship, innovation, and scientific and technologic development (Higuita Palacio, 2015). For that purpose, diverse technological development centres were created, including the Tecnological Base Business Incubator of Antioquia and the Centre of Science and Technology of Antioquia. Those efforts were echoed in 2004, when an ambitious plan was made to transform Medellin into a knowledge hub; the plan was accompanied by a strong public policy to foster linkages between the actors of the triple helix. The regional development plan 2004-2007 was known as 'Cultura E' (entrepreneurial culture), which intended to foster the creation of knowledge-based business. The construction of Parque E and the Program 'Medellín mi Empresa' are examples of the instruments that were used for the mentioned objectives. In addition, the program 'Medellín Ciudad Cluster' (Medellin, cluster city) was important to determine the economic sectors. Those efforts were strengthened by a strong education reform. The infrastructure soon changed in the marginal areas, which now had libraries, better schools, CEDEZOS (Centres of Business development by areas).

Other achievements include the strengthening of inter-institutional relationships and the existence of an earnest dialogue between all the actors that make up the regional innovation system: universities, public research institutes, public agencies, and other government bodies and business associations. The contribution of the University-Government-Industry Committee (CUEE) has been decisive. CUEE is a regional alliance of universities, research groups, firms in the productive sector and government entities devoted to generating and promoting applied research projects aiming to meet the technological needs of the region's industries. In 2007, CUEE created the Tecnnova Corporation to energise corporate research activity and meet the demand for innovation through its partner universities. Also worth noting is the systematic promotion of an

entrepreneurial culture and the support to the formation and development of new firms, which since the mid-2000s has become one of the strategic priorities of Medellin City Council (Kantis et al., 2012).

In the municipal development plan 2008-2011, the city experienced a continuity of the previous policy programs and included other projects such as City E; the construction of Ruta N, the Centre of Business and Innovation and the joint construction of the STI Plan. An improvement with the previous administrative period was that Medellin now had more than one higher education institution, but three. The city also defines the six clusters that led the development of the region for the following years[61].

As mentioned, in 2009, the creation of Ruta N, the innovation agency of Medellin City Council was a breakeven point in the regional development. Ruta N is responsible for the implementation of Medellin's Strategic STI Plan, with the overall objective to promote and coordinate policies to support research and scientific, technological, and innovative development in Medellin, with a view towards the identification and exploitation of new knowledge-based businesses (Pineda and Scheel, 2011).

A study made by OECD (2015) analyses Medellin's RIS from five thematic areas: human capital; public investment in R&D; promotion of business innovation and support to entrepreneurship; demand-side innovation policies; and attraction of foreign innovation-intensive business and institutions. The study identified four goals for the development of the RIS. First, to implement S3 to concentrate the scare financial and human resources for STI in a few priority areas based on regional strengths and the informal economy. Second, internationalization and

[61] It has changed in 2021.

connectivity with global innovation networks through collaborations in STI as well as attracting talent and innovation related business. Thirdly, multilevel governance mechanisms to improve both vertical and horizontal coordination. Finally, social innovation as the focus due to problems such as inequality and the informal economy, for which linking technological progress with social objectives is important to make R&D results more inclusive.

According to Salazar et al. (2011), between 2009 and 2011, Antioquia concentrated 23% of STI investment and 27% of the R&D investment, only behind Bogotá. On the other hand, the participation of STI groups was 13% in 2010 while the number of active researchers was 16% of the total Colombian amount, occupying the second place. Robledo et al. (2012) show that patent requests behave in a similar way, being the second department with the highest rate (0,651 requests by 10 000 inhabitants). According to Higuita Palacio (2015) what is really impressive is to compare with the rankings of 2001, when the city was ranked 11th; which demonstrates the efforts of the region to generate the conditions to advance in RDI.

For the regional STI plan 2011-2021, 7% of the exceeding resources from EPM were destinated to the plan and Ruta N managed the resources. One of the main outcomes of this period was the implementation of Smart Specialisation Strategies in the region.

Today, Medellin has an efficient and dynamic local innovation system, where the leadership of Ruta N has been outstanding. Ruta N is the local innovation agency created in 2009 with the mandate to implement the Strategic STI Plan 2011-2021, which ambitiously aims to transform Medellin into the Latin American capital of innovation. Not surprisingly, in 2013 Medellin was voted Innovative City of the Year by the Wall Street Journal, the Urban Land Institute and Citigroup. (OECD, 2015).

Over the years, the system has been characterised for being institutionally thick and with linkages between the actors of the different helixes. Although, more collaboration is needed between companies which is also reflected in the dialogs for policymaking.

Hormecheas et al. (2019) made a study in which the dialog in Medellin is analysed and concluded that moderation was necessary to overcome rent-seeking behavior and to understand the different concepts, expectations, and trust. Another limitation found by the authors was the inclusion or exclusion of the results of the dialog processes in the policies (p.10).

Nevertheless, the fact the region has built a more solid regional innovation system in a few years demonstrates the willingness of the region to become a knowledge hub and a Latin American reference for innovation.

6.3.3.1 The Actors of the Regional Innovation System. In Medellin, as in the rest of Colombia, it is universities that are at the forefront of STI, while investment by the private sector remains low. Clearly, the development of the human capital of companies is paramount to reverse this situation and encourage entrepreneurs to invest in STI in the medium- and long-term. (OECD, 2015).

However, the diffusion of innovation initiatives, has been highly linked to the efforts of the private sector, which is governed by an economic elite known as Antioquia Business Group (GEA), which emerged as a joint effort by three of the largest regional companies. (Londoño, 2004; Restrepo Santamaría, 2011), which has grown due to the structural changes towards a finance-based portfolio and the economy liberalisation that followed the Constitution of 1991, which allowed this elite to expand to other Latin American Markets (Betancur, Stienen, and Oran,

2001; Restrepo Santamaría, 2011). Therefore, the industrial changes have been linked to this prevailing economic elite and supported by the public authorities.

The recognition of Medellin as an innovative city is due to the regional transformation applying technology. One clear example is the application of the technology of ski slopes for public transport to respond to the geographical communication needs of the poorest areas that were located behind the heels that surrounded the urban center. In addition, the attempts to transform the city based on innovation and education has led to the construction of a regional innovation system, formally leadered by the public sector (Higuita Palacio, 2015)

6.3.3.2 The Regional Innovation Capabilities. Medellin has promoted the generation of regional innovation capabilities through fostering education, infrastructure, and policy. Although the investment in R&D is limited, the ranking of competitiveness of cities ranks Medellin as the third Colombian city in Innovation matters, just after Bogotá and Manizales, but is the top city in amount of patent applications and the second in industrial designs which is related to product and process innovation (Consejo Privado de Competitividad, 2022).

A type of innovation that has grown recently is the innovation in business model and marketing. For the former, companies like EPM have developed solutions from the Bottom-of-the-pyramid (Prahalad and Hart, 2002); one example was the development of a pre-paid system for light and energy. For the latter, four interviewees mentioned examples, but it was commonly mentioned that new restaurants, stores, and other services providers are starting to build their companies around novel concepts.

Medellin intends to bring R&D intensive capital to the region and increase innovation capabilities that way. To meet that goal, the region needs to enhance even more the availability of advanced human capital, technological specialisation, and English-language skills (OECD, 2015).

The interviews show that despite the efforts made in education and an increase in the regional absorptive capabilities, the higher value-added positions in firms are being occupied by people from other Colombian regions such as Cali or Bogotá that have migrated to Medellín.

According to the perceptions, the region of Medellin is mostly focused in services, so, based on the classification of the Oslo Manual (OECD, 1992/2005), the capabilities were more frequently identified to be in marketing, followed closely by business model or organizational innovations; admitting that the non-technological innovation is more common in the region. The level of innovation was perceived in general to be more incremental, however, three of the interviewees argued that the domestic firms were capable of innovations that were new to the world, in the words of one interviewee 'the paradigm that suggests opportunities only in incremental innovations for developing regions is already broken' (Interview 20). Contrary to that vision, the co-invention as an initial stage was perceived as coherent by two of the interviewees, and the capabilities to provide solutions to already known goals were also mentioned.

Although a good level of absorptive capability was perceived, infrequent arguments for the limited innovation capabilities included a need for a stronger ecosystem, with an argument criticizing the current cooperation culture; to increase IT capabilities; and, higher level of both private and public investment in innovation.

6.3.4 The Experience with S3

The point of departure of S3 was a region with experience in participatory approaches, that through all the reforms since Major Sergio Fajardo (2004-2007) had implemented informal institutions such like trust and sense of ownership. A RIS characterized by a complex institutional structure, important participation from the University and a strong private-public collaboration and an economic structure based on six clusters.

6.3.4.1 The Rationale for S3: Seeking New Structural Changes. Medellin has followed a sequential trajectory in STI policies (See Table 20). Since 2007, the region has been targeting specialization areas according to different organisations. One of the largest projects of the region was the definition of the six clusters that encompass the major economic activities of Medellin.

Table 20.

Specialisation areas in Medellin from 2006 to 2018.

Antecedent	**Focus**	**Year**	**Leading Institution**
Medellin Cluster City	Construction; textile, confection, design and fashion; Business tourism, ferias and conventions; medical and odonatological services; technology, information and communication (TIC) and electric energy.	2006	Chamber of Commerce of Medellin and Town Hall.
Strategic sectors	Mining, cattle and horse farming, trade, trading, confection, production and distribution of energy, specialized health and medicine services, fruits and flowers, value-added vegetables, preserves and food in general, forest products, housing construction, vehicles (cars and motorcycles) and financial, stock exchange, banking, and insurance services. To these are added other cross-cutting sectors: software, electronics, telecommunications, machinery and equipment, business tourism, medical tourism, and tourism in general, congresses and conventions, and transportation	2007	Departmental Administration
STI Plan of Medellin	Health, Energy and ICT	2011	Ruta-N
2016-2019 Development Plan Medellin	Sustainable mobility; education and employment; social equity and security.	2016	Medellin Town Hall
Technological activities	Electromechanical machinery and equipment and household appliances; electronics; spares; industrial parts; telecommunications; software. ADVANCES IN:		

Antecedent	Focus	Year	Leading Institution
	production of laboratory and medical scientific equipment; research and production of molecular biological technology and related (applications both human and agricultural)		
Opportunity diagnosis studio.	Pharmaceutics, Energy, fruits and Vegetables, construction, female lingerie and Wood.		
Smart Specialisation	DINAMIZING AREAS: **Green and sustainable territory** (Smart mobility and sustainable construction). **Advanced health and wellbeing** (Bio products and textures, personalised medicine, health services supported by ICT, innovation capabilties). **Smart region** (open government and social participation, social security, smart urban planning). **Sustainable and inclusive industry** (advanced manufacturing, the internet of things, new materials, circular economy). OPPORTUNITY NISCHE: **entrepreneurial region**	2017	Medellin Chamber of Commerce

Note: Author's elaboration.

The initiatives that include social participation occurred since about a decade ago. According to one of the interviews, Medellin and Antioquia conversed about the strategy after the era of *narcoterrorism* to improve the city dynamics. In those conversations, participants were grouped by comunas, but the results just showed that there were different realities in the region, so, the comunas were mixed to get different results. After that learning experience, The Town Hall, EPM and the CCMA, got 28 recommendations for improving Medellin; one of them was to get a regional shared vision (Interview 17).

A group from the region, traveled to Bilbao (Basque Country, Spain) to understand better the cluster strategy and got inspired by the Guggenheim project, and the Botero Museum and Botero Square were built. The aim was to change the concept of the region to a place in which art and innovation are placed as the soul of the city. Aligned with that idea, the industrial transformation that Medellin suffered from mining and agriculture to manufacturing were expected to be re-transformed towards services and knowledge-based activities.

With the aim to embrace new theories of transformation based on innovation, in 2011, RUTA N performed the smart specialization strategy based on the European experience and came up with three main areas, namely health, energy, and ICT. Then, in 2015, the OECD published a report on the Innovation System of Medellin in which a S3 strategy is suggested to prioritise technological activities[62].

In addition, the CCMA then considered that the cluster strategy needed to be rethought and adapted to the regional situation a decade after the first cluster was created. The implementation of S3 in Europe inspired the head of CCMA, Jaime Echeverri who decided to adapt the strategy to Medellin. The need for adaptation from the original European S3 strategy was based on the recognition that the region was not prepared for an innovation policy due to financial limitations, innovation capabilities and support from institutions such as the European Union. However, the process of priority definition seemed attractive for the region, especially the so-called Entrepreneurial Discovery Process in which the city was expected to discover the economic potential.

[62] The report also suggests orientating the strategy towards social innovation strategies and internationalisation (OECD, 2015).

The consultancy carefully selected key informants to interview before the process began, to gain insights and higher place sensitivity. From such interviews it became clear that the objective was not to replicate the S3 from Europe, for two main reasons: first, the lack of resources for innovation and technology and that they were lower than the structure and amount of ERDF funds from the European Commission; and second the lack of business and science and research capabilities to focus STI (emphasis Int. 21 and 22). Thus, the idea was to execute a customised exercise focused on finding those activities or dynamic areas that would foster higher productivity and economic growth in the region. Some of the interviewees suggested that more precise nomenclature such as 'productive specialisation' (Interview 24) or 'specialised productivity and competitiveness' (Interview 25) helped customise the strategy.

The regional reality in this large metropolitan area with income disparities, remaining mobility difficulties from marginal areas and a prevailing informal economy, in fact, led to criticism of a Medellin-centred strategy (emphasis in Interviews 17 and 30).

Although the initiative originally was from CCMA, it was headed by the city's Major to take advantage of the image of 'good governance' and strong leadership held by the regional Major which has mobilised different actors in previous initiatives.

6.3.4.2 The EI Strategy in Medellin. In Medellin, the S3 strategy was called EI for the Spanish of Smart Specialisation (Especialización Inteligente) and was presented by the CCMA in 2017. The governance was divided in three different levels:

Table 21.

Governance Structure for the S3 Strategy in Medellin.

Directive Committee:	Mayor's Office of Medellín: 1 person

	CCMA: 1 person Metropolitan Area: 1 person University-Business-State Committee: 1 person
Executive Committee:	Mayor's Office of Medellín: 1 person CCMA: 1 person Metropolitan Area: 1 person University-Business-State Committee: 1 person South Chamber of Commerce of Alburrá: 1 person
Advisory Committee:	Proantioquia: 1 person Private companies: 5 people Private-public company: 1 person Universities and Research Centers: 3 people

Note: Own elaboration based on CCMA 2016.

The first governance level was just present both, in the start of the project and to close the project. However, one of the interviewees said, 'it was key for the S3 strategy to put the Mayor at the head, because it gives formality to the process and the sense of officiality' (Interview 21).

As a first step in the process, the concept of S3 was explained to the attendees, who, according to the interviews, were familiar with the concept and why it was adopted in the region. However, 8 of the interviews explained that it was expected to be an evolution of the successful cluster strategy after 10 years, which was denied by the CCMA, who argued this was an independent initiative that expected to find a strategic fit based on the regional reality, strengths, and capabilities. The idea of focusing on the endogenous strengths and capabilities was expressed in 8 of the interviews, which demonstrates a diffused understanding of the concept.

The consultancy firm brought an analysis of hard data macroeconomic trends, but then, the data was placed there for the participants to decide and prioritise; from there, different regional challenges were grouped as follows:

First, some challenges of transversal character were identified in terms of future development from the perspectives of education, learning and knowledge; citizen culture and leadership; and institutional arrangements. The challenges were the following:

1. Strengthen the capabilities for STI based on social innovation.
2. Generate changes in behaviour based on the common good values that can be supported by the citizens and lead by authorities.
3. Assure coordination and common action between the stakeholders involved in the productive, competitive and RDI development of the region.
4. Strengthen the linkages between academia and research-government-company centres.

Second, challenges in sustainability and life quality that respond to the need to harness existing knowledge, the territorial occupation and environmental sustainability to have a positive impact in a more equilibrated human development. The challenges were the following:

1. Improve life quality through solutions based in scientific and technological specialisation.
2. Manage resources (water, roof, air, energy, waste) in an efficient way.
3. Build a kind territory that responds to globalisation and life quality demands of the citizens.
4. Have citizens that are integral, ethical, engaged with sustainability and an education according to the regional specialisation areas.
5. Regional leadership mobilising both, institutions, and the society in the same direction.

In addition, the region defined a vision and specific objectives according to it. The vision for 2026 is: Be a global, competitive, sustainable, inclusive region, recognised for its innovation system, knowledge levels, high life quality standards, new business development and entrepreneurship with a high value-added business structure. Therefore the objectives included:

foster capabilities for STI; leverage the competitiveness levels through a smart use of existing resources; build a territory that responds accurately to the globalisation and life quality demands; have a society that is integral, ethical, compromised with sustainability and professional education, abilities and competencies; and close the rural-urban gaps, integrating the main regional stakeholders in an institutional cooperation network that guarantees a stable and scalable growth for the region.

As a result of the strategy and based on the current cluster strategy and the existence of a critical mass, the region identified four dynamizing areas and one opportunity area. The areas of opportunity were defined by the Observatory of CTI and RUTA N based on identified capabilities.

Table 22.

Dynamising area:	**Business Niches and Related Clusters.**	**About the area, business and knowledge centres embedded.**	**Areas of opportunity.**	**Number of Projects**
Green and Sustainable Territory	**BUSINESS NICHE:** -Smart Mobility. -Smart Building. **RELATED CLUSTERS:** -ICT. -Electric Energy. -Construction. -Business Tourism.	**BUSINESS:** 8 821 business, mainly in construction (6 055) and services such as transport and warehousing (2 247) **KNOWLEDGE:** CTA, CIDET, ICIPC, CIB, Corporation of Research in Co2 and Forests.	**ENERGY:** -Hydrogen storage. -Generation of bio hydrocarbons from algae. -Alternative energies. -Energy storage. **CONSTRUCTION:** -Certification and generation of sustainable materials for construction.	**20**

Dynamising area:	Business Niches and Related Clusters.	About the area, business and knowledge centres embedded.	Areas of opportunity.	Number of Projects
	-Textile/ design and fashion.			
Advanced Medicine and Wellbeing	**BUSINESS NICHE:** -Bio products. -Personalised medicine. -Health services using ICTs -Generation of innovation capabilities. **RELATED CLUSTERS:** -ICT. -Health. -Textile/ design and fashion.	**BUSINESS:** 10 200 business of which 45% are in textile production (4 606), 27% food and beverages, 17% health services and 10% manufacturers of machinery, medicines, and chemical products. **KNOWLEDGE:** INTAL, ICIPC, CECIF, CIB, ICMY, Vidarium corporation Research Centre in Nutrition, Health and Wellbeing, American Cancer Institute.	**HEALTH:** -Therapeutic agents. -Tropical illnesses management. -Biomedical information. -Tissue engineering and cell therapy. -Nanomedicine. -Telehealth. -Genetical therapy. **TEXTILES:** -Smart textiles. **ICT:** -Mobile health applications.	**20**
Smart Region	**BUSINESS NICHE:** -Open government and social engagement. -Social Security.	**BUSINESS:** Composed by 10 445 business units, most of them in public works (4 292), ICT services (2 151) and creative	**ENERGY:** -Alternative energy. -Smart measurement of energy. -Energy storage. -Smart micro-networks.	**10**

Dynamising area:	Business Niches and Related Clusters.	About the area, business and knowledge centres embedded.	Areas of opportunity.	Number of Projects
	-Smart urban mobility. **RELATED CLUSTERS:** -ICT -Electric Energy -Construction.	and technological industries (2 100). **KNOWLEDGE:** CTA, CIDET, ICIPC, CIB, ECSIM, IAI.	**CULTURE:** -Colaborative creation spaces.	
Inclusive and Smart Industry	**BUSINESS NICHE:** -Advanced manufacturing. -Internet of Things (IoT). -New materials. -Circular economy (waste, energy efficiency, water). **RELATED CLUSTERS:** -ICT -Textile/ design and fashion. -Construction	**BUSINESS:** 11 490 business, most of them in textile, confection, and leather goods (5 308), food (2 777), engineering and design services (1 871) and metallurgic and metal mechanics (1 075).	**TEXTILE:** -Smart textiles. **CULTURE:** -Collaborative collaboration spaces. **AEROSPACE:** -Air monitoring and management.	**10**
Opportunity area:	**Business Niches and Related Clusters.**	**About the área, business and knowledge centres embedded.**	**Areas of opportunity.**	

Dynamising area:	Business Niches and Related Clusters.	About the area, business and knowledge centres embedded.	Areas of opportunity.	Number of Projects
Entrepreneurial Region				

Note: Own elaboration based on CCMA, 2016.

The table shows that beyond productivity, the existence of a critical mass and abilities to absorb knowledge were considered. Also, although clusters played an important role, the process reflected results different to the clusters that were already established through the analysis of hard data.

At the end of the process, financing mechanisms were designed. The three financial mechanisms are public funds, public-private alliances, and private funds. However exactly the public programs that would generate the budget and the amount designated to the projects, the chosen areas or the hall strategy were not clear; a concern reflected in four of the interviews.

In general, the results were perceived as too broad by 10 out of 17 interviews in Medellin, especially for the domain definition, in fact, an often-used analogy was 'A train could fit in', which was sometimes interpreted as a political decision to be as inclusive as possible[63]. However, the areas of opportunity and specific projects for each area showed that the generalisation was more in the names than in the projects, which was confirmed in 8 interviews. That entrepreneurial discovery process is expected to continue and reveal itself the path for the region during the implementation phase.

[63] In fact, there was dissatisfaction among those sectors that did not fit in any of those areas.

The following section will deepen in the bottom-up, EDP process in Medellin, for which 'the great value was to acknowledge not only the business and industrial capabilities but the reflex of the regional capabilities such as entrepreneurship' (Interview 31).

6.3.4.3 The Entrepreneurial Discovery Process. The process of entrepreneurial discovery process had two main lenses. On the first hand, the region was focused on the current cluster structure to find a new complementary strategy; on the other hand, it included a vision for the future which had to me match with the current capabilities.

Governance and Institutional Environment

The S3 dialogs were characterised for having a high level of participation and the presence of the multiple institutions of Medellin's RIS. Partly because CCMA's structure through the different clusters were able to convey relevant actors from the six main economic activities. The level of participation exceeded the expectations of the organisers. The work of CCMA was reflected throughout the process: 'Whenever they [CCMA] detected that someone missed a meeting, they would call to understand why and give them update' (Interview 19). For those who did not participate, especially entrepreneurs, their needs were exposed by Ruta N. Despite time constraints for the business sector, the high response rate was also a consequence of the regional culture, with a strong sense of belonging (Interview 33) that characterises people from Medellin (paisas), which 'is genetical' (Interview 17; Morisson & Panetti, 2020). Consequently, it was stressed in 11 of the interviews as explaining the enthusiastic participation.

The governance structure defined for S3 placed at the top formal regional leaders such as the Major and the directors of the main regional organisations. However, the thematic workshops included more operational actors such as faculty members and university researchers or

entrepreneurs in specific fields. Different committed stakeholders were able to straighten out the process whenever it was perceived to replicate other models, instead of reflecting the conversations from the regional reality.

Although the institutional environment was adequate, the region experienced certain confrontation between regional institutions that had worked before on finding accurate S3 strategies for the region and the consultancy firm which was leading to different results. However, through other institutions, the tension was diminished, and the institutions collaborated despite differences.

Apart from the institutions a pressure from large firms was perceived to get their sectors reflected and their interests met in the projects (Interview 27). However, in general it was considered an important aspect to bring the companies together, as they are not used to collaborate without incentives to do so (Interviews 17 and 23).

However, the institutional environment was considered a very positive aspect that fostered EDP; first, the institutional structure including different stakeholders that gathered information to find an accurate strategy. The institutional environment that was defined as ‘close between companies and universities; where companies respect the knowledge institutions; therefore, universities took an important role. Businessmen respect and accept a lot the knowledge from universities’ (Interview 33). Such trust and collaboration environment has been strengthened along the years, and the triple helix had already participated in the definition of the regional vision and programmes.

In terms of collaboration between the different helix, a close relationship is experienced in the region between academia and government; however, the relationship with business is different due to different working rhythms.

The participation of the institutions and universities were helpful. The interviews reflect that universities also took an entrepreneurial position and were considered as targets of the innovation activities. For the institutions, participants argued that in Medellin, there is project continuity and the phrase ‘policies are written in stones’ that was mentioned a couple of times referred to the fact, there are institutions such as the University-Business-State Committee that oversee such continuity regardless the Major in turn.

The entrepreneurial discovery process is expected to be bottom-up, for that reasons interviewees were asked about their perception and the most frequent perception was that the strategy was inclusive and bottom-up where decisions were a consensus, especially in the workshops. However, the perception of a top-down process, that was wide for political reasons and validated by researchers or by the groups in higher governance levels was less frequent but not missing.

Internal and external scopes.

The geographical situation of Medellin was perceived by one of the interviewees to make it difficult and costly to collaborate with other regions, which would be desirable.

STI-related FDI is desired for access to new knowledge and technology extension. The use of international references was frequent. Most actors seemed to be concerned about what was going on around the globe as in most of the industries international references like Spain, Germany, US, Japan, Chile, or Mexico were given. One fourth of participants in the interviews agreed, that

the strategy was endogenous but considering external knowledge sources and the international position, being the latest, 'fundamental to validate the whole regional strategy' (Interview 22).

Previous experience in participatory policymaking and novelty

Although there were previous experiences in participatory approaches for regional renewal, this was the first time, diverse and numerous groups of actors were participating in a public policy initiative, and most of them were satisfied with the process, from the call to the deliverables.

The interviews reflected surprise when sustainability and life quality standards were jointly selected as the pillars of the strategy. That reflects the sense of ownership and the mindset of the participants. The hard data was aligned with those objectives and that was the way the activities were found. For 38% of the interviewees, this was a real novel discovery; an additional 38% considered that it was based on the existing areas that were already known in the region but with a novel perspective.

Perception on the challenges and strengths of the process

Unfortunately, one of the biggest challenges for S3 in Medellin is that the Federal Government[64] does not devote financial resources for S3, and the region struggles to get enough resources to finance the projects.

Nevertheless, S3 was 'an excise to rethink the productive development' (Interview 33) and to align the regional strategies that were somehow spread.

[64] According to Barroeta et al. (2016:29) Colombia and Chile are legitimising regional competencies in managing funds. However, the regions are still depending on Federal Government for this type of regional initiatives, especially in terms of resource allocation.

Although interviewees would give little comments on the process weaknesses, they were asked about what they would do better the next time with the following responses: First of all, there was a frequent argument on the misunderstanding of concepts and being too much information and theories especially for businesspeople who, given the little time were conveyed too much throughout the process. Second, an excessive focus on the past and the trajectory of the region. A contrasting infrequent argument was on one hand that the process was too focused on economic development and entrepreneurship more than transformation through innovation; on the other hand, it was said to be too focused on knowledge and technology neglecting the importance of the industry and economic development. Third, the process was used as a base to public policy, thus, the sectors not selected were neglected in the whole regional strategy. Finally, the process was perceived to be more interesting than the results, the most common argument here was that the process showed a lack of deepens and was considered as too broad.

The role of the informal sector in S3

The participation of the informal sector, which is a huge economic challenge in the region is difficult due to the lack of capability to find those actors. In addition, the informal sector can be divided in two. On one hand, the entrepreneurs (especially young students) that avoid the implications of a formal business at least at the beginning of their projects. On the other hand, those business and economic activities that people with limited resources uses to survive in an informal way. The importance of the informal sector for innovation strategies changed according to the economic activity performed. For instance, in ICT, the informal sector may be far more innovative than in commerce and other type of services with less value-added.

6.3.5 Conclusions

The city of Medellin has typically been linked to the narcotraffic; however, it is a region that has shown in the last couple of decades a process of 'continuity in change' (Morgan, 2016). Despite the Security problems caused by narcotraffic and cartels, Medellin devoted efforts to transform the city with the vision of becoming a knowledge city and an innovation hub in Latin America. The plan was very ambitious considering the ongoing war and the high poverty and income disparities. In addition, the connectivity with other regions and countries was difficult due to the location of the region which is in a Valley. The access to the city centre was difficult even for those citizens that lived behind the hills. Although there is still a way to go; Medellin has demonstrated abilities to renew itself and become one of the most important references in terms of regional transformation.

The changes were fostered by regional mayors with strong leadership capabilities which placed the knowledge at the centre of the strategy to overcome social problems. Therefore, hand by hand with academics, the city-region applied academic theories and adopted models of development from more developed regions. Ten years after the definition of the six clusters that framed the economic structure. S3 was considered to be a useful methodology to redefine the regional vocation for productivity and to feedback the cluster initiative of the time with new insights defined by a wider set of stakeholders.

The culture in Medellin is widely known for having a string sense of ownership, which is also true in the participation of regional matters and therefore, definition of regional strategies. In addition, the idea to implement S3 emerged from CCMA, a private stakeholder in charge of governing the clusters and with strong public linkages. The initiative to design S3 was supported

by the government and as a consequence of the efforts from the government and CCMA, the call for participants was extended and the responses for participation exceeded expectations.

The regional scope was defined as Medellin and the Alburra Valley, which is a city-region that encompasses the metropolitan area, where S3 was considered to make more sense than in more peripheral regions. Nevertheless, the concept of S3 was questioned by regional stakeholders due to the focus on STI, while Medellin has shown competencies in services; social innovation; and strong innovation capabilities from the public sector.

The transformation of the region has been widely shaped by social innovation addressed by the public sector; which is aware of the difficulties from the bottom of the pyramid. EPM, for example has a pre-paid system of electricity; metrocable, allows poor people who lives in the periphery to be connected to the city core and other projects such as the electric stairs at comuna 13 strengthen this attempt. Unsurprisingly, social innovation emerged from the conversations about the opportunities for the region while designing S3; because the city still needs to combat problems that remain unsolved such as poverty, underdevelopment, and inequality (Bateman et al. 2011).

The institutional environment, has been built around the 'good governance' of regional leaders such as Sergio Fajardo (Devlin & Chaskel, 2010); therefore there is commitment, trust and collaboration to some extent. With the existence of a wide range of institutions to foster innovation and collaboration such as RUTA N and the university-business-government committee. Key players are domestic business units in industries like fashion and IT. Although the prevalence of an economic elite is argued to shape the course of regional policies; and to be the centre of the

willingness to adopt regional changes (Franz, 2017) strategies like S3 have shown a high degree of inclusion.

The foreign consultancy that led the process is based in the region (the regional reality is summarised in Table 23); therefore, there is knowledge of the regional reality and culture to some extent. However, some interviews agree that regional leaders had to reorientate the process to adapt it to the regional reality in different occasions; especially regarding the innovation capabilities.

The results of the strategy were four broad areas and one transversal area (entrepreneurial region). The interviews show that the reason to have such broad areas was political, however, the projects expected to be addressed were more specific. Always addressing regional transformation and economic development over innovation. However, the selection of few key projects was essential due to financial restrictions.

The EDP was place-based and focus on the transformation of Medellin to a knowledge hub and an entrepreneurial region; the six clusters were redefined based on the insights from S3.

Table 23.

Regional reality of Medellin based on three dimensions.

Governance and Institutions	Industrial Structure	Regional Innovation System
Degree of centralisation/ Autonomy Centralisation of funds at the national level. Decentralisation of regional strategies and development plans. **History of Regional Innovation Policy**	**MNEs** The region is seeking for involvement of knowledge related FDI to finance their innovation projects. However, the investment is still limited. The region offers few geographical incentives for manufacturing MNEs to get installed in the region. **Domestic firms**	**Domestic demand for innovation:** Lack of domestic demand for innovation. The region is expected to be a hub for international demands. **Innovation activities** Institutions such as RUTA N foster entrepreneurial innovation. Despite de diffusion of innovation

The region is experienced in regional strategies for decades. The regional transformation has been fostered by regional leaders and has been continuous in change. Experience in participatory approaches. Especially with economic elite, private organisations, academia and the government. **Institutional environment** In terms of regional strategies, the environment is of trust and collaboration, which has been built through the years of positive experience with transformation. Prevailing economic elite, which is concerned about regional matters and that has promoted and supported change. Support organisations and committees as well as a regional development agency have accompanied the transformation process.	Domestic firms are strongly influenced by the cluster initiatives. The main companies are domestic-owned and entrepreneurship has been strongly fostered for the last decades, therefore there is an emergent set of micro enterprises. **Informal economy:** The informal economy is high, and has been fostered by the post-liberalisation industrial policies. 50% of economic activity is in commerce, of which 40% is informal (Mejía, 2018) **Degree of specialisation.** Specialisation in old industrial sectors. Diversification towards services and STI-based activities.	concepts and innovation activities taking place from public initiatives (especially social innovation) STI capabilities of domestic firms remain weak. **Type of innovation:** Limited innovation capabilities Innovation is mainly in services. Incremental innovations are more common than radical ones. **Collaboration** Strong links between government and academia as well as government and business; the linkages between universities and business need to be strengthened. In general, there is a collaboration culture for policymaking.

6.4 Conclusions from both Case Studies

To conclude this section, the case studies present two large metropolitan areas in Latin America that have taken different approaches towards regional development; however, both have used S3 as a regional strategy. In both cases, the overspecialisation led to a risk; in SLP, a lock-in risk and in Medellin, the lack of competitiveness. After that, the overall strategy in SLP after path importation from FDI has been upgrading in the GVC where it is embedded and diversifying in activities within the existing sectors. On the contrary, Medellin has followed unrelated diversification strategies, based on the vision of institutional entrepreneurs. The strategies in each

region are shaped by the regional context. Table 24 provides a comparison of the regions and their approach to S3:

Table 24.

Comparison between the two studied regions.

San Luis Potosí, México	**Medellín, Colombia**
State-Region	City-Region
2.58 million inhabitants (2015)	2.46 million inhabitants (2015)
Economic activities: commerce, real estate, manufacturing of machinery and equipment, construction (and others)	Main activities: financial services, real estate, commerce and tourism, construction, electricity, gas and water and manufacturing industry
Main industries: Manufacturing of auto-parts and Food Processing	Main industries: Food and beverages and other manufacturing industries
Main clusters: automotive and logistics.	Main clusters: 6 main clusters with 28% of employment
RIS 3 at State Level, all states in Mexico were asked to prioritize for the innovation agendas in 2014 and micro-regional level 2019.	RIS 3 at city-region level in an experimental way (First in Bogotá and Medellín)
S3 process considered to find the regional economic vocation.	S3 process considered to rethink the cluster strategy and promote regional productivity

Note: Own elaboration based on: Interviews; CONACYT 2014a, b; Morisson & Panetti, 2020; and in-site observations.

The structural and innovation characteristics of both regions lead to their positioning within different classifications of less developed regions (see Chapter 4) in which a set of policies is suggested:

Table 25

Classification criteria	Type of region	Case Study	Theoretical Objective	Policy recommendations
Level of development	Intermediate region	*SLP* *MED*	Promote innovation-related activities	Foster non-R&D related innovation. Increase basic research activities at firms. Focus on short-cycle technologies. Education to increase absorptive capabilities. Select adequate FDI. Ensure the existence of support organisations.
Industrial structure	Old industrial region dependent on FDI. Domestic firms mainly in services.	SLP	Diversification	Connect with better performing regions. Focus on entrepreneurship for diversification. Search for niche advantages. Increase STI investment. Explore path importation and renewal. Encourage upgrading of domestic sectors. Foster spillovers.
	Old industrial region in the process of transformation to services.	MED		
Leve lof income	Middle-income region	SLP MED	Missing	Focus on short-cycle technologies. Foster demonstration spillovers. Support real opportunities. Generate a formal institutional structure that promotes innovation
Geographical size	Large region	SLP MED	Not considered in the literature.	Integration of challenges
Degree of urbanization	Metropolitan	SLP MED	Increase connectivity, integration	Promote knowledge Exchange. Enhance related variety. Foster connectivity between organisations.
Development of RIS	Less developed, immature or emerging RIS	SLP	Foster linkages between existing stakeholders and create	Proper involvement of key partners Link knowledge institutions and industry. Strengthen institutional environment

			organisations to foster innovation.	Strengthen organisational thickness. Funding private-public consortia. Funding coordination centre. Explore new path opportunities (due to the lack of innovation policy intertia) Explore synergies between stakeholders.
	Immature RIS	MED		Link knowledge institutions and industry. Involve international key partners. Explore new path opportunities (due to the lack of innovation policy intertia) Explore synergies between stakeholders.
Cognitive distance from technology frontier	Region further from the technology frontier/ Knowledge periphery	SLP MED		Co-invention in the application of GPT (training policies to build co-invention capacities).

Note: Author's elaboration.

However, the regions differ in soft aspects such as institutional environment, experience with place-based approaches and place-based leadership. In addition, the rationale to implement S3 was decided at the regional level in Medellin while it was imposed in SLP, which affected the degree of engagement and therefore, the wat S3 was implemented. In fact, the interviews provide information about the process of S3, for which, the RIS3 platform [65] provides information about the phases of the process, which are used as a tool to compare both cases from the literature to the practice (See table 26).

[65] Smart Specialisation (europa.eu)

Table 26.

Phases of Smart Specialisation Strategies

Phase	Theory	San Luis Potosi	Medellin
1.Governance	Engagement of stakeholders from the quadruple helix. If regional stakeholders are not engaged in the formulation of the strategy, they are less likely to take ownership of the resulting Smart Specialization strategy, leading to reluctance in following or implementing it. This can ultimately render the entire process ineffective.	Triple helix level. Representative of the main helixes and important regional businesses. Entrepreneurs, knowledge users and representatives from regions beyond the capital region were missing. Lack of implication, lack of sense of ownership.	Triple helix. Included institutional organisations that spoke on behalf of the fourth helix. Those who did not attend were represented somehow by the institutional organisations. Implication and sense of ownership.
	The governance structure is suggested to be composed by: **1.Steering group:** composed by members of the triple helix in charge of the overall success. Ideally 15 members. Gives political and institutional support, supervises. **2.Management team:** Implementation, progress reports, fosters regional consensus, network with other regions. **3.Working groups**: sector-based, especially to engage business	The governance structure was the following: **1.Management Committee:** Institutional presence, present when the project started and when it was launched. Only public stakeholders. **2. Advisory Group:** The members of the management committee, other knowledge institutions, State ministries, one Business Chamber and three business, in two out of the three sectors prioritised. One of them,	The governance structure was the following: **1.Directive Committee:** Agreement on executing S3 strategy. Institutional presence. Four stakeholders, including private and public members. **2. Executive Committee:** Group in charge of the project implementation, mainly institutions representing the triple helix. **3.Advisory Committee:** Included

Phase	Theory	San Luis Potosi	Medellin
	community, offer information.	manager of a foreign-owned firm. **3. Sectoral workshops:** Once the priorities were selected, more organisations around the sector and business were invited to validate and determine the projects. One group per sector.	five private companies and extended to three knowledge institutions. **4. Working Groups:** Members of the business sector, especially those belonging to the six clusters and entrepreneurial activities.
	Consensus building is important for the awareness of the project, sense of ownership and being able to have an impact on the priority setting of the project. Stakeholders must have a sense that their input is appreciated and if affects the overall process.	Limited consensus building. Foreign consultancy acted as the owner of the process and stakeholders felt their conversations were not reflected but that those with more regional power decided (more of the same).	Difficult consensus building due to the number of participants. However, there was a general common vision. There was the feeling of conversations not reflected by the sectors that were not prioritised. Some confrontation but a regional strategy did emerge.
2.Analysis of the context	Regional assets	Hard data provided by the Ministry of Economy and other data sources. Opinions of participants.	Hard data and the active participation of regional members to ensure the strategy reflected the regional reality.
	Dynamics of entrepreneurial environment	Not considered.	Considered especially through RUTA N and considering that the region aims to become an entrepreneurial area.
	Linkages with other regions and positionality (competitive position)	High linkages with other Mexican and international regions in the automotive sector. The positionality was	The future positionality of the region as an innovation hub was considered. However,

Phase	Theory	San Luis Potosi	Medellin
		only considered regarding such sector.	linkages with other regions are limited.
3.Strategy Formulation	Build a common vision that should be a shared image of the region's future. That would ensure that stakeholders are committed to the vision and can benefit from it; want to contribute.	The lack of sense of ownership led to different visions, lack of commitment and the feeling that the contributions are not taken into consideration, also affected by previous experiences.	Besides some confrontation in the priority setting and the process; there is a common vision for which stakeholders are committed to. Previous experience affected in a positive way.
4. Priority setting	The type of priorities can be a) technological, sectoral or cross-sectoral b) horizontal, supporting priorities. The priorities must be selected based on existing strengths of the regional economy and emerging opportunities within. Entrepreneurial knowledge is acquired by engaging stakeholders. Selecting too many priorities leads to fragmentation of efforts, which result in a little contribution for the competitive advantage. Mistakes include investment in powerful lobbies to preserve status quo.	CONACYT, at the National level, pre-selected sectors aligned with the National Development Plan. From those, State-regions were in charge of defining the priorities (between a few key stakeholders) and validated with firms and institutions in the selected sectors. The selection was based on hard data and the perception of opinion leaders. Therefore, the priorities were catalogued as "obvious" and "inertial". There were a couple of projects such as a molds, tools and dies cluster that will benefit the auto-parts industry and may lead to diversification.	The priorities were selected by a wide range of stakeholders. Therefore, generic names were given to them, which ended up in a broad strategy where "a train could fit in". Then, the specific projects were defined by the participants. In general, the priorities were considered to reflect a real discovery and reflected the conversations.
4.1 Principles	**Granularity:** No sectoral prioritisation (old-fashioned industrial	Sectoral level priority and the projects followed the innovation	Sectoral level priority with projects in diversification domains

Phase	Theory	San Luis Potosi	Medellin
	policy) or too detailed (horizontal policy for micro-projects) but "mid grained" with new activities and projects that involve groups of firms or new domains within an industry.	ideas of individual firms and institutions. No critical mass in one of the priorities (energy) where the opportunity was considered due to the solar impact in the region.	within. Some projects did not represent a growing sector but a sector in which the region wants to excel.
	EDP: Distinction of S3. Vertical priorities are not simple innovations by individual firms but target activities within and between sectors. Generate spillovers and structural changes as the main outcome. Structural changes are based on related diversification and include transition yo new domains; modernisation through GPT and diversification.	The entrepreneurs were mainly business and a few research centres that brought knowledge and opinions. The domains selected do not have the potential to generate structural changes, therefore, are not real discoveries.	The priorities seem to be broad at the beginning but the projects do reflect options within the priority sectors in which the region can be transformed.
	Temporality: priorities emerging today will not be supported forever. Change in 3-4 years.	The project did not have continuity.	The efforts of S3 have not been made again. However, clusters have changed aligned with the S3 priorities.
	Inclusive; Not based only in most dynamic and productive domains but those with less dynamism where structural changes are needed.	Not inclusive, not all sectors had the opportunity to participate as they were not involved in the governance level where the decisions were made.	Inclusive, 80% of the economic force is embedded in the clusters that participated (with the firms within them). Also entrepreneurs were represented.
	Experimentalism and need for evaluation	Not experimental, more of the same. The process of S3 was the first of its kind at was considered a step further for	Certain degree of experimentalism. The whole regional strategy has been re-evaluated after S3. The process of

Phase	Theory	San Luis Potosi	Medellin
		participatory approaches.	S3 was an experiment at the regional level but participatory approaches had been made before.
5) Policy Mix	Not in the scope of this research		
6) Monitoring and Evaluation	Not in the scope of this research		

Note: Author's elaboration.

The table shows that each region has approached S3 in different ways and shaped by the regional conditions and culture. Therefore, despite the similarities between the regions in some historical trajectory, language, size and urban dynamics; the main differences were reflected in the sense of ownership, leadership and the informal institutions. Table 27 summarises the main soft aspects that affected the S3 strategies in the studied regions.

Table 27

Soft regional characteristics affecting the S3 strategy

Topic:	San Luis Potosi	Medellin
Institutionalisation	Several actors (organizational institutions) with repeated functions in certain areas. Weak informal instututions: mistrust in the government, weak linkages.	Several actors (organizational institutions), emergent public-private actors. Strong informal institutions: Trust in the government and the ways in which the city has been run in the last decades.

Topic:	San Luis Potosi	Medellin
	Vested interests 'some left when their sector was not reflected as a priority'.	Disappointment from business and organisations in sectors not reflected; but kept participating.
Centralisation	Predefined by the government and validated by participants. 'Nobody owned the process'.	Regional institution decided to implement the strategy. Perceived as accurate for the region.
Call for participants	Poor participation. Main motivation: accomplish a duty. Companies argued there were too many reunions and a lack of time. The actors from the same organisations were rotating, which difficulted a continuity.	High participation. Main motivation: Need for change. Institutions to speak on behalf of those that could not participate. The same actors that represented specific organisations were committed to the strategy.
Shared Leadership	Formal leadership from government actors that needed to deliver results. Consultancy firm took the leadership role due to a lack of regional leadership.	Different leader institutions in a shared leadership environment despite some confrontations. Emergent leadership from different regional actors. Academic experts that lead new trending topics have participated in defining the vocation of the city.
Novelty Management	'Conservative forces hinder change and new ways of doing things.' Embrace new theories and tried to involve different stakeholders but the degree of participation and commitment was low. S3 was confused with a regional development strategy from the	The region has experienced different way of structuring their region and prioritsation. It has also diffused the concepts of competitiveness and innovation. S3 was confused with a regional development strategy and lost the

Topic:	San Luis Potosi	Medellin
	beginning and tried to focus on innovation projects at the end. Participants complained about the number of theoretical meetings.	innovation focus through the process. Participants from business complained about the number of theoretical meetings.
Path-Breaking	'More of the same' The city has experienced a lock-in since the entry in international global value chains, which define the regional strategy.	Medellin has experienced structural changes recently. An example of path-breaking and public innovation.
Perception on results S3	Too narrow. Focused on the same strong sectors that have been supported. Political reasons have led to narrow results (shaped by strong actors).	Too broad. 'A train fit in'. Needs focus. Political reasons have led to broad results (everyone in).

These results are aligned with recent research in which a methodological 'one size fits all' is criticised (Benner, 2020) and the recognition of the regional uniqueness calls for a balance between the uniqueness of the regions and an universally applicable approach to S3 (Kristensen & Pugh, 2022) as a response to the critiques about the difficulties to generalise the approach (Radosevic et al., 2017). The following chapter will discuss the regional characteristics that have shaped S3 in both case studies.

Chapter 5. Discussion and Conclusions

Chapter 7. Discussion and Conclusions

7.1 Introduction

EEG and RIS that have been increasingly concerned on providing policymakers with tailored policy recommendations (see Asheim, Boschma, & Cooke, 2011; Balland et al., 2018; Isaksen, Tödtling, & Trippl, 2018; Lambooy & Boschma, 2001).

In the Global South, contextual elements have implications for potential regional development strategies that are not frequently discussed in the mainstream European and North American literature (Dunford et al., 2016).

The objectives of this research included looking through the lens of strategy the process of entrepreneurial discovery process in non-European context. As explained in the methodological chapter, this study compares two large metropolitan Latin American regions with similar structural characteristics but different institutional arrangements. The information collected included desk research, regional documents and interviews with relevant regional actors that participated in the S3 strategy.

The case studies present two regions that started with activities such as mining and agrifood. Both regions suffered similar pressure from the so-called Washington consensus[66] and liberated their economies by the 90s after import substitution policies. Another similarity is that

[66] Since the late 1970s and coinciding with an economic downturn in Latin America, international organizations and scholars have been promoting neo- liberal projects commonly known as 'Washington Consensus' policies (see Saad-Filho and Johnston, 2005; Williamson, 1990). These reforms produced shifts in economic development policy away from import-substitution industrialization strategy toward the deregulation, liberalization, and privatization of Latin American economies. Three decades after, research, (i.e. Weisbrot, 2006; Bateman et al., 2011) consider that the failure to deal with the link between extreme poverty and inequality, on the one hand, and violent conflict, on the other, has caused much serious regret in many parts of Latin America.

both regions have large territorial extents that reflect different socio-economic realities and that have led to a large informal economic sector.

Geographical factors vary between the two regions. San Luis Potosi benefits from a strategic geographical location, equidistant from the three main Mexican cities and the three main ports. It is also intersected by the main highway that links Mexico City with the U.S. border. In contrast, Medellin is situated in a valley surrounded by mountains, making it challenging to connect with other regions and even internally. The people living behind those mountains and hills have difficulty accessing the city center. Geography remains a significant factor, particularly for foreign investment. San Luis Potosi has important economic implications for Foreign Direct Investment (FDI), while Medellin is making efforts to attract FDI, particularly in knowledge-related sectors.

While the industrial policy in SLP has followed the natural growth from foreign investment and focused on attracting more FDI; Medellin has an active policy strategy to renew itself and to avoid the logistic limitations by becoming a knowledge city and attract knowledge based FDI. Such efforts included new institutional arrangements, collaboration between the different helixes and the creation of centres and economic zones that promote innovation. Those policies have been accompanied by a strong education focus and connectivity with the most marginal areas. One of the interviews emphasises this point, '…to take the production outside of Medellin is very costly due to the geographic location; therefore, the region had to sophisticate the services that are not limited by logistic restrictions and to make products that are good enough to be exported at high prices' (Interview 33).

The historical path has led to the current industrial structure in both regions, which in the context of S3, is important to understand the regional stakeholders that enjoy a more powerful position. In the case of SLP, foreign multinational firms shape the regional strategy. The interviews reveal that they are aware of that power position and use it to press the government to make policies that benefit their sector. The presence of those powerful groups is not necessary as the government would 'speak on behalf of them' (Interview 2). However, they did participate in the strategy design; defining the priorities and identifying the projects that would benefit both, the companies they represent and the region. The argument was that even if the origin of the capital is foreign, most companies have national or regional managers, who indeed, are interested in participating in regional matters[67].

In the case of Medellin, the industrial structure was organised around the six clusters that belong to the CCMA. Therefore, that institutional actor, the CCMA holds a high-power position in the region. In addition, Ruta N, as the regional development agency is considered an example of the innovation potential of the region and the reference for innovation policymaking matters. Therefore, in the case of S3, RUTA N, performed a strategy years before S3 to identify the innovation opportunities for Medellin held a power position which in fact, helped to contrast the results. In addition; academia has played an important role designing regional policy in Medellin, and assuring that the process was as close to the literature as possible. The definition of the cluster strategy for which important international scholars participated was an example of the importance the region devotes to academia.

[67] Kroll (2017) made a study in which he finds that in European less-favoured regions, multinational subsidiaries typically do not engage much in S3 (p.13).

This study does not intend to evaluate the quality of the S3 process carried in each region through monitoring mechanisms such as the assessment wheel provided in the EU-S3 platform. But to unveil the contextual aspects that shape the S3 strategy; especially those soft characteristics such as centralisation, institutions, and leadership; as well as to include the systemic and evolutionary view on the analysis and including a strategy perspective.

The conclusions from the research are divided in different categories to organise the results; finally, this section is closed with policy implications; limitations; further research and general conclusions.

7.2 Discussion from the Strategy Perspective on the Two Studied Regions

Economic geographers[68] have nurtured the concept of S3 in the last years. Therefore, the literature is "less aware about studies on strategy processes and related agency" (Sotarauta, 2018:2). In a similar line of thought, Bailey et al. (2019) argue that strategic management literature can contribute to place-based strategies for value creation but also for value capture. By considering three different perspectives, that of government representatives, business, and knowledge institutions (triple helix); this research sheds light on different aspects that can be analysed from the strategy perspective. Table 28 summarises the findings in both regions concerning the strategy concepts embedded in the S3 strategy.

Table 28.

Findings from both regions from a strategy perspective.

[68] According to Foray (2019) at the beginning, the concept was built by innovation economists, macroeconomists working on endogenous growth and econometricians specializing in the measurement of R&D and productivity. Then, experts on regional economies added the spatial dimension to the conceptualisation. (p.7-8)

Strategy Concept	San Luis Potosí	Medellín
Resource-based view: Analysis of the regional assets and capabilities.	Weak endogenous analysis of regional assets and capabilities. The regional advantages are mainly based on the regional location. The funds devoted for innovation are a combination of national and regional budgets. The approach through S3 ended up in more horizontal policy fostering few projects rather than promoting innovation capabilities and especially absorptive capabilities. The region has focused on the capabilities for supplying foreign-owned firms.	Strong endogenous analysis of the regional assets and capabilities as well as the regional potential to reach a clear goal. Although reforms have been made on education a building a system in which innovation and opportunities can emerge, the innovation capabilities of regional citizens are rather limited, therefore, the region is getting human capital from other regions. In addition, there are financial restrictions both, at the private and regional level.
Competitive approach: Porter (1990) suggest searching for an advantage in cost/ differentiation or niche market. global innovation economy regarding Global Value Chains (i.e. Radosevic and Ciampi, 2015; Rakhmatullin et al., 2016) and the distance from the technology frontier (i.e. Radosevic et al., 2017; Lin, 2017).	The positionality of the region in a global economy was not considered. The GVC in which the region is embedded (auto-parts) limit the existence of technology spillovers and require large efforts to get domestic firms involved. There was not clear leadership position aimed, except for the goal of obtaining FDI and be more attractive than other surrounding regions specialised in the same industries. The positionality of domestic firms was not considered.	Medellin is searching for a differentiation strategy in which the products from Medellin reduce cost-sensitiveness due to the complicated logistics from the regional location. Public companies, have searched for innovations that search for a cost advantage within the region; for example, in electricity services in order to provide a better life quality for the citizens.
Strategic Fit/ Strategic intent: Used to analyse if S3 goals fit the regional characteristics.	"S3 should think about technology extension policy instead of innovation policy" (Interview 16). The region is embedded in specialised technological activities in the auto-parts GVC. Old-industrial domestic sectors. Lack of	The transformation of Medellin has followed a path of years and continuity along different Majors. S3 was the next step to reconsider the regional productive policy; in a region that aims to become an

Strategy Concept	San Luis Potosí	Medellín
	entrepreneurial environment. Lack of engagement for participatory approaches.	innovation reference in Latin America.
Dynamic capabilities:	The region experiences a lock-in process from an industrial perspective. In addition, the way of doing things and "conservative power leaders" lead to a lock in in policy making. Therefore, dynamic capabilities are considered to be low.	The region experiences financial challenges to accomplish their goals. However, in the last two decades it has proved important dynamic capabilities both in policymaking, building an innovation system (avoiding status quo) and sifting the industries towards a knowledge economy.
View on strategy: Wittington (2001) distinction between classical, processual, systemic and evolutionary views.	A classical top-down approach, taking into consideration an existing process that was considered relevant to find the regional vocation. The systemic perspective was explored by involving different stakeholders in the decision-making, but the institutional environment avoided to have a more systemic view on the strategy. However, the most appreciated aspect of S3 was the innovation of considering diverse stakeholders. The evolutionary perspective on the regional strategy, stemming from the analysis or decision-making, was not taken into account.	A systemic strategy that was performed in a region where the assets were placed. The process was adapted to the regional characteristics along the way. The evolutionary view was also considered for policymaking, and it was also conditioned by prior experiences, mainly positive, which leveraged the level of trust, sense of ownership and participation. Different perspectives were considered for developing S3.
Entrepreneurial Discovery Process as a pattern (Mintzberg, 1978, Mintzberg 1985)	Deliberate/ intended strategies to meet the needs of individual firms and sectors. Horizontal strategies target specific types of projects. S3 was another intended strategy such as different development plans, where just a few the intended strategies are realized.	Horizontal strategies focus on generating deliberately emergent activities in which conditions for the emergence are set. Vertical priorities are deliberate/ intended strategies.

Strategy Concept	San Luis Potosí	Medellín
		The regional strategy has been evaluated every certain time periods when the emergent strategies are considered enough to change the route of the strategy. The same is intended for S3.

Note: Author's elaboration

The above table shows that despite being the same strategy with similar methodology; the way in which the strategy was designed varied in both regions.

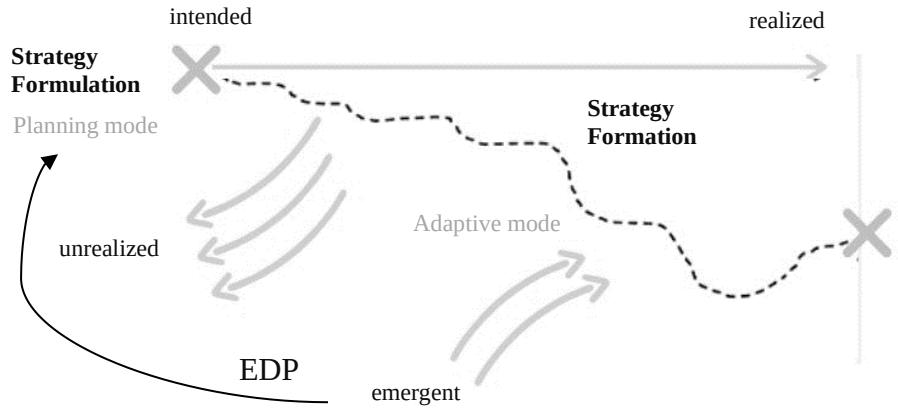
The S3 proposes building a competitive advantage on regional specific strengths, potentials, and opportunities, rather than doing as others do. The examined case studies regarded the interregional dimension as a source of knowledge, innovation, and finance, but not from a competitive standpoint. This was also the case when comparing with other regions within the countries where they are located. Hence, the approach to the strategy is more aligned with the resource-based view of strategy in both instances. In addition, the objectives of the strategies were not understood as structural changes based on related variety; but instead, it was a process of exploring the regional strengths. In Medellin, where the change has been continuous for the last decades, S3 served as a process to evaluate the cluster strategy; while in SLP, the strong sectors are well-known, therefore, a discovery process did not take place but a process of validation.

The strategy literature is useful for a better understanding of S3 and particularly, the Entrepreneurial Discovery Process. For EDP, when the strategy is seen as a pattern (Minzberg, 1985). In the view of strategy as a pattern, deliberate and emergent strategies are identified (See Figure 8); and the EDP is expected to discover those emergent strategies taking place in the region, for which the knowledge from different stakeholders is required. This view of strategy is also

important to discover the opportunities based on unrelated variety such as in the two case studies, where SLP experience path importation from FDI and Medellin diversified from mining to fashion by manufacturing the uniforms for the mining employees. Those emergent opportunities detected or discovered, feedback the strategy formulation and design, which is expected to be modified en route, such as the adaptive mode suggest; and that has been emphasised in the S3 literature (Kleibrink et al., 2016, 2017). Therefore, the role of the EDP is a continuous process that requires continuous adaptation, that is why this view of strategy is suggested in dynamic environments (Mintzberg, 1978) such as the regional environment.

Figure 8.

Strategy as a pattern and the EDP



Note: Author's elaboration adapted from Mintzberg (1985).

The problem with the adaptive mode, is that the S3 process requires huge efforts to get a wide range of stakeholders together, and financial resources devoted to the design; additional to those policy instruments to support the opportunities detected. Therefore, despite the bottom-up character of the strategy, there are some decisions that remain to be top-down. In the case studies,

for example, those adaptations in which less stakeholders were involved are noticed in both places. In SLP a group of researchers adapted the S3 process to each micro-region; arguing that peripheral and rural areas were neglected in the first attempt to implement S3; in Medellin, the CCMA, Town Hall and few intermediate organisations redefined the cluster strategy aligned with the S3 results; therefore, the EDP is revealed by the knowledge of a few key stakeholders.

A part from the importance of considering strategy as a path to understand the dynamics of the EDP; from Wittington (2001), a differentiation is made according to different views of strategy, for which classical, processual, systemic, and evolutionary views are identified. The literature on S3 emphasises the importance of the processual view, in which the systemic and evolutionary views are included (i.e. Sotarauta, 2004, Healey, 2004; Aranguren et al., 2012; Aranguren & Larrea, 2015). One difficulty is to focus on the process when there is pressure to deliver a document in which the priorities is selected (Benner, 2020) which was shown in both case studies; in which the pressure to write a document in which the interest of the different stakeholders (the broad results of Medellin) or powerful stakeholders (MNEs in SLP) were reflected. In both cases, however, S3 was a milestone for place-based strategies.

From the systemic view. In SLP this was the first time a wide range of stakeholders were involved to select the regional priorities; although the process was judged for being top-down, it was the start of a learning process. The interviews reflected that a careful selection of participant stakeholders was missing, which led to different challenges. First, there were missing stakeholders such as entrepreneurs and cluster organisations. Second, the businesses were represented by subsidiaries of MNEs and a few domestic champions in few key industries, which led to lock-ins that were judged for being ‘more of the same’, ‘obvious’ and ‘inertial’. It also led to the feeling of the State validating their already formed decisions while the inputs of other stakeholders were not

really reflected. Thirdly, the different helixes were represented mainly by the head of the participating organisations (i.e. owners and top managers of firms; university directors; institutional directors) while knowledge embodied in individuals that perform specific activities was limited (i.e. faculty directors and researchers in particular fields from the universities) which led to the perception of the process as a 'political process' based 'more on opinions than evidence'. Finally, supporting the argument of Periañez Forte and Wilson (2021), the continuity of the stakeholders throughout the policy cycle was missing; and even worse, at this design phase, the stakeholders were rotating and sending representatives, who were not familiar with the S3 concepts and the decisions that had been made in previous sessions.

In Medellin, the triple helix has a trajectory of the last decades participating in regional matters. There are support organisations such as the university-enterprise-state committee that foster the linkages between the triple helix and the region has been working on strengthening its innovation system. In fact, academia has been highly linked to the development plans; and the business sphere, especially through CCMA has played a key role in regional development policies. However, S3 involved a wider range of stakeholders at different levels, which on one hand, enriched the debates and collective knowledge; and at the same time, difficulted the prioritisation decisions. In fact, participation and engagement was argued to be key for the S3 process.

The systemic view sheds light in the importance of participation and engagement of key stakeholders. Those key stakeholders are not only those with social and economic power, which could lead to policy lock-ins; but those with strategic vision and knowledge. The strategy literature indicates that for designing strategies, both analysis and synthesis are essential (e.g., McKewon, 2011; Mintzberg, 1994; White, 2004); therefore, these capabilities should be balanced among the participating stakeholders.

From the evolutionary perspective, the willingness for change both in policymaking processes and industrial structure differs in both regions. In SLP, the national government decided to implement the SIAs in which S3 was a methodological condition. However, the intention was not transformation but to find the regional economic vocation within a range of selected sectors. The idea of the triple helix was novel for policymaking; but the fact the decision was centralised, led to a lack of ownership of the process, in which regional stakeholders criticised the applicability of S3 to the regional reality. Medellin has followed a transformation path in which policies have played an important role for regional transformation, which has been made hand by hand with academic theories. Therefore, S3 was considered the new wave of place-based policies in which key regional stakeholders got engaged. In addition, the city-region has been emphasising the transformation into a service and knowledge-based economy, for which the goals of S3 fit those of the region.

Th evolutionary perspective shows that in SLP, the lack of interest of doing the things differently and the centralisation of decision making led to similar results than other development policies, which are mainly based on hard data. In contrast, Medellin has followed a path of changes in which S3 fit the willingness to adopt new policymaking approaches as well as an economic transformation. Therefore, the decentralisation in decision making, affects the sense of ownership and engagement with the S3 strategy. In addition, the concept of strategic fit plays an important role to meet the regional goals.

7.3 Discussion about the Role of Actors in Prioritising Regional Economic Domains

The S3 strategy is about vertical prioritisation revealed from the bottom-up EDP. Therefore, stakeholders from the triple helix participate. The power position held by the stakeholders, is a factor that may encourage or hinder a successful S3 process. Uyarra & Flanagan

(2010) call for a deeper understanding of the real role of stakeholders beyond the role that is expected or attributed to their structural functions. The case studies show that in regions with similar structural characteristics, the role of actors varies enormously according to three main factors: the centralisation in the decision to implement S3; regional institutional arrangements; and previous experiences. For instance, in SLP, the lack of ownership of the process derived from a limited role of the regional stakeholders to decide the implementation of S3 led to a lack of engagement by regional authorities; other stakeholders such as universities and the private sector were reluctant to participate due to previous negative experiences in which their inputs were not considered (aligned with the findings of Solleiro et al., 2020) and where the motivation to participate was to protect their own interests (Interviews 2 and 4). In contrast, in Medellin, regional stakeholders from the private sector were motivated about the S3 approach and involved the government in the process. The academia has been historically taken into consideration as a relevant stakeholder for regional development, thus, the diverse stakeholders were motivated about the process. The region has culturally a high sense of ownership, which has a positive impact in the degree of engagement throughout the process. In addition, the positive experiences with regional transformation in the past decades led to a sense of contribution from the different entrepreneurial sources of knowledge. Table 29 analyses the power positions of regional stakeholders in both cases, which are clearly influenced by the factors mentioned above.

Table 29.

Power position of regional stakeholders

	San Luis Potosi	**Medellín**
ACADEMIA		

Universities and Knowledge Centres.	Limited. The heads of the institutions were present in some meetings, missing the participation of those researchers in particular fields. The heads were giving their opinions to prove knowledge in regional matters and there was confrontation especially with some research centres. There were strategic sectors defined due to existence of researchers in the field despite the regional abilities to develop the opportunity area.	Very strong. Academia has played an important role in providing state-of-the-art theories and international trends as well as suggested important scholars to define the regional strategy. Private and public universities are involved in regional policy as well as numerous research institutions specialised in different matters and who had a strong participation.
INDUSTRY		
Domestic Companies	Limited. Some general directors of regional companies participated. The selection of participants from the main industries biased the process towards the industries to which they belong. There were misrepresented sectors, especially in non-manufacturing activities.	Very strong. In Medellin, the main industry actors are domestic. Both private and public firms. Sectoral leaders played an important role in defining the strategy and motivating the participation of other industry stakeholders.
Foreign-owned firms	Strong. There were a few managers of foreign owned firms as well as innovation directors. The companies acknowledged their power to orientate policy towards their interests and argued that beyond the origin of the capital, those companies are the ones that invest in innovation and participate with the government because they need infrastructure and supplier development, which benefits the region.	Limited. The region is seeking to attract STI-related foreign capital. However, most of the important business in the region are domestic. Therefore, the role of the few foreign-owned firms was limited.
Entrepreneurs	Weak. The sector was mis-represented, and no business incubators were involved in the process.	Limited. Few entrepreneurs participated, however, there were associations that know the needs of the entrepreneurs and the interviewed participants agree that

		they spoke on behalf of entrepreneurs.
Clusters	Null. Although the strategy was built around the few existing clusters. The cluster representatives did not participated.	Very Strong. The industrial structure is around the clusters, which were key to motivate the companies that belong to each cluster to participate. The level of motivation and participation was high due to the commitment of the clusters and the involvement of the representatives of clusters was very high.
Industry associations and chambers of commerce.	Limited. One or two participating institutions which did not attend to all meetings.	Very Strong. Especially from the CCMA and other institutions that have played an important role in the regional development strategy and who actively participated in the strategy.
GOVERNMENT		
Major/ Governor	Limited. For formal purposes.	Limited. For formal purposes, but devoted efforts and designated people from the government to implement S3.
Ministries	Passive. Ministry of Economy and Ministry of Economic Development took a more active role, but the representatives changed along the process. Active in presenting regional data.	Active as a regulator and bringing knowledge about the regional dynamics.
Innovation policy institutions	Active. CONACYT led the Regional Innovation Agendas project, therefore the regional representatives were implicated.	Limited. COLCIENCIAS is highly centralised at the National level, the degree of implication in the regional strategy was limited.
Regional Development Agencies	Active as a regulator. COPOCYT helped to regulate the process and bring knowledge about the regional dynamics.	Active. RUTA N Brought knowledge about the process and confronted the consultancy to meet the theory and the regional dynamics at the same time.
OTHERS		

Social organisations	Null. Social organisations did not participate.	Weak. However, social goals were in the top of mind of particpants.
Consultancy Firm	Strong. Led the process, the conversations and the selection of priority areas.	Passive. Controlled only the process.

Note: Author's elaboration based on the Interviews 2016-2018.

The role of intermediaries is important for regional policies (Morgan & Nauwelaers, 2003). The case studies show that the role of the consultancy firm is also important; but differed according to the degree of regional ownership for the process as well as the degree to which the consultancy knew the region. IDOM, which carried the strategy in Medellin, has subsidiaries in the region, where local workers with deep knowledge on the regional reality work, which included the sensibility to the regional issues and culture. In addition, the same consultancy had implemented the strategy in Bogotá previously. ndra, which was responsible for the strategy in SLP, was perceived as an outsider attempting to establish priorities for the region without adequate knowledge of it. The support to the consultancy firm by regional actors for the call of actors, their motivation and the diffusion of concepts also differed in both regions and conditioned the consulting process.

Table 30.

Summarises the role of each type of actor according to the case study analysed.

Helix	**Type of stakeholder**	**San Luis Potosi**	**Medellin**
Government	Head of government	Just formal participation, not involved in EDP.	Just formal participation, not involved in EDP.

Helix	Type of stakeholder	San Luis Potosi	Medellin
	Ministries	Weak. There was no sense of ownership or process appropriation. The Ministry of Economic Development and Ministry of Economy participated in providing information.	Limited. There was a sense of appropriation of the process and the Ministries acted as facilitators with a more passive role.
	Innovation policymakers	High. In Mexico, CONACYT is in charge of innovation policy and the regional representatives were highly involved. In addition, COPOCYT is in charge of regional innovation funds and actively participated in the process.	Low. COLCIENCIAS which is in charge of innovation policy did not define the strategy in any sense. The decision of implementing S3 emerged from the private sector; therefore, it was not a project of COLCIENCIAS.
	Regional development organisation	There is no formal agency for regional development and innovation.	Ruta N played an important role as institutional entrepreneur and provided valuable information about the regional realities and capabilities.
Knowledge Institutions	Research Centres	Strong power position, few research centres with innovation projects which were able to impose their interests. They did actively participate in the project definitions for the EDP. The directors and projects are regional.	In the last decades, different research centres have been created and widely supported by the regional government. Their role is important, but due to their. The directors and project are regional.
	Universities	Weak power position. The universities are	Strong power position. The strategy in Medellin

Helix	Type of stakeholder	San Luis Potosi	Medellin
		considered to go at a slow pace and make small contributions to the regional economy.	has followed closely academic theories.
Private sector	Institutions/ Organisations	Presence of some business chambers. The actors that participated did not have a constant participation and attended one or two meetings only. They spoke on behalf of the companies represented instead of contributing for the call of participants.	Very strong. Indeed, the decision of implementing S3 started from one of these stakeholders. The industrial arrangement allowed the clusters
	Clusters	Did not participate	Very important. Besides speaking on behalf of the sector represented, their crucial role was engaging the companies that belong to the clusters in the process.
	Foreign-owned firms	Very strong. Their regional power shapes the strategies and priorities in the region.	Weak. Most of the participants were national.
	Domestic firms	Limited. Important participation of the key regional leaders, especially in the food industry. Not all the visionary domestic businessman participated due to a lack of trust in the outcome of their participation.	Strong. Domestic firms and institutions that covered domestic firms dominated in quantity of actors involved in the process.

Helix	Type of stakeholder	San Luis Potosi	Medellin
	Entrepreneurs	Not present or represented	Represented through incubators and other associations.
Consultancy	Foreign consultancy firms	Important role. Need to take the leadership on the process and the content of the strategy.	Limited role. Facilitator and process leader.

7.4 The Human Factor of S3 and Leadership

To analyse the role of actors, is important to mention that S3 is about people. The institutions and companies are ultimately represented by individuals, their opinions, knowledge, aspirations, and commitment. Aligned with researchers that consider that the human factor in place-based policies is important, and place leadership as a determinant.

First, as expressed by Aranguren et al. (2015), there are different types of leaders. The authors distinguish between formal leaders which hold important positions within a region but also distinguish the process leaders and the content leaders. In both of the studied cases, the process leaders included the consultancy firm and a few institutional organisations that held knowledge about what S3 was about. Content leaders are those with the knowledge about specific fields, which are especially relevant in the EDP. However, a careful selection of those leaders is important. For example, a university rector will have different opinions than the researcher in a specific field; the same in business, where a shareholder will not have the same knowledge as the innovation director of a multinational firm. Therefore, selecting the people that is holder of the entrepreneurial knowledge becomes a key factor in S3.

In a similar vein, researchers have increasingly demanded consideration of the human factor in regional studies (Aranguren et al., 2015; Collinge & Gibney, 2010a; Gibney, 2011; Sotarauta, 2005). Collinge and Gibney (2010) argue that the role of leadership for economic development 'still receives insufficient attention in an ongoing debate around policy prescriptions that remains heavily informed by "hard" economic theory' (p.380), while softer relational interactions and the power of human agency need to be explored, especially because local and regional institutions and systems are driven by people. Interest in place leadership, considered 'the missing piece in the local and regional development puzzle' (Sotarauta, 2016), has grown in the last decade. Moreover, effective leadership is expected to 'explain how and why some localities are able to adapt and exploit the opportunities afforded by the complex and rapidly changing social and economic circumstances of the modern world' (Colligne et al., 2010, p. 367).

Just like the perception on strategy, the case studies reflect the role of leadership from a systemic and an evolutionary perspective.

From an evolutionary perspective, regional leadership is important for breaking with the past in two senses. First, from entrepreneurial institutions and regional visionaries that are able to discover the opportunity in the sectoral domains, but also, to break with the policymaking inertia. In fact, S3 exercise has had the biggest impact in the countries and regions with the least experience of regional innovation policy in the past. For example, the annual Fraunhofer survey discovered that "policymakers from Southern and Eastern Europe are somewhat more prone to consider S3 efforts a 'paradigm shift in governance' than those from the Nordics and Central Europe" (Kroll, 2017: 21). Similarly, Medellin and San Luis Potosi found that the greatest advance was in including others. In addition, new way of doing things must find a practical way, in both cases, the business complained about the amount of literature and concepts embedded in the process.

From a systemic perspective, leadership is expected to have an impact in the institutional arrangements in a region; at the same time, better institutions allow emergent leadership to take place. Therefore, in S3, leadership is important to develop a shared vision and to cover the gaps in institutional difficulties such as the level of trust, negative previous experiences in policymaking or vested interests. Institutions have been proved to be crucial for S3 (i.e. Gonchar et al., 2017; Kleibrink et al., 2017; Blazek et al., 2014b; Trippl et al., 2019; Radosevic, 2017).

Apart from institutions, another factor that fosters regional leadership is the degree of decentralisation in decision-making. For example, in Medellin, the decision of implementing S3 was taken by regional stakeholders while in SLP it was decided at the national level and somehow imposed at the regional level. In addition, the sector was conditioned or pre-selected according to the National Development plan. Those factors directly impacted the sense of ownership regarding the strategy. In fact, no regional stakeholder felt as the owner of the process except from the foreign consultancy which had to take a leadership position in absence of a regional leader.

7.5 The Challenges for S3 in Latin American Large Metropolitan Regions

Since the concept was launched, academics have aimed to help regions to start these processes. But especially in 2014 and 2015, when some results from these experiences became available, there has been a shift in the literature towards understanding the difficulties faced by regions in their implementation processes and how such difficulties can be overcome. Following Coffano and Foray (2014), most regions are moving from the ‘easy-to-do’ structural analysis to ‘hard-to-do’ entrepreneurial discovery and they are struggling to achieve this. Kevin Morgan (2013) argues that S3 presents three different challenges: conceptual, operational (concept to practice) and political.

Conceptual challenges: Smart Specialisation is recognised as an example of policy running ahead of theory. The concept of smart specialisation is novel, it is called specialisation but is about specialised diversification. In addition, the interviews show that the stakeholders had different perceptions on concepts such as innovation, especially in SLP. In Medellin, organisations like Ruta N have spread regionally the concepts and the regional development plans have been closely advised by academic, therefore, the challenge was larger for SLP. Nevertheless, concepts such as the entrepreneurial Discovery process and what an entrepreneur means in S3 in contrast to the common business vocabulary was somehow confusing in both cases. A common language is required in the city, so that participatory approaches such make sense.

Operational challenges: The operational challenges are understood as those regarding the translation from theory to practice which was especially important in the process of adaptation of a particular concept developed in a different context. One of the main challenges is that "S3 is expected to be bottom-up, but at the end, it has a very top-down factor; supporting incipient STI capabilities in regions like Colombian regions is very hard" (Interview 33). In a similar line of thought, emphasis of S3 in bottom-up is questioned given that design of a "strategy" must necessarily rely, at least at the beginning on a top-down approach (Iacobucci, 2014). Part of the difficulties in implementing S3 is the emphasis on bottom-up approaches, required because of private and public stakeholders is better positioned than governments to find the domains in which the region is likely to excel (Estensoro & Larrea, 2016). In SLP, Solleiro and Castañón (2016) and the interviews to people that were more aware of the concept noticed "a gap between theory and practice" (interview 4).

Political Challenges: One of the most important challenges of S3 is due to the novelty in governance. In S3 it was also affected by the lack of credibility on public innovation programs

especially when the government changes and the time and effort to design a programme does not continue. The interest in participation is also an important challenge, for instance, in Mexico, "none of the states conceived the process without the influence of political interests" (Interview 16). Other political challenges include the resistance to select priorities even though data demonstrated opportunities, which in Medellin led to definition of broad sectors that covered most of the regional economy.

Besides those general strategies that the regions face regarding S3; this research sheds light on the challenges faced by large metropolitan regions in Latin America which are explained below:

7.5.1 The Regional Scope

Opposite to the challenges that small countries face in Europe (Charles et al., 2012; Trits et al. 2015), large metropolitan regions in Latin America have heterogeneous realities, present income disparities and are organised around a regional economic core. Palvacini-Corona (2012) for instance argues that comparison of regions with heterogeneous circumstances like those located in Mexico would enrich the analysis of the role played by local economic development strategies in Latin America (p. 202-203).

Both case studies have shown criticism to the fact the strategy was centred in the core region. In SLP, the challenge was stressed by Solleiro et al. (Solleiro et al., 2020) who worked on a second process for each micro-region because the metropolitan area of SLP holds 80% of the economic activity, therefore, the strategy was focused on a small territorial portion with high economic relevance, neglecting the needs of less developed areas. Therefore, the region is based on the State level given that although it is heterogeneous, it is functionally linked to a central pole (the government) which takes decisions (see Scott & Storper, 2007: S192; Rodríguez-Pose, 2008:

1027 and Cooke, 2001). In the case of Medellin, the geographical position of the valley has led to a Medellin-centred strategy, which in fact, was considered from the beginning as the term 'city-region' (Rodríguez Pose, 2008) is typically used in Medellin.

Besides the economic importance, large territorial extensions make it difficult for representatives of the triple helix in other regional areas to participate in the debate due to the time it takes to get to the regional core. For example, in SLP, one of the interviews argued that businessmen or government representatives did not have time to travel for six hours from the peripheral areas of the Huasteca zone to the regional core.

Intermediate regions, for which S3 is expected to work better (Foray, 2019) contain at the same time urban an less developed rural areas (Torre et al., 2020) which are typically neglected from the results of S3, which were cantered in the core urban regions; where agglomeration economies are reached and therefore, more opportunities emerge. In addition, place-based policies for rural and peripheral with organisational thinness; the need to place key stakeholders and foster the links among them and with other regions requires more horizontal policies; while S3 makes more sense to transform industrial trajectories of metropolitan regions. Therefore, this study reflects on the importance of city-region as an accurate regional scope for S3 in large metropolitan regions.

7.5.2 The Informal Economy

Informality is a common challenge for Latin American economies, it represents an average of 50% of the economic activities. Informality includes those young entrepreneurs that have not registered their business or economic activity until the business grows (garage entrepreneurs); service freelancers that do not provide invoice; those commercial activities especially in food or

handcrafted goods that sell goods and services without law regulation; and workers in construction, household activities and other activities that take place without social security subscription.

De Soto (1989) considered informal firms as unappreciated part of the productive economy. Therefore, their role in S3 is important, especially those software and creative industries that start in an informal way. Mechanisms to make them formal in order to be invited to participate in the regional debate are an important topic for reflection.

7.5.3 Foreign Multinational Firms

The case of FDI is nearly opposite in both case studies. In San Luis Potosi, FDI has promoted economic development in the auto-parts industry, which has sophisticated along the years. Although the sector is innovative, most of the activities performed in the region are not innovation-related. In addition, the knowledge spillovers are not easily replicable in other companies because the knowledge is overspecialised and IP protected. Domestic companies are mostly in Tier 3 and have a lack of capabilities to enter the GVC which is covered by foreign-owned suppliers. In total, foreign firms account for about 70% of the total business units in the sector. Solleiro and Castañón (2016) identified in SLP that transnational companies were not interested in making innovations locally or develop innovative local suppliers, so the participation in the smart specialisation strategy was conditioned by the origin of the capital and the sector. In contrast to that perspective, domestic managers of foreign-owned firms assure that they have a key role in engaging the headquarters in more innovation-related investments and do care about regional matters; which sheds light on an opportunity for policymakers to involve them in regional matters while controlling vested interests of few foreign-owned firms, which recognise their power when pressing the regional authorities to protect their own interests. In addition, some regions experiment unrelated entrepreneurship from supplying foreign-owned sectors through activities

such as cleaning, supplying uniforms, logistics, construction and other activities that could represent a regional opportunity.

In Medellin, the regional leaders are domestic firms, which do want to attract foreign FDI but due to the logistic limitations, location is not an attractive region in terms of productivity. Therefore, the aim is to attract STI-related FDI[69] for which the location of Medellin in the Alburra Valley is not a constraint.

In conclusion, the external perspective of the region to connect with other regions is important, especially for catching-up economies. However, it is important to reflect if that would benefit the region in terms of agglomeration externalities. Especially, regarding STI topics. The region must develop absorptive capabilities and an institutional environment through which value can be captured and decide on the type of value chains and knowledge that are accurate for the regional development.

7.5.4 Limited Funds and Capabilities for Innovation Matters

One of the often-mentioned differences between the EU and the non-EU regions is the lack of funds for S3 and innovation matters. Regions can devote efforts to define regional priorities but without a budget that can cover the discovered domains; the region is not likely to be able to diversify.

The budget for innovation matters together with the innovation capabilities have led to suggestions such as that of Barroeta et al. (2017) which suggest that Latin American regions follow a regional specialisation strategy rather than smart specialisation.

[69] This is aligned with the recommendation by OECD (2015) which suggests that "Medellin is a yes" for attracting STI-related FDI.

In practice, both regions missed an innovation focus at the behinning, and the interviews show they are not prepared but for innovation in a broad sense; focus on horizontal policies or take ideas from S3 such as the bottom-up character to rethink industrial policy. However, in Medellin STI was present in the debates, especially due to the goal to become a knowledge-oriented economy in which the region has been working for decades.

In both cases, the interviews reflected an opportunity in niche markets in which the region could excel. Apart from one interview in SLP where the capability to innovate in products if public investment were available; most projects mentioned in both regions as opportunities were non-technological incremental innovations.

The experimentalism of S3 leads to the need of devoting efforts to develop the strategy, monitor it, generate data, and other activities in which many non-European regions have to build from scratch. Therefore, funds availability becomes especially important.

In SLP, a problem that was explained was that public funds were being captured by multinational firms and national champions; which actually had the financial capabilities to do the projects by themselves; therefore, the public funds substitute the private financial capabilities rather than complementing them. This sheds light on a challenge that must be considered when designing programmes that support STI.

7.5.5 The Granularity Level

Mid-grained granularity is expected to be the accurate granularity level because too broad projects or sectoral projects lack focus and do not lead to the specialised discoveries (Trippl et al., 2019: 11) and too narrow projects by individual firms lead to horizontal policies that cover those type of projects. However, the concept of domain that is key for the entrepreneurial discovery

process is widely understudied (Mäenpää & Teräs, 2018). The extent to which a narrow or broader priority fields has also been questioned (Nauwelaers et al., 2014: 12). The experience in the two case studies show contrasting approaches to regional domains. SLP ended up with projects from specific firms and institutions; where the outcomes were perceived as obvious; while in Medellin, the definitions were too broad, but the projects were perceived as actual discoveries.

7.5.6 The Continuity

For the future of the strategy, continuity is not a major concern, however, the monitoring and adjustment of the selections is. Similarily, Guimon et al. (2018) concluded from an analysis of Chile that strategies like smart specialisation, that picking winners strategies are risky but as argued by Rodrik (2005) self-correcting policies are important.

In this experimental approach where emergent opportunities take place and need to be discovered and analysed in time to define the impacts that S3 is generating in the region and that can be different than those intended impacts, monitoring and evaluation become crucial. Not only about repeating the effort of designing S3 in a time period but also *en route*.

Non-EU regions face the challenge of designating institutions to assure continuity; which in European regions is covered by the European Commission. Medellin, for instance, has different institutions that assure project continuity, which then become "written on stone" (Interview 32). Although changes in the government leaders take place, the institutions which are already committed to the realisation of projects put those projects into debate and typically continue or adapt to new challenges. In contrast, in SLP, the projects have 3-6 years period to be realised because with government changes, some programmes continue, especially those that belong to national institutions, but the overall strategy changes.

7.6 Conclusions

This research aims to develop a Conceptual Framework of Smart Specialisation for Developing Regions considering the main contextual elements that shape the S3. This study was designed with four main goals. The first is to contribute to the understanding of the Entrepreneurial Discovery Process from a processual perspective. Second, to explore the role and power of actors for the determination of regional strategies and priorities. Thirdly, to shed light on the regional innovation system characteristics that affect the design of S3. Finally, to add evidence on intermediate large metropolitan regions from a non-European context.

In this section, a response to the research question is addressed: How can Smart Specialisation Strategies be designed to support less favoured regions to become competitive based on their hard (economic and structural) as well as soft (institutions and capabilities) characteristics?

The economic and structural characteristics have been widely explored from different perspectives; however, the application of S3 in large intermediate metropolitan regions requires further research. These type of regions with a core urban micro region surrounded by peripheral micro regions faces different challenges. First, the difficulty to get stakeholders from outside the core region involved in regional strategies. On one hand due to the challenges of face-to-face interaction due to long distances and lack of accessibility. On the other hand, there are challenges regarding the STI capabilities for which the key players are not typically located in those areas. Although SLP was expected to implement S3 for the whole region, in practical terms it was core-cantered. Medellin deliberately approached the metropolitan area. Therefore, the concept of city-region is suggested to be important for the applicability of S3. Peripheral regions require connectivity with the core regions but more horizontal innovations to build and strengthen a local innovation system. Those horizontal measures are supported by findings on lagging and peripheral

regions in which a focus on strengthening institutional capacity, cross-border learning and identification of societal challenges is suggested.

The economies in both regions are impacted by a strong informal economy, however, in S3, their participation has been null due to the difficulty to approach informal workers. However, informal entrepreneurs are aware of societal challenges and address them through bottom of the pyramid business models and solutions; therefore, their role for the EDP is increasingly important. To overcome this challenge, the inclusion of the participation of the quadruple helix through online methods (Laranja, 2021) is suggested. The observation of the activities of the informal entrepreneurs is a challenge of these regions and is extended to other developing regions that aim to incorporate social innovation projects.

The incorporation of the social innovations, service innovation and sustainability has been reflected in the last few years (Benner, 2020; Dax, 2019; Teräs & Mäenpää, 2016) as well as a broader view of innovation, especially developing regions (Gianelle et al., 2020; Sörvik et al., 2019) which is related to one of the research sub questions: How is the design of S3 affected by the innovation potential?

S3 has been criticised for being too focused on STI (Benner, 2020) while in practice, S3 is broadening not only in terms of innovation but also of scope, becoming more a regional strategy which requires a holistic view of policy frameworks (Nauwelaers et al., 2014; Sörvik et al., 2019). Therefore, there is room of opportunity for discovering opportunity domains beyond science and technology.

The strategy literature helps to understand the EDP, in which the consideration of strategy as a pattern makes sense to differentiate those intended strategies from the emergent strategies, in

which EDP is in between strategy formation and formulation. Therefore, the importance of the discovery consists on identifying those existing and emergent strategies, to feedback the formulation process through constant monitoring. Emergent opportunities are in various fields. Therefore, a definition of the domains to be prioritised is important and which type of innovation is to be supported. In addition, although S3 is based on related-variety principles, both regions have transformed their regional structures through unrelated variety. SLP imported a path from FDI; and Medellín first switch to different industries that indirectly supplied the first and is now switching to services. Therefore, the identification of opportunities through unrelated variety but that fit with the regional capabilities is an opportunity for intermediate regions.

The case studies revealed that the applicability of the S3 objectives were nor entirely aligned with the regional context; therefore, in both regions, the strategy was not focused on STI but had a broader view of innovation, arguing the limitation of funds and innovation capabilities. However, the methodology was considered to support the overall regional strategy through the participation of the different stakeholders from a common goal. Which was more related to finding the economic vocation of the region. To avoid inertia and obvious results, a future orientation (opportunity) must be emphasised, which differentiates the results of the studied regions.

The other sub question addressed is: How is the role of actors that participate in the strategy formulation? And for that, the way in which the context shapes their roles and the EDP is analysed. First, the role of stakeholders in the cases analysed has been different. Hard regional characteristics have affected the strategy in terms of the industrial configuration. The strategy in SLP was a clear case of policy capture by MNEs, from which the participation was key because they are the stakeholders that perform more innovation activities. However, the pressure over the State has limited the discovery of diversification opportunities for the region. In the case of Medellin, the

industrial structure around six clusters was key to invite the participants related to those economic sectors; which positively affected participation. In addition, the existence of numerous organisational institutions for regional development and collaboration promoted a trust environment.

The case studies reveal two contrary examples in which institutions played an important role. In SLP the problem of vested interests and the difficulties to build a shared vision limited the EDP and therefore, the S3 was based on hard data and opinions and focused on bringing those ideas down into paper. In Medellin, the previous experiences, the collaboration environment and trust showed stronger informal institutions which positively affected the process and results. In addition, Ruta N has diffused innovation concepts in the city, developing a common language on which the strategy was built.

Another difference found in the case studies which shaped the strategy was the autonomy in decision making, especially in the decision to implement S3. In Mexico, the strategy was imposed from the national government, which led to criticism about the regional fit; a lack of process ownership and less engagement, which was notorious from the call for participants. In the case of Medellin, on the contrary, the decision emerged from regional private bodies, who involved the government in the decision. The regional culture is characterised for a strong sense of ownership which is translated to the policy making environment. Therefore, it is concluded that the autonomy in decision making impacts the sense of ownership and thus, the degree of engagement at least in the first part of the process.

To maintain a positive level of engagement, leadership has shown to play a key role. Beyond the process leadership taken by the consultancy firms and the formal leadership from the

regional heads at the government; the emergent leadership during the process from regional stakeholders is important for S3, and especially for the EDP.

Apart from the systemic view of leadership to engage stakeholders and motivate collaboration; leadership is important from an evolutionary perspective, to promote change. To motivate stakeholders to avoid inertia and engage in new approaches such as S3. The case studies show one place in which a lack of regional leadership, leads to top-down processes and those stakeholders with better economic position define strategies in which their interests are protected. On the contrary, in Medellin, there has been continuity in change, and regional leaders from the business sector as well as from the government have worked together to achieve those changes. One of the changes is to place education at the core of the regional strategy, therefore, also universities have been important agents of change. Because the different stakeholders know their relevance in the regional strategy, emergent leadership existed. That leadership is fostered by the institutional arrangements and stresses the importance of the consideration of the human factor.

This thesis also argues that S3 is ultimately about the people who participate and the knowledge they embody. Therefore, it is important to select the key stakeholders that hold relevant knowledge. In SLP for example, stakeholders represented a helix, however, most of them were at the top levels and therefore, had limited knowledge about particular fields in which the region may have opportunities. In Medellin, key actors from the business sector participated and researchers from the universities and research centres with knowledge in particular fields. Therefore, it is important to recognise which stakeholders hold the knowledge necessary for the EDP.

Finally, it is important to remark that this exploratory study sheds light on the S3 experience in a type of region that has been understudied; large intermediate metropolitan regions in a non-

European context; which is expected to contribute to the understanding of diverse regional contexts and the importance of softer institutions beyond structural characteristics.

7.7 Policy Implications

The policy implications are important especially for designing the strategy. There are some implications about the process of S3 itself, and others that include having the accurate regional settings for S3.

First, it is important to designate regional leaders, beyond formal leadership, to invite other regional stakeholders to participate, especially in those regions in which the government is mistrust, because the credibility of public authorities and willingness of companies to be involved in strategic planning has proved to be an important driver of S3 (Kominos et al., 2014) which is supported by the findings in this research; where the main difference in the whole process between both regions relies on the institutional context and the existence of regional leaders.

If the external consultancy firm does not have presence in the region, it becomes more important to include the regional stakeholders to fill those gaps. It is also important to consider that the entrepreneurial knowledge for S3 is embedded in individuals, rather than institutions, therefore, it is important to promote the participation of the people with entrepreneurial knowledge from the institutions. To maintain the interest, leadership is important, especially where the institutional arrangements do not promote open debates, and make sure that the outcomes of the conversations are reflected in the process.

In both cases, the businesses are more willing to collaborate with universities and regional institutions than with competitors and other business units; therefore, it is important to consider the coordination of efforts and collaboration when designing S3.

It is also important to consider the sources of knowledge, and in particular, to consider those stakeholders that beyond STI knowledge can provide information about the societal challenges, in the studied regions, for instance, the entrepreneurs in the informal economy are expected to contribute to social innovation opportunities.

The leadership that needs to get involved in the process is not the one of regional champions that lead to more of the same policies and capture the value of regional efforts. But those that help to develop an environment in which entrepreneurial knowledge and emergent leadership take place.

Regional Innovation Agencies such as Ruta N in Medellin play a crucial role in S3, it is important that regions with inexistent bodies that assure the project continuity designate an institution in charge of such task.

Second it is important to have a thick and interconnected innovation system, with strong institutional arrangements to foster innovation and a sense of ownership to get actors involved in the process. Regional education is important to promote strong absorptive capabilities and innovation-related activities; for which it is important that S3 is not considered as the regional strategy but one of the regional strategies complemented with more horizontal approaches to reduce the difficulties related to the regional context in which innovation policy is expected to cause an impact. This is especially important considering that S3 strategies depend on the institutional and governance context embedded in the regions (McCann & Ortega-Argilés, 2017).

7.8 Limitations & Further Research

In this section the limitations about the study are mentioned as well as the scope for further research.

7.8.1 Limitations Regarding Data Collection

Regarding data collection, this research has some limitations. First, the heterogeneity of the data collected by country makes it difficult to compare both regions. It would be interested to develop tools such as Eurostat to make it possible to compare industrial and innovation information in Latin America. The time periods and frequency of the data of interest in both regions is also different as well as the scope, as some information is only available at a national level. This research used hard data to describe the case studies, however, is focused on softer regional matters, which rely less on such type of statistics.

The fact there were different consultancy firms carrying the strategy in each region, with their particular methodologies make it also difficult to compare the results. In the case of Medellin, IDOM was in charge of the process while in SLP, Indra was the consultancy firm designated for the task. Therefore, the type of information published; the transparency of the information and the processes followed differed.

7.8.2 Limitations Regarding the Research Method

The research method followed in this study is accurate, as explained in the Methodology chapter. It corresponds to the object of study, especially because the context is of particular importance. However, it has limitations, especially those regarding the interpretation both, from the interviewees and the interviewer. The inductive methodologies depend on the meaning that the researcher considers to correspond to the analysis, therefore, although is considered to be an accurate methodology for the exploratory studies that depend heavily on the context; the degree of rigor is less strict than in other research methodologies such as quantitative approaches.

7.8.3 Limitations Regarding the Period Covered in the Research

This research started in 2016 and is analysed according to the regional reality at the moment of the study; although some data that does not affect the context has been updated; the regional context explained corresponds to SLP and Medellin in 2020. It is acknowledged that the regional reality in both regions has changed. For instance, in Mexico, the efforts to promote R&D have been diminished since 2019, when the new government started to act; but the interviews were carried between 2016 and 2018. In Medellin, the sense of belonging is still strong; however, the trust on the government has also diminished with the change of Major.

In addition, the literature on S3 has advanced in the last years. This research is taking as a point of departure the literature available until 2020; however, the contribution of the research is still relevant as it provides the strategy point of view, new evidence on large metropolitan regions in Latin America and it is still relevant in the fields covered.

Finally, it would be interesting to analyse the case studies after years to analyse the impacts; how the intended strategies become realised and how the regional stakeholders are aware emergent strategies to change the route of the strategy. A problem in SLP, in particular, is the changes in government, because the project did not have continuity while in Medellin, the institutional arrangements contribute to the project continuity.

7.8.4 Limitations Regarding the Researcher's Positionality

One limitation of the research was the fact the researcher belongs to one of the studied regions. Therefore, there is a risk of bias in the analysis. To reduce the risk, the researcher travelled to the second regions in which three months were spent to get involved in the context analysed (More information in chapter 4).

7.8.5 Further Research

This is an exploratory study in an unexplored context for S3; large metropolitan intermediate regions, which characterise many regions in non-EU context in which the income disparities lead to core urban regions surrounded by peripheral areas. Further research in the characterisation and innovation dynamics in those regions emerges as an opportunity.

This study is centred in the S3 participatory design of the process and how it is shaped by the regional context; however, monitoring and evaluation represent an interesting scope of research, especially in strategies like S3 where the implementation phase is the most challenging (Foray, 2019).

The degree to which related variety is a better option for intermediate regions than unrelated variety requires further research, examples, and evidence. Especially for the type of innovation that is to be fostered in the region, if it would be more narrow or broad especially considering the limitation in financial resources.

Annexes

Annex 1. Conversation scheme for interviews

1. **Rationale/ Strategy Revision: The concept of Smart Specialisation**
    a. Which other models/ strategies were explored for the region?
    b. Who decided to implement smart specialisation strategies? Why smart specialisation?
    c. What does the approach offer to the regional needs? Is it accurate for the regional characteristics?
    d. Why did you decide to participate?
2. **Strategy Design Phase:**
    a. Who performed the leadership role?
    b. Was the strategy inclusive? Who was missing?
    c. Was there any process capture by any of the helixes? Pressure?
    d. How was the Entrepreneurial Discovery Process? How did you choose the priorities and the projects?
        i. Were all helixes considered as entrepreneurs? In priorities and project selection? As targets?
        ii. Accurate granularity level? Sectors? Activities?
        iii. Process of analysis or synthesis?
    e. The role of the consultancy? Challenges?
    f. Importance of ownership (role of multinationals)
    g. Is there a specific budget for smart specialisation? From which level?
    h. So far, have you perceived changes?

i. Has your university changed programs? Received support?

ii. Has your business received support?

iii. Has your region tangible changes so far?

i. Where are the regional innovation capabilities according to Oslo Manual? Product? Process? Marketing? Business model?

j. Perception about the suggestion to co-invent with more advanced regions

3. Realist Review: Smart Specialisation in the region

a. Further challenges of the strategy? Will it continue? How often will this be reviewed?

b. Did the regional context shape the strategy? How did it needed to be adapted?

c. Are you satisfied with the priorities and the process?

d. Reinforcing and summarising: Smart Specialisation for your region:

i. Yes (how): What would you do different? What needs to adapt to the context?

ii. Yes (why): What did it bring to the region so far?

iii. No (why): The role of actors? FDI?

iv. No (why): The level of innovation?

Annex 2. List of participants by helix, position, type of capital and expected role in auto-parts and automotive industry in SLP

Helix	Position	Capital	Expected Role
Industry: Foreign company 2	Director	Private	Representation
Industry: Foreign company 2	Manager	Private	Representation
Industry: Foreign company 3	Manager	Private	Representation
Knowledge Institution: Research Centre 2	Director	Public	Representation
Knowledge Institution: Research Centre 2	Marketing	Public	Representation
Government: Government Institution 2	Director for Centre micro-region	Public	Organizer
Government: Government institution 1	Regional director	Public	Governance
Government: Government institution 1	Linkages director	Public	Organizer
Industry: Foreign company 1	R&D manager	Private	Specific know-how
Industry: Foreign company 4	Plant Manager	Private	Representation
Industry: Foreign company 5	Plant Manager	Private	Representation
Knowledge institution: University 1	Engineering and science director	Private	Representation
Government: Government institution 3	State Director	Public	Representation
Government: Government institution 4	Director	Public	Representation
Government: Government Ministry 3	Promotion director	Public	Representation
Government: Government Ministry 1	General director	Public	Organizer
Government: Government Ministry 1	Planning and competitiveness directior	Public	Organizer
Industry: Foreign company 6	Operations Manager	Private	Representation
Knowledge institution: University 2	Linking department from engineering	Public	Representation
Knowledge institution: University 2	Academic Secretary	Public	Representation
Knowledge institution: University 3	Director	Public	Representation
Industry: Foreign company 7	Foreign commerce director	Private	Representation

Note: Own elaboration based on CONACYT, 2014b

Annex 3. List of participants by helix, position, type of capital and expected role in Food Industry in SLP

Helix	Position	Description	Role
Industry: Foreign company 2	Director	Private	Representation
Industry: Foreign company 2	Manager	Private	Representation
Industry: Foreign company 3	Manager	Private	Representation
Knowledge Institution: Research Centre 2	Director	Public	Representation
Knowledge Institution: Research Centre 2	Marketing	Public	Representation
Government: Government Institution 2	Director for Centre micro-region	Public	Organizer
Government: Government institution 1	Regional director	Public	Governance
Government: Government institution 1	Linkages director	Public	Organizer
Industry: Foreign company 1	R&D manager	Private	Specific know-how
Industry: Foreign company 4	Plant Manager	Private	Representation
Industry: Foreign company 5	Plant Manager	Private	Representation
Knowledge institution: University 1	Engineering and science director	Private	Representation
Government: Government institution 3	State Director	Public	Representation
Government: Government institution 4	Director	Public	Representation
Government: Government Ministry 3	Promotion director	Public	Representation
Government: Government Ministry 1	General director	Public	Organizer
Government: Government Ministry 1	Planning and competitivenes s director	Public	Organizer
Industry: Foreign company 6	Operations Manager	Private	Representation
Knowledge institution: University 2	Linking department from engineering	Public	Representation
Knowledge institution: University 2	Academic Secretary	Public	Representation

Helix	Position	Description	Role
Knowledge institution: University 3	Director	Public	Representation
Industry: Foreign company 7	Foreign commerce director	Private	Representation

Note: Own elaboration base don CONACYT, 2014b

Annex 4. List of participants by helix, position, type of capital and expected role in Energy in SLP.

Helix	Position	Description	Role
Industry: Foreign company 2	Director	Private	Representation
Industry: Foreign company 2	Manager	Private	Representation
Industry: Foreign company 3	Manager	Private	Representation
Knowledge Institution: Research Centre 2	Director	Public	Representation
Knowledge Institution: Research Centre 2	Marketing	Public	Representation
Government: Government Institution 2	Director for Centre micro-region	Public	Organizer
Government: Government institution 1	Regional director	Public	Governance
Government: Government institution 1	Linkages director	Public	Organizer
Industry: Foreign company 1	R&D manager	Private	Specific know-how
Industry: Foreign company 4	Plant Manager	Private	Representation
Industry: Foreign company 5	Plant Manager	Private	Representation
Knowledge institution: University 1	Engineering and science director	Private	Representation
Government: Government institution 3	State Director	Public	Representation
Government: Government institution 4	Director	Public	Representation
Government: Government Ministry 3	Promotion director	Public	Representation
Government: Government Ministry 1	General director	Public	Organizer
Government: Government Ministry 1	Planning and competitiveness directior	Public	Organizer
Industry: Foreign company 6	Operations Manager	Private	Representation
Knowledge institution: University 2	Linking department from engineering	Public	Representation
Knowledge institution: University 2	Academic Secretary	Public	Representation
Knowledge institution: University 3	Director	Public	Representation
Industry: Foreign company 7	Foreign commerce director	Private	Representation

Note: Own elaboration based on CONACYT, 2014b

Annex 5. Global classification of participants in the SIA SLP.

Type of organisation	No. of participants (organisations)	No. of participants (people)	No. of interviews
Consultive group	16	16	10
Research centre	1	1	1
Universities	3	3	1
Industrial organisation	1	1	1
Domestic Firms	2	2	2
MNEs	1	1	1
Government	8	8	4
Sectorial workshop (Automotive)	16	23	3
Research centre	2	3	0
Universities	3	4	1
MNE	6	8	1
Government	5	8	1

Note: Own elaboration based on CONACYT, 2014b

References

Acemoglu, D., Aghion, P., and Ziliboti, F. (2006). Distance To Frontier, Selection and Economic Growth. *Journal of the European Economic Association*, 1, 37–74. https://doi.org/10.1162/jeea.2006.4.1.37

Aghion, P., and Howitt, P. (2005). Appropriate Growth Policy: A Unifying Framework. *Journal of the European Economic Association*, 4(2-3), 269-314. https://doi.org/10.1162/jeea.2006.4.2-3.269

Aghion, P., and Howitt, P. (2006). Appropriate Growth Policy: A Unifying Framework joseph schumpeter lecture appropriate growth policy: a unifying framework. *Journal of the European Economic Association*, 4(2-3), 269-314 https://doi.org/10.1162/jeea.2006.4.2-3.269

Aghion, P., Boulanger, J., Cohen, E., David, P., and Foray, D. (2011). MOOC – Designing Strategy References. *Bruegel Policy Brief Research Policy*, 38(04), 681-693.

Aghion, P., Harmgart, H. and Weisshaar, N., (2011). Fostering growth in CEE countries: a country- tailored approach to growth policy. In Radosevic, S., Kaderabkova, A. (Eds.), *Challenges for European Innovation Policy: Cohesion and Excellence From a Schumpeterian Perspective*. Edward Elgar Publishers, Cheltenham. https://doi.org/10.4337/9780857935212.00011

Aitken, B., Hanson, G., and Harrison, A. (1997). Spillovers, foreign investment and export behavior. *Journal of International Economics*, 43(1-2), 103-132. https://doi.org/10.1016/s0022-1996(96)01464-x

Albrechts, L. (2004). Strategic (spatial) planning reexamined. *Environment and Planning B: Planning and Design*, 31(5), 743–758. https://doi.org/10.1068/b3065

Alcaldía de Medellín (2011). Medellin en cifras. Medellín: Departamento Administrativo de Planeación & Observatorio de Políticas Públicas.

Aleksejeva, L., Šipilova, V., Jermolajeva, E., Ostrovska, I. and Olehnovics, D. (2018) Regional risks and challenges in smart growth in Latgale Region, *Journal of Security and Sustainability Issues*, 7(4), 727-739. https://doi.org/10.9770/jssi.2018.7.4(10)

Almirall, E., Wareham, J., Ratti, C., Conesa, P., Bria, F., Gaviria, A., and Edmondson, A. (2016). Smart cities at the crossroads: New tensions in city transformation. *California Management Review*, 59(1), 141–152. https://doi.org/10.1177/0008125616683949

Álvarez-Goyatu, J.L. (2005). Cómo hacer investigación cualitativa. Fundamentos y Metodología [How to do qualitative research. Fundamentals and Methodology]. México: Paidós.

Amin, A., and Thrift, N. (1995). Globalization, institutions, and regional development in Europe. Oxford: Oxford university press. In P. Healey, S. Cameron, S. Davoudi, S. Graham, A. Madani-Pour (Eds.), *Managing Cities*, 92-108. John Wiley, Chichester.

Amit, R. and Schoemaker, P.J.H. (1993) Strategic Assets and Organizational Rent. *Strategic Management Journal*, 14, 33-46. https://doi.org/10.1002/smj.4250140105

Ansoff, H. I. (1965). Corporate strategy: an Analytic Approach to Business Policy for Growth and Expansion. McGraw Hill.

Ansoff, H.I. (1980). Strategic issue management. *Strategic Management Journal*, 1(2), 131-148.

Aranguren M.J., Magro, E. and Wilson J.R. (2017b). Regional competitiveness policy in an era of smart specialisation strategies. In Huggins R and Thompson P (eds) *Handbook of Regions*

and Competitiveness, 546–564. Cheltenham: Edward Elgar, https://doi.org/10.4337/9781783475018.00035

Aranguren, M. J., Magro, E., Navarro, M., and Wilson, J. R. (2018). Governance of the territorial entrepreneurial discovery process: looking under the bonnet of RIS3. *Regional Studies*, 0(0), 1–11. https://doi.org/10.1080/00343404.2018.1462484

Aranguren, M.J. and Larrea, M. (2015). Territorial Strategy: Deepening the "how". In J.M. Valdaliso and J.R. Wilson (Eds.), *Strategies for Shaping Territorial Competitiveness*, 55-93. London: Routledge.

Aranguren, M.J. and Wilson, J.R. (2013). What can experience with clusters teach us about fostering regional smart specialisation? *Ekonomiaz*, 83(2) 126-154

Aranguren, M.J., Magro, E., and Wilson, J.R. (2017a). Regional competitiveness policy evaluation as a transformative process: From theory to practice. *Environment and Planning C: Politics and Space*, 35, 703 - 720. https://doi.org/10.1177/0263774x16662469

Aranguren, M.J., Navarro, M., and Wilson, J., (2015). From Plan to Process: Exploring the Leadership Implications of RIS3. *Orkestra Working Paper Series in Territorial Competitiveness Number 2015-R01*.

Asheim, B. T. (2019). Smart Specialisation, innovation policy and regional innovation systems: what about new path development in less innovative regions? *The European Journal of Social Science Research*, 32(1), 8–25. https://doi.org/10.1080/13511610.2018.1491001

Asheim, B. T., Boschma, R., and Cooke, P. (2011). Constructing Regional Advantage: Platform Policies Based on Related Variety and Differentiated Knowledge Bases. *Regional Studies*, 45(7), 893-904. https://doi.org/10.1080/00343404.2010.543126

Asheim, B. T., Boschma, R., and Cooke, P. (2011a). Constructing Regional Advantage: Platform Policies Based on Related Variety and Differentiated Knowledge Bases. *Regional Studies*, 45(7), 893-904. https://doi.org/10.1080/00343404.2010.543126

Asheim, B. T., Smith, H. L., and Oughton, C. (2011b). Regional Innovation Systems: Theory, Empirics and Policy. *Regional Studies*, 45(7), 875-891. https://doi.org/10.1080/00343404.2011.596701

Asheim, B., and Isaksen, A. (1997). Location, Agglomeration and Innovation: Towards Regional Innovation Systems in Norway? *European Planning Studies*, 5(3), 299-330. https://doi.org/10.1080/09654319708720402

Asheim, B.T. (1996). Industrial districts as 'Learning Regions': A Condition for Prosperity. *European Planning Studies*, 4(4), 379–400. https://doi.org/10.4337/9781847205537.00012

Asheim, B.T. (1997) "Learning regions" in a globalised world economy: towards a new competitive advantage of industrial districts? In Conti, S. and M. Taylor (eds.) *Interdependent and Uneven Development: Global-Local Perspectives*. Avebury: London.

Asheim, B.T. (2014). North Denmark Region RIS3: An expert assessment of behalf of DG Regional and Urban Policy.

Asheim, B.T. and Isaksen, A. (1997). Location, Agglomeration and Innovation: Towards Regional Innovation Systems in Norway? *European Planning Studies*, 5(3), 299-328. https://doi.org/10.1080/09654319708720402

Asheim, B.T., Bugge, M., Conen, L. and Sverre, H. (2013). What Does Evolutionary Economic Geography Bring To The Policy Table? Reconceptualising regional innovation systems, Circle, Lundt University Report.

Audretsch, D.B. (1998). Agglomeration and the location of innovative activity. *Oxford review of economic policy*, 14(2), 18-29. https://doi.org/10.1093/oxrep/14.2.18

Bailey, D. Pitelis, C. and Tomlinson, P.R. (2019). Strategic management and regional industrial strategy: cross-fertilization to mutual advantage. *Regional Studies*, 54(5), 647-659. https://doi.org/10.1080/00343404.2019.1619927

Bailey, D., Bellandi, M., Califfi, A., and De Propris, L. (2010). Place-renewing leadership: trajectories of change for mature manufacturing regions in Europe. *Policy Studies*, 31(4), 457-474. https://doi.org/10.1080/01442871003723408

Balland, P., Boschma, R., Crespo, J., and Rigby, D. (2018). Smart specialization policy in the European Union: relatedness, knowledge complexity and regional diversification. *Regional Studies*, 53(9), 1252-1268. https://doi.org/10.1080/00343404.2018.1437900

Balogun, J. and Johnson, G. (2005). From intended strategies to unintended outcomes: The impact of change recipient sensemaking. *Organization Studies*, 26, 1573-1601. https://doi.org/10.1177/0170840605054624

Barca F. (2009). An Agenda for a Reformed Cohesion Policy. A Place-based Approach to Meeting European Union Challenges and Expectations, 1-219. Brussels: DG Regio.

Barca, F., McCann, P. and Rodríguez-Pose, A. (2012). The case for regional development intervention: place-based versus place-neutral approaches. *Journal of Regional Science*, 52 134–152. https://doi.org/10.1111/j.1467-9787.2011.00756.x

Barnard, H., Bromfield, T. and Cantwell, J. (2009). The Role of Indigenous Firms in Innovation Systems in Developing Countries: The Developmental Implications of National Champion Firms' Response to Underdeveloped National Innovation Systems. In B.-Å. Lundvall, K.

J. Josepth, C. Chaminade, and J. Vang (Eds.), *Handbook of Innovation Systems and Developing Countries: Building Domestic Capabilities in a Global Setting*, 241–279. Cheltenham: Edward Elgar. https://doi.org/10.4337/9781849803427.00017

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of management*, 17(1), 99-120. https://doi.org/10.1177/014920639101700108

Barroeta, B., Gómez Prieto, J., Paton, J. and Palazuelos, M. (2017). Innovation and Regional Specialisation in Latin America: identifying conceptual relations with the EU Smart Specialisation approach. *JCR Technical Reports*. European Commission

Barzotto, M., Corradini, C., Fai, F.M., Labory, S. and Tomlinson, P.R. (2019). Enhancing innovative capabilities in lagging regions: an extra-regional collaborative approach to RIS3. *Cambridge Journal of Regions, Economy and Society*, 12(2), 213-232. https://doi.org/10.1093/cjres/rsz003

Bateman, M., Durán Ortíz, J.P., and Maclean, K. (2011). A Post–Washington Consensus Approach to Local Economic Development in Latin America? An Example from Medellín, Colombia. London: Overseas Development Institution. https://doi.org/10.2139/ssrn.2385197

Becattini, G. (2017). The Marshallian industrial district as a socio-economic notion. *Revue d'économie industrielle*, 157, 13-32. https://doi.org/10.4000/rei.6507

Beer, A., and Clower, T. (2014). Mobilizing leadership in cities and regions. *Regional Studies*, 1(1), 5-20. https://doi.org/10.1080/21681376.2013.869428

Bejarano, J.A. (1987). El despegue cafetero [Coffee takeoff], 1900-1928. In: J.A. Ocampo (comp.) *Historia Económica de Colombia [Economic History of Colombia]*, 173-208. Siglo XXI editors.

Belussi, F., and Trippl, M. (2018). Industrial districts/clusters and smart specialisation policies. *Advances in Spatial Science*, 283-308. https://doi.org/10.1007/978-3-319-90575-4_16

Blažek, J., Healey, A., Trippl, M., Asheim, B., Miörner, J., Aranguren, M. J., Magro, E., Navarro, M. and Wilson, J. (2014). The Smart Specialisation for Regional Innovation: Regions with Less Developed Research and Innovation Systems. *Research Working Paper: work package 3 SMARTSPEC*. Retrieved in: http://orca.cf.ac.uk/78216/1/Regions%20less%20developed.pdf

Blomström, M., and Persson, H. (1983). Foreign investment and spillover efficiency in an underdeveloped economy: Evidence from the Mexican manufacturing industry. *World Development*, 11(6), 493-501. https://doi.org/10.1016/0305-750X(83)90016-5

Bosch, A., and Vonortas, N. (2019). Smart specialization as a tool to foster innovation in emerging economies: Lessons from brazil. *Foresight and STI Governance*, 13(1), 32-47. https://doi.org/10.17323/2500-2597.2019.1.32.47

Boschma, R. (2005). Proximity and innovation: A critical assessment. *Regional Studies*, 39(1), 61-74. https://doi.org/10.1080/0034340052000320887

Boschma, R. (2013). Constructing Regional Advantage and Smart Specialisation: Comparison of Two European Policy Concepts. *IDEAS Working Paper Series from RePEc*. https://doi.org/10.3280/scre2014-001004

Boschma, R. (2014). Constructing Regional Advantage and Smart Specialisation: Comparison of Two European Policy Concepts. *Scienze Regionali*, 13, 51-68. https://doi.org/ https://doi.org/10.1080/01442871003723408

Boschma, R. (2014a). Towards an Evolutionary Perspective on Regional Resilience. *Circle*, Lund University and Department of Economic Geography, Urban and Regional Research Centre Utrecht, Utrecht University. https://doi.org/10.1080/00343404.2014.959481

Boschma, R. and Frenken, K. (2009b). Technological relatedness and regional branching. *Papers in Evolutionary Economic Geography (PEEG) 0907*. Utrecht University, Department of Human Geography and Spatial Planning, Group Economic Geography.

Boschma, R. and Frenken, K. (2011). The emerging empirics of evolutionary economic geography. *Journal of Economic Geography*, 11, 295–307. https://doi.org/10.1093/jeg/lbq053

Boschma, R., and Frenken, K. (2006). Why is economic geography not an evolutionary science? Towards an evolutionary economic geography. *Journal of Economic Geography*, 6(3), 273–302. https://doi.org/10.1093/jeg/lbi022

Boschma, R., and Frenken, K. (2009a). Some Notes on Institutions in Evolutionary Economic Geography. *Economic Geography*, 85(2), 151–158. https://doi.org/10.1111/j.1944-8287.2009.01018.x

Boschma, R., Coenen, L., Frenken, K.. and Truffer, B. (2017). Towards a theory of regional diversification: combining insights from Evolutionary Economic Geography and Transition Studies. *Regional Studies*, 51(1), 31-45. https://doi.org/10.1080/00343404.2016.1258460

Botero, F. (1984). *La industrialización en Antioquia: génesis y consolidación 1900-1930* [Industrialization in Antioquia: genesis and consolidation 1900-1930]. Universidad de Antioquia.

Boyatzis, R. E. (1998). Transforming qualitative information: Thematic analysis and code development. Thousand Oaks: Sage.

Brand, P. and Davila, J. (2011). Mobility innovation at the urban margins. *Medellin's Metrocables*, 15(6), 647-661. https://doi.org/10.1080/13604813.2011.609007

Brennan, L., and Rakhmatullin, R. (2017). Transnationalizing Smart Specialisation Strategy. In S. Radosevic, A. Curaj, R. Gheorghiu, L. Andreescu and I. Wade (Eds), *Advances in the Theory and Practice of Smart Specialisation*. Elsevier Academic Press. https://doi.org/10.1016/b978-0-12-804137-6.00011-5

Bresnahan, T. (2010). General purpose technologies. *Handbook in Economics of Innovation*, 2. Hall, B., and Rosenberg, N.

Bresnahan, T., and Trajtenberg, M. (1995). General purpose technologies: engines of growth. *Journal of Econometrics*, 65(1), 83–108. https://doi.org/10.1016/0304-4076(94)01598-t

Bryson, J.M. and Roering, W.D. (1987). Applying Private-Sector Strategic Planning in the Public Sector. *Journal of the American Planning Association*, 53(1), 9-22. https://doi.org/10.1080/01944368708976631

Bryson, J.M. and Roering, W.D. (1996). Strategic Planning options for the public sector. *Handbook of Public Administration.* Perry, J. L., 2nd edition.

Burgelman, R. A. (1983). A process model of internal corporate venturing in the diversified major firm. *Administrative Science Quarterly*, 28(2), 223–244. https://doi.org/10.2307/2392619

Burgelman, R. A. (2002a). Strategy as vector and the inertia of coevolutionary lock-in. *Administrative Science Quarterly*, 47(2), 325–357. https://doi.org/10.2307/3094808

Camagni, R., and Capello, R. (2013). Regional Innovation Patterns and the EU Regional Policy Reform: Toward Smart Innovation Policies. *Growth and Change*, 44(2), 355–389. https://doi.org/10.1111/grow.12012

Camagni, R., Capello, R., and Lenzi, C. (2014). A territorial taxonomy of innovative regions and the European regional policy reform: Smart innovation policies. *Scienze Regionali*, 13(1), 69-105. https://doi.org/10.3280/scre2014-001005

Capello, R. (2014). Smart specialisation strategy and the new EU cohesion policy reform: Introductory remarks. *Scienze Regionali*, 13(1), 5–13. https://doi.org/10.3280/scre2014-001001

Capello, R., and Kroll, H. (2016). From theory to practice in smart specialization strategy: emerging limits and possible future trajectories. *European Planning Studies*, 24(8), 1393-1406. https://doi.org/10.1080/09654313.2016.1156058

Carayannis, E. G., and Rakhmatullin, R. (2014). The Quadruple/Quintuple Innovation Helixes and Smart Specialisation Strategies for Sustainable and Inclusive Growth in Europe and Beyond. *Journal of the Knowledge Economy*, 5(2), 212-239, https://doi.org/10.1007/s13132-014-0185-8

Carayannis, E., and Grigoroudis, E. (2016). Quadruple Innovation Helix and Smart Specialization: Knowledge Production and National Competitiveness. *Foresight and STI Governance*, 10(1), 31–42. https://doi.org/10.17323/1995-459x.2016.1.31.42

Carayannis, E., Grigoroudis, E., and Pirounakis, D. (2016). Quadruple innovation helix and smart specialization: knowledge production and natiolan competitiveness. *Foresight and STI Governance*, 10(1), 31-42. https://doi.org/10.17323/1995-459x.2016.1.31.42

Carayannis, E.G., and Campbell, D. F. J. (2009). Mode 3 and Quadruple Helix: Towards a 21st century Fractal Innovation Ecosystem. *International Journal of Technology Management*, 46(3/4), 201–234. https://doi.org/10.1504/ijtm.2009.023374

Carrillo, J. (2004). Transnational Strategies and Regional Development: The Case of GM and Delphi in Mexico. *Industry and Innovation*, 11(172), 127-153. https://doi.org/10.1080/1366271042000200484

Ceballos, R., and Cronshaw, F. (2001) The evolution of armed conflict in Medellín: An analysis of the major actors. *Latin American Perspectives*, 28(1), 110–131. https://doi.org/10.1177/0094582x0102800107

Chaminade, C., and de Fuentes, C. (2015). Who are the world leaders in innovation? Exploring the changing role of firms in emerging economies. *International Journal of Technological Learning, Innovation and Development*, 7(4), 279-302. https://doi.org/10.1504/ijtlid.2015.073035

Chaminade, C., Lundvall, B.A., Vang-Lauridsen, J., and Joseph, K.J. (2009). Innovation Policies for Development: Towards a Systemic Experimentation Based Approach. 7th Globelics Conference, Dakar (Senegal) 6-8 October 2009.

Charles, D., Gross, F., and Bachtler, J. (2012). 'Smart Specialisation' and cohesion policy – a strategy for all regions? Iq-net thematic paper no. 30(2).

Charmes, J., Gault, F., and Wunsch-Vincent, S. (2018). Measuring innovation in the informal economy – formulating an agenda for Africa. *Journal of Intellectual Capital*, 19(3), 536-549. https://doi.org/10.1108/jic-11-2016-0126

Chiquiar, D. (2005). Why Mexico's regional income convergence broke down. *Journal of Development Economics*, 77(1), 257-275. https://doi.org/10.1016/j.jdeveco.2004.03.009

Coenen, L., Asheim, B., Bugge, M. M., and Herstad, S. J. (2017). Advancing regional innovation systems: What does evolutionary economic geography bring to the policy table? *Environment and Planning C: Politics and Space*, 35(4), 600–620. https://doi.org/10.1177/0263774x16646583

Cohen, W.M., and Levinthal, D.A. (1990). Absorptive capacity: a new perspective on learning and innovation. *Administrative Science Quarterly*, 35(1), 128–152. https://doi.org/10.2307/2393553

CONACYT (2014). Programa especial de ciencia, tecnología e innovación 2014-2018.

Consejo Privado de Competitividad (2022). *Índice de Competitividad de Ciudades* [Cities Competitiveness Index]. Universidad del Rosario.

Content, J., and Frenken, K. (2016). Related variety and economic development: a literature review. *European Planning Studies*, 24(12), 2097-2112. https://doi.org/10.1080/09654313.2016.1246517

Cooke, P. (2001a). Regional innovation systems, clusters and the knowledge economy. *Industrial and Corporate Change*, 10(4), 945–974. https://doi.org/10.1093/icc/10.4.945

Cooke, P. (2005). Regional Knowledge Capabilities and Open Innovation regional Innovation systems and Clusters in the Asymmetric Knowledge Economy. In Breschi, S. and Malerba, F. (eds), *Clusters, Networks and Innovation*. Oxford University Press.

Cooke, P., Gómez, M., and Etxeberria, G. (1997). Regional innovation systems: institutional and organizational dimensions. *Research Policy*, 26(4-5), 475–491. https://doi.org/10.1016/s0048-7333(97)00025-5

Corona, J. M., Dutrénit, G., Puchet, M. and Santiago, F. (2014). The Changing Role of Science, Technology and Innovation Policy in Building Systems of Innovation: The case of Mexico. *Science, Technology and Innovation Policies of Development*, 15-43. London: Springer. https://doi.org/10.1007/978-3-319-04108-7_2

Costa-i-Font, J., and Rodriguez-Oreggia, E. (2005). Is the impact of public investment neutral across the regional income distribution? Evidence from Mexico. *Economic Geography*, 81(3), 305–322. https://doi.org/10.1111/j.1944-8287.2005.tb00272.x

Crespi, G., Fernández Arias, G., and Stein, E. (2014). Rethinking Productive Development. Retrieved from https://publications.iadb.org/bitstream/handle/11319/6633/Rethinking Productive Development%3A Sound Policies and Institutions for Economic Transformation.pdf?sequence=1&isAllowed=. https://doi.org/10.1057/9781137393999_1

Crotty, M. (1998). The Foundations of Social Research: Meaning and Perspective in the Research Process. Sage, London. https://doi.org/10.4324/9781003115700

Cruz Amaya, M. (2012). *Auto Organización Comunitaria para la Innovación Social y el Desarrollo Local Caso: Comuna 13, ciudad de Medellín* [Self Community Organization

for Social Innovation and Local Development Case: Comuna 13, city of Medellín]. Thesis for the Master's Degree in Development. Universidad Pontificia Bolivariana, Colombia.

Dąbrowska, A. (2017). Traditional sectors based on natural resources - A blessing or a curse for less developed regions? A case study of Podlaskie Voivodeship. *Miscellanea Geographica*, 21(3), 89-95. https://doi.org/10.1515/mgrsd-2017-0020

David, P. A., Foray, D., and Hall, B. H. (2009). Measuring Smart Specialisation: The concept and the need for indicators.

Dávila, J., and Daste, D. (2011). Pobreza, participación y Metrocable. Estudio del caso de Medellín. *Boletín CF+S 54. La ciudad a escala humana.* XII Congreso Anual N-aerus.

Dávila, J.D., and Daste, D. (2011). *Pobreza, participación y Metrocable. Estudio del caso de Medellín* [Poverty, participation and Metrocable. Medellin case study]. Boletín CF+S 54. La ciudad a escala humana. XII Congreso Anual Naerus.

Dax, T. (2019). Development of mountainous regions: Smart specialization approaches as a means to overcoming peripheralization. In Kristensen, I., Dubois, A., & Teräs, J. (Eds.), *Strategic approaches to regional development: Smart experimentation in less-favoured regions*, 52–67. Routledge.

Del Castillo Hermosa, J., Paton Elorduy, J., and Barroeta Barroeta, B. (2015). *Especialização Inteligente e Descoberta Empreendedora: Teoria e Realidade.* [Smart specialisation and entrepreneurial discovery: Theory and reality]. *Revista Portuguesa de Estudos Regionais*, 39, 5–22.

Del Castillo, J., and Paton, J. (2015). *Los clústeres como herramientas de la especialización inteligente*. [Clusters as smart specialization tools]. TCI, Medellín, Colombia. Retrieved from http://es.slideshare.net/TCINetwork/8-clac-16-junejaime-del-castillo

Del Castillo, J., Barroeta, B., and Paton, J. (2012). Smart Specialisation Strategies RIS3: A quick guide. *INFYDE Working Papers,* 2(1).

Del Castillo, J., Paton, J., and Barroeta, B. (2015). Smart Specialisation and entrepreneurial discovery: Theory and reality. Retrieved from: http://www.apdr.pt/siterper/numeros/RPER39/39.1.pdf

Delgadillo, J. (2008). *Desigualdades territoriales en México derivadas del tratado de libre comercio de América del Norte* [Territorial inequalities in Mexico derived from the North American free trade agreement]. *Eure*, 34(101), 71-98. https://doi.org/10.4067/s0250-71612008000100004

Delvenne, P., and Thoreau, F. (2017). Dancing without listening to the music: learning from some failures of the "national innovation systems" in Latin America. *Research Handbook on Innovation Governance for Emerging Economies: Towards Better Models*, 37-58. Edward Elgar Publishing. https://doi.org/10.4337/9781783471911.00007

Dosi, G. (1982). Technological paradigms and technological trajectories: A suggested interpretation of the determinants and directions of technical change. *Research Policy*, 11(3), 147-162. https://doi.org/10.1016/0048-7333(82)90016-6

Dubois, A., Kristensen, I., and Teräs, J. (2017). Outsmarting geography: implementing territorial innovation strategies in sparsely populated regions. *European Planning Studies*, 25(8), 1316-1333. https://doi.org/10.1080/09654313.2017.1320355

Dunford, M., Aoyama, Y., Campolina Diniz, C., Kundu, A., Limonov, L., Lin, G., Liu, W., Ock Park, S., and Turok, I. (2016). Area development and policy: An agenda for the 21st century. *Area Development and Policy*, 1(1), 1–14. https://doi.org/10.1080/23792949.2016.1158621

Durán, A. (1999). *La Geografía de la innovación: ciencia, tecnología y territorio en España* [The Geography of innovation: science, technology and territory in Spain]. Madrid: Los Libros de Catarata.

Duranton, G., and Puga, D. (2001). Nursery Cities: Urban diversity, process innovation, and the life cycle of products. *American Economic Review*, 91(5), 1454-1477. https://doi.org/10.1257/aer.91.5.1454

Dutrénit, G., and Suárez, M. (2018). Involving stakeholders in policymaking: Tensions emerging from a public dialogue with knowledge-based entrepreneurs. *Science and Public Policy*, 45(3), 338-350. https://doi.org/10.1093/scipol/scx043

Dutrénit, G., Vera-Cruz, A., Arias, A., Sampedro, J., and Urióstegui, A. (2006). *Acumulación de capacidades tecnológicas en subsidiarias de empresas globales en México: el caso de la industria maquiladora de exportación* [Accumulation of technological capabilities in subsidiaries of global companies in Mexico: the case of the export maquiladora industry]. *Revista Espacios*, 24(2).

Eadie, D. C. (1983). Putting a Powerful Tool to Practical Use: The Application of Strategic Planning in the Public Sector. *Public Administration Review*, 43(5), 447-452. https://doi.org/10.2307/975852

Echeverri, A., and Orsini, F. (2010) *Informalidad y urbanismo social en Medellín*. [Informality and social urbanism in Medellín]. In Hermelin-Arbaux, M. Echeverri, A., and Giraldo J. (eds), *Medellín: Environment, urbanism, society*. Center for Urban and Environmental Studies, Universidad Eafit, Medellin, 130–152.

Edquist, C. (Ed.) (1997). Systems of Innovation: Technologies, Institutions and Organizations London: Printer/Cassell Academic, 31(2), 333. https://doi.org/10.1016/S0024-6301(98)90244-8.

Eisenhardt, K.M., and Martin, J.A. (2000). Dynamic Capabilities: What are they? *Strategic Management Journal*, 21, 1105-1121.

Estensoro, M., and Larrea, M. (2016). Overcoming policy making problems in smart specialization strategies: engaging subregional governments. *European Planning Studies*, 24(7), 1319-1335. https://doi.org/10.1080/09654313.2016.1174670

Etzkowitz, H., and Klofsten, M. (2005). The innovating region: toward a theory of knowledge-based regional development. *R&D Management*, 35(3), 243-255. https://doi.org/10.1111/j.1467-9310.2005.00387.x

Etzkowitz, H., and Leydesdorff, L. (2000). The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university–industry–government relations. *Research Policy*, 29(2), 109–123. https://doi.org/10.1016/s0048-7333(99)00055-4

European Commission, (2013). The role of clusters in smart specialisation strategies. Luxembourg.

European Commission, (2015). Perspectives for research and Innovation Strategies for Smart Specialisaton (RIS3) in the wider context of the Europe 2020 Growth Strategy. Retrieved from: https://ec.europa.eu/research/regions/pdf/publications/ris3_report-082015.pdf

Farole, T., Rodriguez-Pose, A., and Storper, M. (2011a). Human Geography and the Institutions that Underlie Economic Growth. *Progress in Human Geography*, 35(1), 58-80. https://doi.org/10.1177/0309132510372005

Farole, T., Rodriguez-Pose, A., and Storper, M. (2011b). Cohesion policy in the European Union: growth, geography, institutions. *Journal of Common Market Studies*, 49 (5), 1089-1111. https://doi.org/10.1111/j.1468-5965.2010.02161.x

Feldman, M., and Audretsch, D. (1999). Innovation in cities: Science-based diversity, specialisation and localized competition. *European Economic Review*, 43, 409-429.

Fellnhofer, K. (2017). Evidence revisited: literature on smart specialisation calls for more mixed research designs. *International Journal of Knowledge-Based Development*, 8(3), 229-248. https://doi.org/10.1504/IJKBD.2017.086407

Flanagan, K., Uyarra, E., and Laranja, M. (2011). Reconceptualising the "policy mix" for innovation. *Research Policy*, 40(5), 702–713. https://doi.org/10.1016/j.respol.2011.02.005

Foray D. (2017). The Economic Fundamentals of Smart Specialisation Strategies. In S. Radosevic, A. Curaj, R. Gheorghiu, L. Andreescu and I. Wade (Eds), *Advances in the Theory and Practice of Smart Specialisation*. Elsevier Academic Press.

Foray, D. (2012). Smart specialisation and the New Industrial Policy agenda. European Commission Policy Brief No. 8.

Foray, D. (2014). From smart specialisation to smart specialisation policy. *European Journal of Innovation Management*, 17(4), 492–507. https://doi.org/10.1108/ejim-09-2014-0096

Foray, D. (2019). In response to 'Six critical questions about smart spezialisation'. *European Planning Studies*, 0(10), 1-13. https://doi.org/10.1080/09654313.2019.1664037

Foray, D. and Goenaga, X. (2013). The Goals of Smart Specialisation. European Commission S3 Policy Brief Series, No. 01/2013. https://doi.org/10.2791/20158

Foray, D. and Rainioldi, A. (2013). Smart Specialisation programmes and implementation. S3 Policy Brief Series No. 2 (2013). European Commission. JRC Luxembourg: Publications Office of the European Union.

Foray, D., and Ark, B. Van. (2007). Smart specialisation in a truly integrated research area is the key to attracting more R&D to Europe.

Foray, D., David, P. A., and Hall, B. (2009). Smart Specialisation. The concept. Knowledge. *Economists Policy Brief: Expert group on Knowledge for growth*, (June), 1–5.

Foray, D., David, P. A., and Hall, B. H. (2011). Smart specialisation - From academic idea to political instrument, the surprising career of a concept and the difficulties involved in its implementation. *Mtei-Working_Paper-2011-001*, 1–16. Retrieved from https://infoscience.epfl.ch/record/170252

Foray, D., Goddard, J., Goenaga Belderrain, X., Landabaso, M., McCann, P., Morgan, K., Nauwelaers, C., and Ortega-Argilés, R. (2012). Guide to Research and Innovation Strategies for Smart Specialisations (RIS 3). European Commission. Luxembourg: Publications Office of the European Union, 2012. https://doi.org/10.2776/65746

Franz, T. (2017). Urban Governance and Economic Development in Medellín. *Latin American Perspectives*, 44(2), 52–70. https://doi.org/10.1177/0094582x16668313

Frenken, K., Van Oort, F., and Verburg, T. (2007) Related Variety, Unrelated Variety and Regional Economic Growth. *Regional Studies*, 41(5), 685-697. https://doi.org/10.1080/00343400601120296

Fromhold-Eisebith, M., and Eisebith, G. (2005). How to institutionalize innovative clusters? Comparing explicit top-down and implicit bottom-up approaches. *Research Policy*, 34(8), 1250– 1268. https://doi.org/10.1016/j.respol.2005.02.008

Fu, X., Pietrobelli, C., and Soete, L. (2011). The Role of Foreign Technology and Indigenous Innovation in the Emerging Economies: Technological Change and Catching-up. *World Development*, 39(7), 1204–1212. https://doi.org/10.1016/j.worlddev.2010.05.009

Fukuyama, F., and Colby, S. (2011). Half a Miracle: Medellín's rebirthis nothing short of astonishing. But have the drug lords really been vanquished? *Foreign Policy*, 186(6), 1–17

Gaglio, C., Kraemer-Mbula, E., and Lorenz, E. (2022). The effects of digital transformation on innovation and productivity: Firm-level evidence of South African manufacturing micro and small enterprises. *Technological Forecasting and Social Change*, 182. https://doi.org/10.1016/j.techfore.2022.121785

Gebhardt, C., and Stanovnik, P. (2016). European Innovation Policy Concepts and the Governance of Innovation: Slovenia and the Struggle for Organizational Readiness at the National Level. *Industry and Higher Education*, 30(1), 53-66. https://doi.org/10.5367/ihe.2016.0290

Georghiou, L., Uyarra, E., Scerri, R.S., Castillo, N., and Harper, J.C. (2014). Adapting smart specialisation to a micro-economy – the case of Malta. *European Journal of Innovation Management*, 17(4), 428-447. https://doi.org/10.1108/ejim-03-2014-0026

Gereffi, G. (1989). Rethinking development theory: Insights from East Asia and Latin America. *Sociological Forum*, 4(4), 505–533. https://doi.org/10.1007/BF01115062

Ghemawat, P. (2002). Competition and business strategy in historical perspective. *Business History Review*, 76(1), 37–74. https://doi.org/10.2307/4127751

Gheorghiu, R., Andreescu, L., Zulean, M., and Curaj, A. (2017). Entrepreneurial Discovery as a Foresight for Smart Specialisation: Trade-Offs of Inclusive and Evidence-Based Consensus. In S. Radosevic, A. Curaj, R. Gheorghiu, L. Andreescu and I. Wade (Eds).

Advances in the Theory and Practice of Smart Specialisation, 225-248.. Elsevier Academic Press.

Gianelle, C., and Kleibrink, A. (2017). Monitoring innovation and development strategies. Stakeholder involvement, learning, and sustainable policy cycles. In: Kyriakou, D., Palazuelos, M., Periáñez-Forte, I., and Rainoldi, A. (Eds) in *Governing Smart Specialization.* Routledge, 1st Edition, 95-111.

Gianelle, C., Guzzo, F., and Mieszkowski, K. (2020). Smart Specialisation: what gets lost in translation from concept to practice? *Regional Studies*, 54(10), 1377-1388. https://doi.org/10.1080/00343404.2019.1607970

Gianelle, C., Kyriakou, D., Cohen, C., and Przeor, M. (eds) (2016). Implementing Smart Specialisation: A Handbook. Brussels: European Commission. https://doi.org/10.2791/53569.

Gibney, J. (2011). Knowledge in a 'shared and interdependent world': Implications for a progressive leadership of cities and regions. *European Planning Studies*, 19(4), 613–627. https://doi.org/10.1080/09654313.2011.548474

Glaeser, E. L., Kallal, H. D., Scheinkman, J. A., and Shleifer, A. (1992) Growth of cities. *Journal of Political Economy*, 100(6), 1126–1152. https://doi.org/10.1086/261856

Gonchar, K., Kuznetsov, Y. and Wade, I. (2017). Lessons for a Policy Maker from Real-Life Self-Discovery in Economies With Weak Institutions. In S. Radosevic, A. Curaj, R. Gheorghiu, L. Andreescu and I. Wade (Eds), *Advances in the Theory and Practice of Smart Specialisation*, 225-248. Elsevier Academic Press.

Grillitsch, M. (2016). Institutions, smart specialisation dynamics and policy. *Environment and Planning C: Government and Policy*, 34(1), 22–37. https://doi.org/10.1177/0263774X15614694

Grillitsch, M., and Asheim, B. (2018). Place-based innovation policy for industrial diversification in regions. *European Planning Studies*, 26(8), 1638-1662. https://doi.org/10.1080/09654313.2018.1484892

Grillitsch, M., Asheim, B., and Trippl, M. (2018). Unrelated knowledge combinations: The unexplored potential for regional industrial path development. *Cambridge Journal of Regions, Economy and Society*, 11(2), 257–274. https://doi.org/10.1093/cjres/rsy012

Guimón, J. (2018). Decentralisation of science and innovation policies in emerging countries: Three key challenges that deserve further attention. *International Journal of Technological Learning, Innovation and Development*, 10(1), 69-87. https://doi.org/10.1504/ijtlid.2018.091801

Guimón, J., Chaminade, C., Maggi, C. and Salazar-Elena, J. C. (2018). Policies to Attract R&D-related FDI in Small Emerging Countries: Aligning Incentives With Local Linkages and Absorptive Capacities in Chile. *Journal of International Management*, 24(2), 165-178. https://doi.org/10.1016/j.intman.2017.09.005

Hamel, G., and Prahalad, C. K. (1989). Strategic Intent. *Harvard Business Review*, (November), 1–17. https://doi.org/10.1225/R0507N

Hanson, G. H. (2010). Why Isn't Mexico Rich? *Journal of Economic Literature*, 48(4), 987-1004. https://doi.org/10.3386/w16470

Harmaakorpi, V. (2006). Regional development platform method (RDPM) as a tool for regional innovation policy. *European Planning Studies*, 14(8), 1085-1104. https://doi.org/10.1080/09654310600852399

Harrigan, K. (1981). Barriers to Entry and Competitive Strategies. *Strategic Management Journal*, 2(4), 395-412. https://doi.org/10.1002/smj.4250020407

Hasselwander, M., Kiko, M., and Johnson, T. (2022). Digital civic engagement, open data, and the informal sector: A think piece. *Transportation Research Interdisciplinary Perspectives*, 16. https://doi.org/10.1016/j.trip.2022.100700

Hassink, R., and Gong, H. (2019). Six critical questions about smart specialisation. *European Planning Studies*, 27, 2049-2065. https://doi.org/10.1080/09654313.2019.1650898

Hassink, R., Isaksen, A., and Trippl, M. (2018). Towards a comprehensive understanding of new regional industrial path development. *Regional Studies*, 53(11), 1636-1645. https://doi.org/10.1080/00343404.2019.156670

Hausmann, R., and Rodrik, D. (2003). Economic Development as Self-Discovery. *Journal of Development Economics*, 72(2), 603–633. https://doi.org/10.1016/s0304-3878(03)00124-x

Hausmann, R., and Rodrik, D. (2006). Doomed to choose: Industrial policy as predicament, draft. Blue Sky Seminar, Center for International Development, Harvard University.

Healy, A. (2016). Smart specialization in a centralized state: strengthening the regional contribution in North East Romania. *European Planning Studies*, 24(8), 1527-1543. https://doi.org/10.1080/09654313.2016.1184233

Higuita Palacio, A. M. (2015). *Medellín: Capital de la Innovación* [Medellín: Capital of Innovation]. *Ingeniería Solidaria*, 11(18), 41–56. https://doi.org/10.16925/in.v11i18.990

Hooghe, L., and Marks, G. (2001). Multi-level governance and European integration. Lanham: Rowman & Littlefield.

Horlings, L., Roep, D., and Wellbrock, W. (2018). The role of leadership in place-based development and building institutional arrangements. *Local Economy*, 33(3), 245-268. https://doi.org/10.1177/0269094218763050

Hormecheas, K., Villalba, M. L., Lugo, W., Castañeda, R., and Robledo Velásquez, J. (2019). *Construcción participativa de políticas de CTI transformativas* [Participatory construction of transformative STI policies]. Medellín, Colombia. ALTEC.

Iacobucci, D. (2014). Designing and implementing a Smart Specialisation Strategy at regional level: some open questions. *Scienze Regionali*, 13(1), 107-126. https://doi.org/10.3280/scre2014-001006

Intarakumnerd, P. and Chaminade, C. (2011) Innovation policies in Thailand: towards a system of innovation approach? *Asia Pacific Business Review*, 17(2), 241-256. https://doi.org/10.1080/13602381.2011.533504

Isaksen, A., and Trippl, M. (2016). Path Development in Different Regional Innovation Systems: A Conceptual Analysis. In M. D. Parrilli, R. D. Fitjar, and A. Rodríguez-Pose (eds), *Innovation Drivers and Regional Innovation Strategies*, 82-100. London: Routledge. https://doi.org/10.4324/9781315671475-12

Isaksen, A., and Trippl, M. (2017) Exogenously Led and Policy-Supported New Path Development in Peripheral Regions: Analytical and Synthetic Routes. *Economic Geography*, 93(5), 436–457. https://doi.org/10.1080/00130095.2016.1154443

Isaksen, A., Tödtling, F., and Trippl, M. (2018). Innovation policies for regional structural change: combining actor-based and system-based strategies. In *New Avenues for Regional*

Innovation Systems – Theoretical Advances, Empirical Cases and Policy Lessons, 221-238. https://doi.org/10.1007/978-3-319-71661-9_11

Jacobs, J. (1989). The economy of cities. Random House, NewYork.

Jaffe A.B. (2015). Science and innovation in small countries: speculation and research agenda. *Asia-Pacific Journal of Accounting & Economics*, 22(1), 4-12. https://doi.org/10.1080/16081625.2015.1010267

Jarzabkowski, P. (2008). Shaping strategy as a structuration process. *Academy of Management Journal*, 51(4), 621-650. https://doi.org/10.5465/amj.2008.33664922

Jordaan, J. (2005). Determinants of FDI-induced externalities: New empirical evidence for Mexican manufacturing industries. *World Development*, 33(12), 2103-2118. https://doi.org/10.1016/j.worlddev.2005.07.007

Jordaan, J.A. (2008). Intra- and inter- industry Externalities from Foreign Direct Investment in the Mexican Manufacturing Sector: New Evidence from Mexican Regions. *World Development*, 36(12), 2838-2854. https://doi.org/10.1016/j.worlddev.2008.02.006

Jordaan, J.A. (2017). Producer firms, technology diffusion and spillovers to local suppliers: examining the effects of Foreign Direct Investment and the technology gap. *Environment and Planning A*, 49 (12), 2718-2738. https://doi.org/10.1177/0308518x17731942

Jucevčius, R., and Galbuogienė, A. (2014). Smart specialisation: towards the potential application of the concept for the local development. *Procedia - Social and Behavioral Sciences*, 156, 141-145. https://doi.org/10.1016/j.sbspro.2014.11.136

Jucevicius, G., Juceviciene, R., Gaidelys, V., and Kalman, A. (2016). The emerging innovation ecosystems and "Valley of death": Towards the combination of entrepreneurial and

institutional approaches. *Engineering Economics*, 27(4), 430-438. https://doi.org/10.5755/j01.ee.27.4.14403

Karo, E., Kattel, R. and Cepilovs, A. (2017). Can Smart Specialisation and Entrepreneurial Discovery be Organized by the Government? Lessons from Central and Eastern Europe. In S. Radosevic, A. Curaj, R. Gheorghiu, L. Andreescu and I. Wade (Eds), *Advances in the Theory and Practice of Smart Specialisation*, 269-292. Elsevier Academic Press. https://doi.org/10.1016/b978-0-12-804137-6.00013-9

Kaufman, J. L., and Jacobs, H. M. (1987). A Public Planning Perspective on Strategic Planning. *Journal of the American Planning Association*, 53(1), 23–33. https://doi.org/10.1080/01944368708976632

Kehoe, T., and Meza, F. (2011). Catch-up Growth Followed by Stagnation: Mexico. *Latin American Journal of Economics*, 48(2), 227-268. https://doi.org/10.7764/laje.48.2.227

Kempton, L., Goddard, J., Edwards, J., Hegyi, B., and Elena-pérez, S. (2013). Universities and Smart Specialisation. European Commission. *JRC Scientific and Policy Reports*. S3 Policy Brief Series.

Ketels, C. (2015). What Is Regional Strategy? Lessons from Business Strategy. In J.M. Valdaliso and J.R. Wilson (Eds.), *Strategies for Shaping Territorial Competitiveness*, 37-54. New Tork, NY: Routledge.

Khavul, S., and Bruton, G. D. (2013). Harnessing Innovation for Change: Sustainability and Poverty in Developing Countries. *Journal of Management Studies*, 50(2), 285-306. https://doi.org/10.1111/j.1467-6486.2012.01067.x

Khawar, M. (2003). Productivity and foreign direct investment - evidence from Mexico. *Journal of Economic Studies*, 30(1), 66-76. https://doi.org/10.1108/01443580310455277 8

Kleibrink, A., Gianelle, C. and Doussineau, M. (2016). Monitoring innovation and territorial development in Europe: emergent strategic management. *European Planning Studies*, 24(8), 1438-1458. https://doi.org/10.1080/09654313.2016.1181717

Kleibrink, A., Larédo, P. and Philipp, S. (2017). Promoting innovation in transition countries: A trajectory for smart specialisation. *JRC Science for Policy Report*, EC. https://doi.org/10.2760/988830

Kokko, A. (1994). Technology, market characteristics and spillovers. *Journal of Development Economics*, 43(2), 279–293. https://doi.org/10.1016/0304-3878(94)90008-6

Komninos, N., Musyck, B., Iain Reid, A., and University, F. (2014). Smart specialisation strategies in south Europe during crisis. *European Journal of Innovation Management*, 17(4), 448–471. https://doi.org/10.1108/EJIM-11-2013-0118

Konstantynova, A. (2019). Cluster policy change and evolution: Facilitating regional smart specialisation and economic development. *International Journal of Globalisation and Small Business*, 10(2), 127-142. https://doi.org/10.1504/ijgsb.2019.097929

Korzinov, V., and Savin, I. (2018). General Purpose Technologies as an emergent property. *Technological Forecasting & Social Change*, 129, 88-104. https://doi.org/10.1016/j.techfore.2017.12.011

Kotnik, P., and Petrin, T. (2015). Implementing a smart specialisation strategy: an evidence-based approach. *International Review of Administrative Sciences*, 83(1), 85–105. https://doi.org/10.1177/0020852315574994

Kotter, J. P. (1995). Leading change: Why transformation efforts fail. *Harvard Business Review*, 73, 59-67.

Krammer, S. M. S. (2017). Science, technology, and innovation for economic competitiveness: The role of smart specialization in less-developed countries. *Technological Forecasting and Social Change*, 123, 95-107. https://doi.org/10.1016/j.techfore.2017.06.028

Kristensen, I. F., and Pugh, R. (2022). Opportunities and challenges in implementing Smart Specialisation in Nordic 'strong innovator' regions. *Regional Studies*, 57(1), 129-140. https://doi.org/10.1080/00343404.2022.2054975

Kroll, H. (2015a). Efforts to Implement Smart Specialisation in Practice-Leading Unlike Horses to the Water. *European Planning Studies*, 23(10), 2079-2098. https://doi.org/10.1080/09654313.2014.1003036

Kroll, H. (2015b). Weaknesses and opportunities of RIS3-type of policies, seven theses. Karlsruhe: Fraunhofer ISI.

Kroll, H. (2017a). Smart specialisation policy in an economically well-developed, multilevel governance system. In S. Radosevic, A. Curaj, R. Gheorghiu, L. Andreescu, & I. Wade (Eds.), *Advances in the theory and practice of smart specialisation*, 99–123, London: Academic Press. https://doi.org/10.1016/b978-0-12-804137-6.00005-x

Kroll, H. (2017b). The challenge of smart specialisation in less favoured regions. *Working Papers Firms and Regions.*

Kroll, H., Müller, E., Schnabl, E., and Zenker, A. (2014). From smart concept to challenging practice – how European regions deal with the commission's request for novel innovation strategies. In Fraunhofer, K., Krugman, P. (1991), *Working papers firms and region*, R2/2014.

Krugman, P. (1994). Competitiveness: A Dangerous Obsession. *Foreign Affairs*, 73(2), 28-44. https://doi.org/10.2307/20045917

Kugler, M. (2006). Spillovers from foreign direct investment: Within or between industries? *Journal of Development Economics*, 80(2), 444–477. https://doi.org/10.1016/j.jdeveco.2005.03.002

Kuznetsov, Y. and Dahlman, C. J. (2008). Mexico's Transition to a Knowledge-Based Economy: Challenges and Opportunities. WBI Development Studies. Washington, DC, World Bank. https://doi.org/10.1596/978-0-8213-6921-0

Kuznetsov, Y., and Sabel, C. (2017). Managing Self-Discobery: Diagnostic Monitoring of a Portfolio of Projects and Programs. *Advances in the Theory and Practice of Smart Specialization*, 51-72. https://doi.org/10.1016/b978-0-12-804137-6.00003-6

Květoň, V., and Blažek, J. (2018). Path-development trajectories and barriers perceived by stakeholders in two Central European less developed regions: narrow or broad choice? *European Planning Studies*, 26(10), 2058-2077. https://doi.org/10.1080/09654313.2018.1509061

Kvint, V. L. (2009). The global emerging market: strategic management and economics. https://doi.org/10.4324/9780203882917

Kyriakou, D., Palazuelos Martínez, M., Periáñez-Forte, I., and Rainoldi, A. (2017). Governing Smart Specialisation. Regional Studies Association: Regions and Cities. Routledge. https://doi.org/10.4324/9781315617374

Lall, S. (1980). Vertical inter-firm linkages in LDCs: an empirical study. *Oxford Bulletin of Economics and Statistics*, 42(3), 203–226. https://doi.org/10.1111/j.1468-0084.1980.mp42003002.x

Lambooy, J. G., and Boschma, R. A. (2001). Evolutionary economics and regional policy. *The Annals of Regional Science,* 35, 113-131. https://doi.org/10.1007/s001680000033

Landabaso, M. (2012). Regional Innovation Strategies for Smart Specialisation. OECD. https://doi.org/10.2776/70221

Laranja, M. (2022). Translating Smart Specialisation and entrepreneurial discovery into a process-oriented policy. *Regional Studies*, 56(5), 853-865. https://doi.org/10.1080/00343404.2021.1959028

Laranja, M., Marques Santos, A., Edwards, J., & Foray, D. (2021). Rethinking the 'Entrepreneurial Discovery Process' in times of physical distancing. *EUR 30615 EN*. Publications Office of the European Union. https://doi.org/10.2760/094408

Larrea, J. L., Aranguren, M. J. and Valdaliso, J. M. (2017). Exploring the role of leadership in territorial strategies for competitiveness. *Competitiveness Review: An International Business Journal*, 27(4), 390-409. https://doi.org/10.1108/cr-10-2016-0065

Lee, K., (2013). Schumpeterian Analysis of Economic Catch-up: Knowledge, Path Creation, and the Middle-income Trap. Cambridge University Press.

Lee, K., (2017). Smart Specialisation With Short-Cycle Technologies and Implementation Strategies to Avoid Target and Design Failures. In S. Radosevic, A. Curaj, R. Gheorghiu, L. Andreescu and I. Wade (Eds), *Advances in the Theory and Practice of Smart Specialisation*, 201-224. Elsevier Academic Press. https://doi.org/10.1016/b978-0-12-804137-6.00009-7

Liagouras, G. (2010). What can we learn from the failures of technology and innovation policies in the European periphery? *European Urban and Regional Studies*, 17 (3), 331- 349. https://doi.org/10.1177/0969776409356214

Lin, J. Y. (2017). Advances in the Theory and Practice of Smart Specialisation. In *New Structural Economics and Industrial Policies for Catching-Up Economies*, 185–200.

Lipsey R., Carlaw K., and Bekar, C. (2005). Economic Transformations. Oxford University Press Inc., New York.

Lopes, J., Farinha, L., Ferreira, J.J., and Silveira, P. (2018). Smart specialization policies: innovative performance models from European regions. *European Planning Studies*, 26(11), 2114-2124. https://doi.org/10.1080/09654313.2018.1530148

Lorentzen, J., Muller, L., Manamela, A., and Gastrow, M. (2011). Smart specialisation and global competitiveness: Multinational enterprises and location-specific assets in Cape Town. *African Journal of Business Management*, 5(12), 4782-4791.

Lundvall, B. A., and Tomlinson, M. (1992). Learning-by-comparing: Reflections on the use and abuse of international benchmark-ing. In: Sweeney, G. (ed.), *Innovation, Economic Progress and the Quality of Life*, 120–36.

Lundvall, B. A., Joseph, K. J., Chaminade C., and Vang, J. (eds) (2009). Handbook of Innovation Systems and Developing countries: Building domestic capabilities in a global setting. Science, Technology and Society, 16(3), 397-400. https://doi.org/10.1177/097172181101600308

Lundvall, B.-Å. (ed.) (1992). National Systems of Innovation. Towards a Theory of Innovation and Interactive Learning. *Research Policy*, 24(2), 320. https://doi.org/10.1016/0048-7333(95)90017-9

Maclean, K. (2014). The 'Medellín Miracle': The Politics of Crisis, Elites and Coalitions. Birmingham: Development Leadership Program, University of Birmingham.

Mäenpää, A., and Teräs, J. (2018). In Search of Domains in Smart Specialisation Case Study of Three Nordic Regions. *European Journal of Spatial Development*, 68. https://doi.org/10.30689/ejsd2018:68.1650-9544

Magro, E. (2011). Evaluation in a systemic world the role of regional science and technology policy [Doctoral dissertation, University of Deusto]. Retrieved from https://www.orkestra.deusto.es/images/investigacion/publicaciones/tesis/tdivc003.pdf.

Magro, E., and Nauwelaers, C. (2015). Reconciling territorial strategies goals and means: Towards smart competitiveness policies. In Valdaliso J.M, Wilson, J.R. (eds), *Strategies for Shaping Territorial Competitiveness*. London: Routledge.

Marinelli, E., and Perianez Forte, I. (2017). Smart Specialisation at work: The entrepreneurial discovery as a continuous process. https://doi.org/10.2760/514714

Martinez Melgarejo, M. (2014). *Impactos de la Inversión Extranjera Directa en las Empresas Locales de la Zona Metropolitana de San Luis Potosí: El Caso de la Cadena de Proveeduría de la Industria Automotriz* [Impacts of Foreign Direct Investment on Local Companies in the Metropolitan Area of San Luis Potosí: The Case of the Supply Chain of the Automotive Industry] (Unpublished Doctoral Dissertation). Universidad Nacional Autónoma de México.

Martins, J. T. (2016). Relational capabilities to leverage new knowledge: Managing directors' perceptions in UK and Portugal old industrial regions. *The Learning Organization*, 23(6), 398-414. https://doi.org/10.1108/tlo-03-2016-0022

McCann, P., & Ortega-Argilés, R. (2015). Smart Specialisation, Regional Growth and Applications to European Union cohesion policy. *Regional Studies*, 49(8), 1291-1301. https://doi.org/10.1080/00343404.2013.799769

McCann, P., and Ortega-Argilés, R. (2014). Smart specialisation in European regions: issues of strategy, institutions and implementation. *European Journal of Innovation Management*, 17(4), 409–427. https://doi.org/10.1108/EJIM-05-2014-0052

McCann, P., and Ortega-Argilés, R. (2014a) The role of the smart specialisation agenda in a reformed EU cohesion policy. *Scienze Regionali, Italian Journal of Regional Science*, 13(1), 15–32. https://doi.org/10.3280/scre2014-001002

McCann, P., and Ortega-Argilés, R. (2016a). Smart specialisation, entrepreneurship and SMEs: issues and challenges for a results-oriented EU regional policy. *Small Business Economics*, 46(4), 537–552. https://doi.org/10.1007/s11187-016-9707-z

McKeown, M. (2011). The Strategy Book. Financial Times Publishing/ Prentice Hall

Metcalfe, J. S. (1995). Technology systems and technology policy in an evolutionary framework. *Cambridge Journal of Economics*, 19(1), 25–46. https://doi.org/10.1093/oxfordjournals.cje.a035307

Miles, M. B. and Huberman, A. M. (1994). Qualitative data analysis: An expanded sourcebook (2a ed.). Thousand Oaks, CA: Sage.

Mintzberg, H. (1978). Patterns in Strategy Formation. *Management Science*, 24(9), 934–948. https://doi.org/10.1287/mnsc.24.9.934

Mintzberg, H. (1987). The Strategy Concept I: Five Ps for Strategy. *California Management Review*, 30(1), 11–24. https://doi.org/10.2307/41165263

Mintzberg, H. (1994). The Rise and Fall of Strategic Planning. *Long Range Planning*, 28(1), 125. https://doi.org/10.1016/0024-6301(95)92105-2

Mintzberg, H., Ahlstrand, B. and Lampel, J. (1998). Strategy Safari: a guided tour through the wilds of strategic management. *Work Study*, 48(2). https://doi.org/10.1108/ws.1999.07948bae.002

Mintzberg, H., and Waters, J. A. (1985). Of Strategies, Deliberate and Emergent. *Strategic Management Journal*, 6(3), 257–272. https://doi.org/10.1002/smj.4250060306

Monsson, C.K. (2014). Development without a metropolis: Inspiration for non-metropolitan support practices from Denmark. *Local Economy: The Journal of the Local Economy Policy Unit*, 29(4-5), 295-308. https://doi.org/10.1177/0269094214532903

Moodysson, J., Trippl, M. and Zukauskaite, E. (2016). Policy learning and smart specialisation: balancing policy change and continuity for new regional industrial paths. *Science and Public Policy*, 44 (3), 382-391. https://doi.org/10.1093/scipol/scw071

Moran, T. (2006). Harnessing Foreign Direct Investment for Development: Policies for Developed and Developing Countries. Brookings Institution Press.

Morgan, K. (1997). The Learning Region: Institutions, Innovation and Regional Renewal. *Regional Studies*, 31(5), 491-503. https://doi.org/10.1080/00343409750132289

Morgan, K. (2013). The regional state in the era of Smart Specialisation. *Ekonomiaz*, 83(2), 103-126.

Morgan, K. (2015). Smart Specialisation: Opportunities and Challenges for Regional Innovation Policy. *Regional Studies*, 49(3), 480-482. https://doi.org/10.1080/00343404.2015.1007572

Morgan, K. (2016). Collective entrepreneurship: the Basque model of innovation. *European Planning Studies*, 24(8), 1544–1560. https://doi.org/10.1080/09654313.2016.1151483

Morgan, K. (2016b). Nurturing novelty: Regional innovation policy in the age of smart specialisation. *Environment and Planning C: Politics and Space*, 35(4), 569-583. https://doi.org/10.1177/0263774x16645106

Morgan, K. (2017). Nurturing novelty : Regional innovation policy in the age of smart specialization. *Environment and Planning C: Politics and Space*, 35(4), 569-583. https://doi.org/10.1177/0263774X16645106

Morgan, K. Marques, P. (2019). The public animateur: mission-led innovation and the smart state in Europe. *Cambridge Journal of Regions, Economy and Society*, 12 (2), 179-193. https://doi.org/10.1093/cjres/rsz002

Morgan, K., and Nauwelaers, C. (Eds.) (2003). Regional Innovation Strategies: The Challenge for Less-Favoured Regions. Routledge.

Morisson, A. and Panetti, E. (2020). Institutional entrepreneurs and socio- institutional changes in Medellín, Colombia. *Regional Studies, Regional Science*, 7(1), 35-51. https://doi.org/10.1080/21681376.2019.1703796

Morisson, A. (2018). Knowledge Gatekeepers and Path Development on the Knowledge Periphery: The Case of Ruta N in Medellin, Colombia. *Area Development and Policy*, 4(1), 98–115. https://doi.org/10.1080/23792949.2018.1538702

Morisson, A., and Doussineau, M. (2019). Regional innovation governance and place-based policies: design, implementation and implications. *Regional Studies, Regional Science*, 6(1), 101-116. https://doi.org/10.1080/21681376.2019.1578257

Muscio, A., Reid, A., and Rivera Leon, L., 2015. An empirical test of the regional innovation paradox: can smart specialisation overcome the paradox in Central and Eastern Europe?

Journal of Economic Policy Reform, 18(2), 153–171. https://doi.org/10.1080/17487870.2015.1013545

Mytelka, L. K. and Smith, K. (2002). Policy Learning and Innovation Theory: An Interactive and Co-Evolving Process. *Research Policy*, 31(8-9), 1467-1479. https://doi.org/10.1016/s0048-7333(02)00076-8

Nauwelaers, C., Magro, E., Aranguren, J., Navarro, M., Trippl, M., Hansen, T., and Healy, A. (2014a). Smart Specialisation for Regional Innovation Underpinning Effective Strategy Design. https://doi.org/10.13140/RG.2.2.31110.98887

Navarro, M. (2015). Territorial Strategy: Deepening the "what". In Valdaliso J.M, Wilson, J.R.(eds), *Strategies for Shaping Territorial Competitiveness,* 17-35. London: Routledge.

Navarro, M. Gibaja, J. J., Franco, S. and Murciego, A. (2011b). *El análisis de benchmarking y la identificación de regiones de referencia: aplicación al País Vasco* [Benchmarking analysis and identification of reference regions: application to the Basque Country]. In Navarro, M. (dir.) *Indicadores de innovación y benchmarking. Reflexión y propuesta para el País Vasco* [Innovation and benchmarking indicators. Reflection and proposal for the Basque Country]. Zamudio: Innobasque.

Navarro, M., Arangren, M. J. and Magro, E. (2012). *Las estrategias de especialización inteligente: una estrategia territorial para las regiones* [Smart specialization strategies: a territorial strategy for the regions*]*. *Cuadernos de Gestión*, 12, Especial Innovación, 27-49. https://doi.org/10.5295/cdg.110310mn

Navarro, M., Aranguren, M., and Magro, E. (2011). Smart Specialization Strategies: The Case of the Basque Country. *Orkestra Working Paper Series in Territotal Competitiveness.*

Navarro, M., Valdaliso, J. M., Aranguren, M. J., and Magro, E. (2014). A holistic approach to regional strategies: The case of the Basque Country. *Science and Public Policy*, 41(4), 532–547. https://doi.org/10.1093/scipol/sct080

Neffke F., Henning M., and Boschma, R. (2011). How do regions diversify over time? Industry relatedness and the development of new growth paths in regions. *Economic Geography*, 87, 237– 265. https://doi.org/10.1111/j.1944-8287.2011.01121.x

Nelson, R. (Ed.) (1993). National Innovation Systems: A Comparative Analysis. Oxford University Press.

Nelson, R., and Winter, S. (1982). An Evolutionary Theory of Economic Change. Harvard University Press.

North, D. (1990). Institutions, Institutional Change and Economic Performance. Cambridge: Cambridge University Press.

OECD (1992/ 2005). Oslo Manual: Proposed guidelines for collecting and interpreting technological innovation data. The measurement of Scientific and Technological Activities. OECD Publishing. https://doi.org/10.1787/9789264192263-en

OECD (2011). Regions and Innovation Policy (Summary). OECD Publishing, Paris.

OECD (2015). Promoting the Development of Local Innovation Systems: The Case of Medellin, Colombia.

OECD (2018). Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation. *OECD Publishing*, The Measurement of Scientific, Technological and Innovation Activities, 4th Edition. https://doi.org/10.1787/9789264304604-en

Padilla, R., Vang, J., and Chaminade, C. (2008). RIS and Developing Countries: Linking firm technological capabilities to regional systems of innovation.

Palacios, M. (2006). Between Legitimacy and Violence. A History of Colombia, 1875-2002. London: Duke University Press.

Palavicini-Corona, E. (2012). Local economic development in Mexico: the contribution of the bottom-up approach. PhD Thesis, London School of Economics and Political Science. Retrieved from: http://etheses.lse.ac.uk/507/

Park, Y. T. and Park, G. M. (2003). When does a national innovation system start to exhibit systemic behaviour? *Industry and Innovation*, 10 (4), 403-414. https://doi.org/10.1080/1366271032000163649

Pastor Pérez, M. (2012). *Innovación en la industria mexicana: reflexiones a partir del estudio del sistema de innovación de San Luis Potosí* [Innovation in the Mexican industry: reflections from the study of the innovation system of San Luis Potosí]. *Revista legislativa de estudios sociales y de opinión pública*, 5(10), 121-145.

Pawson, R., Greenhalgh, T., Harvey, G., and Walshe, K. (2005). Realist review - A new method of systematic review designed for complex policy interventions. *Journal of Health Services Research and Policy*, 10(SUPPL. 1), 21–34. https://doi.org/10.1258/1355819054308530

Periañez Forte, I. and Wilson, J.R. (2021). Assessing Smart Specialisation: The Entrepreneurial Discovery Process. JRC Science for Policy Report.

Periañez Forte, I., Marinelli, E., and Foray, D., (2016). The Entrepreneurial Discovery Process (EDP) cycle from priority selection to strategy implementation. In European Commission (Ed.), *Implementing Smart Specialisation Strategies: A Handbook*, 14-35. Luxembourg: Publications Office of the European Union.

Pettigrew, A. (1973). The politics of organizational decision making. London: Tavistock.

Pettigrew, A. (1985). Awakening giant: Continuity and change in ICI. Oxford: Blackwell.

Piekkola, H. (2018). Internationalization via export growth and specialization in Finnish regions. *Cogent Economics and Finance*, 6(1), 1-25. https://doi.org/10.1080/23322039.2018.1514574

Pietrobelli, C., and Rabellotti, R. (2009). The global dimension of innovation systems: linking innovation systems and global value chains. In B.A. Lundvall, K.J. Joseph, C. Chaminade and J. Vang (Eds.), *Handbook of Innovation Systems and Developing Countries*, 214-238. Edward Elgar Publishing Limited, UK, Glos and Edward Elgar Publishing, Inc. USA, Massachussets. https://doi.org/10.4337/9781849803427.00015

Pineda, L., and Scheel, C. (2010). *Plan Estratégico de Ciencia, Tecnología e Innovación de Medellin 2011- 2021* [Strategic Plan for Science, Technology and Innovation of Medellin 2011-2021]. Universidad del Rosario. Ruta N, Medellin.

Poister, T. H. and Streib, G. D. (1999). Strategic Management in the Public Sector: Concepts, Models and Processes. *Public Productivity & Management Review*, 22(3), 308-325. https://doi.org/10.2307/3380706

Porter, M. (2011). Microeconomics of Competitiveness. Institute for Competitiveness and Strategy, Harvard.

Porter, M. E. (1980). Competitive Strategy: techniques for analysing industries and competitors (First). New York: The Free Press.

Porter, M. E. (1985). Competitive Advantage: creating and sustaining superior performance. Free Press, N.Y.

Porter, M. E. (1990). The Competitive Advantage of Nations. *Harvard Business Review*, 68 (2) pp. 73–93.

Porter, M. E. (1990/1998). Clusters and the New Economics of Competition. *Harvard Business Review*, 76(6), 77–90.

Porter, M. E. (1996a). Competitive Advantage, Agglomeration Economies, and Regional Policy. *International Regional Science Review*, 19(1-2), 85-90. https://doi.org/10.1177/016001769601900208

Porter, M. E. (1996b). What is Strategy? *Harvard Business Review*, 61–78. https://doi.org/10.1016/j.cell.2005.09.009

Porter, M. E. (2003). The Economic Performance of Regions. *Regional Studies*, 376(7), 549–578. https://doi.org/10.1080/0034340032000108688

Porter, M. E. (2008). The Five Competitive Forces That Shape Strategy. *Harvard Business Review*, 86, 78–94.

Prahalad, C. K., and Hart, S. L. (2002). The Fortune at the Bottom of the Pyramid. *Strategy and Business*, 26, 54-67.

Prasetyo, E. H. (2022). Legitimacy building of digital platforms in the informal economy: Evidence from Indonesia. *Journal of Entrepreneurship in Emerging Economies*, 14(6), 1168-1187. https://doi.org/10.1108/jeee-02-2021-0073

Pugh, R., and Dubois, A. (2021). Peripheries within economic geography: Four "problems" and the road ahead of us. *Journal of Rural Studies*, 87, 267-275. https://doi.org/10.1016/j.jrurstud.2021.09.007

Radosevic, S. (2017). Asessing EU Smart Specialisation Policy in a Comparative Perspective. In S. Radosevic, A. Curaj, R. Gheorghiu, L. Andreescu and I. Wade (Eds), *Advances in the Theory and Practice of Smart Specialisation*. Elsevier Academic Press.

Radosevic, S., and Ciampi Stancova, K. (2015). Internationalising Smart Specialisation: Assessment and Issues in the Case of EU New Member States. *Journal of the Knowledge Economy*, 9(1), 263-293. https://doi.org/10.1007/s13132-015-0339-3

Radosevic, S., Curaj, A., Gheorghiu, R., Andreescu, L., and Wade, I. (2017). Advances in the Theory and Practice of Smart Specialisation. Chapters 2,4,6,8,9,10 and 12.

Rakhmatullin, R., Stanionyte, L. and Mariussen, A., (2016). Transnational cooperation and value chains. In Gianelle, C., Kyriakou, D., Cohen, C., and Prezor, M. (Eds), *Implementing Smart Specialisation Strategies: a Handbook*. European Commission, Brussels.

Ranga, M. (2018). Smart specialization as a strategy to develop early-stage regional innovation systems. *European Planning Studies*, 26(11), 2125-2146. https://doi.org/10.1080/09654313.2018.1530149

Restrepo Santamaria, N. (2011). *Empresariado Antioqueño y Sociedad, 1940–2004: Influencia de las Elites Patronales de Antioquia en las Políticas Socioeconómica* [Antioquia Entrepreneurship and Society, 1940–2004: Influence of Antioquia's Employer Elites on Socioeconomic Policies]. Medellin: Editorial Universidad de Antioquia.

Rodríguez-Oreggia, E. (2005). Regional disparities and determinants of growth in Mexico. *The Annals of Regional Science*, 39(2), 207-220. https://doi.org/10.1007/s00168-004-0218-5

Rodriguez-Pose, A. (2008). The rise of the "city-region" concept and its development policy implications. *European Planning Studies*, 16(8), 1025-1046. https://doi.org/10.1080/09654310802315567

Rodríguez-Pose, A. (2013). Do institutions matter for regional development? *Regional Studies*, 47 (7), 1034-1047. https://doi.org/10.1080/00343404.2012.748978

Rodríguez-Pose, A. and Di Cataldo, M. (2015). Quality of Government and innovative performance in the regions of Europe. *Journal of Economic Geography*, 15(4), 673-706. https://doi.org/10.1093/jeg/lbu023

Rodríguez-Pose, A., and Villareal, E. M. (2015). Innovation and regional growth in Mexico: 2000-2010. *Growth and Change*, 46(2), 172-195. https://doi.org/10.1111/grow.12102

Rodríguez-Pose, A., Di Cataldo, A., and Rainoldi, A. (2014). The Role of Government Institutions for Smart Specialisation and Regional Development. *JRC Technical Reports*, S3 Policy Brief Series No. 04/2014. https://doi.org/10.2791/71842

Rodríguez-Pose, A., Di Cataldo, and M., Rainoldi, A. (2014). The role of government institutions for smart specialisation and regional development. JRC Technical Reports - Joint Research Centre of the European Commission, Publications Office of the European Union, Luxembourg, 1–16. https://doi.org/10.2791/71842

Rodríguez-Pose, A., Di Cataldo, M., and Rainoldi, A. (2014). The role of government institutions for smart specialisation and regional development. S3 Policy Brief Series No. 04/2014 . EUR 26562 EN. Luxembourg (Luxembourg): Publications Office of the European Union.

Rodrik, D. (2006). Goodbye Washington Concensus, hello Washington Confusion? A review of the World Bank´s economic growth in the 1990s: learning from a decade of reform. *Journal of Economic Literature*, 44(4), 973-987. https://doi.org/10.1257/jel.44.4.973

Rubin, H. J. and Rubin, I. S. (1995). Qualitative Interviewing. The art of hearing data, 2nd Edition. Sage Publications, London.

Ruelas-Gossi (2011). *El síndrome maquiladora en México* [The maquiladora syndrome in Mexico]. *Harvard Business Review*, 89 (1), 20.

Rumelt, R. (1984). Towards a strategic theory of the firm. In Lamb, R., (Ed.), *Competitive Strategic Management*. Prentice-Hall.

Rumelt, R. (1991). How much does industry matter? *Strategic Management Journal*, 12(3), 167-185. https://doi.org/10.1002/smj.4250120302

Saha, N., Sáha, T. and Sáha; P. (2018). Cluster strategies and smart specialisation strategy: do they really leverage on knowledge and innovation-driven territorial growth? *Technology Analysis & Strategic Management*, 30(11), 1256-1268 https://doi.org/10.1080/09537325.2018.1444747

Salazar, A. (2010) *No nacimos pa' semilla. La cultura de las bandas juveniles en Medellin* [We were not born for seed. The culture of youth gangs in Medellin]. Planeta: Bogotá (4th edition).

Sánchez, A. (2013). *La reinvención de Medellín* [The reinvention of Medellin]. *Lecturas de Economía*, 78, 185-227. https://doi.org/10.17533/udea.le.n78a15768

Santiago, F., De Fuentes, C., Dutrénit, G. and Gras, N. (2016). What hinders innovation performance of services and manufacturing firms in Mexico? *Economics of Innovation and New Technology*, 26(3), 247-268. https://doi.org/10.1080/10438599.2016.1181297

Santos, D., and Caseiro, N. (2015). The Challenges of Smart Specialization Strategies and the Role of Entrepreneurial Universities: A New Competitive Paradigm, Handbook of Research on Global Competitive Advantage through Innovation and Entrepreneurship. *Advances in Business Strategy and Competitive Advantage*, 537-551. https://doi.org/10.4018/978-1-4666-8348-8.ch029

Schumpeter, J.A. (1934). The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle. Harvard University Press.

Scott, A., and Storper, M. (2003). Regions, Globalization, Development. *Regional Studies*, 37(6-7), 579-593. https://doi.org/10.1080/0034340032000108697a

Scott, A., and Storper, M. (2007). Regions, globalization and development. *Regional Studies*, 41(S1), S191-S295. http://dx.doi.org/10.1080/0034340032000108697

Segura, F., Borjas, H., and Sifuentes, A. (2015). *Evaluación del ambiente innovador en San Luis Potosí* [Evaluation of the innovative environment in San Luis Potosí]. *Región y Sociedad*, 26(61), 161-200. https://doi.org/10.22198/rys.2014.61.a63

Segura-Mojica, F., Borjas, H., and Sifuentes, A. (2015). Evaluación del ambiente innovador en San Luis Potosí. *Región y Sociedad*, 26(61), 161-200. https://doi.org/10.22198/rys.2014.61.a63

Senyo, P. K., Gozman, D., Karanasios, S., Dacre, N., and Baba, M. (2023). Moving away from trading on the margins: Economic empowerment of informal businesses through FinTech. *Information Systems Journal*, 33(1), 154– 184. https://doi.org/10.1111/isj.12403

Sheikh, F. A. (2019). Undervaluation of informal sector innovations: Making a case for revisiting methodology. *African Journal of Science, Technology, Innovation and Development*, 11(4), 505-512. https://doi.org/10.1080/20421338.2018.1532630

Šipilova, V., Ostrovska, I., Jermolajeva, E., Aleksejeva, L., and Olehnovičs, D. (2017). Evaluation of Sustainable Development in Rural Territories in Latgale Region (Latvia) by Using the Conception of Smart Specialization. *Journal of Teacher Education for Sustainability*, 19(1), 82-105. https://doi.org/10.1515/jtes-2017-0006

Solleiro, J., and Castañón, R. (2016). RIS3 in the context of northern Mexico: Lessons learned in the process of drafting state innovation agendas. 2016 Portland International Conference

on Management of Engineering and Technology (PICMET), 2016, 146-154. Https://doi.org/10.1109/PICMET.2016.7806832

Solleiro, J., García, M., Castañón, R., and Martínez, L. (2020). Smart specialization for building up a regional innovation agenda: the case of San Luis Potosí, Mexico. *Journal of Evolutionary Studies in Business*, 5(1), 81-115. https://doi.org/10.1344/jesb2020.1.j069

Sörvik, J., Teräs, J., Dubois, A., and Pertoldi, M. (2019). Smart Specialisation in sparsely populated areas: challenges, opportunities and new openings. *Regional Studies*, 53(7), 1070-1080. https://doi.org/10.1080/00343404.2018.1530752

Sotarauta, M. (2004). Strategy Development in Learning Cities. Retrieved from http://www.uta.fi/haku.php

Sotarauta, M. (2018). Smart Specialisation, Shared Vision and Policy Traps. Sente Working Papers, 40/2018. (pre-print version of a paper submitted to a Journal).

Sotomayor, L. (2018). Medellín, Colombia: Social Urbanism to Build Human Security. In S. Darchen and G. Searle (Eds.), *Global Planning Innovations for Urban Sustainability*, 42-55.1st Edition, London: Routledge. https://doi.org/10.4324/9781351124225-4

Soulard, C. T., Lardon, S. (2019). Action-Research Helps Researchers Foster Smart Rural Development: Two Case Studies on Local Food Policy. *Systemic Practice and Action Research*, 32(2), 155-166. https://doi.org/10.1007/s11213-018-9469-4

Stake, R. (2005). Qualitative Case Studies in Denzin, N. and Lincoln, Y. *The Sage Handbook of Qualitative Research*. Sage Publications, Thousand Oaks.

Stough, R. (2003). Strategic management of places and policy. *The Annals of Regional Science*, 37(2), 179-201. https://doi.org/10.1007/s001680300149

Suri, H. (2011). Purposeful sampling in qualitative research synthesis. *Qualitative Research Journal*, 11(2), 63-75. https://doi.org/10.3316/QRJ1102063

Teece, D. J., Pisano, G. P., and Shuen, A. (1997). Dynamic Capabilities and Strategic Management. *Strategic Management Journal*, 18, 509-533 https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z

Teece, D.J. (2007). Explicating Dynamic Capabilities: The Nature and Microfoundations of (Sustainable) Enterprise Performance. *Strategic Management Journal*, 28(13), 1319-1350. https://doi.org/10.1002/smj.640

Teräs, J., and Mäenpää, A. (2016). Smart specialisation implementation processes in the north: Lessons learned from two Finnish regions. *European Structural and Investment Funds Journal*, 4(2), 75–86.

Thoumi, F. E. (2002). Illegal drugs in Colombia: From illegal economic boom to social crisis. *The Annals of the American Academy of Political and Social Science*, 582(2), 102–116. https://doi.org/10.1177/0002716202058002008

Tödtling, F., and Trippl, M. (2005). One size fits all? Towards a differentiated regional innovation policy approach. *Research Policy*, 34(8), 1203–1219. https://doi.org/10.1016/j.respol.2005.01.018

Tomilson, M., and Lundvall, B.-Å. (2001). Policy learning through benchmarking national systems of competence building and innovation- learning by comparing. Retrieved from https://www.researchgate.net/publication/229027656_Policy_learning_through_benchmarking_national_systems_of_competence_building_and_innovation-learning_by_comparing

Tracy, S. (2010). Qualitative quality: Eight a"big-tent" criteria for excellent qualitative research. *Qualitative Inquiry,* 16(10), 837-851. https://doi.org/10.1177/1077800410383121

Trippl, M., Zukauskaite, E.and Healy, A. (2019). Shaping smart specialisation: the role of place-specific factors in advanced, intermediate and less-developed European regions. *Regional Studies*, 54(10), 1328-1340. https://doi.org/10.1080/00343404.2019.1582763

Tsipouri, L.J. (2017). Innovation Policy in Southern Europe: Smart Specialisation Versus Path Dependence. In S. Radosevic, A. Curaj, R. Gheorghiu, L. Andreescu and I. Wade (Eds), *Advances in the Theory and Practice of Smart Specialisation*. Elsevier Academic Press.

Uyarra, E., and Flanagan, K. (2010). From regional systems of innovation to regions as innovation policy spaces. *Environment and Planning C: Government and Policy*, 28(4), 681–695. https://doi.org/10.1068/c0961

Uyarra, E., Flanagan, K., Magro, E., Wilson, J. R., and Sotarauta, M. (2017). Understanding regional innovation policy dynamics: Actors, agency and learning. *Environment and Planning C: Politics and Space*, 35(4), 559–568. https://doi.org/10.1177/2399654417705914

Valdaliso, J. M., Magro, E., Navarro, M., Aranguren, M. J., and Wilson, J.R. (2014). Path dependence in policies supporting smart specialisation strategies: Insights from the Basque case. *European Journal of Innovation Management*, 17(4), 390-408. https://doi.org/10.1108/ejim-12-2013-0136

Vallance, P., Blažek, J., Edwards, J., and Kve, V. (2018). Smart specialisation in regions with less-developed research and innovation systems: A changing role for universities? *Politics and Space*, 36(2), 219-238. https://doi.org/10.1177/2399654417705137

Vallance, P., Blažek, J., Edwards, J., and Květoň, V. (2017). Smart specialisation in regions with less-developed research and innovation systems: A changing role for universities? *Environment and Planning C: Politics and Space*, 36(2), 219–238. https://doi.org/10.1177/2399654417705137

Van Der Panne, G. (2004). Agglomeration externalities: Marshall versus Jacobs. *Journal of Evolutionary Economics*, 14(5), 593-604. https://doi.org/10.1007/s00191-004-0232-x

Van der Ven, A. H., Polley, D. E., Garud, R. and Venkataraman, S. (1999). The Innovation Journey. Oxford University Press, New York, NY.

Varela, P., Gonzales, M., and Sanchez, M. D. (2019). The uneven regional distribution of projects funded by the EU framework programmes. *Journal of Entrepreneurship, Management and Innovation*, 15(3), 45-72. https://doi.org/10.7341/20191532

Villarreal Gonzalez, A., Mack, E. A., and Flores, M. (2017). Industrial complexes in Mexico: implications for regional industrial policy based on related variety and smart specialisation. *Regional Studies*, 51(4), 537-547. https://doi.org/10.1080/00343404.2015.1114174

Viotti, E. (2002). National Learning Systems: A New Approach on Technological Change in Late Industrializing Economies and Evidences from the Cases of Brazil and South Korea. *Technological Forecasting and Social Change*, 69, 653–680.

Wall Street Journal (2013). The city of the year. The Wall Street Journal. Retrieved from http://online.wsj.com/ad/cityoftheyear

Watts, L., Steele, L., and Den Hartog, D. (2020). Uncertainty avoidance moderates the relationship between transformational leadership and innovation: A meta-analysis. *Journal of International Business Studies*, 51(1), 138-145. https://doi.org/10.1057/s41267-019-00242-8

White, C. (2004). Strategic Management. Palgrave Macmillan.

Whittington (1993/2001). What is strategy- and does it matter? 2nd edition, Thomson Learning, London. 1st edition in 1993 by Routledge.

Witcher, C. (2010). Negotiating Transcription as a Relative Insider: Implications for Rigor. *International Journal of Qualitative Methods*, 9(2), 122-132. https://doi.org/10.1177/160940691000900201

Xiao, J., Boschma, R., and Andersson, M. (2018) Regional diversification: the differentiated role of industry relatedness over sectors and regions. Working paper.

Yin, R. (1994). Case study research: Design and methods (2nd ed.). Sage Publishing.

Yin, R. (2009). Case Study Research: Design and Methods. Fourth Edition. SAGE Publications California.

Zacca-González, G., Chinchilla-Rodríguez, Z., and Vargas-Quesada, B. (2018). Medical scientific output and specialization in Latin American countries. *Scientometrics*, 115(3), 1635-1650. https://doi.org/10.1007/s11192-018-2717-7

Zukauskaite, E., Plechero, M., and Trippl, M. (2014). Institutional thickness: redefining the concept. CIRCLE, Lund University.