INNOVATION SYSTEMS AND THE REVITALISATION OF AN OLD INDUSTRIAL AREA: THE CASE OF THE TEXTILE INDUSTRY IN DAEGU, SOUTH KOREA

By

Bong Kyung Jeon

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The Bartlett School of Planning

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DECLARATION

I, Bong Kyung Jeon, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis

ABSTRACT

National, regional and sectoral innovation systems are considered key concepts in economic and industrial analysis for understanding the (re)combination of existing knowledge and physical systems to produce innovation in goods and services. Therefore, the framework of innovation systems is widely analysed in both academic and policy circles given that it provides both theoretical and empirical insights. Yet, the extant literature has paid less attention to a number of important matters – 1) the centralised top-down model, 2) low-tech industry and SMEs innovation, 3) the role of intermediaries, 4) the evolutionary process of innovation systems, and 5) a lack of consideration of policy leverage, which is part and parcel of innovation (systems). Furthermore, there is a paucity of empirical applications regarding how to connect three types of innovation systems within one single research framework.

To fill these gaps above, this research examines the restructuring process of an old textile region in Daegu, South Korea. Daegu's textile industry was the subject of policy during the past developmental state period (from the 1960s to the end of the 1980s) and it has been the focus of the first government-led regional attempt at industrial upgrading in the post-developmental state (since the end of the 1990s) period. This suggests that the study of the contribution of the South Korean innovation system to industrial upgrading in Daegu requires an evolutionary approach involving in-depth longitudinal observation covering ample historical events to compensate for the typical methodological weaknesses of the static snapshots found in many innovation studies.

With an evolutionary perspective of the Daegu textile industry as a case study, this research unearths the following questions: 1) how Korea's innovation systems have contributed to the revitalisation of the old industrial region; 2) how local textile intermediaries themselves have evolved and stimulated knowledge dissemination; 3) how the local textile SMEs have transformed their businesses toward a high value-added one, and; 4) how the post-developmental state model has affected the regional upgrade, compared to the previous governance.

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TABLE OF CONTENTS

Chapter 1 INTRODUCTION 15

1.1 Background 15

1.2 Research aims and questions 17

1.3 The structure of the thesis 22

Chapter 2 LITERATURE REVIEW: INNOVATION SYSTEMS AND SMEs INNOVATION 27

2.1 Introduction 27

2.2 Systems of Innovation 29

2.2.1 Introduction 29

2.2.2 Notions of “system” and “innovation” 30

2.2.3 National Innovation Systems (NIS) 32

2.2.4 Regional Innovation Systems (RIS) 39

2.3 Intermediaries and Sectoral Innovation Systems (SIS) 49

2.4 Market segmentation and SMEs Innovation 53

2.5 Conclusion 59

Chapter 3 POLICY REVIEW: FROM DEVELOPMENTALISM TO INNOVATION SYSTEMS 64

3.1 Introduction 64

3.2 The developmental state and policy intervention 66

3.2.1 Financial intervention and conglomerate control 70

3.2.2 Korea's unique feature of the developmental state 76

3.3 A brief history of STP in Korea 81

3.3.1 Park Chung-hee (1963 to 1979) 81

3.3.2 Chun Doo-hwan (1980 to 1988) 87

3.3.3 Roh, Tae-woo (1988 to 1993) 90

3.3.4 Kim Young-sam (1993 to 1998) 94

3.3.5 Kim Dae-jung (1998 to 2003) 97

3.3.6 Roh Moo-hyun (2003 to 2008) 100

3.4 Conclusion 103

Chapter 4 METHODOLOGY 109

4.1 Introduction 109

4.2 Research methods 110

4.2.1 Case Study 110

4.2.2 Documentary analysis 113

4.2.3 Qualitative interview 114

4.3 Methodological issues for innovation studies 122

Chapter 5 TEXTILE INDUSTRY IN DAEGU: THE FIRST GOVERNMENT-LED REGIONAL RESTRUCTURING 128

5.1 Daegu's textile industry in the past and now 128

5.2 The outset of a restructuring process in the local textile industry 132

5.3 Institutional and business environments in Daegu..... 135

5.4 The rationale for the case region selection 141

Chapter 6 THE ROLE OF LOCAL PUBLIC INTERMEDIARIES IN THE RESTRUCTURING PROCESS 144

6.1 Introduction..... 144

6.2 From national to regional innovation systems 145

6.3 The trajectory of the local institutions 148

6.3.1 The genesis of the institution-led restructuring, 1999 – 2003 148

6.3.2 In a transitional period, 2004 – 2013 153

6.4 The advancement of local intermediaries 161

6.5 Conclusion 167

Chapter 7 THE MARKET SEGMENTATION IN THE LOCAL TEXTILE BUSINESS…..... 170

7.1 Introduction..... 170

7.2 Company case study 172

7.2.1 Apparel-oriented firms 174

7.2.2 Technical-oriented companies 186

7.3 Summary and Findings 193

7.3.1 Technology, innovation and patents in SMEs in the low-tech sector 193

7.3.2 The emergence of younger generations in the local textile industry 196

7.3.3 Summary 200

Chapter 8 THE ROLE OF THE KOREAN GOVERNMENT IN THE POST DEVELOPMENTAL ERA 204

8.1 Introduction 204

8.2 The emergence of the post-developmental era 205

8.3 Regional innovation system in the post-developmental era 210

8.3.1 The feature of Korea's regional innovation system 211

8.3.2 Regional economic integration 213

8.3.3 The legacy of the developmental state 222

8.4 Conclusion and Discussion 229

Chapter 9 CONCLUSION 235

9.1 Introduction 235

9.2 Summary of empirical findings 236

9.3 Contribution to the literature 242

9.4 Further studies and research limitations 246

BIBLIOGRAPHY 250

APPENDIX: LIST OF INTERVIEWS 273

LIST OF TABLES

Table 2-1 The features of innovation systems in the context of the developmental state 38

Table 2-2 Innovation share by size of innovating unit in the UK, 1945-83 57

Table 2-3 Main terms and their meanings 60

Table 2-4 Characteristics of innovation systems 62

Table 3-1 Basic indicators in latecomers 64

Table 3-2 Socioeconomic development and income 80

Table 3-3 Major R&D Indicator in Korea (billion won) 92

Table 3-4 The policy evolution 105

Table 4-1 Typology of interview strategies 115

Table 4-2 The advantage of the elite corporate interview 118

Table 4-3 Empirical studies of industrial upgrade, regional restructuring, and innovation systems 125

Table 5-1 The background of Daegu's key manufacturing industry from 1999 to 2004 131

Table 5-2 The leading industry shares of Korean exports 132

Table 5-3 The expenditure of the restructuring scheme (Unit: million US Dollar ($), %) 135

Table 5-4 The state of manufacturing industry in Daegu 137

Table 5-5 The number of research organisations & researchers..... 138

Table 6-1 Major projects of local intermediaries in the first restructuring scheme (1999-2003)..... 152

Table 6-2 The state of local business sectors in Daegu Metropolitan Area in 2012 157

Table 6-3 The distribution of firm sizes by employment in Daegu textile industry, 2014 159

Table 6-4 The number of patents in KTDI & DYETEC 162

Table 6-5 The number of R&D projects and visitors in KTDI & DYETEC..... 163

Table 6-6 The state of technical textile firms in Daegu and neighbouring cities 166

Table 6-7 The recent evolution of Daegu's textile industry 168

Table 7-1 The condition of garment-oriented firms in 2015 [Unit: One million Won] 174

Table 7-2 The condition of technical-oriented firms in 2015 [Unit: one million won] 186

Table 7-3 The industrial structural change in Daegu..... 198

Table 7-4 The features of the nine case corporations regarding methods of survival 200

Table 8-1 The feature of RIS in the Roh and the Lee regimes 213

Table 8-2 The allocated budget of Daegu's new scheme by the central government. 220

Table 8-3 The outcome of the commercialisation support project for the mixed textile material 221

Table 8-4 The budget support to regional development policy [million US Dollar]227

Table 8-5 The role of government in the early and latest developmental states..... 230

LIST OF FIGURES

Figure 1-1 The structure of three key actors in each dimension 17

Figure 1-2 Thesis structure 26

Figure 2-1 The structure of RIS in Korea 43

Figure 3-1 The transformation of policy direction in Korea 106

Figure 3-2 The role of ministries on S&T policy and Innovation Systems 108

Figure 5-1 The location of Daegu region 128

Figure 5-2 The location of Daegu's key textile clusters and organisations 130

Figure 6-1 KTDI site 149

Figure 6-2 DYETEC site 150

Figure 7-1 The types of local innovative companies in Daegu 171

Figure 7-2 The manufacturing process of textile industry 172

Figure 7-3 Dyeing cluster in Daegu 173

Figure 7-4 Fabric ranges 175

Figure 7-5 The process of deriving EFP fibre from corn 177

Figure 7-6 EFP (corn) fabrics 178

Figure 7-7 Military uniform textile material 179

Figure 7-8 Antibacterial fabric products 181

Figure 7-9 Sites in company E 182

Figure 7-10 Sites in Company F 184

Figure 7-11 Main products 185

Figure 7-12 Site of company [G] 187

Figure 7-13 Endless felts 188

Figure 7-14 Factories and shops in case company [H] 188

Figure 7-15 Washable velvet products 190

Figure 7-16 Site of company [I] 191

Figure 7-17 Insulation parts for vehicle 192

Figure 7-18 The technical textile for the space launch vehicle 193

Figure 7-19 The knowledge flow of the local textile industry 196

Figure 8-1 Sixteen districts in the Roh administration 217

Figure 8-2 Seven districts in the Lee administration 218

Figure 8-3 Daegu's strategic industries in the restructuring project 223

Figure 8-4 The budget flow of Daegu's regional restructuring programmes 227

Chapter 1 INTRODUCTION

1.1 Background

After the Korean War, which took place between 1950 – 1953, the socioeconomic circumstances of South Korean society (henceforth referred to as Korea) had been dramatically changed by an authoritarian state. Under the state's intervention in the developmental period, in particular, the nation's industrial structure had successfully been transformed from the agricultural industry to the heavy chemical industry, thereby achieving rapid economic growth. Therefore, the government's well-operated intervention and policy implementation attracted attention in academic circles following the unprecedented growth of the Korean economy within almost three decades (Amsden 1989; Balassa 1988; Chang 1993; Collins and Park 1988; Dornbusch et al. 1987; Jeong 1997; Jones and Sakong 1980; Rodrik 1994; Minns 2010; Nelson 1993).

However, the Asian financial crisis in 1997 resulting in the collapse of Korea's economic and industry structure changed the perception of the nation's successful achievement and the developmental state. The financial crisis directly caused the bankruptcy of a substantial number of companies, including the nation's promising conglomerates (called *chaebol*), and indirectly disclosed several socioeconomic problems derived from the previous government system. Indeed, much less is known about the sequel to the successful catching-up story of Korea's macroeconomic planning over the last few decades, which eventually resulted in severe side effects, such as regional disparities between the capital region and the rest of South Korea. Thus, the Western media promulgated the end of "the Asian Miracle" (Choi 2012; Weiss 1998). Meanwhile, the Korean government was constrained to modify the former policy orientation since the emergence of neoliberalism, as the past developmental strategy for intervening in the international financial market and the domestic private sector, was no longer available.

On the other hand, since the early 1990s, the concept of the Regional Innovation System (RIS) has been prevalent in academic and policy circles in Western economies (Asheim and Coenen, 2005; Cooke, 2001; Doloreux and Parto, 2005; Doloreux, 2002;

Howells, 1999; Iammarino, 2005; Uyarra, 2010; Uyarra and Flanagan 2010; Braczyk et al., 1998; Cooke et al., 1997; Malmberg and Maskell, 2007), as it may provide both a theoretical/conceptual understanding and a framework for empirical evidence. Indeed, regional competitiveness has been increasing in importance since the 1990s (Huggins and Williams 2011; Lundvall and Borrás 1997). In terms of the academic perspective, the concept can explain the phenomenon of every region having a different economic outcome depending on its economic, geographical, and institutional milieus. In policy circles, RIS is employed for policy programmes designed to ameliorate uneven regional development and divergence.

Under the changing fortune in Korea's socioeconomic milieu at the end of the 1990s, the concept of RIS had penetrated academic and policy circles in Korea and had been regarded as a useful policy tool for stimulating regional economics. Thus, RIS was employed to remedy the condition of regional disparities and to prevent the sudden collapse of local-based traditional industries that had been directly affected by the financial crisis.

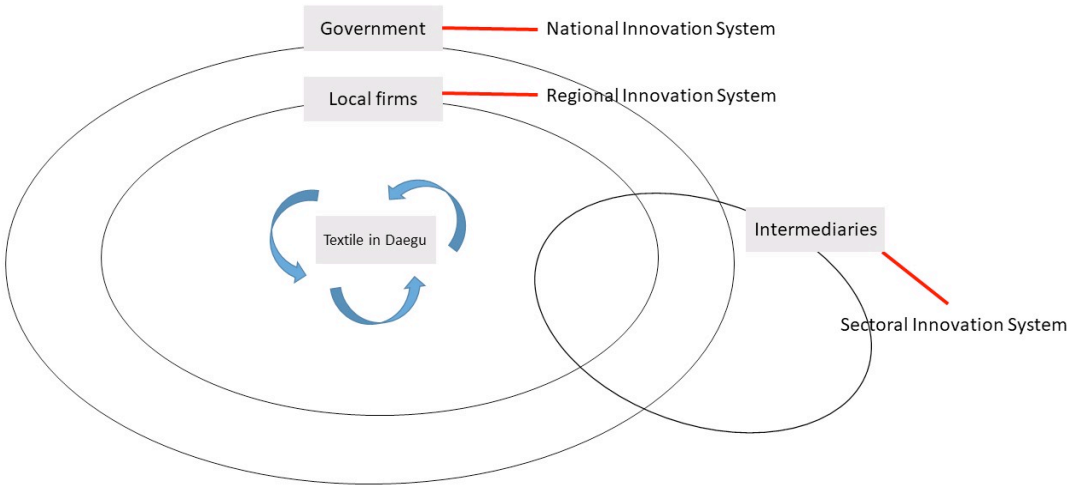
During the developmental period, furthermore, the government had already established the National Innovation System (NIS), which also can refer to the nation's institutional setting; this aimed to catch up rapidly with advanced economies and to bring about a structural transformation in the industry, given the lack of financial and human resources in Korea. Therefore, Korean policy makers aimed for the betterment of regional economic and industrial circumstances through the interaction between the NIS and RIS. It was a new driving force for sustainable economic growth, so that the government-led restructuring project for the textile industry under innovation systems in Daegu emerged in 1998.

Hence, this thesis critically examines Korea's first regional restructuring, drawing on the case of Daegu's textile industry, thereby providing an opportunity to see how Korea's innovation system has contributed to the transformation of the old textile industry.

1.2 Research aims and questions

This thesis aims to trace the restructuring process of the old industrial region using a multidimensional analysis. Arguably, the revitalisation process is not operated by local stakeholders alone, but instead is strongly influenced by various actors, such as the central government and other institutions. Therefore, this study selects three key actors (government, intermediaries, and local firms) in each dimension, and examines how they have been contributing to the revitalisation process. Also, given the strong linkage between the actors, the triple helix of Korea's innovation system helps show the interplay and the evolutionary process of these three key actors over time.

Figure 1-1 The structure of three key actors in each dimension



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In seeking a long-term revitalisation process, first of all, this research employs a single case study - an appropriate method for a longitudinal study (Yin, 2013) - to comprehend the changing fortunes of the textile industry in Daegu over the last half century, thereby providing an understanding of cause and effect in regional transformation when confronting unfavourable circumstances. In other words, the single case study as an empirical inquiry can demonstrate the evolutionary process of each actor in the transformation of the case region.

In order to trace how each set of embedded components in national, regional, and sectoral innovation systems had endeavoured to promote mutual learning (i.e., innovation activities) to upgrade the local textile industry, the framework of SI is mainly used. This approach emphasises the institutional setting and the interplay of innovative actors within the system, which is regarded as the crux of sustainable economic growth for national, regional, and sectoral dimensions (Edquist, 1997; Freeman, 1995; Godin, 2009; Lundvall, 2007; Nelson, 1993).

In particular, RIS is used as a main conceptual framework of this thesis because of its dual functions in providing both theoretical and empirical explanations for regional economic development and revitalisation. Therefore, RIS has penetrated policy programmes, which mitigate uneven regional development and divergence (e.g., the European Union's regional policy, such as the Lisbon strategy, the policies of VINNOVA in Sweden's Innovation Agency and OECD). Likewise, the Korean government has been used RIS as a crucial regional policy tool since the Kim, Dae-Jung administration. For the reason, previous studies on RIS in Korea (e.g., Park 2001; Gress 2015; Sonn and Kang 2014) also reconfirmed the importance of RIS (including innovation policy) for alleviating the nation's disparities in economic and industrial structure, and for bolstering regional competitiveness.

However, the existing work in the RIS tradition has been analysed mainly in connection to Western economies (especially decentralised countries, such as the German and Italian regions), high tech and fashionable-industries. These studies tend overly to emphasise agglomeration and geographical proximity in improvements in the competitiveness of regions notably in innovative regions and milieus (Camagni, 1991; Ratti et al., 1997), high-tech areas (Keeble and Wilkinson, 2000), clusters of knowledge-based industries (Cooke, 2002), regions benefitting from knowledge spill-overs (Audretsch and Feldman, 1996; 2004; Bottazzi and Peri, 2003), and the 'Third Italy' (Asheim, 2000) and 'Silicon Valley' (Saxenian, 1994).

In contrast, there is a dearth of empirical studies on lagging regions and low-tech sectors, implying that much less is known about the process of how older industrial regions and low-tech industrial sectors have been changing. Indeed, it is queried

whether the RIS approaches could properly be utilised in the aforementioned context. Thus, analysing the case of the restructuring process of Daegu's textile industry may fill the gap regarding the lack of empirical evidence not only of the RIS but also of the SIS.

Another empirical and theoretical paucity of RIS is that much of the literature has analysed regions in Western decentralised economy systems, whereas the top-down model of RIS in non-Western countries has received less attention. In this respect, the investigation of the role of the government and of national innovation systems (NIS) is essential for understanding the top-down model of RIS, which has a strong systemic linkage to innovative resources at the national level. Yet, the extant studies do not focus sufficiently on this matter, though the conceptual framework and the terminology of "Regionalised National Innovation System" (Asheim and Isaksen, 2002) and "Dirigist RIS" (Cooke 1998) are introduced in academic circles.

Considering these issues, the starting point of the research is to explore how Korean innovation systems (NIS, RIS, and SIS) are linked to each other and have affected the revitalisation of the old textile industry in Daegu after the Kim Dae-jung administration, which initiated the nation's first restructuring process. Thus, my main research question is as follows:

- (RQ 1) How have Korean innovation systems contributed to the revitalisation of an old textile industry in Daegu in the context of the (post-) developmental state?

Previous studies on RIS have tended to overplay the interactions of inter-organisations as a crucial factor of innovation. Yet, there is less attention on policy, structural, and institutional perspectives (Ter Wal and Boschma, 2009), so that Asheim et al. (2011a, p. 881) pinpointed the conceptual weakness of RIS using Feldman's (2001) words: 'A weakness of many studies of RIS is that they look at "full-blown systems" at a point in time, without providing an analysis of how the system evolved and developed'.

In a similar vein, there is almost no research about the influence of intermediaries upon the old industrial region, even though the role of intermediaries in innovation systems

has been underlined (Bessant and Rush, 1995; Howells, 2006). Fritsch and Slavtchev (2011, p. 906) also mentioned the lopsided view of previous studies, which neglect the underlying systemic circumstances and the policy aspects as follows: 'Little is still known about the conditions that are conducive or unfavourable for innovation activity and how policy could help improve the functioning of RIS'.

In order to scrutinise such neglected issues, this research looks at the trajectories of the evolutionary process of local institutions, which were established by the government's policy for supporting the textile industry and for stimulating RIS in Daegu, thereby showing how intermediaries have contributed to the formation of RIS. From a policy perspective, investigating the local intermediaries provides clues of the (innovation) policy influence over RIS, as all government bodies in Korea, especially regional-based agencies, are under the control of the central government on account of the financial situation.

Therefore, this research aims to examine how local intermediaries themselves under the government control evolved and then contributed to the restructuring of the local textile industry. This leads to the first sub-question:

- (RQ 2) How have local intermediaries themselves evolved and then stimulated the revitalisation of Daegu's textile industry?

Whilst the framework of RIS has been utilised as a promising policy tool for regional issues, there are limited concrete examples of whether the older industrial regions could significantly be facilitated by RIS. Indeed, innovation systems help improve regional circumstances, but this does not guarantee the prosperity of all regions (see, e.g., Tödtling and Trippl, 2005). Rather, the actual improvement of regions is mainly effected by local firms and their innovation activities, such as technological innovations. In this regard, this research needs to look at the innovation activities of the local textile firms, thereby narrowing the knowledge gap stemming from the insufficient study on firm level innovation in the context of low-tech sectors. In particular, the analysis of the innovation process of SMEs (small and medium-sized enterprises) seems more worthy of study than that of large-sized corporations. Even

though the innovation performance at firm level often depends on the size of the firm, most of the empirical studies have focused on the view of large-sized firms, paying less attention to innovation among SMEs (Winter, 1984; Acs and Audretsch, 1988).

Therefore, the second sub-question focuses on the innovative activities (e.g., learning process by mutual collaboration) of local textile firms since the outset of the industrial restructuring in Daegu:

- (RQ 3) How have local textile companies transformed their businesses into high value added ones?

Following the Asian economic financial crisis at the end of the 1990s, the Korean government had attempted to use public policy and institutional (re-)arrangements to alleviate the severely uneven regional development, which had resulted from the early developmental state. Under the long history of the centralised system, the regions were not able to carry out the restructuring process independently due to the lack of financial and other resources.

Therefore, the government-led RIS model was seemingly not implemented well in the first stage because of path-dependence, technological and political lock-ins, and disharmony between local actors (Cho and Hassink 2009). These negative circumstances, in which too much proximity and too specialised-industrial regions were major obstacles to regional restructuring, have already been revealed by a number of studies (see, e.g., Boschma, 2005; Tödtling and Trippl, 2005).

Despite the relatively disappointing results, nonetheless, the government continued with the restructuring process to implement changes in policy strategy and reform innovation systems in light of the changing socio-economic milieu (e.g., neoliberalism). However, the problem is that although the new government system has been responding to global neoliberalism, there remain important legacies of the early developmental state that are entrenched in all sectors of society, especially bureaucracy (i.e. policy circle). So this has created a mixed model of developmentalism and neoliberalism, which is also referred to as the post-developmental state. Therefore, it is important that this research looks at the current government (and innovation) system

and its influences upon the restructuring process. Therefore, the third sub-question is as follows:

- (RQ 4) How has the post developmental state in Korea affected the restructuring process of the old industrial region?

Hence, this research addresses the aforementioned empirical and theoretical silences on the grounds of a longitudinal study when speaking of the restructuring process of the Daegu textile industry. After answering the three-sub questions in Chapter 6 (the evolutionary process of local intermediaries), in Chapter 7 (the structural upgrade of the local textile enterprises), and in Chapter 8 (the role of the current government system), an answer to the main question eventually is offered.

1.3 The structure of the thesis

The following Chapter 2 reviews the literature on multidimensional innovation systems (i.e., NIS, SIS, and RIS), in order to provide theoretical linkages between the literature review and the empirically-based analysis chapters (Chapters 6, 7, and 8). The chapter examines how innovation systems have been dealt with by both academic and policy circles, and identifies the neglected issues that are the research gaps this study needs to fill. In doing so, the research questions and potential contributions of this thesis can be explored. The NIS literature allows an understanding of the role of the state in establishing institutional arrangements and in boosting innovation systems, with a focus on the national level. The SIS review is designed to interpret how the textile sector has been transformed by other innovative actors and policies. In particular, regional-based intermediaries, which act as a bridge between the NIS and the SIS, or the SIS and the RIS, are deemed a crucial factor within the SIS, so the SIS literature focuses on the analysis of the role of the intermediaries in the process of regional economic upgrading. The main conceptual framework of the RIS helps unravel the evolutionary process and the interplay of regional stakeholders within the regional boundary. It therefore allows an understanding of the transformation process of the local textile corporations through restructuring. Given the historical fact that the Korean state had exploited the NIS as an important means for fostering a national industrial upgrade, Korea's RIS has a somehow unique function, and has a strong

dependence on the NIS. This suggests that this study can provide an opportunity to compare the RIS model between Korean and other (mostly) Western decentralised countries to explore how the centralised-RIS has operated and how it has contributed to restructuring.

In addition to the three innovation systems, the feature of SMEs' innovation is introduced in Chapter 2. Innovation at the firm level varies, depending on firm size and turnover. Therefore, Chapter 2 interprets the advantages and disadvantages of smaller-sized firms when conducting innovation activities, and introduces the historical importance of SMEs' innovation in the national economy and technological advancement. In this regard, the analysis of SMEs' innovation also gives a clue regarding the importance of market segmentation. In the literature, the SMEs' innovation may permit the structural change of the business sector, but there is a dearth of empirical studies. For this reason, analysing SMEs' innovation here can help provide an understanding of the phenomenon of the market and the business segmentation of the local textile sector in Daegu, which will be addressed in Chapter 7.

Chapter 3 provides a review of the characteristics of the early developmental state and a review of Korea's economic, science and technology, and innovation policy so as to aid understanding of the path of the nation's development trajectory that may give the overall story of institutional settings. Through an analysis of the policy record over the last half-century from the Park regime (1963 – 1979) to the Roh government (2003 – 2008), we can perceive how the nation's social and political circumstances have been changing and how innovative environments have been established. On the other hand, the story of the Lee regime (2008 – 2013) is omitted in the policy review chapter. As this study compares the policy stance of the Korean state between the past and the least developmental model, in Chapter 8, the Lee government is selected as a comparison target as the latest regime that will address up-to-the-minute (regional) policies.

Chapter 4 provides a rationale for why this study employs its selected methodologies (case study, documentary analysis, and qualitative interview), and shares the fieldwork experiences of conducting interviews, thereby demonstrating both the merits and the

limitations of qualitative elite interviews. The chapter particularly expounds upon how the author approached elite interviewees to collect high-level information and stories of specific (policy and management) decisions. With regard to innovation studies, on the other hand, there is a perennial issue of the measurement of innovation activities and processes, as the nature of innovation is invisible and requires the analysis of complicated interplays with various interests that make it difficult to determine which input resources created a particular innovation. Further, the contemporary innovation process itself frequently occurs in a non-linear way in which there is no clear correlation between input resources and outputs. Therefore, the chapter deals with the aforementioned issue and considers how to overcome such fundamental methodological limitations.

Chapter 5 introduces the overall background of the case region (e.g., location, main local industry, local business structure), and explains why the case study of Daegu's textile industry is so meaningful. Especially, the chapter provides a discussion of the changing fortunes of the local industry from the 1960s and gives accompanying explanations of how the government has dealt with the local industry with policy benefits. The review also gives a hint as to why the textile stakeholders in Daegu tended to resort to a central government (i.e., political lock-in) in the restructuring process. This chapter also elaborates upon why the local textile industry was selected as Korea's first restructuring project by the government, and explores why local intermediaries were established in Daegu and with what purpose.

Chapter 6 is concerned with the evolutionary process of regional tech-intermediaries and shows their changing roles over the last three stages of the restructuring process. In particular, the chapter provides evidence of cause and effect while the local intermediaries were undergoing several critical moments. Elite interview data with other public officials and the use of secondary data were essential to search out the invisible character of the innovative atmosphere in the local industry and the intermediaries, thereby providing a clue as to why the local agencies (and textile stakeholders) were pressurised by policy circles, the media, and local citizens, and how they have changed their behaviours.

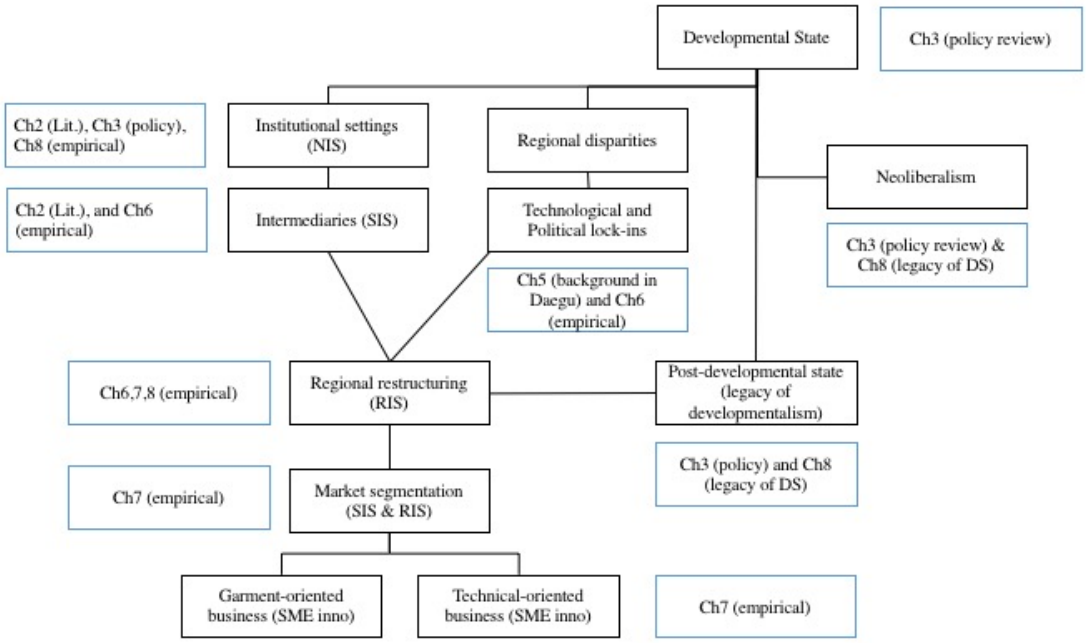
An important ingredient within not only the innovation system but also the economic structure is a company's actual innovation activities, which also exert a direct influence upon the restructuring process. In terms of historical records, the local textile firms were frequently treated by the government as a protected industry, resulting in several negative effects, such as political lock-ins. Therefore, Chapter 7 discusses how the local firms have themselves evolved and progressed by collaborating with other innovation actors, drawing on nine case study companies. In addition, the chapter describes the phenomenon of market segmentation in the local textile industry, which results in companies being divided into two main groups, namely, garment- and technical-oriented businesses, through the restructuring process. Thus, the transformation process of the local textile enterprises and the reformation of the local textile industry are addressed in this chapter, thus helping to overcome a prejudice against low-tech and unfashionable industrial sectors in the academic literature.

In the case of Korea, the government has been playing the role of conductor and facilitator when assisting in the upgrade of the national and regional economies. Since facing the era of neoliberalism after the Asian financial crisis, however, the government system also has been changed in light of the current socioeconomic environments. So, Chapter 8 explores how the current government system has been participating in the restructuring process and in regional innovations by policy measures, thereby explaining the changing role of the government and of Korea's RIS. In light of the lack of research about the sequel to the developmental state, this chapter attempts to establish a normative model of the post-developmental state by comparing predominant traits between the past and present model, contributing to theoretical and empirical insights.

In Chapter 9, final conclusions are drawn. First, empirical findings, which are taken from Chapters 6, 7, and 8, answer the research questions, thereby demonstrating the influence of Korea's innovation system upon the restructuring process. The thesis is felt to narrow some of the empirical and theoretical knowledge gaps evident in the extant literature. Indeed, with the policy-oriented characteristic of RIS (and, by extension, Korea's innovation systems), the chapter provides not only theoretical contributions to academic circles, but also policy implications for policy makers who

are seeking to address similar problems of regional disparities and uneven development.

Figure 1-2 Thesis structure



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Like all research, this study also has a number of drawbacks and limitations, particularly methodological issues, which indicate the need for further research to establish a robust theoretical basis of innovation systems and of other related academic fields.

Chapter 2 LITERATURE REVIEW: INNOVATION SYSTEMS AND SMEs INNOVATION

2.1 Introduction

Innovation systems can be described as combinations of existing resources (e.g., organisations, knowledge, human resources, and so on) within physical boundaries designed to maintain and improve national, regional, and sectoral competitiveness, since innovation is of increasing importance in the fierce competition of the current global market.

Therefore, a number of scholars (Edquist, 1997; Freeman, 1989; Lundvall, 1992; Nelson, 1993) have noted the contribution of innovation systems to economic and technological betterment with a question as to how innovative ingredients can be maximised. The provision of a useful tool for analysing national and regional economies gained popularity in academic and policy circles, as mentioned by Freeman:

> National and regional systems of innovation remain an essential domain of economic analysis. Their importance derives from the networks of relationships which are necessary for any firm to innovate. (Freeman 1995, p. 5)

Because of its variable usefulness, there are a number of relevant theoretical and conceptual formations of 'innovation systems,' such as an NIS (Edquist and Johnson, 1997; Freeman, 1989; Lundvall, 1992; Nelson, 1993), an RIS (Braczyk et al., 1998; Malmberg and Maskell, 2007), and an SIS (Breschi and Malerba, 1997; Malerba and Orsenigo, 1990).

Thus, this chapter will first review the literature on national and regional innovation systems, thereby helping us to understand how those systems have affected the national and regional economy and innovation. Given the importance of geographical characteristics, two innovation systems (NIS and RIS) are linked together in Section 2.2, whereas the sectoral innovation system will be discussed individually in Section 2.3, as it is closely linked to intermediaries and to the improvement of particular industrial sectors.

With the review of three levels of innovation systems, investigating SMEs' innovation at the firm level is also required because 1) such small companies are regarded as a basic unit of innovation systems, 2) the case study region consists mostly of SMEs, and 3) there is less known about SMEs' innovative ways and processes (compared to large-sized firms). Nonetheless, despite less attention having been paid to low-tech SMEs, there have been a couple of key studies about "low-tech industry", "SMEs' innovation", and "industrial segmentation" (see e.g., Nichter and Goldmark 2009; Wind and Cardozo 1974; Taylor and Thrift 1982; Cumbers et al., 2003; Rothwell 1989; Acs and Audretsch 1988; Hirsch-Kreinsen 2008). However, the impact of SMEs on business segmentation has not been discussed in this literature. For this reason, Section 2.4 deals with the process of low-tech SMEs' innovation, giving a clue regarding how the local textile business sector is classified into two different types (garment and technical textile) in Chapter 7.

On the other hand, there are several drawbacks of innovation studies (e.g., innovation system, technological innovation, so on). Firstly, there has not been adequate discussion about the plain outcomes from innovation systems (Bessant and Rush 1995); secondly, there is ongoing debate as to whether the system of innovation is a theoretical framework or not (Edquist 2004; Uyarra 2010); and finally, it is difficult to measure innovation activities that generally arise from combinations of diverse ingredients, thereby making it extremely difficult to clarify a certain reciprocity between inputs and outcomes (Cumbers et al. 2003; Innovation Regions in Europe 2008). Thus, this chapter carefully examines the literature considering the aforementioned shortcomings, and Chapter 4 Methodology will identify and discuss the weakness of innovation studies in more detail.

To sum up, this chapter looks at three different types of innovation systems with the following question in mind: To what extent and by which means have SI exerted their influence on the contemporary economy. By analysing the literature, we may figure out how innovation systems have contributed to national and regional economies and sectoral competitiveness. Given the main research aim of identifying the process of restructuring the local textile industry, the RIS will receive (relatively) more attention than the others. The RIS concept also prevails in the fields of both innovation study

and geography given the increasing regional significance of economic coordination at the micro levels (Asheim and Isaksen, 2002; Cooke et al., 1997; Hassink, 2002; Howells, 2005; Park, 2001). However, understanding the framework of the NIS is an essential prerequisite for understanding the regional and sectoral innovation systems of the East Asian countries (i.e., the developmental state) as seen in the previous policy chapter. Due to the strong role played by the governments in those nations, the relation between innovation and public policy is crucial not only in making institutional configurations, but also in operating the overall innovation system. So, this framework is also discussed in depth in Section 2.2.

The following chapter interprets the meaning of SI, as the terminology is used across diverse academic fields (e.g., innovation studies, management, economics, economic geography, and so forth) since the concept has been efficiently diffused by Christopher Freeman (1987) and Bengt-Âke Lunvall (1992). Therefore, the explanation of the historical concept and approach about SI is required.

2.2 Systems of Innovation

2.2.1 Introduction

In the last three decades, a manifold approach to 'system' emerged in many different theoretical and conceptual frameworks, such as national SI (Edquist and Johnson, 1997; Freeman, 1989; Lundvall, 1992; Nelson, 1993), technological systems (Carlsson and Stankiewicz, 1991; Hughes, 1993), sociotechnical systems (Bijker, 1997), the network approach (Håkansson, 1990), RIS (Braczyk et al., 1998; Malmberg and Maskell, 2007), and other similar approaches. In this atmosphere, the concept of "system of innovation" (also known as "innovation system") has emerged as a crux of economic, technical, and other institutional development. Such a relatively new theory (or concept) has a tendency to be emphasised based on a systemic view (i.e., institutional arrangements and mutual relations with relevant determinants within physical boundaries), which may include governmental organisations, research institutions, enterprises, and other factors enabling innovation. Among those diverse approaches, the system of innovation at the geographical level in particular lies at the centre of this research, as

it attempts to identify regional disparities and industrial upgrading in an older industrial region of Korea.

To fully understand the mechanism of innovation systems, the following chapters interpret three levels of the concept of innovation systems, as each system will be drawn into the discussion found in the later empirical chapters:

1) The national dimension (NIS) is required to explain an overall picture of innovation systems in Korea from the macro perspective, thereby giving a hint about how the system lays the foundation of regional and sectoral innovation in that both of them are substantially influenced by NIS under a centralised state.

2) The regional dimension (RIS), as the main theoretical framework, deals with an industrial upgrading in Daegu's textile sector with a focus on the micro perspective (firm-level), addressing how local SMEs, as a pivotal part of innovation systems, have evolved due to the innovation systems.

3) The sectoral innovation is appropriate to illuminate the upgrade process of an unfashionable industrial sector (i.e., the textile industry) and the role of intermediaries in that those state bodies have been playing a crucial role in facilitating the regional-based textile industry. Moreover, it gives an indication of how to connect national and regional stakeholders through local intermediaries.

Moreover, this research analyses the features of Korea's innovation model compared to models in other East Asian countries; the Japanese and Taiwanese cases are appropriate, as they share a context with Korea as a developmental state (and a centralised state) and have a similar trajectory of economic and industrial growth.

2.2.2 Notions of "system" and "innovation"

There are many definitions of the concept of an innovation system, as noted earlier; however, this research principally focuses on national and regional innovation to interpret the systemic feature of the geographical perspective, and sectoral innovation to elucidate the innovation process of a certain sector, namely, the textile industry.

Before addressing those three approaches, this section first defines the terms "innovation" and "system" separately so as to clarify the relevant notions. According

to numerous authors (Dosi, 1988b; Freeman, 1989; Lundvall, 1992; Nelson and Rosenberg, 1993; Niosi et al., 1993), the term "innovation" is derived from Joseph Schumpeter, whose classical concept referred to product and process innovation, technological innovation, the emergence of new markets, and organisational reforms. Because of his considerable efforts and his contribution to the concept of innovation in academia, Schumpeter is regarded as a pioneer of the study of innovation, even though his initial ideas had emphasised the role of individuals rather than organisations (Pavitt, 2005).

Various scholars have since defined the terminology about innovation in the context of their academic fields. For example, Christopher Freeman (1982, p. 6) disentangled the confusing notions of "innovation" and "invention":

> An invention is an idea, a sketch or model for a new or improved device, product, process or system. Such inventions may often (not always) be patented but they do not necessarily lead to technical innovations. In fact the majority do not. An innovation in the economic sense is accomplished only with the first commercial transaction involving the new product, process system or device, although the world is used also to describe the whole process.

Dosi (1988a, p. 222) defined its meaning with a slightly different view, as follows:

> Innovation concerns the search for, and the discovery, experimentation, development, imitation, and adoption of new products, new production processes and new organizational set-ups.

Pavitt's idea (2005, p. 88) is also useful:

> Innovation is inherently uncertain, given the impossibility of predicting accurately the cost and performance of a new artifact, and the reaction of users to it. It therefore inevitably involves processes of learning through either experimentation (trial and error) or improved understanding (theory). Some (but not all) of this learning is firm-specific. The processes of competition in capitalist markets thus involve purposive experimentation through competition among alternative products, systems process and services, and the technical and organizational processes that deliver them.

With these diverse definitions, Lundvall (1992) and Edquist (1997) have pinpointed that innovation is fundamentally reflected by existing determinants and knowledge, thereby creating novelty, i.e., innovation creates something new by means of the combination of existing sources. This study particularly espouses the notion made by Lundvall and Edquist.

On the other hand, there are many definitions of the term "system". According to Nelson (1991, p. 276), 'the "system" concept is that of a set of institutional actors that, together, play the major role in influencing innovative performance.' Lundvall (1992, p. 2) states the term of a system that borrowed a word from Boulding's (1985) definition that a system is 'anything that is not chaos.' Based on these definitions, the characteristic of the system was analysed by Carlsson et al. (2002), who stated that a system has strong tendencies towards robustness, flexibility, and ability, which can be generated in existing milieus.

To sum up, whilst the notions of "innovation" and "system" vary depending on the authors, this study argues that the meaning of "system" comprises several components; thus, an "innovation system" can be described as the interaction per se with diverse elements within a specific systemic environment. For this reason, the investigation of three different actors (government, intermediaries, and firms) with different geographical levels is required to demonstrate how various innovation actors in the system can be intertwined.

2.2.3 National Innovation Systems (NIS)

Since the end of the 1980s, a new conceptual and theoretical framework has emerged in academia, that is, the National Innovation System (NIS, also referred to as a National System of Innovation, NSI) (Edquist, 1997; Freeman, 1995; Godin, 2009; Lundvall, 2007; Nelson, 1993). Although Swedish economist Lundvall (1992) first introduced the terminology of the NIS, such a concept was not an entirely new idea. The origin of the idea stemmed from Freidrich List's 'The National System of Political Economy' in 1841. List had conducted an empirical study about Germany's attempts to catch up technologically with the United Kingdom (Freeman, 1995), thereby finding

that there was a strong affinity between economic growth and technology acquisition and application.

First, this study explores the definition of an NIS to gain understanding of its ideas and framework. Nelson views an NIS as 'a set of institutions whose interactions determine the innovative performance of national firms' (Nelson 1993, p. 4). Lundvall had a kindred idea, as follows:

> [A] system of innovation is constituted by elements and relationships which interact in the production, diffusion, and use of new, and economically useful, knowledge and that a national system encompasses elements and relationships, either located within or rooted inside the borders of a nation state (Lundvall 1992, p. 2).

Both scholars are rather different in terms of their basic approach. Nelson's NIS tended to emphasise the role of the government and the relevant institutional milieu at the national level, such as public policy, regulation, R&D budget allocation, and accumulated public knowledge. His idea therefore seems better suited to explain the NIS in the context of the developmental state, for example, Korea, Japan, and Taiwan, given that these countries have been developed by a state-led development framework (thus, the peculiar features of those three countries will be compared at the end of this section in more detail). In addition, Nelson analysed the NIS with a focus on empirical research by undertaking a comparative study in a variety of countries (high, middle, and low income nations, with a total of 15 countries), thereby drawing lessons as to how the innovation systems have contributed to each nation in light of its economic and social environments. In contrast, Lundvall concentrated on a different perspective of NIS. In his book, titled 'National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning' (1992), he emphasised knowledge diffusion and learning processes within national systems, putting more focus on a theoretical approach rather than on empirical cases. Despite their conspicuously dissimilar approaches and the crucial factors of what they consider NIS to be, however, Nelson and Lundvall fundamentally agree that a well-functioning innovation environment (Nelson's institutional configuration and Lundvall's learning process) may achieve better outcomes in terms of economic and technological development.

As seen from the two scholars above, like other terminology in academia, the notion of an NIS can be interpreted in various ways. In this vein, Chung (2002) pointed out that it can also be categorized according to its sphere of influence, thereby giving a broad definition of an NIS which embodies all relevant innovative participants and their innovative activities and knowledge spillovers (creation, diffusion, and exploitation). However, the narrow meaning of an NIS according to his definition is confined to direct involvement in innovation activities, such as innovation policies and research collaboration between academia and the business sector.

In terms of a conceptual approach, it needs to be elucidated how institutional and organisational arrangements can affect a national innovation process, e.g., economic and technological development. As this research suggested in the introduction section, the concept of NIS needs to fulfil sufficient empirical studies to find unities by means of comparative studies across countries in order to diagnose its mechanism clearly (Lee and Yoo, 2007). In order to determine the characteristics of NIS, in the context of the developmental state especially, the following reviews may provide hints about which determinants played major roles in facilitating innovation systems.

First, the concept of NIS had received wide attention from academia and policy-makers after Freeman published a book titled 'Technology Policy and Economic Performance: Lessons from Japan (1989)' which analysed with great precision Japanese economic performance under the state-planned system. His main question was how the Japanese economy has become one of the world's largest economies since the Second World War. To answer the question, he concentrated on four key actors, which could operate in the Japanese innovation system, and on their roles, as follows:

1) the Ministry of International Trade and Industry
2) R&D performance and technical acquisition (such as reverse engineering) in private sector
3) human resources education and training systems
4) conglomerates and their systemic structure within Japanese industry

By analysing the Japanese innovation system, Freeman asserted the importance of the institutional factor by which the Japanese government had fully exploited its powerful authority through the state's bodies to stimulate national industrial modernisation and economic catching-up. Under the government's strong will, educational reform, which improved scientific education and training schemes, and provided an improved network between the government and major firms (Japanese conglomerates called '*zaibatsu*'), smoothly triggered Japanese industrialisation.

Freeman's approach is closer to Nelson's idea than to that of Lundvall in the way that hard institutions (e.g., organisations and legislation) played a pivotal role in upgrading the state's environments. In addition to this, he found the common feature of systemic commonalities between the case of Japanese industrialisation and the cases of German and US processes during the period at which both countries strived to outperform Britain in the 19th and 20th centuries respectively. Germany and the US also carried out 'new ways of organising the professional education of engineers and scientists and of organising research and development activities as specialised departments within firms and employing graduate engineers and scientists' (Freeman 1987, p. 31), as in the Japanese method of industrialisation. Hence, Freeman defined an NIS as 'the network of institutions in the public and private sectors whose activities and interactions initiate, modify and diffuse new technologies' (ibid., p. 1).

Another useful empirical study on NIS is Nelson's book, titled 'National Innovation Systems: A comparative Analysis (1993)' which was written by authors from each of the 15 countries, thus providing an opportunity to compare different NIS. Nelson also had a perspective akin to that of Freeman, i.e., focusing on institutional changes and the role of the government. Based on Nelson's research (in particular, two chapters that conducted deep analyses of Korean and Taiwanese NIS strategies) and in view of Freeman's study of the Japanese innovation system, this thesis identifies commonalities and differences in the context of the developmental state.

Regarding the similarities, the NIS in those three countries relied on the role of the government and public policy, which directly influenced industry and the economy. In the early stages of their industrialisation, the respective governments paved the way

for national innovation activities. In the cases of Korea and Japan, specific government ministries (the Ministry of Science and Technology in Korea and the Ministry of International Trade and Industry in Japan) represented and initiated the overall schemes for science, technology, industry, and innovation policy under the central government. Taiwan's National Science Council played a similar role, implementing a 'Plan of National Long-Term Development Science' and conducting a mission to organise and promote scientific research. These ministries and agencies are regarded as the crux of the NIS in the developmental state in that they could make decisions about an entire NIS more quickly and with more coherence, along with the full support of the authoritarian governments.

As reviewed by Kim (1993) and Hue and Gee (1993), during the infant stage of industrialisation in Korea and Taiwan, the central government and the aforementioned government organisations chose promising industrial sectors (or specific enterprises) to achieve the economic development and technological advancement rapidly in light of their limited resources. By doing so, the Korean state deeply intervened in the tax system, which gave preferential treatment to key selected industries and conglomerates (also referred to as *chaebol* – diversified conglomerates that are usually controlled by one or two families). As discussed earlier, the Taiwanese government also adopted a similar policy, called 'pick the winners,' by which the central government selected particular industries to set up a favourable environment to stimulate the growth of infant industries. Therefore, all three countries tended to protect local markets and provide beneficial policies of tax reduction until the local firms gained competitive power in the international market, such as Korean conglomerate-based firms, Japanese auto and electronics firms, and the semiconductor industry in Taiwan. Yet, such an industrial policy eventually engendered many problems, e.g., the imbalance of the industrial structure, rent-seeking behaviour, influence peddling, and the diversion of entrepreneurial efforts away from productive activities. In particular, both the Korean and Taiwanese governments employed a carrot-and-stick approach. If specific firms put on a good show, the government continually rewarded them along with giving them new opportunities to launch a new business. If firms did not perform well, the government enforced mergers (such a case will be addressed in Chapter 8 in more detail). In contrast, the Japanese case is slightly different, but even though the Japanese

government did not choose to support certain industries and companies, most of the large-sized firms were under the control of bureaucratic government elites during the phase of industrialisation.

Another finding is that all three nations strived to improve their state educational systems to nurture the quality of the labour force and to satisfy industrial demand, in particular in the field of engineering and science education. The governments strongly believed that well-educated human resources may accumulate a high level of technological awareness and strengthen national research and development activities; this is particularly significant given that Korea and Taiwan especially have relatively small populations and few natural resources. For this reason, a highly educated workforce is still regarded as a crucial factor for national prosperity.

Regarding the differences in NIS, analysing the case of Korea and Taiwan is interesting given their similarities in economic size and the period at which they began industrialisation. Hence, they are addressed separately from the Japanese experience. According to Nelson (1993), Korea and Taiwan initiated several analogous policies, albeit they fostered their innovation systems in different ways. In the case of Korea, the government preferred to select a few large-scale enterprises and then give priority to launching new businesses, so the enterprises enlarged the scale of their operations with a greater turnover as time passed, eventually enabling them to conduct R&D activates alone without government support (see Chapter 3). In contrast, a driving force of the Taiwanese economy was the SMEs. Given the limited capability of R&D in SMEs, therefore, the role of government-funded research institutions in Taiwan was relatively more important than in Korea due to the scant resources for local SMEs to conduct R&D activities. However, the industrial society had greater equality than in Korea. Another difference is that the Korean government resisted foreign investment in and foreign ownership of domestic firms. As mentioned previously, to acquire advanced technology, the government tended to dispatch young engineers who were mostly working in GRIs to the US. On the contrary, Taiwanese firms tended to expand and acquire their technological skills by foreign direct investment or by technical cooperation with oversea enterprises.

Nonetheless, there are some points of resemblance in which each development method conferred benefits upon selected industrial sectors (H&C industry in Korea / semiconductor industry in Taiwan) and specific firms by means of tax exemptions and financial aid so as to ensure international comparative advantage. Furthermore, the governments paid significant attention to public education and export-oriented schemes. The following Table 2-1 summarises the features of innovation systems in the context of the developmental state.

Table 2-1 The features of innovation systems in the context of the developmental state

	Korea	**Japan**	**Taiwan**
Differences	conglomerates (*Chaebol*) led national innovation system, long dictatorship, resistance to foreign direct investment and ownership	conglomerates (*Zaibatsu*) led innovation system, relative autonomy in the business sector	SMEs led innovation activity, government picked promising industrial sectors, embraced foreign direct investment
Similarities	1) dirigisme (tax reductions, protectionism, etc.); 2) state's powerful authority (top-down policy); 3) strong bureaucracy (a key actor of innovation system); 4) the importance of education and skills-training for human resources; 5) selection and concentration strategy (picked promising industrial sectors by the state)		

Source: Author

On the other hand, the NIS approach, like the other conceptual frameworks, has certain drawbacks. Regarding knowledge interchange and diffusion as one of the pivotal factors in the process of innovation (as in Lundvall's perspective), Smith (1995, p. 72), who is an author of an OECD methodological manual on measuring innovation, argued:

> The overall innovation performance of an economy depends not so much on how specific formal institutions (firms, research institutes, universities, etc.) perform, but on how they interact with each other as elements of a collective system of knowledge creation and use, and on their interplay with social institutions (such as values, norms, legal frameworks, and so on).

Given that the intrinsic value of innovation and learning processes (e.g., tacit knowledge) in terms of interacting with others is invisible, it has fundamental limitations regarding interactions among relevant actors and innovation performances per se. In this regard, there are no appropriate means of measuring NIS, as mentioned by David and Foray (1995, p. 81),

> A system of innovation cannot be assessed only by comparing some absolute input measures such as research and development (R&D) expenditures, with output indicators, such as patents or high-tech products. Instead innovation systems must be assessed by reference some measures of the use of that knowledge.

Hence, this study fully perceives the methodological defect of the NIS framework, and therefore, diverse approaches for analysing the innovation system are utilised (see Chapter 4 for more detail).

Up to now, this section has looked at the conceptual framework of NIS and the different systemic environments by analysing the cases of three East Asian countries. The following section 2.2.4 focuses on a regional innovation system that is the main framework of this research for answering the given research questions. Through the analysis of the literature review, therefore, the section will first seek to identify the knowledge gaps in the literature on RIS and on the characteristics of the concept in the Western economies. It will then look at Korea's RIS. First, this gives the rationale of why the RIS is an appropriate framework for this research, and second, it gives indications of the systemic peculiarities of Korea's RIS.

2.2.4 Regional Innovation Systems (RIS)

This section focuses on regional-level innovation systems along with the important elements such as (tacit) knowledge and learning processes and geographical proximity,

which are regarded as pivotal components in boosting and in facilitating RIS and regional development. Since the early 1990s, policy makers and academic researchers have been attracted by the concept of RIS as a promising analytical framework that provides both theoretical and empirical explanations for why every region sees different economic outcomes depending on its economic, geographical, and institutional milieus.

The RIS has also been widely adopted as a policy programme designed to ameliorate uneven regional development and divergence (Asheim and Coenen, 2005; Cooke, 2001; Doloreux and Parto, 2005), as follows.

> Research on regional innovation has grown significantly over the past three decades driven partly by advances in theoretical analysis, partly by the growing interest in innovation as a source of competitive advantage, and partly by the need for new policies to address regional inequalities and divergence. (Asheim et al. 2011a, p. 876)

With regard to theoretical perspectives, however, like other SI, the RIS is criticised for its equivocal nature (Doloreux, 2002; Doloreux and Parto, 2005; Howells, 1999; Iammarino, 2005; Uyarra, 2010; Uyarra and Flanagan 2010). In this regard, Edquist (2005, p. 186) noted,

> It is certainly not a formal theory, in the sense of providing specific propositions regarding casual relations among variables. It can be used to formulate conjectures for empirical testing […] Scholars disagree on the seriousness of these weakness of the SI approach and on how they should be addressed. According to some, the approach should not be made too rigorous; the concept should not be "overtheorized" and it should remain an inductive one. Another position argues that the SI approach is "undertheorized," that conceptual clarity should be increased and that the approach should be made more "theory-like"

Regarding the empirical aspect, there is also a disparity in that previous literature on RIS emphasises collaboration, agglomeration, proximity, and learning processes to improve competitiveness in the regions, such as innovative regions and milieu (Camagni, 1991; Ratti et al., 1997), high-tech areas (Keeble and Wilkinson, 2000), clusters of knowledge-based industries (Cooke, 2002) and knowledge spill-overs

(Audretsch and Feldman, 1996, 2004; Bottazzi and Peri, 2003), Third Italy (Asheim, 2000), Silicon Valley in the US (Saxenian, 1994), and so on.

Arguably, as a result, work in the RIS tradition has been overly oriented towards the Western economies and high technology industries with a consequent lack of information on important topics regarding innovation and regional economic development. First, much of the empirical research within the RIS tradition tended to focus on high technology and on growing or otherwise dynamic industry sectors. Second, despite the purported emphasis on institutions, it could be said that studies in the RIS tradition have paid less attention to the structural and institutional content of RIS (Ter Wal and Boschma, 2008). Third, Feldman (2001) and Fritsch and Slavtchev (2011) stated that the research in the RIS tradition has neglected any consideration of the processes by which RIS evolve including the involvement of public policy. Fourth, much of the literature has analysed regions in decentralised governmental systems, such as Germany and Italy, but there remains a lack of research on top-down models of RIS, such as those found in East Asian developmental states (Gress, 2015). Fifth, and in particular, there are relatively few empirical studies of how public and private intermediaries within RIS have helped shape regional economic development (Howells, 2006; Inkinen and Suorsa, 2010; Rantisi, 2014; Smedlund, 2006). Thus, this section scrutinises the extant literature, and several of these silences are addressed by discussing the case of the Daegu textile industry in more detail in the empirical chapters.

These silences are all the more curious given that the RIS concept has been influential within policy circles. Indeed, among the adopters of the RIS concept in regional policy, South Korea emerges as an important case to consider (e.g., Gress, 2015; Park, 2001; Sonn and Kang, 2014). Since the South Korean government has pursued national economic and industrial development by applying government-led policy, it is widely recognized as an example of the developmental state model (Amsden, 1989; Wade, 1990). Unsurprisingly, to date, previous studies have focused on how national-level policies and institutions have played a role in the transformation of such a resource-poor country into the 10th largest economy in the world, with a particular focus on the NIS model, to the detriment of research into regional level policies and institutions in

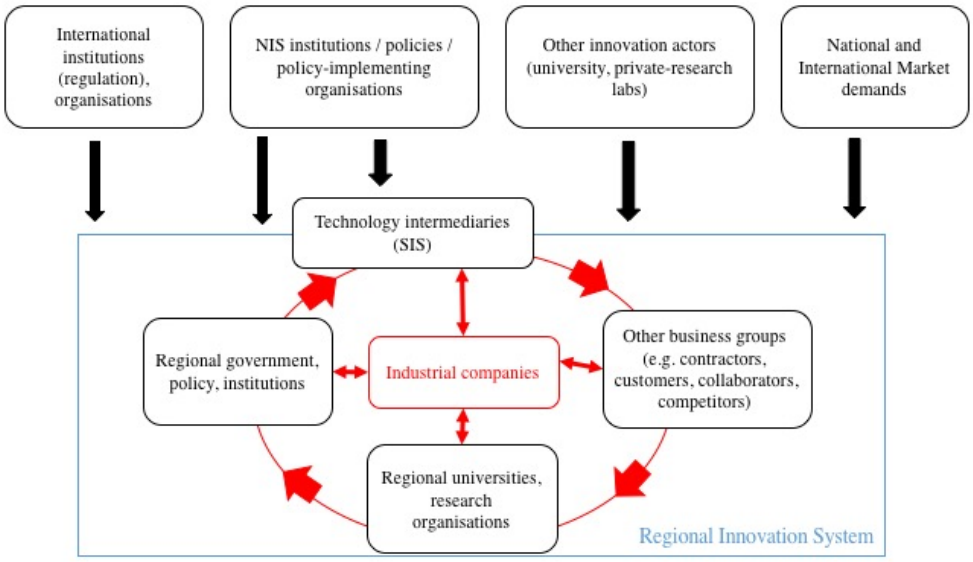
the revitalisation of old industries that were supported as part of earlier developmentalism (Cho and Hassink, 2009). There is no doubt that the RIS concept has been taken up explicitly in a top-down fashion and involving public sector intermediaries. As a recent white paper on regional industrial policies explains:

> The main aims of regional industrial policy are to strengthen the footing of regional industries, and to improve autonomous innovation capability for the upgrade of declined industries toward high-value added one, thereby pursuing the goal of the nation's balanced development on the basis of Regional Innovation Systems. (White Paper on Regional Industrial Policies, Ministry of Trade, Industry and Energy, 2013: Author's own translation)

Yet, it is not clear whether old industries can be modernised especially in light of doubts over the suitability of a developmental state's capabilities to effect transitions from factor- and investment-driven industrialisation to innovation-driven industrialisation (Lenway and Murtha 1994, p. 528). In addition, in the context of Korea, the regional innovation (industrial) policy per se is apparently designed to foster decentralisation. Of course, that will be brought about by fundamentally improving regional competitiveness, yet due to its multi-purpose policy direction, the matter of policy incoherence has also emerged.

The structure of the RIS in Korea is illustrated in Figure 2-1. The NIS refers to the economic development and technological innovation at the national level, whereas the RIS is intended to resolve the nation's disparities in industrial structure, higher education, and local community (Park, 2001) and to improve industrial competitiveness in the regional dimension (Cho and Hassink, 2009). So, both concepts (NIS/RIS) are inevitably required to understand 1) the overall process of Korean innovation policy – the central government still decides most (S&T and regional) policies with a strong financial impact on the budget of public schemes and organisations; 2) the reason those (top-down) policies induce sectoral and regional disparities, including a case study area; and 3) the ongoing phenomenon of regional innovation policy — why the central government initiated the regional revitalising schemes.

Figure 2-1 The structure of RIS in Korea



Source: Author

On the other hand, there are at least two rationales for using the RIS theory in this study. First, the RIS is an appropriate method of analysing regional uneven development, given that it may offer analytical and empirical explanations for why some regions perform well and others do not. Second, the RIS idea specifically has been implemented and has informed policy designed to ameliorate regional uneven development in Korea. Hence, it is doubly appropriate to the case of Korea where there are severe regional disparities and where central government retains a strong role.

Returning to theoretical matters, the RIS is not an entirely new theoretical concept in terms of analysing regional clusters and its pivotal constituents. This theoretical approach emerged in the mid-1990s (Asheim and Isaksen, 1997; Cooke et al., 1997), as a logical progression from the national innovation system of Freeman and Lundvall. Although the RIS concept is not used as widely as the NIS concept, this approach is regarded as quite useful for research on innovation policy and systems. According to Lundvall and Borrás (1997), regions are increasing their responsibilities in economic coordination by means of local networks of relevant actors, industrial clusters, and the synergy effect among organisations. Furthermore, the geographical proximity of homogeneous firms and the potential for regional growth are related to stimulating

'socially and territorially embedded collective learning and continuous innovation' (Asheim and Isaksen 2002, p. 83).

Given that RIS and NIS share the same roots, there are similarities between the two. For instance, both concepts emphasise 'territorially based innovation systems' (Asheim et al., 2005). In addition, considering the strong policy implications on the basis of the empirical study of some successful and some failed cases, both conceptual frameworks would be a good policy tool for policy-makers (Cooke, 2002). In this vein, there are case studies of regional competence, such as Third Italy (Asheim, 2000) and Porter's examples of successful regional clustering (1990), whereby the framework of regional innovation and competitiveness is prevalent among academia and policy-makers.

Another notable example of the regional concern was Saxenian's book 'Regional Advantage: Culture and Competition in Silicon Valley and Route 128' (1994), which focused on finding regional advantages by means of a comparative study of the electronic industry in California's Silicon Valley and the computing industry of Route 128 in Massachusetts. Saxenian found that Silicon Valley achieved better outcomes in overall employment growth and the creation of new venture enterprises because of structural flexibility, e.g., more open and high-mobility systems. This structural (systemic) openness and circulation also are deemed as a vital factor in innovation systems.

On the one hand, in terms of the low-tech context, Maskell (1998) scrutinised the geographical proximity and aggregate advantages, drawing on the case of the Danish furniture industry, which gave an answer to the question: Why are low-tech industries still important even in the era of the knowledge-based society? His study also helped to break the stereotype of (European) policymakers, as follows: 'It is not at all obvious that the low-tech path will always lead directly to misery, while shifting to the high-tech one guarantees a golden future' (Maskell 1998, p. 115).

Indeed, the real outcomes of the European furniture industry indicate that the furniture sector outperformed many high-tech industries in terms of economic benefits and the employment record. Moreover, a fruitful result of his case study is confirmation that

geographical proximity between intimate firms would create much better competitiveness. This means that low-tech firms tend to be strengthened in their competence through mutual trust, a sense of kinship along with society and culture, and exchanges of technological skills and skilled human resources. However, his case study concentrated only on homogeneous firms and their performances based on the tacit knowledge shared among them within a geographical boundary, and tended to neglect the role of other organisations, such as regional research institutions and universities.

On the other hand, Asheim and Isaksen (2002) investigated the innovation activities of local firms in three regional clusters of Norway – shipbuilding, mechanical engineering, and electronics - using three different RIS approaches. First, the shipbuilding industry at Sunnmøre is described as a 'territorially embedded regional innovation network.' This type of RIS emphasises accessibility, i.e., geographical, social, and cultural proximity, rather than interactions of knowledge organisations. Second, the mechanical engineering industrial area at Jæren can be classified as a 'regional networked innovation system,' which is surrounded by a local institutional infrastructure and which is more vigorous in promoting collaborations among involved organisations in the region. This RIS tends to be formed by strong cooperation with local organisations, such as R&D institutions and technology transfer agencies. Regional actors may provide proper knowledge and technological prowess for local firms. However, this form of RIS often engenders path-dependence and lock-ins because of the strong ties among regional actors. The final approach of RIS is called a 'regionalised national innovation system' or an 'exogenous development model.' Knowledge providers (i.e., innovative actors of regional clusters) are generally located outside of the region. The electronics industry in Horton belongs to this type. The place is made up of national or international participants. The innovative process and the collaboration among actors might emerge, as 'people have the same kind of education (e.g., as engineers) and share the same formal knowledge, rather than belonging to the same local community' (Asheim and Isaksen 2002, p. 84). As a consequence, the authors drew lessons from the Norwegian case study, which indicates that there are two prerequisite conditions to facilitating an RIS – 1) fostering close cooperation between firms within industrial clusters, and 2) strengthening national and regional

institutional infrastructure in that knowledge providers and institutional milieu play a pivotal role in the innovation process within geographical boundaries. Another finding is that the RIS is composed mainly of two key actors: "local firms" and "institutional milieu". Indeed, most RIS studies claim that firms and organisations are crucial in the system, yet this study adds one more key actor in light of the condition of Korean innovation system, namely, public policy. Whilst the role of innovation policy within the RIS has been downplayed recently (Coenen et al., 2017), the structure of RIS in Korea is enviably being supported by the central government and by policy initiation due to its governance model (the centralisation) and the regions' inability to carry out innovation processes themselves (see Chapter 3).

In this regard, one drawback of the extent of RIS research is that the majority of studies principally fail to offer any explanation of the interaction process among local stakeholders (i.e., how to connect and to interplay with each actor). Given that 'firms seldom innovate in isolation' (Fagerberg et al. 2006, p. 180), the previous studies should have paid more attention to the systemic perspective of the role of public policy, which may link diverse stakeholders more smoothly. In other words, both Danish and Norwegian case studies are deficient in the role of policy perspective as well as of intermediaries, like technology transfer offices. Rather, most of the empirical studies tend to focus on the advantage of geographical agglomeration and kindred-proximity within the industrial clusters.

Nonetheless, the Danish and Norwegian studies can corroborate some key issues. First of all, the geographical proximity of local firms and agglomeration economies may contribute to increasing regional competitiveness through relatively easy ways of knowledge acquisition among companies. Second, cultural and social homogeneity is regarded as the catalyst of knowledge spillovers and exchanges more than other organisational factors.

With regard to agglomeration economies, on the other hand, Boschma posed a question to economic geographers about the genuine impact of geographical proximity on the regional advantage, as follows:

> Too much and too little proximity are both detrimental to learning and innovation…. Although geographical proximity facilitates interaction and cooperation, it has been claimed here that it is neither a prerequisite nor a sufficient condition for interactive learning to take place. (Boschma 2005, p. 71)

Geographical proximity seemingly has both positive and negative aspects. In terms of a positive aspect, RIS can facilitate easy cooperation with firms and local actors within limited geographical boundaries. However, too much proximity often engenders innovation and institutional lock-ins. From the evolutionary perspective, not only geographical proximity, but also mature technology and industrial clusters per se easily engender several path-dependencies including political lock-ins (see e.g., Cho and Hassink, 2009). Therefore, this study needs to look carefully at the issue of geographical proximity in the case of regions.

According to Tödtling and Trippl (2005), RIS have potential deficiencies, as can be seen from cases in three types of regions: 1) fragmented metropolitan regions, 2) peripheral regions, and 3) old industrial regions. First, the drawback of RIS in fragmented metropolitan regions is the lack of networks and of interactive learning. Given that such regions are surrounded by favourable circumstances for innovation activities, e.g., superb research institutions, universities, and high-tech firms, the regions will be expected to operate innovation activities effectively. Nonetheless, some agglomerated regions, like Vienna and Frankfurt, are suffering from a disconnection or a dearth of institutional cooperation that might be the result of insufficient collaboration between knowledge-providers and firms. Because of these problems, such agglomerations demonstrate a relatively lower performance than expected in terms of the processes of technological and regional development.

Second, many peripheral regions see a paucity of institutional support and an absence of dynamic clusters along with the circumstance of there being no large-sized firms in regions. Therefore, SME-dominated regions having a relatively weak R&D performance seldom interact and cooperate with other regional innovative actors due to a fundamental institutional thinness.

Finally, the main defect of old industrial areas is a lack of volition to develop new technologies (i.e., technological lock-ins / the stage of technology maturity) and cooperate with other regional actors; due mainly to inertia, they tend to be stuck in the past phase. Even though the regions already possess sufficient institutional settings unlike the peripheral regions, the condition of institutions is likely to be specialised specific-industries similar to when they were in the early phase. Therefore, the main barrier to regional innovation activities in old industrial areas is, paradoxically, local industries that are too specialised, and that thereby suffer from various forms of lock-in.

Up to now, this section has examined the existing literature on RIS and explained the rationale for why this thesis employs the RIS (largely system of innovation) approach, which is also capable of embracing a number of other related concepts, such as industry districts, clusters, or agglomerations. Yet, it is also important to clarify a theoretical distinction with other concepts (e.g., cluster theory) as reviewed by Tödtling and Trippl (2005, p. 1206).

> Clusters are central elements of the knowledge application and exploitation system, whilst the RIS is a wider concept in the sense (1) that there are usually several clusters and many industries in a RIS and (2) that institutions play a larger role. As already mentioned above, institutions in this context refer to innovation relevant organisations, rules and behavioural characteristics of firms and actors.

With consideration of such extant issues, the case study of Daegu's textile industry can provide opportunities for comparison with previous literature reviews and the context of Western economies, as the condition of the case region makes it appropriate for addressing several issues as follows: 1) there are several different kinds of industrial clusters; 2) the older industrial region is being supported by not only the RIS, but also the NIS and the SIS; and 3) the role of the government (i.e., public policy) is relatively more important than other factors in the context of the developmental state.

The following section 2.3 will focus on the sectoral perspectives through a sectoral innovation system. Unlike the innovation systems addressing geographical matters, the sectoral system concentrates mainly on the trajectory of industries, technological

advances, and agents which can directly boost specific industrial sectors. Therefore, analysing such an innovation framework helps us understand the view of local tech-intermediaries and the local textile sector that will be addressed in depth in Chapters 6 and 7.

2.3 Intermediaries and Sectoral Innovation Systems (SIS)

This section elaborates on the concept of Sectoral Innovation Systems (SIS) by reviewing the existing literature from several authors. This conceptual framework is derived from various empirical and theoretical studies, and it shares the same evolutionary approach with a national and regional innovation system (Malerba, 2002; Shohet and Prevezer, 1996; Foster and Heeks, 2013; Shou and Intarakumnerd, 2013; Intarakumnerd and Chaoroenporn, 2013). Under the same innovation theory as two other SI (NIS and RIS), the main focus of the section here is to analyse why SIS are related to this research, and how an SIS connects with other innovation systems.

In addition, the SIS is useful to expound on the role of sector-specific intermediaries, which are designed to facilitate the knowledge circulation process in industrial sectors. Therefore, the following section first explains the framework of the SIS, and then deals with the intermediary actors.

The concept of sectoral innovation can be traced to two earlier approaches: "input/out analysis" (Leontief, 1941) and "development blocs" (Dahmén, 1950). The early phase of innovation systems tended to focus on limited activities. For instance, Leontief analysed the flow of products into a sectoral system which mainly concentrated on the ingredients of products/services and their interactions at the industry scale. From this approach, his main interest was how the system was being organised (Carlsson et al., 2002). Another early approach was introduced by Dahmén (1950), whose concept emphasised "the sequences of complementarities" that principally occurred due to structural tensions. His argument was that innovation activity can cultivate new opportunities which, paradoxically, seize the developmental potential of each component within inequitable systems. Notwithstanding the common acceptance of his contention in academia that imperfect systems can stimulate innovative activities, later studies tended to emphasise the importance of balanced constituents in which the

sectoral innovation may be well demonstrated once the relevant inputs (e.g., resources, technologies, market conditions, and so on) are properly established (Carlsson et al., 2002; Malerba, 2002)

Since the 1990s, several authors (Breschi and Malerba, 1997; Malerba and Orsenigo, 1990) have re-examined the "sectoral system of innovation" under changes in industrial environments and the emergence of relatively new industrial sectors like biotechnology. As reviewed by Breschi and Malerba (1997, p. 131), the sectoral system of innovation can be described as follows:

> A system (group) of firms active in developing and making a sector's products and in generating and utilizing a sector's technologies; such a system of firms is related in two different ways: through processes of interaction and cooperation in artifact technology development and through processes of competition and selection in innovative and market activities.

According to their definition, the SIS has quite a normative outlook, sharing its basic ideas with "National Innovation Systems" (Freeman, 1988; Lundvall, 1988, 1992; Nelson, 1988, 1993), "Technological Systems" (Berget et al., 2008; Carlsson, 1991), Michael Porter's "diamond" model (1990), and other ideas from the industrial economics literature. Despite having a vague (or common) notion of the SIS, however, there is the rationale for using this approach. Unlike NIS and RIS, this framework deals mainly with the transformation process of specific industrial sectors, and is less closely related to geographical issues. Therefore, technological innovation and the role of agencies are main subjects considered. In particular, the SIS is essential for understanding middle-level agencies (i.e., intermediaries) and their contributions to industrial upgrades by knowledge creation and diffusion and by innovative performances in collaboration with other organisations and firms (Malerba, 2002). Indeed, sectoral innovation systems and intermediaries are closely connected (see e.g., Intarakumner and Chaoroenphrn, 2013; Shohert and Prevezer, 1996). Given that the aim of this thesis is to investigate the long-term process of structural transformation in the local textile industry, therefore, the framework of the SIS is appropriate to investigate the role of intermediaries.

The importance of intermediaries, specifically as pivotal agencies in connection with the innovation process including at the regional level, has been underlined in recent contributions to the literature (Bessant and Rush, 1995; Howells, 2006). In particular, the correlation between intermediaries and innovation systems is epitomised by Howells[1] (2006). The most common feature of intermediaries in innovation systems is with regard to the role of technology transfer (Bozeman, 2000), though when examined in detail, it can be seen that the roles of intermediaries extend well beyond this, as Howells (2006) describes. While, by now, well-developed knowledge intensive business services (KIBS) industries themselves act as private sector intermediaries to other parts of national and regional economies (Hertog, 2000), almost all national governments also have recognised a need to support and intervene directly or indirectly in the innovation process including by way of publicly-funded intermediary institutions (Inkinen and Suorsa, 2010; Tödtling, 1992). However, public sector intermediaries also play a role in supporting regional development based on high technology industries. For instance, Inkinen and Suorsa (2010) depict how public sector intermediaries play an important role in assisting the private sector with direct financial support – notably the Finnish Funding Agency for Technology and Innovation (TEKES), considered the most critical factor in surveys of high-technology enterprises in Northern Finland. Nor are public intermediaries absent in the restructuring and renewal of older industries around the world. Tödtling (1992) described the support provided by public policy to local enterprises in newly industrialized, old industry, and stagnant rural and peripheral areas of Austria. Public support for old industrial areas was oriented towards an identified need to support the localized lack of R&D activity and product innovation. Elsewhere, Rantisi (2014) focused on the role of intermediaries in the process of cluster renewal and the construction of local pipelines in the Montreal Fur Garment cluster. Here, diverse public and quasi-public intermediary institutions have played a role in reorganising the industry in light of changing consumer demand and ethical consumption initiatives. Rantisi's study also draws attention to the value of intermediaries in those industries

[1] Howells (2006) clearly summarised two types of intermediaries according to their main functions. These are first, organisation-purpose intermediaries: third parties, brokers, consultants as bridge builders, bricoleurs, knowledge & technology brokers, etc. Secondly, the include processes-purpose intermediaries: innovation consultancy services, technology brokering, innovation bridging knowledge brokering.

and localized clusters that are dominated by small enterprises. Recourse to external sources is considered indispensable in the strengthening of technological capabilities of private sector enterprises, as Bessant and Rush (1995, p. 97) described:

> Even large and well-endowed firms, and certainly smaller and less experienced organisations, will at some point need to look to external sources for inputs to the process of building up technological competence.

In the context of Korea, local intermediaries were established by the state order in the developmental period for the improvement of specific industrial sectors (e.g., textile, automobile, shipbuilding and so on) as policy-implementing agencies. Due to the state's historical background, these intermediaries are deemed as not only knowledge disseminators for local SMEs, but also bridges of innovative actors between the central and regional dimensions (see Figure 2-1). Therefore, given that the idea of the sectoral system stresses the interplay between innovative actors and agents (Malerba, 2002) as a key method of innovation (i.e., learning process) and the role of the connector between NIS and RIS, the SIS is an appropriate method.

Another reason for using the SIS here is to narrow the theoretical and empirical gaps with other innovation systems literature as follows:

> Both the NIS and the LIS (Local Innovation System) perspectives do not focus on specific industries or technologies. Rather, they focus on the whole set of industries active in a specific country or region and the institutions supporting them. (Breschi and Malerba 1997, p. 130)

Basically, an SIS tends to look at the process of a sector's technology and product development with mainly firm- and agency-oriented views, which means that it does not neglect other innovative actors and their roles. This means the SIS revolves around the innovation process of firms and intermediaries and how they could evolve in connection with other innovative actors. Therefore, analysing the processes of interaction, cooperation, and competition with other innovative actors for boosting innovation activities in the sectoral level is essential. The aforementioned issue focusing on the evolution of industrial sectors, especially low-tech industries, has not been reviewed enough in academia, and there remain misunderstandings. For example,

unfashionable sectors such as the textile industry will soon disappear if there are no co-evolution processes. Yet, these low-tech sectors also have been transforming their structure in light of the change of internal and external milieus. In this regard, the SIS provides a compatible framework for dissecting the technological and sectoral upgrade, thereby breaking down the prejudice against low-tech sectors in the literature.

The following section 2.4 will interpret the concept of market segmentation and the feature of SMEs innovation for understanding how the innovation performances of the local textile SMEs have influenced the textile business segmentation in Daegu. Through the literature, we can better understand the restructuring and innovation process of the local business sector, which will be addressed in Chapter 7.

2.4 Market segmentation and SMEs Innovation

Companies are considered to be a basic economic unit; therefore, firm-level innovation (e.g., technological, organisational, or process improvement) results in a better outcome of regional and national growth, which implies that the firm is the keystone of SI (Amin, 1999; Edquist, 1997; Freeman, 1995; Lööf and Heshmati, 2002; McAdam et al., 2004; Nelson, 1993; Patel and Pavit, 1997; Tödtling and Kaufmann, 2002). Notwithstanding its crucial role in innovation systems, however, the investigation of SMEs innovation in the context of Korea has been relatively underplayed (compared to large-sized companies). Indeed, the nation's previously developmental pathway which steered economic and industrial development by "picking winners", resulted in the neglect of the aforementioned matter. Therefore, we will examine the historical contribution of SMEs to two Western economies (the UK and the US) and then examine the innovative method employed by SMEs.

Another benefit of analysing SMEs' innovation is to connect with the framework of "market segmentation". The extant studies on firm-level innovations have largely focused on size, that is, on matters related to big vs small companies (Acs and Audretsch, 1988); internationalisation (Gallo and Sveen, 1991; Vila and Kuster, 2007); productivity (Hall et al., 2009); international diversification (Jeong, 2003); and entrepreneurship (Huggins and Williams, 2011). Yet, there is little research regarding the impact of SMEs' innovation on business segmentation. Given the previous

literature, firm-level innovation is likely to impinge directly on the business market, so this study assumes that the innovative performances of the local textile SMEs might fulfil a function of the market segmentation according to companies' embedded technological levels. Also, the innovative performance of SMEs in collaboration with other local organisations may result in the upgrade of the existing (textile) markets in light of the contemporary demands for specific textile-material functions (e.g., improved persistence).

For these reasons, this Section 2.4 can help us to understand how the local textile corporations have transformed their businesses into higher value-added businesses during the restructuring process, thereby being segmented in the local business sector, an issue that will be addressed more fully in Chapter 7.

Before addressing the main issue of SMEs' innovation, this research first has to examine a normative definition about the size of SMEs due to various notions, depending on the economic scale of each country. Most studies and scholars have adopted the definition of SMEs from a standard given by the OECD (2005). In the US, SMEs are defined on the basis of the number employees, that is, companies having fewer than 500 workers, whereas the standard of the European Union deems that the number of workers is generally fewer than 250 employees at most. Korea also has its own standards whereby the range of SMEs is determined by the average turnover over the previous three years, rather than considering the number of workers. The reason the Korean government employs a different standard compared to other countries is related to a consideration of growth patterns in domestic enterprises. A previous standard of SMEs in Korea was similar to that applied in the EU and the US, and was based on the number of workers and the company's capital assets. Yet, tampering with the record of the company's account book meant these two criteria could be artificially manipulated, resulting in certain side effects. For example, some corrupt companies, by deliberately manipulating their account books, used to misuse the government subsidies which were designed to protect SMEs in a free market economy (Homepage of Small and Medium Business Administration, 2016). Therefore, the new regulation for the standard of SMEs in Korea was modified quite recently in 2015 so as to circumvent such potential abuse of the system.

The historical evidence clearly showed how SMEs had contributed to economic growth not only in developed countries, but also in developing countries. Also, these small-sized firms have been acting as game changers in the market by launching highly improved innovative products. Their relatively flexible structure (i.e., no massive burdens from the market and customers) can facilitate the development of risk-driven technology, thereby introducing new and better products (Choi, 2003; Keeble, 1997; Nugent and Yhee, 2002; Rothwell, 1989; Vaessen and Keeble, 1995).

However, academic and policy interest in SMEs, in particular their contribution to the regional economy, has been neglected for a long time. Since the 1980s, such issues were highlighted by several scholars, who by analysing eminently successful case regions, examined how SME-rich regions had improved their market competitiveness (e.g., Castells and Hall, 1994; Cooke, 2001; Saxenian, 1994; Scott, 1988). In addition, an interest in SMEs is seemingly related to geographical variations from the US to Europe as mentioned by Rothwell (1989), whose research discloses how academic and policy interest in SMEs has expanded. According to him, policy-makers in the European countries during the 1950s had an obsession about nurturing only large-sized enterprises rather than smaller firms, and therefore, until the 1970s, reserved the support of most public policies and most R&D support for major corporations.

In contrast, the attitude of the US government was more in favour of SMEs, and they were protected under the US Small Business Act of 1953 as follows:

> It is the declared policy of Congress that the Government should aid, counsel, assist and protect as far as possible the interests of small business concerns in order to preserve free and competitive enterprise….

The favourable social and industrial environments for SMEs in the US have consequently turned back to economic rewards to the nation along with the emergence of many high-potential innovative firms specifically in the advanced technology sectors where small-sized high tech companies are pivotal in the IT and electronics sectors on account of major companies' reluctance to participate in risk-taking research (Taylor and Thrift, 1982). In addition, the favourable atmosphere towards SMEs directly and indirectly resulted in the advent of the most innovatory industrial

agglomerations in the world, like the Silicon Valley and Route 128. Consequently, the SMEs sector in the US has created more job opportunities compared with its counterpart of larger size firms (Rothwell, 1989), and has contributed to around half of the US's GDP (Hausman, 2005).

After witnessing the successful role and contribution of SMEs to the US economy, therefore, many European policymakers changed their attitude since the beginning of the 1980s. They eventually devised a considerable number of public policies for revitalising SMEs and establishing industrial agglomerations, like science parks with a pivotal mission, which engages scattered regional innovatory resources so as to boost regional innovation, thereby promoting national and regional prosperity.

On the other hand, there is a bias against innovatory activities, which are generally associated with large-sized firms rather than SMEs. However, this perception was inaccurate and people's views are steadily being changed by them witnessing the emergence of highly innovative (tech-oriented) SMEs (Cumbers et al., 2003; Keeble, 1997; Pavitt et al, 1987; Piore, 1986). Indeed, a number of scholars have analysed a correlation between the size of companies and innovation performances through both quantitative and qualitative research methods, ascertaining that there is no strong causality between two variables: such research has been conducted in Italy (Hall et al., 2009); in the UK (Cumbers et al., 2003; Rothwell, 1989), and in the US (Acs and Audretsch, 1988).

In particular, the Science Policy Research Unit (SPRU) in the UK revealed the innovative activities of British corporations from 1945 to 1983 by means of their own database (see Table 2-2), which collected and analysed over 4,400 cases of significant innovation. The results suggested that small firms (fewer than 199 employees) in the UK had steadily increased their innovation activities, and had eventually leapfrogged medium- and large- sized firms with regard to the number of innovative activities during the 1980s (from 1980 to 1983). Although the data is quite old, it at least gives details of SME's peculiar structure, which clearly showed a more risk-taking tendency, and this has helped break the prejudice that SMEs are unlikely to conduct innovatory activities.

Table 2-2 Innovation share by size of innovating unit in the UK, 1945-83

Time period	Size of corporation							
	1-199	200-499	500-999	1000-9999	10000-29000	30000-99999	100000+	No. of Innovations
1945-49	18.6	9.3	8.8	48.7	11.5	0.9	2.2	226
1950-54	20.1	13.6	6.1	46.8	9.2	2.8	1.4	514
1955-59	17.9	14.0	11.5	39.7	11.9	2.7	2.3	514
1960-64	17.4	12.7	10.2	41.8	11.7	3.4	2.8	684
1965-69	21.4	14.2	11.4	37.9	9.2	3.3	2.6	720
1970-74	24.5	14.0	11.4	37.9	9.2	3.3	2.6	720
1975-79	31.3	13.6	13.0	29.8	8.3	2.7	1.3	823
1980-83	32.1	17.7	10.1	29.3	6.8	2.8	1.3	396
Number of innovations	1025	605	480	1625	427	125	91	4387
Average percentage	23.4	13.8	11.0	37.1	9.8	2.9	2.1	100

Source: Roy Rothwell, 1989, p. 54

As seen in the table above, large-sized businesses have not vigorously conducted innovative activities, and this has had a bearing on their structural characteristics. Instead, major companies that have sufficient financial assets tend to take over small-sized firms, which already have new knowledge and technology, thereby avoiding some of the risks of research and development and so saving on the initial installation costs (Taylor and Thrift, 1982).

In contrast, SMEs have several merits when carrying out innovation, especially in terms of behavioural perspectives:

> [S]mall firm advantages are those of entrepreneurial dynamism, internal flexibility and responsiveness to changing circumstances, i.e. they are behavioural advantages. (Rothwell 1989, p. 52)

The relatively simple organisational structure in small firms, which are managed by few owner families and professional managers, facilitates rapid decision making, as there are also fewer demands from particular customers and directors. Therefore, the executives are willing to attempt uncertain challenges (i.e., innovation activities) that are accompanied by high-potential risks and big rewards in a specific niche market (Hausman, 2005; Love and Roper, 2015; Olson et al., 1995; Sivades and Dwyer, 2000; Vossen, 1998). Hence, smaller firms inevitably display high birth and death rates (Taylor and Thrift, 1982).

With regard to innovatory processes, there are two different pathways: "radical" and "incremental" innovation. These are mostly distinguished by the pattern of innovation applied to improve and foster existing products and processes regardless of any industrial and sectoral boundaries. An incremental innovation is likely to slightly and gradually alter existing products, such as changes in product design (Nelson and Winter, 1982) and processes. So, this type of innovation clearly entails far less effort regarding research competence (Hirsch-Kreinsen, 2008). In contrast, a radical innovation is meant to significantly reform existing processes and products 'based on a different set of engineering and scientific principles and often opens up whole new markets and potential application' (Henderson and Clark 1990, p. 9). This implies that compared to incremental innovation, radical innovation inevitably needs to be accompanied by higher technological capacities and more time-consuming processes. Thus, in Chapter 7, this study will disclose which innovation pathway is being conducted by local textile SMEs in Daegu.

Up to now, this section has dissected SMEs' method of innovation and identified its characteristics. Because of the relative lack of studies on Korean SMEs, this study has highlighted the historical importance of such small-sized corporations to national

economies and industrial sectors through analysing the cases of Western economies. Meanwhile, such literature may help to overcome the prejudice against SMEs. Instead, they might be regarded as unsung heroes that have been greatly neglected in both academic and policy circles. These neglected matters will be addressed in Chapter 9 and will be based on the findings in Chapter 7.

2.5 Conclusion

This chapter has examined three levels of innovation systems and the features of SMEs' innovation, thus providing the theoretical and conceptual rationale for the following empirical chapters, so they can assist in narrowing the knowledge gaps.

As stated by many scholars, the definition of innovation systems varies, but most of the literature reviews embrace the idea that emphasises the mutual interactions of relevant actors (e.g., organisations, firms, universities, so on) within given systems. For example, Nelson and Rosenberg defined an innovation system as 'a set of institutions whose interactions determine the innovative performance of national firms' (Nelson and Rosenberg 1993, p. 5). As the originator of the term of 'System of National Innovation,' Lundvall stated that 'the innovation system […] included elements that interact in shaping innovation processes as well as elements that link innovation to economic performance' (Lundvall 2007, p. 99).

Owing to the broad acceptance of the theoretical grounds, the approach of innovation systems has been widely exploited in academia and policy contexts, and even by multi-national and supranational organisations, such as the Organisation for Economic Co-operation and Development (OECD), the European Union, the United Nations Conference on Trade and Development (UNCTAD), and so on. Yet, it is important to bear in mind that there is no panacea for innovation system models or innovation policy; as mentioned by Tödtling and Trippl (2005, p. 1203), 'There is no "ideal model" for innovation policy as innovation activities differ strongly between central, peripheral and old industrial areas.'

In addition to the wide variety of regional conditions, the framework of innovation systems is widely analysed by a range of perspectives depending on various academic

fields. Geographers mostly concentrate on geographical agglomerations and the proximity of related firms in mostly industrial clusters, focusing on the regional dimension, whereas the field of innovation studies is given to analysis using systemic views, which can be applied to the structure of sectors (specific technologies and industries), nations, and regions. In this vein, Asheim and Coenen also interpret the differences between the concept of the cluster (the geographer's view) and the innovation system (the innovation school view) as follows:

> The cluster concept is substantially narrower than the RIS concept because of the strong sectoral connotation in clusters whereas a regional innovation system can transcend multiple sectors. (Asheim and Coenen 2005, p. 1186)

Having examined previous literature reviews, this study would suggest that innovation systems are best described as the process of systemic interaction among components within specific boundaries. In other words, each target level (nation, region, or sector) sees improved innovation and competitive advantage through mutual interaction among existing materials. Table 2-3 below summarises the meaning of basic terms in innovation systems.

Table 2-3 Main terms and their meanings

Term	Meaning
Innovation	The first commercial transaction, inherently uncertain, a new combination
System	A set of institutional actors (firms, organisations, and institutions) for the creation and commercialisation of knowledge, and for improving competitiveness
Innovation Systems	An interaction between various components within a specific geographical boundary
National Innovation Systems (NIS)	'A set of institutions whose interactions determine the innovative performance of

	national firms' (Nelson and Rosenberg 1993, p. 5) 'Network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies' (Freeman 1987, p. 1) 'Organizations involved in searching and exploring (Narrow definition) / Institutional set-up affecting learning as well as searching and exploring (Broad definition)' (Lundvall 1992, p. 12)
Regional Innovation Systems (RIS)	'The institutional infrastructure supporting innovation within the production structure of a region' (Asheim and Gertler 2005, p. 299)
Sectoral Innovation Systems (SIS)	'A system (group) of firms active in developing and making a sector's products and in generating and utilizing a sector's technologies' (Breschi and Malerba 1997, p. 131)

Source: Author

Along with the basic ideas given above, Table 2-4 indicates the characteristics of SI. It can be seen that the concept of RIS emerged from the basic idea of NIS, sharing several same theoretical grounds, such as the evolutional perspective. The NIS literature has provided success stories demonstrating how well-operated innovation systems have contributed to the economic and technological development in latecomers, in particular developmental states such as Japan and Korea, whereas the concept of RIS demonstrates how the competitiveness of specific regions and industrial districts has been improving rapidly. On the other hand, the SIS literature, which shares an evolutionary approach, has principally focused on the role of intermediaries in contributing to the local economy and the industrial sector. Given that this literature chapter deals with systemic views, interpreting the contribution of intermediaries to the (national, regional, and sectoral) economic system was more useful than analysing the process of developing the technology of specific sectors.

Table 2-4 Characteristics of innovation systems

Term	Example of case studies in the literature	Pivotal factors for innovation	(Potential) weaknesses of innovation systems
National Innovation System (NIS)	The context of developmental state – Korea (Kim, 1993), Taiwan (Hue and Gee, 1993), Japan (Freeman, 1987)	Knowledge and learning, institution, research and educational organisations, S&T policy.	The difficulties of measuring innovative performance between components and of finding a key actor for innovation systems Often, innovation systems engender the political/ technological lock-ins of old industrial areas No best (ideal) model Insufficient innovation due to inadequate support for knowledge spillovers in peripheral regions Weak linkage between innovative actors Instability of systemic structure (but, often gives rise to innovation activities)
Regional Innovation System (RIS)	Electronic industry in Silicon Valley and computing industry in Route 128 (Saxenian, 1994), Danish wooden furniture industry (Maskell, 1998), Norwegian regional clusters – shipbuilding, mechanical engineering and electronics (Asheim and Isaksen 2002)	Tacit knowledge, location (institutional proximity, agglomeration), structural flexibility, mutual trust, and sense of kinship)	
Sectoral Innovation System (SIS)	Industry: Montreal Fur Garment cluster	Symphony of agents (firm, intermediary, etc.), interaction	

	Intermediary: knowledge intensive business services (Hertog, 2000)	and cooperation,
	the Finnish Funding Agency for Technology and Innovation (TEKES) Inkinen and Suorsa (2010)	

Source: Author

Thus far, the literature chapter has focused on three types of innovation systems regarding SME innovation and the effects on the national, regional, and sectoral dimensions. As this research principally examines the revitalisation of an old industrial area, the analysis of national, regional, and sectoral conditions of institutions and characteristics was necessary. Moreover, looking at SMEs' innovation will help understand the technological advancement in the textile SMEs in the later empirical chapters. To comprehend such technological matters including the R&D issue, the perspectives both of geography and innovation schools will be utilized.

Hence, through an analysis of four literature sections, we can identify 1) that an approach to the institutional perspective on NIS (Nelson and Freeman's view rather than Lundvall's theoretical emphasis) is appropriate in the context of the developmental states, 2) that the hallmarks of three different innovation systems and the importance of SMEs' innovation are each important, including in the Korean case, 3) that the role of intermediaries in facilitating innovation systems and in developing technological advancement in industrial sectors is diverse, and 4) that there is a weaknesses in innovation systems approaches - the methodological deficit will be discussed in the methodology chapter, Chapter 4.

Chapter 3 POLICY REVIEW: FROM DEVELOPMENTALISM TO INNOVATION SYSTEMS

3.1 Introduction

A half-century ago, Korea, which had already suffered from Japan's colonial exploitation policy, was devastated by the Korean War. Yet, nowadays, the country is known to be benefitting from unprecedented economic growth and social stability by means of the developmental state model (see Table 3-1). In terms of the rate of economic growth, Korea is regarded as one of the most strikingly developed countries since the World War II era.

In 1961, Korea's Gross National Product (GNP) was one-third that of Mexico and even lower than that of Sudan. However, Korea successfully transformed its industrial structure from labour intensive, based on textile manufacturing, to capital intensive, based on advanced technology products, such as semiconductors. According to the World Bank (1988), between 1965 and 1986, Korea's annual per capita GNP and Gross Domestic Product (GDP) grew 6.7% and 8.6% respectively, compared to 2.9% and 5.0% growth for other developing countries. The manufacturing growth rate in Korea between 1965 and 1986 was 14.3%, compared to 7.8% for Singapore, 5.4% for Brazil, 1.2% for Argentina, and 3.7% for Mexico. More recently, the World Competitiveness Yearbook of IMD ranked Korea 12th and 6th in science and in technology respectively (2006).

Table 3-1 Basic indicators in latecomers

Middle-income economies	Average annual growth rate (percent) from 1965 - 1986			
	GNP	GDP	Industry	Manufacturing
Korea	6.7	8.6	13.4	14.3
Brazil	4.3	5.9	5.8	5.4

Malaysia	4.3	6.1	6.0	5.8
Mexico	2.6	3.5	3.8	3.7
Argentina	0.2	1.3	0.8	1.2
Hong Kong	6.2	7.3	-	-
Singapore	7.6	7.9	8.3	7.8
The average of developing economies	2.9	5.0	5.9	7

Source: World Bank, 1988

So, one question is inevitably raised: how has the Korean government contributed to the economic growth and to the complete transformation of the industrial structure from labour-intensive industries to cutting-edge industries in unfavourable environments including a lack of natural and financial resources?

On the one hand, when Korea's industrialisation began at the end of the 1960s, economic development was one of the key policy concerns, resulting in the intensive state intervention in domestic and international markets. During the developmental period, therefore, all economic-related policies, such as science and technology (S&T), industry, and land-planning, were regarded as implicit parts of the economic development plan (Lee et al., 1991; Hahm and Yang, 2012).

However, investigating S&T policy, specifically, regarding how to contribute to changing the industrial structure and strengthening technological development, is important (Schlossstein and Reichartshausen, 2007; Radosevic, 2012; Gupta et al., 2013; Kim et al., 2014). This is because S&T policy in the early developmental period provided the appropriate infrastructure of the NIS that helped improve the nation's entire technological competence and later influenced the operation of

RIS/SIS, thereby sustaining economic and industrial growth. Given that the institutional configuration within innovation systems is a keystone (Lundvall, 1992; Edquist, 1997) that can improve relations between individual components (e.g., industrial research laboratories, research universities, government research institutions, and so on), we need to know why specific institutions and organisations were established by the central government.

In this vein, since the 1990s, Korea's innovation systems are widely analysed (see e.g., Nelson, 1993; Kim, 1993, 1997, 2001; Chung, 2002; Yim and Kim, 2005; Lee and Park, 2006; Kim, 2007; Park, 2001; Lee, 2003; Sohn et al., 2007; Gress, 2015; Sonn and Kang, 2014). However, the origin of Korea's innovation system and the trajectory of institutional configurations are paying less attention to academia. To answer the two questions above, economic and S&T policy reviews in Korea over the last five decades from the beginning of the 1960s to the end of the 2000s are essential and will help to understand the role of the government.

On the other hand, we also need to disclose why Korea's developmentalism showed better outcomes, compare with other latecomer countries (e.g., Latin American economies). Since the 1960s, not only East Asian but also Latin American countries have attempted the transformation of industrial structures by central government initiatives, but the outcomes have varied considerably. Therefore, looking at the investigation of Korea's developmentalism and its distinguishing features will provide the answer to the question that is raised in the following Section 3.2. Furthermore, this earlier model of developmentalism will significantly help understand Korea's recent innovation policy and regional upgrading process in the later empirical chapters (Chapters 6 and 7) because of its strong legacy in the socioeconomic environment. Therefore, it is worth looking for traces of the developmental state here.

3.2 The developmental state and policy intervention

After witnessing the rapid economic growth and industrial transformation of Korea since the mid-1960s, many scholars have explored the role of the state in the Korean developmental experience (Jones and Sakong, 1980; Luedde-Neurath, 1986; Amsden, 1989; Wade, 1990; Chang, 1993; Rodrik, 1994; Woo-Cumings, 1999; Minns, 2010; Yeung, 2016).

The developmental state can be defined as 'a shorthand for the seamless web of political, bureaucratic, and moneyed influences that structures economic life in capitalist Northeast Asia' (Woo-Cumings 1999, p. 1).

Since the rapid economic growth of the East Asian countries, in particular the four Asian tigers, that is, Hong Kong, Singapore, Taiwan, and South Korea, their successful stories have captured the attention of a considerable number of scholars, with a focus on the state-led macroeconomic planning that engendered the accomplishment of national reconstruction and industrialisation within relatively short periods.

The aforementioned type of the economic growth model is also described as a "plan-rational state" (Evans and Rauch, 1999), which is explained in more detail in Choi's words (2012, p. 89):

> [a] "plan-rational" state, which constructed a Weberian ideal type of an interventionist state that was neither socialist nor free market but something different, that is, a rationally planned capitalist development state.

The term "plan-rational" state also is consistent with Jayasuriya's (2005, p. 382) perspective:

> A state has 'core' strategic capacities to plan, monitor and enforce key developmental objectives, which will shift the comparative advantage of national economies towards those sectors that are of strategic value in the global economy.

The common perspective emphasising the pivotal role of government by the bureaucratic authority can also lie in the innovation studies school where they tend to focus more on a perspective of technical developments brought about mainly by S&T policy and interactive learning. This school has a basic tenet that government per se is a key component in facilitating technological development and learning processes. Therefore, the volition of the government to improve the absorptive capacity of technology and innovation is crucial (Kim, 1997). Rodrik (1994, p. 83) also commented on the Korean state's peculiar trait as follows:

> [T]he Korean government has always perceived itself as a mediating agent and a facilitator for bringing about industrial change, through arm-twisting, subsidies or public enterprises as the circumstances may demand.

In the early stage of the developmental period in Korea, the government fully exploited conglomerates (*chaebol*) as an instrument for nurturing specifically selected sectors (e.g., the heavy and chemical industries) that later engendered the cosy relations between politics and business (*jeongkyungyuchack*). At that time, an escape from poverty through the nation's overall economic growth was the top priority of the dictatorial President Park Chung-hee[2].

Unlike his predecessor, President Syngman Rhee, who had paid attention to national integration and other political issues rather than to economics, President Park had clearly become obsessed with the nation's economic development without help from other developed countries - often called an "independent economy (*jarip gyongje*)" (Jones and Sakong, 1980). Given the nation's insufficient resources to stimulate economic and industrial growth, there were not many options. For that reason, the government had steered selected companies (i.e., national champions or picking winners) by rewards (policy benefits) and disciplines in order to change the nation's industrial structure.

There are several reasons why the government wanted to generate an independent economy (*Jarip Gyongje*). In the 1960-70s, Korean ruling groups (e.g., policy makers) were severely concerned about 1) too much reliance on foreign capital and its direct investment in the domestic market (Chang, 1993), 2) the North Korean military threat, and 3) a huge desire to catch-up to the Japanese economy due to historic anti-Japanese sentiments (Michell, 1984).

For these reasons, the Park regime thought an upgrade of the industrial structure from the agro-industries to the heavy and chemical (H&C) industries was indispensable, as the H&C sector as a consumer goods manufacturing sector would help expand a domestic market, and would earn more profits (Amsden, 1989; Chang, 1993; Yeung,

[2] This research deals with views of only his economic and industrial policy not his politics.

2016). Moreover, the promotion of the H&C sector was closely related to geopolitical factors. In the 1970s, the US President Nixon ordered the evacuation of US forces (almost 24,000 men) from Korea. Then, the incoming President Carter offered public pledge for the withdrawal of the remaining US military from Korea by the end of the 1970s. This political atmosphere between the US and South Korea as an important military alliance ensued as a consequence of the Vietnam war.

Notwithstanding the huge sum of money and the number of soldiers involved, the US troops were defeated in North Vietnam, meaning that for Nixon and his successor Carter, government operations in supporting other distant wars involving their allies like Korea became a major political burden because of an anti-war movement throughout the nation. This was exacerbated by the US government's need to halt China's support to the North Vietnamese, which Nixon's administration brought about by arranging a rapprochement with the People's Republic of China, which was a close ally of North Korea during the Korean War.

Under the above political circumstances, the Korean government (namely President Park) felt uneasy, resulting in a distrust of the US. Therefore, the H&C sectors, which were linked with military defences such as steel, petrochemicals, and shipbuilding, were selected as the key industries in order to provide a self-defence of the nation should US military aid cease (Woo, 1991; Choi, 1993; Minns, 2010).

On the other hand, the remarkable achievements of the economic catching up and structural change raise two pertinent questions.

1) How did the government efficiently intervene in both domestic and international markets? The government's discipline on conglomerates in Korea was widely regarded as a key measure of the country's industrial restructuring, thereby reaping the economic growth as well, whereas the state's control over the financial market was a crucial weapon which paved the way for facilitating an export-oriented development.

2) Why is it that other latecomers, who also utilised the same strategy of developmentalism as a main tool of their economic growth model, have not achieved similar outcomes to Korea and Taiwan? In the case of Latin America, the countries are

often compared with East Asian countries, as all those countries began to upgrade their economic structure at around the same period. As commented by Bhagwati (1987, p. 225):

> The key question then is not whether there is governmental action in the Far Eastern economies, but rather how have these successful economies managed their intervention and strategic decision making in ways that dominate those of the unsuccessful ones.

In order to answer the aforementioned questions, in the following sub-sections 3.2.1 and 3.2.2, this study focuses on several significant factors that affect the success story of Korea.

3.2.1 Financial intervention and conglomerate control

As has already been mentioned, the government initiative to accomplish an independent economy had a bearing on the geopolitical issue and financial dependency on foreign capitals. Even though some of the latecomers, such as Taiwan, were more open to external resources (e.g., foreign direct investment, FDI), the Korean government placed a strict limit on this in the domestic market. Therefore, FDI accounted for only around 5% of total foreign capital inflow in the domestic market between 1962 and 1983 (Amsden, 1989).

The policy makers fundamentally wanted to remedy the dependence on foreign savings, which led to a chronic balance of payment deficit, hampering the improvement of the nation's economic structure (Chang, 1993). Thus, the Korean government actively intervened in and distorted both the international and the domestic financial markets by means of 'traditional import substitution policies' (Rodrik, 1994), which were also referred to as 'getting the price wrong' to quote Amsden (1989, p. 13).

As reviewed by Chang (1993, p. 132), there were three key financial policies which transformed the country's economy from being import-substituting to being export-oriented:

1) the introduction of a unified, realistic exchange rate regime;
2) trade liberalisation involving cuts in tariffs and the abolition of most quantitative restriction;
3) a substantial increase in real interest rates

In order to exercise total control over the domestic financial market, the government had nationalised all private banks since 1961 (i.e., after the military coup), thereby enabling the distribution of investible funds and the credit extension with negative real interest rates to selected conglomerates so as to facilitate the development of infant industries (Rodrik, 1994). Subsequently, new state-owned banks (e.g., the Korean Exchange Bank and the Bank for Medium and Small Firms) were continually being founded by the Park regime to strengthen the control of the inflow of money into industry (Chang, 1993).

Meanwhile, President Park Chung-hee adhered unwaveringly to an outward-looking policy, thereby providing significant incentives to export companies that had ridden a wave of a 50% tax cut on their export earnings and had received significant financial aid from the government (Amsden, 1992; Minns, 2010). Such financial market intervention (e.g., tax incentives) led to an environment in which "picked winners" could rapidly grow their businesses, thereby accomplishing export enlargement (Yeung, 2016) on account of the comparative advantages of merchandise prices (i.e., the decline in the Korean Won rate) (Amsden, 1989), and the low cost of labour, given that by the late 1980s, the average hourly rate of pay in Korea's manufacturing sector was lower than in Taiwan and Hong Kong (Bello and Rosenfeld, 1990).

In the late 1960s and early 1970s, in addition to financial support, the government devised "Promotional Laws" that were designed to provide preferential support for designated companies in specific industries. Under the state intervention in a macroeconomic circle (e.g., under-priced credit), Korea's major companies could rapidly gain market competitiveness (Jones and Sakong, 1980). At that time, the private sector relied heavily on the government-run banks in order to borrow money with favourable credit conditions (Luedde-Neurath, 1988), forcing conglomerates to be obedient to the government.

On the other hand, the Korean government took a carrot-and-stick approach for controlling large business groups in the developmental period. The government decided to either provide relevant incentives or punish the companies depending on their economic performances, especially their actual export record. With regard to the state's harsh treatments, namely, using the government's absolute power to impose penalties on the private sector, Amsden (1989, p. 15) exemplified this with the following case:

> A company named Shinjin had a larger market share in the Korean automobile industry in the 1960s than Hyundai Motors. Shinjin's owner, however, could not survive competition from Hyundai's "Pony" and the oil shock in the 1970s. The company went bankrupt and the government, as banker, transferred Shinjin's holdings to Daewoo Motors.

Meanwhile, almost all leading businesspersons were placed under arrest as a punishment for 'accumulating wealth illicitly by taking advantage of their positions and powers' in accordance with the 1971 Special Law for Dealing with Illicit Accumulation (Jones and Sakong 1980, p. 280). This punishment was closer to being a political action in that the government later released them on certain conditions, as follows:

1) The government would exempt most businessmen from criminal prosecution;
2) With the notable exception of commercial bank shares, existing assets would not be confiscated;
3) Businessman would instead pay off their assessed obligations by establishing new basic industrial firms and donating to shares to the government (ibid., pp. 69-70).

Chang (1993, p. 151) viewed the above situation as being due to the need to 'serve the nation through enterprise'.

On the basis of a high degree of state autonomy (or 'embedded autonomy' to borrow a term from Evans (1995), the rearrangement of the industrial structure was carried out as a reflection of the government's will. However, later, this structural change engendered too many domestic firms with a tendency to participate in the H&C

industries, as they easily received incentives from the central government, thus making it difficult to achieve economies of scale (Chang, 1993). The EPB (Economy Planning Board) also had fully perceived such a problem (Jones and Sakong, 1980), so established restrictions in that the government created a barrier to entry to the nation's industrial strategy sectors, and then reorganised busy industries by means of coercive measures, such as mergers and market sharing arrangements in order to balance the market.

Considering contemporary industrial and economic environments in which the private sector generally has more information and knowledge than the public sector, the state-led structural change in the post-developmental state model seems like an inappropriate way to reallocate resources on account of the information asymmetry between the public and private sectors. Yet, in the early phase of Korea's industrialisation, all corporations were under complete surveillance by the government on the grounds of the "Promotional Laws", which embodied a unique clause that obliged companies to submit their export performance to the government (Jones and Sakong, 1980). Because of this monitoring system, policy makers could seize control of private corporations, thereby enabling them to give rewards or punishments to the private sector. Public agencies like KOTRA (Korean Trade Promotion Corporation) were also fully utilised by the government for gathering important information overseas. Thus, the policy makers had a better stock of information than had the private companies (Chang, 1993).

This had a range of consequences.

First, the financial control over the private sector was crucial in that Korean businesspersons relied heavily on state-owned banks to borrow money for their business (Luedde-Neurath, 1988; Chang, 1993). Jones and Sakong (1982, p. 296) also pinpointed the importance of controls of financial institutions as follows:

> Government control of the banks is thus the single most important economic factor explaining the distinctly subordinate position of the private sector.

Second, the state intervention in industrial policy (e.g., a compensation scheme to conglomerates for upgrading the nation's industrial structure) was regarded as a pivotal feature which facilitates the nation's structural change (Amsden, 1989).

Yet, the control of the private sector, in particular, large business groups (*chaebol*), was an essential precondition of such industrial intervention. Given the financial and institutional conditions in the 1960-70s, the picking-winners strategy in the priority industries seems to have been the correct way to resource poor nations like Korea. Indeed, this strategy significantly nourished the growth of private companies, as noted by Chang (1993, p. 141).

> Most of Korea's major industries were designated as priority sectors at some stage and were developed through a combination of massive support and heavy controls from the state. The 'designated' industries had priority in acquiring rationed (and often subsidised) credits and foreign exchange, state investment funds, preferential tax treatments (e.g., tax holidays, accelerated depreciation allowances) and other supportive measures, including import protection and entry restrictions. In return for these supports, they became subject to state controls on technology (e.g., production methods, products), entry, capacity expansion, and prices.

On the other hand, the government control of the large business groups using the carrot-and-stick approach had reaped benefits for both parties. The growth of the private sector along with an improvement in technological competitiveness, in turn, had acted as the catalyst for radical national structural change and economic growth, thereby eventually achieving an independent economy. In this manner, the success of the picking-winners strategy was contingent upon reciprocity between the nation's and the conglomerates' goals. In terms of the government side, Pack and Westphal (1986) pointed to Korea's business-friendly industrial policy, like credit incentives towards those conglomerates which held a dominant position in the private sector, enabling the state-driven industrial diversification strategy. In the view of the private sector, Amsden (1989) and Jones and Sakong (1980) exemplified the case of Hyundai when the company entered into the shipbuilding industry. In 1975, the world shipbuilding industry collapsed, allowing late developer countries and their enterprises to invade the market. Under this situation, Hyundai attempted to create a shipbuilding business, yet could not receive financial support from overseas due to a lack of brand-awareness

and uncertain technologies in the sector. Therefore, the company was going to have to withdraw their business plan regarding shipbuilding sector. At that time, however, President Park became aware of this and decided immediately to support Hyundai financially in light of the circumstance of the global shipbuilding industry and future prospects. Furthermore, President Park personally trusted the company's owner (Chung Ju-young), who was a legendary figure in the Korean business sector for his boldness and driving force. For these reasons, President Park commanded unlimited aid, including financial guarantees to the company, in order to establish the infrastructure as well as to help borrow the external funds by the government guarantee.

Up to now, this study has reviewed Korea's developmentalism and its representative examples by presenting theoretical discussions of the developmental state and the cases of interventions in the business sector. Paradoxically, such an authoritarian state as an invisible but important factor in developmentalism could lead to outstanding performances in industrial upgrading and economic growth. There was also the consonance of two key actors' purposes: the government aimed to achieve a high level of economic growth by means of the nurturing of domestic large-scale business corporations, whereas the private sector aimed to establish a stable business foundation which both directly and indirectly led to the improvement of competitiveness in both domestic and international markets. In this regard, Jones and Sakong (1980, p. 293) noted:

> Given economic growth as the legitimizing goal of the Park regime, there is a clear harmony of interest between government and business, and this is reflected in close working relationships of a sort that might be crudely characterized as "Korea, Inc."

Therefore, this section can help us understand what the basic framework of Korea's past developmental state model was, and then the following sub-section 3.2.2 will answer the question regarding why the Korean developmental state has shown better outcomes than others.

3.2.2 Korea's unique feature of the developmental state

It is interesting that not only East Asian countries but also Latin American governments had widely employed the strategy of the developmental state while they were less developed economies. So, there is still doubt as to why those latecomers in Latin America have not accomplished similar outcomes as can be seen in the Asian countries. The basic concept of the Korean state's developmentalism was not principally different from that of those countries, as pointed out by Dornbusch et al. (1987, p. 404):

> The Korean strategy is much the same (as that of the Latin American countries), with pervasive protection of an infant-industry kind going hand in hand with favourable treatment of the export sector through tax incentives and credits.

Therefore, we need to analyse which distinct factors (e.g., policy measures) produced different results between Korea and others, thereby providing more precise information with regard to Korea's policy distinctions. At the same time, understanding the developmental state in Korea helps us understand the information in the following empirical Chapter 8, for instance, how legacies of the past developmental model have affected current governance structures and innovation systems.

To answer the question above, first of all, this study looks at the level of the state's authority as a prominent constituent in developmentalism. One legacy of the Japanese occupation and the Korean War was that Korean society did not have any powerful social classes in the 1960s when the country was beginning its industrial upgrade, as the Japanese state had abolished the class of aristocratic landowners in Korea (called *yangban*). Thus, there was no turf war between the state and specific ruling groups, which gave rise to a high level of state autonomy (Hamilton, 1983; Lim, 1985; Evans, 1987; Amsden, 1989; Minns, 2010).

Notwithstanding the lack of any stratified class, on the other hand, Korean society retained a long historical tradition of centralisation even stronger than that in other Confucian countries like Japan and Taiwan. This means that people unconsciously

accepted the central-dominated political power (Chang, 1993). Given such historical circumstances combined with the peculiar situation of a military junta, the state had dominated all classes in Korea at the early developmental period. Therefore, policy makers could easily implement their planned policies, which were made by a few elite bureaucrats in accordance with the aims of an authoritarian regime (namely, President Park's intentions) and were insulated from the demands of powerful groups (Rodric, 1994). In this manner, the higher degree of state autonomy in Korea could also rectify the condition of both private and public sectors through a reorganisation of government ministries and even the industrial sectors (Amsden, 1989; Haggard and Moon, 1990; Rodrick, 1994).

As reviewed by the political economy school (Alesina and Rodrik, 1994; Persson and Tabellini, 1994), the absence of specific ruling groups in Korean society meant that there was a lack of severe inequities, resulting in the avoidance of growth-retarding policies, which otherwise could easily have led to the society suffering from significant social disequilibrium. For this reason, the Korean state was able to steer the economic growth-driven scheme with no consideration of redistributive policy (Rodrik, 1994), and this facilitated the arrangement of resource efficiency during the development of industrialisation (Minns, 2010).

In terms of a systemic view, a well-organised agency, notably the Economic Planning Board (EPB), had played a significant role in the management of designated industrial sectors, such as shipbuilding and steel, which were at the forefront of the growth-driven governance, thereby devising coherent policies with massive power. In contrast, the Latin American countries did not have such a single control unit involved exclusively in making and implementing the economic and industrial policy, as mentioned by Balassa (1988, p. 287),

> There are pervasive controls of investment, prices, and imports and decisions are generally made on a case by case basis, thereby creating uncertainty for business decisions.

The EPB was established in 1961 after the military coup led by President Park with a mission that forged the nation's economic development with a long-term view. The

government needed a conductor of the overall economic plan, so delegated all powers to the EPB, which absorbed several departments, for instance, Developmental Plan and Foreign Cooperation Activities from the Ministry of Construction, the Bureau of Budget from the Ministry of Finance, and the Bureau of Statistics from the Ministry of Home Affairs. Furthermore, the head of the EPB was promoted as the Deputy Prime Minister in 1963, which meant that all ministers involved in economic plans were first required to discuss their proposals with the minister because the agency had the sole authority to manage the nation's economic policies (Choi, 1987). Thus, the EPB could play both policy-planning and budgeting roles, thus making more consistent and effective policy (Jones and Sakong, 1980) without conflicting with other government departments and agencies. The advantage that an exclusive agency gave to the nation's comprehensive economic plans is that it could obviate potential conflicts in making important economic policies with coherence. As a result, it led to the better performance of the Korean economy in the catching-up phase, compared with not only Latin America countries, but also Japan and France, which were also regarded as 'industrial policy states' (Chang, 1993).

Regarding the promotion of the nation's infant industries, most of the latecomer countries awarded several grants such as tax incentives to protect the industry, but the Korea took a slightly different path. The industrial policy of the Korean state was implemented by the choice and concentration strategy (e.g., picking winners in specific industrial sectors) owing to the limited resources available. Therefore, it eventually resulted in the nurture of the H&C industry and conglomerates whereby the industrial sector could generate huge numbers of jobs and enlarge the domestic market rapidly. In contrast, the policy stance of the Latin American countries (namely, three large latecomers: Argentina, Brazil, and Mexico) basically took a case-by-case approach that yielded an incoherent industrial policy and led to an absence of competitive industrial sectors. In addition to this different policy approach, Korea's peculiar strategy, in which the government could enforce the penalties imposed on corporations whenever necessary in light of their performance, generated entirely different results. Thus, the differential among the developmental state model had a strong bearing on the different degrees of state autonomy (Amsden, 1989; Chang, 1993).

With regard to the promotion of the private sector, the Korean state had some unique features. A comparison with the case of Taiwan is particularly useful, because even though both countries had similar economic scales, development strategies, and industrial backgrounds, their philosophies for steering the industrial change were substantively different. For instance, the biggest dissimilarity between both countries was their way of promoting their industrial sectors. The efforts of the state to manage private enterprise in Korea was considerably greater than that of the Taiwanese government - the policy stance of the Korean government towards the private sector had offered aggressive support by focusing on selected industries and companies to rapidly catch up its economic scale to reach that of advanced countries. In contrast, the Taiwanese government concentrated on creating an industrial environment that was more conducive to economic growth and thereby fostered small business firms. This strategy was regarded as more flexible, as small firms were better able to adapt to changing economic conditions than were large firms owing to their structural advantage. Further, the SMEs-driven policy could easily stimulate entrepreneurship, which encouraged competitiveness in the market. Therefore, the significant advantage of Taiwan's model was that it helped reduce income and social inequality. In contrast, the Korean state's approach entailed a more pervasive relationship between the government and the private sector, contributing to the increase in the nation's overall absorptive capacity, which occupied a large portion of the market share of specific industries by utilising a few conglomerates. Consequently, this route helped to grow Korea's economy and industry more quickly than was the case in other developing countries (Scitovsky, 1985; Smith, 2000).

On the other hand, the initial social conditions of the country were another decisive factor in the intensive promotion of structural change. The collapsed social hierarchy during the Japanese occupation meant the government did not pay attention to the policy, which mollified the excluded classes on account of there being no severe imbalance of people's levels of education, wealth, and other factors. In particular, whilst there was a lack of first-class education, the average educational level of citizens was significantly higher than in other countries considering their economic size and income. Rodrik (1994) asserted the importance of the initial conditions in upgrading

the economic structure by means of Adelman and Morris's (1967) index of socioeconomic development for a range of countries.

Table 3-2 Socioeconomic development and income

	Index of socioeconomic development, 1960	Per-capita GNP, 1961 ($)
South Korea	0.85	73
Taiwan	1.05	145
Brazil	0.79	186
Cambodia	-0.55	101
Ivory Coast	-0.98	184
Morocco	-0.57	150
Cyprus	1.08	416
Jamaica	1.06	436

Source: Adelman and Morris (1967, Table IV-5).

According to Table 3-2 above, Korea was ranked at a quite high position despite having the lowest level of per-capita income. These outstanding intrinsic elements in society could also give an answer to the question of why other latecomer countries could not accomplish similar outcomes to Korea.

Rodrik (1994, p. 97) also pinpointed how

> South Korea and Taiwan shared a number of special initial conditions - high levels of educational attainment relative to income, and equal distribution of income and wealth - that these other countries lack. Consequently, the relevance of their experience with government intervention to other developing economies may well be limited.

Indeed, Korea's literacy level and primary enrollment rate were considerably higher than those of other countries (Adelman and Morris, 1967), implying that the government could easily exploit a good quality local labour force. This educational issue is also important in explaining how the state possessed and utilised a well-organised bureaucracy, which efficiently intervened in economic and industrial policy, as the relatively plentiful supply of skilled labour clearly enabled the creation of better government organisations.

Up to now, this section has interpreted the feature of the Korean developmental state, thereby demonstrating why the state has outperformed other similar nations, specifically, that there was both a relatively higher degree of state autonomy and a well-established social environment. In particular, the difference in the educational level can be considered an important distinction between Korea and other latecomers. Under the circumstances, a single policy unit, the EPB, which had the absolute authority over an overall economic policy, could adopt President Park's ambitions without conflict, thereby making for a more consistent policy approach. These unique characteristics of Korean developmentalism can give us the basic information and framework of the developmental state that help explain the current Korean innovation and governance system that will be addressed in Chapter 8. The following section 3.3 will describe Korea's S&T policy in order to explain the policy record of institutional settings and how innovation systems have been established.

3.3 A brief history of STP in Korea

3.3.1 Park Chung-hee (1963 to 1979)

Before tracing the development of the S&T policy of the Park Chung-hee administration, it should be noted that Korea's S&T policy was deemed an implicit feature of the industrial policy at the infant stage of industrialisation, from President Park to Chun (Lee et al., 1991). However, there are also slightly different purposes between S&T and the industrial and economic policies. The general purpose of S&T policy was to lay the foundation for the nation's technological competence and to pave the way for the promotion of select industries that the government was eager to promote. S&T policy, therefore, in the initial stage of the developmental period, had

focused on establishing government-supported research institutions (GRIs) and on nurturing human resources of mainly the engineering and science fields, whereas industrial and economic policies were likely to concentrate on protecting the infant manufacturing and product sectors through the market intervention (e.g., the market distortion) (Hahm and Yoon, 2007).

Historically, Korea's economic growth has been intimately linked to political matters. The nation's initial industrialisation stemmed from the military regime of Park Chung-Hee, whose cabinet attempted to foster export-oriented industrialisation by means of diverse incentives for selected industries, such as the heavy and chemical industries. The regime believed that industrial development and competitiveness would lead to the nation's prosperity and overcome the problem of severe poverty (Collins and Park, 1988; Ministry of Science and Technology, 2008). In 1962, with Park as acting president, the Korean government sought to switch its industrial paradigm from import substitution industrialisation to export-oriented growth through the Five-Year Economic Development Plan, which was devised by a few elite bureaucrats. The plan's main aim was to foster rapid technological advance for industrialisation and to encourage domestic infant industries by means of government aid. It was thought that, eventually, the nation's national competitiveness and economic independence would improve (Westphal, 1990).

The hallmark of the industrial policy during the Park regime was extensive government interventions in both domestic and international capital markets (e.g., tariff systems, interest rate subsidies, exchange rates, etc.). The administration firmly believed that supporting policies, such as government grants to specific industries, would protect infant industries and gain international competitive power (Chang, 1993). Regarding the trade protection policy, the Korean tariff systems were reformed several times. Lee (1996, p. 393) pointed out:

> The simple average of legal tariff rates rose during the period of import substitution and has declined gradually since the tariff reform of 1962, when Korea switched its trade regime.

Between 1952 and 1962, Korean tariff rates increased by more than 10% (from 25.4% to 39.9%), whereas from 1963 to 1973, the Ministry of Finance imposed special customs tariffs from 70 to 90% for specific import commodities that were regarded as nonessential. The government actively intervened, imposing import restrictions in order to reduce the balance of payments deficits and protect domestic industries (Collins and Park, 1988). Furthermore, the Park regime intervened significantly in the tax system and gave preferential treatment to key industries and conglomerates[3]. Such conglomerates were deemed the key driving force that successfully led a structural transformation, thereby strengthening the nation's industrial competition in the early developmental state through the use of state aid (Amsden, 1989; Chang, 1993; Kim et al., 2004; Nelson, 1993), so it is necessary to look briefly at this feature and examine the influence of those business groups. From the outset of the first five-year economic development plan in 1962, the nation had suffered from insufficient resources and too few support organisations for boosting the national economy; therefore, the government wanted to offer their scarce resources to those companies who were willing to accept a high-risk and high-reward strategy. According to Kim (1993, p. 363), the Korean government had artificially fostered big-size business groups:

> Where Korea differs from other developing countries in promoting big businesses was in the discipline its state exercised over these chaebols by penalizing poor performers and rewarding only good ones. Good performers were rewarded with new licenses in other industries, leading to further diversification. For those entering risky industries, the government rewarded entrants with licenses in more lucrative sectors, providing a cushion to nurture risky infant industries.

With the negotiation between political and business groups, some successful conglomerates were developed by lavish support from the government, and these then diversified their business sectors in response to the government's economic and industrial plan (like the H&C industry, electronics, so forth) (Km et al., 2004). Before the Asian financial crisis in 1997, which was a turning point in Korea's chaebol system, the top 30 conglomerates in Korea operated around 25 affiliated firms each, and the top 5 companies possessed an average of 62 affiliated corporations. In terms of the

[3] Also referred to as *chaebol* – diversified corporations that are usually controlled by one or two families

economic power in the end of 1990s, while the top 30 *chaebols* accounted for 24% of all firms listed on the Korean Stock Exchange (KSE), and for around 46% of the KSE's total market capitalisation (Bae et al., 2002).

Since the initiation of the "Five-Year Economic Development Plan", which was regarded as a classic state-led economic growth plan in Korea, the tax system has often been revised to provide incentives for reorganising and maintaining domestic industries that import raw materials and capital equipment for export; therefore, these industries benefitted from drastic government measures, such as exemptions from tariffs (Chang, 1993). According to Kwack (1985), in the mid-1970, the Korean state significantly reformed its domestic tax schemes through a programme of "Special Treatment for Key Industries." The government provided a tax holiday during the five years in the domestic industry sector (i.e., full exemption during the first three years and then a 50% exemption for the next two years), which was particularly offered to major H&C industries. However, many domestic firms tended to deal with the state indirectly (i.e., rent-seeking behaviour) in order to get tax incentives or exemptions; in other words, domestic enterprises had an affinity with government officials for rent-seeking behaviour, and the Korean economy still suffers from this negative legacy.

In the mid-1970s, Korea's industrial structure became more advanced and complicated. The industrial atmosphere was one of conflict between the import-substitution and the export-oriented sectors, while the government consistently attempted to protect infant industries as part of its planned economy. Furthermore, internally and externally, the economic environments were unfavourable, which coincided with a worldwide resurgence of inflation, a slowdown in export growth, and a deterioration of income. Hence, the Park cabinet initiated a task force to deal with inefficient firms following the massive investment boom in the late 1960s (Chang, 1993). For example, in the late 1960s and early 1970s, the government enforced mergers, sales, and liquidations of some inefficient firms. Furthermore, in the late 1970s, the Korean state initiated a rearrangement of the domestic industries. In the automobile industry, one of the major car companies "Kia" was forced to specialise in trucks and buses[4]. In addition, Hyundai and Ssangyong—two major automobile companies—were forced to split the market

[4] Kia was later integrated into the Hyundai automobile company

into two segments and to specialise (Hyundai in over-6000 horsepower engines and Ssangyong in under-6000 horsepower engines). In the heavy electrical machinery industry, three companies—Hyosung, Ssangyong, and Kolon—were merged into one (Hyosung) and allowed to produce only highly specialised and expensive products (Lee, 1985).

On the other hand, Korea's S&T policy encouraged an incipient industrialisation in the 1960s, as the government recognised the lack of Research and Development (R&D) capability for the burgeoning demand in the field of science and technology. President Park strongly believed that national prosperity could not be achieved without the advancement of S&T, so the government forged diverse S&T supporting organisations to achieve its goals (Park and Leydesdorff, 2008). In 1966, the Korea Institute of Science and Technology (KIST) was established with support from the US government as the first modern, multidisciplinary, government-supported research institution. Like other GRIs, the main purpose of KIST concentrated on integrating the nation's technological capabilities and well-educated human resources within the context of limited resources. In particular, KIST carried out various research tasks to support the nascent stage of Korea's industrialisation. There were many processes of trial and error in the private sector, so one of KIST's main missions[5] was to solve those problems directly as a technology consultant agency for rapid industrial development (Lee et al., 1991). In order to deal efficiently with S&T matters, in 1967, the Park administration established the Ministry of Science and Technology (MOST) as the main government department, which played a pivotal role in promoting Korea's S&T policy (Hahm and Yoon, 2007; Kim and Dahlman, 1992). These activities between 1966 and 1967 helped to promote the emergence of Korea's NIS.

In order to deal with the increasing demand of highly educated human resources in the science and engineering fields, in 1971, the Korea Advanced Institute of Science (KAIS) was established as a government initiative. Later, in 1981, during the Chun regime, KIST and KAIS merged to become the Korea Advanced Institute of Science

[5] Yet, KIST seems not to have connected well with the industrial sectors by the mid-1970s owing to insufficient knowledge and manufacturing expertise, thus hampering the interplay between research organisations and domestic industries (Kim 1993).

and Technology (KAIST), resulting in the country's first research-oriented university (Lee, 2009). The government's efforts in improving technological competence finally engendered the Daedeok Science Town (DST), which was regarded as Korea's first R&D and science city, where GRIs, KAIST, and other advanced research institutions were agglomerated within a specially designed district. The administration became aware of the capability of limited national R&D, and so ordered the concentration of its related research institutions in DST. As a result, the DST was planned in the early 1970s and finally established in 1978 by the central plan-economic scheme.

According to Felsenstein (1994), science city, like the DST, were established for two important purposes: 1) to serve as seedbeds for technology, and 2) as catalysts for regional economic development and revitalisation (in the case of the Daegu's textile cluster). Regarding the former role, science city, therefore, can play an incubator role in nurturing the growth of local corporations. It is also regarded as a facilitator of the knowledge transfer between local universities and tenant firms, thereby encouraging the establishment of academic faculty-based spin-offs as well as stimulating innovation processes. In this respect, the DST has been playing a significant role in leading national technological progress through efficient research and development, thereby promoting government-university-industry (U-I) relations (Sohn and Kenney, 2007).

In addition to the establishment of the science city DST, the Park regime focused on the development planning of industrial complex that was aimed at efficiently laying the groundwork for industrialization. Therefore, the Ulsan industrial complex and the Korea export industrial complex were established in 1962 and 1964 separately. On the basis of such complex, the government economic plan nurturing the heavy and chemical industry with the export-oriented policy could move ahead.

In turn, the Park regime has provided an essential prerequisite for the nation's development in terms of both S&T and industrial and economic policy. In particular, the foundation of diverse GRIs with relevant laws and ordinances could pave the way for changes in social, industrial, and economic structures – the MOST and the 16 public research institutions, including KIST, the Korea Science and Engineering

Foundation (KOSEF), and the Korea Institute Science and Technology Information (KISTI), were established under Park's regime.

In addition to these institutional settings, in 1978, Daedeok Science Town, which became a milestone in the agglomeration of Korea's knowledge-based industries and the primary S&T Park, were also devised by President Park and his bureaucrats. As an early contributor to the successful transformation of the nation's industrial structure from an agrarian society to a technologized society, therefore, President Park Chung-Hee has been called the father of modernisation, notwithstanding his reputation as an oppressive military dictator; the Park government's strong mandate enabled it to facilitate top-down policies in the economic and industrial environments, which implies that all policy decisions depended on the president's opinion rather than institutional strategy (Amsden, 1989; Oberdorfer et al., 2013).

3.3.2 Chun Doo-hwan (1980 to 1988)

In the early 1980s, the Korean economy was confronted by several difficulties because of the second oil crisis in 1979, resource nationalism, and the protection of technology among developed countries. Under the circumstances, President Chun's main goal was to improve economic growth to allay the public mistrust stemming from the military coup; therefore, his biggest task was to gain legitimacy for the regime by fostering the national economy (Hahm et al., 1995).

The Chun administration initiated an organisational change of the major GRIs and of inefficient industries. In order to do so, Chun gave all responsibility for S&T policy and efficient management to MOST (Kim, 2006), which remained the strong legacy of the bureaucratic elitism in the policy-making process. Rapid economic and industrial development brought structural disparities, so another powerful policy advisor, Kim Jaeik, who was the senior secretary to the president for economic policy, also identified and rectified the inefficient systems of the GRIs and related policies. As a result, MOST and Kim Jaeik, with President Chun's permission, carried out a reorganisation of the 16 GRIs, resulting in 9 sub-institutions (Ministry of Science and Technology, 2008).

With the increasing importance of S&T policy, the government operated the Science and Technology Policy Institute (STEPI) beginning in 1987. STEPI is deemed to be a representative think tank of Korea's overall S&T policy, fostering core S&T research with diverse government grants, such as the National Investment Fund, the Industrial Development Fund, the Korea Development Bank Technology Development Reserve Fund, and industrial technology promotion funds for promoting the field of S&T (Kim, 2006). In addition to the establishment of support institutions, since the end of the 1970s, the Korean government has concentrated on dispatching human resources, particularly engineers, to advanced countries like the US so as to acquire technical knowledge as one of the ways towards industrialisation, and to satisfy domestic demands from infant S&T sectors (Westphal, 1990).

In terms of the private sector, the government strategies of rapid industrialisation and of focusing on the heavy and chemical industries for over the last two decades in Park's regime had several drawbacks for the industrial environment. Thus, the first year of Chun's regime resulted in liquidations and the reorganisation of insolvent enterprises in the H&C industries. For instance, 1) the power plant field was unified into the Daewoo group; 2) the Samsung, Hyundai, and Daewoo group took responsibility for heavy construction equipment, and 3) the Kolon group's heavy electronic departments were amalgamated into the Hyosung group (The Seoul Economic Daily, 2007). Four years later, in 1984, the Chun administration initiated a merger of 63 shipping companies into 17 firms, as the government was severely concerned about the insolvency of the domestic shipbuilding industry. These government actions were related to the unfavourable external circumstances in which the second oil crisis caused a shrinking of the world trade volume, resulting in a global economic rescission. Korea's shipping industry therefore also suffered (Park, 2009).

The Chun regime also carried out the rearrangement of regional industries to reform the spatial structure in the capital and some highly industrialised areas, therefore the west coast cities in Gyeonggi province (e.g., Banwol and Hwaseong) and Busan's neighbouring cities Gimhae and Yangsan were made newly industrial complexes for scattering manufacturing factories from the capital and Busan region, thereby at the same time exploiting idle land in the peripheral regions.

On the other hand, in accordance with the actions outlined in 'A long-range plan for promotion of small and medium enterprises' in 1981, the government carried out various policies to promote SMEs (e.g., the financial aid programme and the prime rate), thereby steadily changing the industrial structure in Korea by straightening out its asymmetric development in the H&C industry areas and in specific firms, particularly *chaebols*. Such matters derived from a lengthy industrial policy fostering selected and concentrated sectors in the early stage of industrialization.

Another key feature of Chun's regime was the weakened regulation of the university system. Private sector conglomerates sought to collaborate with academia on research so as to strengthen their R&D capabilities and prepare for fierce competition in the global market (Park et al., 2010). Thus, Park Tae-joon, who was a chair of POSCO (currently one of the leading steel companies in the world), recognised the need for well-educated talent as a crucial factor in further economic development for self-reliance in the S&T. Under the leadership of Chairman Park and with the financial support of POSCO, therefore, Korea's first private research-oriented university, the Pohang University of Science and Technology (POSTECH), was established in 1986. The POSTECH was actively involved in cooperation between academia, industry, and local government. The university, the local governments of Pohang and Gyeongbuk provinces, and POSCO have been contributing to the driving force of not only regional but also national economic growth in that the university provided a stable human resource base to POSCO and over 900 SMEs in the region. Although there is still a lack of research-oriented universities in Korea, triple helix collaborations were instrumental in facilitating the remarkable contributions to the company and both national and regional economies (Hahm and Yoon, 2007; Park, 2009).

In conclusion, the influence of external occurrences, such as the second oil crisis, engendered the Chun administration's struggle for national price stabilisation, export promotion, and economic recovery. With regard to the internal concerns, the government encountered burdens associated with the side effects of rapid economic growth and the unbalanced structure of the domestic industry in the process of industrialisation. Under the circumstances, instead of the enforcement of an impractical scheme, his regime sought stable economic growth and social stability. In

order to do so, President Chun met frequently with politicians, academic scholars, and researchers, and then created a policy-support agency of "The National Science and Technology Council" in 1984 to exchange opinions and initiate a long-term policy for S&T (Hahm and Yoon, 2007; Park, 2009). One of the outcomes of such efforts was the scheme of 'The long-range plan for the development of science and technology towards the 2000s' in 1987. This initiative involved the nation's future strategic industries towards the 2000s, such as semiconductors, synthetic chemistry, electromechanics, and so on. Hence, the impressive attainments in his cabinet were that they remedied the problem of the nation's structural disparities, and made a policy direction towards the nation's future prosperity. In this respect, a large-scale restructuring of the H&C and shipping industries and a rearrangement of the nation's chaotic system of GRIs (including the foundation of STEPI and KISTEP as a pivotal actor in the S&T field) are noteworthy (OECD, 2009).

3.3.3 Roh, Tae-woo (1988 to 1993)

Unlike in Chun's regime, Roh's administration thrived in the economic climate with "three low tides" (i.e. low-interest rates, low oil prices, and the low value of the US dollar). Under the favourite external environments, the Korean economy achieved its growth rate, and the domestic market began to demand higher wages with a pro-democracy movement (Park, 2009), which was deemed as one of the triggers for transforming the socio-political environment towards neoliberalism.

On the other hand, the international community underwent a seismic political change in the 1990s. West and East Germany were reunified, and the collapse of the former Soviet Union brought an end to the Cold War in 1991. Therefore, the Roh administration prioritized diplomatic ties with neighbouring countries — China, Russia, and North Korea — because of geographic proximity to those countries, thereby paying less attention to economic and industrial policy. This meant that his government tended to concentrate on political diplomacy. On behalf of the President, the Minister of the EPB and other related cabinet members mainly dealt with both industrial and S&T policies (Park, 2009) under the central bureaucracy.

In the late 1980s, most of the developed countries invested considerably in new technologies so as to pull their economies out of recession and gain technological superiority in a cutthroat global market. Developing and latecomer countries such as Korea were inevitably required to reform their S&T policies in light of such changing atmospheres. The Roh administration therefore sought to create a new technology paradigm instead of a technology-imitation strategy because industrialised countries demonstrated caution regarding developing countries' technology assimilation (Ministry of Science and Technology, 2008). Such a (technological) protectionist mode affected the policy direction for S&T in Korea; technological enhancement without external help became crucial for the nation's future. Therefore, the senior presidential secretary for economic affairs (initially Moon Heegap and later Kim Jongin) forced conglomerates (*chaebols*) to invest more in R&D and innovation activities to narrow the technological gaps with other advanced countries. To promote this initiative, the government conceded an economic monopoly to the *chaebols* for the improvement of indigenous technological capability and for the establishment of a business friendly environment (Hahm and Plein, 1995).

In the meantime, under the changed environment (i.e., technological protectionism), the business sector was being influenced by liberalization, thereby keenly realising the necessity for independent rather than external technological development. As a result, high-tech entrepreneurs, especially *chaebols*, rushed to establish research laboratories to sustain technological competitiveness, inevitably investing hugely in R&D and innovation activities (see Table 3-3) (Ministry of Science and Technology, 2008; Kim, 1993). Given the data in Table 3-3, we can ascertain a changed situation in terms of R&D investment in the government and the private sector. In the late 1960s, the R&D investment ratio of the government and private sector was 87 to 13, whereas under the Roh regime in 1993, the government to private sector ratio was 20 to 80, implying the private sector (mostly *chaebols*) began to be absorbed into the technological development themselves without any government enforcement (Ministry of Science and Technology, 1994).

Table 3-3 Major R&D Indicator in Korea (billion won)

	1971	1976	1981	1987
R&D expenditures	10.67	60.90	293.13	1,878.0
Funds from government	7.29	39.18	121.73	383.0
Funds from private sources	3.38	21.72	171.40	1,495.0
Number of researchers (total)	5,320	11,661	20,718	52,783
Government/public institutions	2,477	3,592	5,065	9,184
Universities	1,918	4,811	8,488	17,495
Private sector	925	3,258	7,165	26,104
Number of firm R&D laboratories	1	12	65	455

Source: Kim, 1993; p. 370

On the other hand, whilst the number of higher education institutions and private research laboratories was steadily increasing, there were no proper linkage systems between them, as many private universities just focused on merely teaching and their main funds came from high tuition fees, not from research outcomes. Therefore, the Roh administration looked into ways of further invigorating relations between university and industry research capacities, resulting in the "Research of Basic Sciences Promotion Act" in 1989. Under this legislation, the KOSEF established two supporting initiatives – the Science Research Centres (SRCs) and the Engineering Research Centres (ERCs). The aim of the KOSEF was to facilitate the research

interactions between academia and industry, thereby nurturing the potential research abilities. In order to achieve its goal, two special programmes were devised: 1) SRCs were designed to cope with the upswing in basic research projects, and 2) ERCs were concerned with the stimulation of engineering research and relevant industries. Through such plans, which fostered collaboration between academia and industry, the government strived to consolidate the nation's (limited) research capabilities (Ahn, 1995).

With regard to the land use policy, the Roh regime had strived to resolve the problem of unbalanced regional development which derived from the previous government's development planning that focused on the promotion of specific industrial regions like Ulsan. Policy makers were aware of the danger that nurturing particular industrial complexes would exacerbate unbalanced regional development. Therefore, the government initiated the development of rural and peripheral regions (such as Chungcheong and Jeolla provinces). During the 1970s, the South East seashore regions were mostly granted the government favour, however, since the end of the 1980s, the lagging west coast regions were the main beneficiary of regional development planning that resulted in newly industry-based areas (e.g., Asan Bay and Gunsan with Janghang).

To conclude, the Roh regime experienced a fluctuating international situation and witnessed the emergence of democratisation internally; therefore, the regime tended to focus on diplomatic issues instead of economic and S&T schemes. For instance, several fruitful outcomes were achieved in terms of diplomacy – Seoul held a successful Olympic Games in 1988, and North and South Korea joined the United Nations (UN) during the Roh regime. Notwithstanding a relative neglect of S&T policy, the government agonised deeply about the latent growth model of the nation's technological development owing to the circumstances which derived from the technical protection in developed countries. Meanwhile, the private sector found the enlightenment of insufficient market competitiveness themselves. All these factors highlighted the importance of the indigenous growth of technological abilities, eventually changing the atmosphere, which emphasised the research collaboration between academia and the private sector. Such changes also highlighted how the

business sector had seized the initiative for technological development and R&D investment that used to lead the GRIs.

3.3.4 Kim Young-sam (1993 to 1998)

With the transformation into a knowledge-based society, universities were regarded as "engines" or "raw material" producers for economic development and the development of S&T. Knowledge resources from universities like intellectual property (IP) and patents played a pivotal role in the improvement of competitive power among enterprises (Etzkowitz and Leydesdorff, 2000; Florida, 1999).

However, despite the increasing importance of higher education, only a few universities in Korea could contribute to the technological advancement and knowledge transfer, as the main aim of Korean universities generally was teaching-oriented instead of research. Because of the academic environment, historically, domestic tech-firms also tended to depend on technology from overseas companies rather than the resources from university laboratories, so the relations between academia and industry were quite weak (Kim, 1993; Eom and Lee, 2010; Sohn and Kenney, 2007).

In this context, like the previous government, President Kim Young-sam reinforced the U-I collaboration as a crucial S&T policy during his regime. Therefore, a relevant law, the "Cooperative Research and Development Promotion Act" was enacted in 1994 with the aim of revitalising the knowledge interchange between domestic firms, particularly high-tech enterprises, and the (research-oriented) universities (Lee, 2003). In response to the emergence of Information and Communications Technology (ICT), moreover, several public research-intensive universities (e.g., the Gwangju Institute of Science and Technology in 1993, the Korea Institute for Advanced Study in 1996, and the Information and Communications University in 1998) were established by the government initiative to nurture highly qualified human resources (Park and Leydesdorff, 2010).

In terms of the institutional support, the Ministry of Trade and Industry created "The University-Industry-Government Research Institute Consortium" in 1993, which has

been managed by the Small and Medium Business Administration (SMBA) since 1996. The aim of this consortium was to promote the effective use of equipment and human capital from universities, thereby encouraging R&D collaborations between the universities and SMEs. In order to receive financial aid from the consortium, universities had to organise a team including at least ten SMEs from one province. In 1998, 86 consortia were subsidised by this scheme, which was designed 1) to supply half of the total cost of each consortium, 2) for 25 to 30% of funding to come from local government, and 3) for the remaining 20 to 25% to come from participating SMEs. Following the IMF (International Monetary Fund) bailout programme in 1997 (known as the Asian Financial Crisis), this government support scheme received immense popularity because most enterprises were desperately seeking external financial support for their R&D activities (WIPO, 2007; Ministry of Science and Technology, 2008).

Since the mid-1980s, many industrialised countries have been establishing science parks to accumulate innovation capacities, such as human resources and technological knowledge. Some examples include Baden-Wurttemberg in Germany and Emilia-Romagna in Italy (Castells, 2014). Those industrial clusters could easily integrate traditional, context-linked, and tacit and codified knowledge, thereby accumulating regional indigenous potential from diverse local actors like universities, SMEs, and so on (Freeman, 1989). In this respect, the Ministry of Commerce, Industry, and Energy (MCIE) founded six techno-parks[6] in Gyounggi, Kyoungbuk, Gwangju, Daegu, Incheon, and Chungnam. Korea's techno-parks are industrial and technological complexes where stakeholders in the techno-park can easily share human, material, and technological resources due to the advantage of geographical proximity. In particular, the government sought to establish these clusters to narrow the gap between the capital area and the rest of country in terms of economic and industrial environments. To achieve this goal, the techno-park was meant to gather regionally scattered academic institutions, research facilities, central and local government agencies, and firms in the same place (Kim and Jung, 2009).

[6] The Korean Science Park is called 'Technopark.'

In 1996, the Kim administration adopted the Project Based System (PBS)[7] to strengthen the research competitiveness of GRIs as well as the government funding scheme. The main aim of the PBS was to evaluate R&D projects based on performance, thereby promoting highly qualified researchers with the goal of reforming the knowledge intensity of Korean industry (Yim and Kim, 2005; Park and Leydesdorff, 2010). Thus, the PBS itself was a policy measure which facilitated research capacity and enhanced the accountability of GRIs.

In conclusion, the Kim administration properly perceived the importance of S&T policy in an era of a knowledge economy and clearly showed the President's will through the New Year's message in 1994 (National Archives of Korea, 2015):

> We cannot enhance the international competitiveness of the Korean economy without striking technological development.

Due to the President's ambitions, the Kim government strived to reform its strategy of S&T policy and move from the heavy chemical sector towards a focus on high technology industries, such as ICTs, and to nurture highly qualified talent by establishing several research-intensive universities. In this regard, the government's effort on the accumulation of innovative actors resulted in the establishment of Korea's science park referred to as the "Techno-park" in six regions and the facilitation of U-I

[7] According to Lee (2006), several university faculties and government researchers have pointed out that PBS has had a negative influence on the overall research environment. Basically, the aim of PBS was to promote research capacity and creation by using scientists' motivation for obtaining funding. Researchers were only guaranteed 50% of their salaries from the government, while their remaining salary depended on their own research projects that involved government research tasks, external projects (including joint research with universities and firms), and so on. Moreover, salary issues, such as a salary gap between university faculty and government researchers, created an obstacle to enhancing the fields of advanced technological industries like the aerospace industry, which require long-range goals and stable government funding. Because many professors and researchers tended to publish in international journals and collaborate with each other, only academic collaborations gained government funding. Academic collaborations received funding over other knowledge transfer activities between universities and government research institutes, such as spin-off creation and technology transfer. This has resulted in hopelessly inefficient government funding programmes. Hence, this scheme has obviously failed to take into account long-term research programmes in that the performance of those long-term projects saw difficulties regarding the production of immediate outcomes. As a result, researchers tended to prefer short-term projects instead of basic science research, which has resulted in a general lack of ability in these basic science fields.

cooperation by a specific policy measure. On the other hand, the Asian financial crisis in the end of 1990s engendered a shrinking of direct R&D investment to economic actors (Ministry of Science and Technology, 2008). Instead, the provision of the necessary physical infrastructure for boosting S&T was prevalent in order to fundamentally modify the nation's innovation system (S&T structure).

3.3.5 Kim Dae-jung (1998 to 2003)

To prepare the forthcoming knowledge-based society, President Kim Dae-jung sought to foster an evolution from a material-oriented to a knowledge-intensive industry as one of the six major goals of his regime. The government initially concentrated on reforming the higher education system to strengthen research capabilities to be on a par with the global academic standard. Further, since the government had witnessed the successful knowledge creation and transfer activities of Silicon Valley in the US by research collaborations between academia and industry, policymakers paid more attention to the role of research-oriented universities. For this reason, the "Brain Korea 21 Project (BK21)" was initiated in 1998 to facilitate the maximization of universities' research capacities and to nurture well-educated human resources, particularly in regional-based universities. This programme also aimed at establishing a balance of research competence between the capital area and the rest of the nation (Moon and Kim, 2001; Shin, 2009).

The importance of the relationship between the two actors was outlined in a report from the World Intellectual Property Organization (WIPO 2007, p. 2):

> Universities worldwide play a leading role in advancing the frontiers of science and technology. In recent years, a key concern for policy-makers has been how to ensure that the wealth of knowledge generated within universities can be transferred to industry so that society in general, and local businesses in particular, can benefit from university scientific and technological expertise. The realization that important research results would not reach society as a result of bottlenecks in the commercialization of university research results led to increasing interest in finding the most adequate frameworks to promote university-industry partnerships for the transfer of technology.

The purposes of the BK21 scheme were 1) to nurture human resources in S&T, 2) to improve research capacity in Korean universities, 3) to strengthen industry-university cooperation, 4) to induce university specialisation, and 5) to balance national development between the capital area and the rest of the nation. To successfully support its policy, the government provided a large number of subsidies – 1.5 trillion won (approximately $1.2 billion US dollars) to universities between 1999 and 2005 – to encourage the capacity for university research, thereby cultivating highly qualified human resources particularly in the field of science and technology (Moon and Kim, 2001; Seong et al., 2008). The project was implemented in around 70 universities and in 111 institutions.

Regarding the funded scheme, it was awarded based on an open competition among individual departments or groups of departments in the field of science and engineering. Before the initiation of BK21, the Korean government tended to provide financial support to only a few prestigious universities, like Seoul National University. However, President Kim and the Korean National Assembly had revised its policy beneficiary in order to subsidise various universities, especially regional universities, instead of selected ones (Shin, 2009).

To improve the overall educational system, in addition, the Ministry of Education announced "the mid-term (1999-2003) investment plan for a base establishment of 21st century Korean higher education" in 1998. This initiative also was aimed at reforming Korea's university system to prepare for a knowledge-based society with the following seven core initiatives: 1) transformation of research-oriented universities, 2) industry-university cooperation, 3) reduction in the number of students per professor, 4) education reform, 5) evaluation and funding system, 6) university reform, and 7) base establishment for academic research (Korea Education Development Institute, 1998).

On the other hand, President Kim realised the increasing importance of S&T policy, so established the National Science and Technology Council (NSTC) in 1999 to integrate overall S&T organisations and policies. Under the NSTC, the ratio of R&D investment to GDP increased up to approximately 3.7%, to the extent that Korea was ranked the fourth largest public R&D investment country in the world (Korea Institute

of Science Technology Evaluation Planning, 2011). However, knowledge-transfer activities from universities and GRIs were relatively low, so the government enacted a law which regulated the enforcement of the "Technology Transfer Promotion Act" in 2000. The goal of this action was to promote university knowledge transfer activities. Before the enactment of this law, neither national nor public universities had any authority over their patent rights. In addition, government research grants to universities belonged to the public domain; therefore, university researchers were not interested in knowledge creation, transfer, and commercialization. In order to resolve these problems, the Technology Transfer Promotion Action was amended so that universities could exploit their technological knowledge for commercial purposes and take charge of their technology transfer activities (WIPO, 2007; OECD, 2014). In order to support the law, the Kim regime established the Korea Technology Transfer Centre (KTTC) at select universities to foster knowledge transfer activities with nearby companies. Indeed, this supportive intermediary was quite helpful. The Korean government investigated 13 universities with the KTTC on campus from 2001 to 2003, and found that those universities conducted 133 cases of technology transfer to firms in 2003, which represents a rapid growth, especially when compared to the 102 cases in 2002 and 58 cases in 2001. Therefore, the S&T-supportive organisation and law contributed to increasing universities' technology transfer through the efficient management of intellectual property rights (Kim, 2001).

Consequently, given that Korea is vastly deficient in natural resources, Kim's government invested intensively in human resources by reforming the higher education system as the backbone of national competitiveness and innovation systems (Gupta et al., 2013; Sampat and Mowery, 2004; Etzkowitz and Leydesdorff, 2000; Sohn and Kenney, 2007). To revitalise university knowledge-transfer as the focus of S&T policy (and the NIS), the Kim government initiated an ambitious scheme, "BK21," and provided institutional support under the Technology Transfer Promotion Action. Particularly, BK21 contributed to reforming the nation's university system to align it with global standards (Moon and Kim, 2001). Furthermore, President Kim attempted to revitalise the stagnant industries of the older industrial regions to create an economic balance across the country. This revitalisation is the main topic of this research, which will be dealt with in detail in the empirical chapters 6, 7, and 8.

3.3.6 Roh Moo-hyun (2003 to 2008)

Since President Park Chung-hee, the central government has led the nation's industrialisation and economic growth with the planned economy (i.e., the developmental state), resulting in a dichotomous economy between the capital area and the non-capital regions. To resolve the nation's unbalanced development, President Roh Moo-hyun proclaimed balanced development and prioritized decentralization, so the government began to exploit the potential regional resources, particularly the work force (Lee, 2009; Park, 2008). Therefore, the Ministry of Education and Human Resources Development established the New University for Regional Innovation (NURI) project in 2004 with the purpose of enhancing the competitiveness of regional universities (Byun et al., 2012; Kim, 2007). BK 21 was designed to improve the research competence of the national educational system, whereas the NURI was aimed at increasing the overall quality of regional higher education to steadily nurture the regional work forces.

The NURI project was originally launched as a follow-up measure in the implementation of former President Kim Dae-Jung's pledge for balanced regional development. Therefore, its funding scheme could be applied only to local universities, and not to those in the Seoul Metropolitan Area. To gain government aid, in addition, local universities were required to construct a consortium with other local organisations, such as local research institutes and firms, for boosting the region's research collaboration. From 2004 to 2008, the government awarded 1,420 billion won (approximately $13 billion US dollars) in grants to select regional universities. The government also provided several incentives for regional high-school graduates to cultivate an educated workforce of regions, and these incentives offered continuous support up to postgraduate school, thereby encouraging regional high-school graduates to enrol in regional universities rather than in the universities located in the capital area.

Thus, the NURI had four main purposes: 1) to encourage a high level of competence in local universities so they could play a pivotal role in regional development, 2) to attract and retain talent outside of Seoul, 3) to strengthen relationships among local stakeholders, and 4) to provide skilled workers and advanced technologies to local industry by improving local university capacities (OECD, 2013; Presidential

Committee on Balanced National Development, 2007). The procedure for obtaining the government grant was as follows: first, the Regional Innovation Committee (RIC)[8] reviewed each project proposal, and then the Ministry of Education managed the process, including the selection of proposals, allocation of funds, and monitoring and evaluation.

Due to Korea's loss of industrial and technological competitiveness to the newly industrialised countries such as China, the Roh administration initiated the "Next Generation Growth Engine Programme" in 2003 for the promotion of selected growth-engine industries.[9] The aim of this scheme was to discover indigenous industries with growth potential and to invest intensively in and exploit those industries under the government's S&T policy and its grants for the next generation. To ensure smooth support for this initiative, each government department took responsibility separately – the MOST undertook to support the development of key generic technologies; the Ministry of Commerce, Industry, and Energy (MOCIE) and the Ministry of Information and Communication (MOIC) were in charge of applied technologies; the Ministry of Education and Human Resource Development concentrated on training high-quality human resources in the S&T fields; and the Ministry of Finance and Economy took responsibility for the relevant regulations to achieve the goal (Presidential Commission on Policy Planning, 2008). As can be seen, this government plan and the government-led economic development (i.e., industry promotion) could still draw on societal conditions that were the legacy of developmentalism so that industry sectors and other interests embraced the government initiative without hesitation.

In 2004, President Roh announced three predominant actions related to S&T policy and its enforcement. First, the administration reformed the structure of S&T decision-

[8] All local governments were required to organise their own Regional Innovation Committee (hereafter RIC) for the effective management of the NURI project. These committees consisted of members from local universities, the government, and other stakeholders.

[9] This plan selected ten industries/technologies – intelligent robots, futuristic automobiles, next-generation batteries, digital display, next-generation semiconductors, digital TV and broadcasting, next-generation telecommunications, intelligent home networking, digital content & software solutions, and new biomedical products.

making: the Minister of Science and Technology was elevated to the Deputy Prime Minister level, giving more power to the position, so that the Minister could deal with overall S&T policies, such as the planning, evaluation, and allocation of R&D budgets. This changed structure resulted in the consolidation of the MOST's power, enabling the ministry to manage inter-ministry projects. Moreover, the NSTC was strengthened, extending its functions to the planning and coordination of S&T policy, regional S&T promotion, and the measurement of S&T-related budgets and R&D programmes. The President and the Minister of Science and Technology occupied the positions of Chairman and the Vice Chairman of the NSTC respectively (Yim and Kim, 2005).

Second, the government strengthened the NIS to fulfil the President's election pledge to transform the nation into a "science and technology-based society" under the command of the Presidential Commission on Policy Planning (PCPP) (Hong, 2005).

Third, in terms of regional competitiveness (i.e., RIS), the Presidential Committee on Balanced National Development was created by presidential decree with the goal of balancing regional development in 2003. The main role of this committee was to deliver strategic decisions on balancing regional development directly to the President, thereby providing opportunities to improve cross-sectoral communication among diverse stakeholders (e.g., public servants in both local and national levels, and other relevant people). The following year, in 2004, the government reinforced its regional policy by establishing the "Special Law on Balanced National Development", which was deemed to be the first legislation aimed at balancing regional development in a comprehensive way. With this special law, the NURI project was one of the most salient policies during Roh's regime. A legacy of the BK21 in the previous administration, the NURI project focused mainly on improving the competencies of regional universities to develop the regional economy and promote local knowledge-transfer activities through nurturing regional talent. So, while his regime could determine at the outset of the RIS that the previous Kim regime had prepared the ground for regional development, President Roh devised more substantial institutional arrangements.

Consequently, President Roh vested a strong authority in the MOST and its minister, empowering the department to control general S&T-related programmes. In this way, the nation's S&T policy became more systemised (Ministry of Science and Technology, 2008; Presidential Commission on Policy Planning, 2008). In addition, this regime paid significant attention to keeping a balanced development, thereby eventually moving toward a system of decentralisation.

3.4 Conclusion

This chapter has examined in chronological order the trajectory of economic and S&T policy since the outset of the nation's industrialisation. Under the state's planned economy (i.e., the developmental state), we have looked at how the government strived to strengthen the economic structure by policy intervention, and to improve technological competencies by institutional configuration. Through the investigation of the policy records, we can figure out the origin of Korea's innovation systems. Arguably, it is difficult to determine the outset of the innovation system technically, yet this study can conjecture that Korea's innovation systems were formed after the establishment of the MOST and the KIST at the end of the 1960s on the basis of the review of S&T policy. The MOST was the first government ministry for dealing exclusively with S&T policy, and the KIST was regarded as the first multidisciplinary science research institute in Korea for stimulating the nation's S&T competence.

This study also revealed Korea's policy transformation. The direct intervention in the financial market and domestic industrial sectors was a key way to stimulate rapid economic growth until the 1980s. At the same time, policy makers began to pay attention to the nurturing of S&T competence, so the government dispatched many researchers to developed countries to acquire technological expertise and knowledge. This was fundamental to Korea's S&T field, as the dispatched researchers later participated in government-funded research institutions. After that, institutional upgrades (e.g., the reformation of the higher educational system), the improvement of networks between potential innovative actors (e.g., between university and industry), and the nurture of regional competitiveness became crucial policy measures. With the beginning of the free-market economy in the 1980s, the role of the private sector in the S&T field (e.g., R&D investments and activities) was increased, and therefore the

government concentrated more on the institutional arrangements, regional capacities, and university research abilities that were relevant to the nation's potential economic dynamics. In addition, the S&T policy was no longer part of the economic policy, so its importance has been increasing substantially (Ripley and Wilson, 1990). In this regard, the NSTC, which is a presidential advisory body that has been playing a pivotal role in planning the entire S&T policy, emerged at the end of the 1990s. Therefore, this chapter has presented the trajectory of Korean government policy from the developmental state (economic-driven policy with market interventions) to innovation systems (innovation-driven policy with the promotion of systemic circulation).

In terms of institutional underpinnings, the earlier developmental state contributed to providing the nation's institutional climate by establishing S&T-related research institutions (GRIs). The government carried out not only setups of hard-infrastructure (organisations), but also several policy actions (soft-institutions). For instance, the "1st 5-year technology promotion plan" (1962 to 1966), the "2nd 5-year science and technology promotion plan" (1967 to 1971), the "3rd 5-year science and technology promotion plan" (1972 to 1976), and the "science and technology promotion plan for the long term" (1976 to 1986) were carried by the government under the economic plan for promoting infant industries (e.g., heavy chemical industry) (Hahm and Yang, 2012).

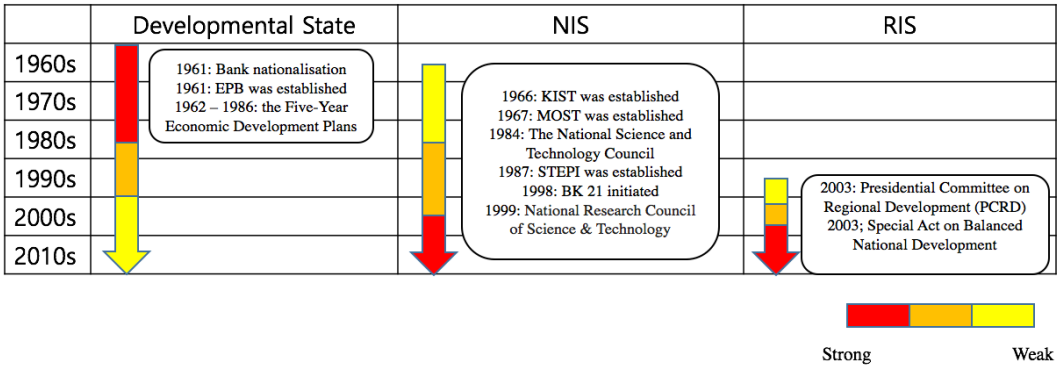
After the democratization of Korea (from the Roh Tae-woo administration), policy-making processes involved several organisations and participants, and a few elite officers. Meanwhile, the private sector invested significantly in R&D and human resources, implying they had led the technological advancement, but remained under the strong influence of the central government. In the knowledge-based economy, the role of the universities has been increased (Florida, 1999), and therefore, the cabinets of the Kim Dae-jung and the Roh Moo-hyun administrations devised specific educational policies which cultivated the universities, particularly those outside of Seoul, thereby encouraging regional competitiveness and attempting to narrow the gap between the metropolitan area and the regions. In this regard, the concept of RIS was introduced at the end of the 1990s. The policy evolution (see Table 3-4) and the transformation of policy direction (see Figure 3-1) may be summarised as follows:

Table 3-4 The policy evolution

Stage	Period	Features
First phase	1970 – 1987 (From President Park Chun-hee to Chun Doo-hwan	Planned-economy system (Five Year Economic Development Plan / S&T Promotion Plan) Paved the way for the nation's economic and technological development through establishing GRIs Supported selected industries by nurturing conglomerates (caused close relations between politics and business, but neglected SMEs)
Second phase	1988 – 1998 (From President Roh Tae-woo to Kim Young-sam)	A proliferation of the private sector's R&D investment – roughly 20 (government): 80 (private sector) Conglomerates became significant knowledge providers (conceded the monopolies on the market) Emphasised research collaboration between universities and industry (established several research-oriented universities) Sought agglomeration economies by establishing Korean Science Parks (called Techno-parks)
Third phase	1998 – 2008 (From President Kim Dae-jung to Roh Moo-hyun)	Remedied regional disparity (launched regional restructuring projects); Strengthened the National Innovation System, and established Regional Innovation Systems as a crucial policy tool for regional matters Reformed the educational system (emphasised research-role, facilitated the competitiveness of local universities)

Source: Author

Figure 3-1 The transformation of policy direction in Korea



Source: Author

Using background information on policy reviews, this chapter can reveal the government structure related to S&T policy and innovation systems (see Figure 3-2[10]). At first, the NSTC and the Presidential Committee on Regional Development (PCRD) were key presidential advisory bodies for the nation's overall S&T policy and innovation systems. The authority of these institutions has differed slightly according to each regime, but their role has been more significant with their additional functions of budget allocation and the planning of overall S&T policy (NSTC) and regional S&T policy (PCRD). The main policy field of the two institutions covers S&T policies at the macro level, which is related to the National Innovation System, whereas PCRD concentrates on S&T in the local dimension and regional development (i.e., Regional Innovation System).

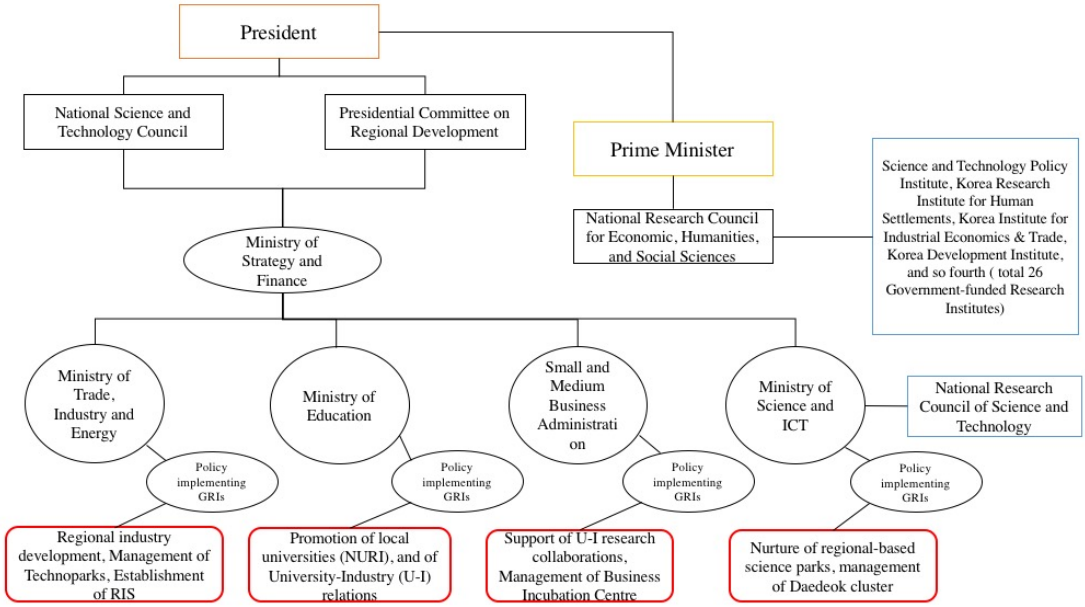
In the mid-1990s, the role of the EPB as a key agency of the nation's economic policy during the developmental-period changed in light of the emergence of a market-driven economy; then the Ministry of Strategy and Finance (MSF- formerly the Ministry of Finance and Economy) emerged. The role of the MSF is to establish the direction of economic policy, to evaluate the performance of allocated budgets, and to distribute

[10] The name of government ministries in Korea has been frequently changed, therefore the following map adopts its name as of 2017.

the government's budget to each ministry (after discussions with two presidential bodies in the case of S&T and regional policy).

There are four key ministries, and each ministry has its own research institutions where it can be regarded as a policy implementing agency by assuming the roles of the evaluation and management of government schemes. In a knowledge-based society, the role of the university is crucial for economic and technology development, so the Ministry of Education deals with the promotion of local universities' research competence (NURI), and of U-I relations. Regarding the nation's overall S&T abilities, the Ministry of Science and ICT (MSIT - the former of the Ministry of Science and Technology, MOST) focuses on the improvement of agglomeration economies which nurture regional-based science clusters and stimulate Korea's most advanced cluster, Daedeok Science Park. As the main ministry of S&T policy, the National Research Council of Science and Technology, which consists of 25 GRIs, is under the control of the MSIT. Historically, SMEs used to be neglected in the Korean economy owing to its unusual development model (conglomerate-led economic development); however, their importance has been increasing, in particular after the Asian financial crisis in 1997, which forced changes in the industrial structure. Therefore, Small and Medium Business Administration takes responsibility for all SME issues, including the management of the business incubation centre and the support of U-I research collaborations. The Ministry of Trade, Industry, and Energy is the main department conducting regional restructuring schemes with the operation of Korean Science Parks (i.e., Techno-park). The key role of the ministry in terms of S&T and innovation systems is to establish RIS using institutional supports, thereby securing improved regional innovation capacities. In addition to these ministries, there is a National Research Council (NRC) under the Prime Minister's office. As of 2017, 26 government-funded research institutions belong to the council, and all of them are closely involved in government schemes.

Figure 3-2 The role of ministries on S&T policy and Innovation Systems



Source: Author

Consequently, this chapter has revealed the evolution of economic and S&T policy over the last five decades; such a longitudinal policy review helps to understand the contemporary government structure and policy. The next chapter will deal with the literature review on SI and the innovation of SMEs, which provides the rationale of why this research employs the aforementioned theoretical and conceptual frameworks.

Chapter 4 METHODOLOGY

4.1 Introduction

This chapter provides an overview of the methodological design of this thesis, thereby explaining 1) why specific research methods were chosen, 2) how data were collected, and 3) how qualitative elite interviews were conducted. By doing so, the chapter shows 1) the advantage of "a single case study" approach, and 2) the benefit of conducting qualitative elite interviews, thereby making it possible to extract high-level information and delve behind the stories of policy and management decisions.

The case study has strong advantages for 'a contemporary phenomenon in depth and within its real-world context' (Yin 2013, p. 16). It also allows different types of data (quantitative and qualitative, and primary and secondary) to be collected and analysed. Furthermore, the aim of this research is to trace a trajectory of the revitalisation in the Daegu textile industry from 1997 until now. This kind of longitudinal analysis is easily accommodated within a single-case study (Yin 2013, p. 51).

Another reason for employing the single case approach in this research is that even though many developing countries as well as newly industrial countries (NICs) are suffering from similar phenomena of regional disparity and older industrial regions' falling behind, all regions and countries possess different socioeconomic milieus. Hence, it is difficult to analyse intensively different cases (i.e., regions) to produce a comparative study. Under such circumstances, this study principally adopts qualitative research methods, such as interview research and a desk-based analysis of secondary data, when seeking to explore the role of intermediaries and the Korean government's efforts to reform the old textile industrial area through public policy and other subsidies. In terms of firm-level analysis, in particular, in-depth interviews with selected local textile managers and owners are meaningful to collect data related to ostensibly 'invisible factors' (e.g., critical incidents and untold stories) which cannot be grasped by quantitative research.

Three research methods (i.e., case study, document analysis, and qualitative interview) seeking answers to the given research questions will be addressed in the following

section 4.2; this section will also present the ways by which each method approaches research subjects.

4.2 Research methods

4.2.1 Case Study

This section will address the reasons why a case study methodology is the proper approach to fulfil the aims of this research and to answer the questions given above. According to Yin (2013, p. 4), the case study is a useful method in circumstances such as the following:

> [the more] your questions seek to explain some present circumstance (e.g., "how" or "why" some social phenomenon works), the more that case study research will be relevant. The method also is relevant the more that your questions require an extensive and "in-depth" description of some social phenomenon.

In this vein, the selected case study approach for this thesis is likely to satisfy the conditions above, especially in regard to the in-depth investigation of a particular social-economic phenomenon, so as to address the contribution of each key actor (the government, local intermediaries, and regional textile firms) to regional restructuring.

In terms of types of research questions, this study has one primary question, which encompasses all sub questions, and three supported questions, using "how" and "what". Arguably, both "how" and "what" types of questions are appropriate for the case study, as they are used for explanatory, descriptive, and exploratory researches. From this perspective, Daegu is an excellent case study due to the following reasons:

1) The case region is the first government scheme for the revitalisation of older industrial areas in Korea since 1999, providing chances to see as to how the local textile industry has changed its environments (e.g., number of firms and employees and value added), and to examine the advantages and drawbacks of past regional policy with huge data and empirical evidence. Furthermore, such a long-term restructuring (around two decades and three different administrations) clearly demonstrates the evolutionary process by which the government has modified its policy orientation in light of the internal and external circumstances.

2) It offers the opportunity to examine continuities and discontinuities in the developmental state and the role of the public sector in the creation of a major industry concentration as part of earlier national developmental state policies and the partial revival of the same industry concentration under the regional-orientation of what may be considered post-developmental state policies. In particular, this study deals with the less visible processes by which local innovative actors, such as technology intermediaries and local firms, have paid attention to innovation in order to overturn the conditions of several lock-ins.

Regarding the observation period of the case study region, a previous study by Cho and Hassink (2009) on Daegu's textile restructuring dealt with only the first phase (involving the MP) of the upgrading process, focusing on the relation of local actors; it provided limited findings given that regional and industrial restructuring generally takes place over a long time. In contrast, this study analyses the current industrial situation with the second and third phases of the restructuring project, thereby disclosing more details of the outcomes and the detailed stories that lie behind the overall process.

It can be argued that Korea's regional policy has been set up by the central-level policy makers in accordance with the president's pledges and aims, but as the regime changes every five years, so does the policy. Thus, this research has scrutinised the restructuring processes of Daegu's textile industry over the terms of three presidents (from 1998 to 2013), thereby compensating for the gaps in the former study.

The case study approach also is deemed a worthwhile tool from the perspective of evolutionary economic geographers who are adherents of 'methodological variety and openness' in the field of (economic) geography (Boschma and Frenken 2006, p. 292). Given the pioneering work of an evolutionary approach, which also offers inspiration to innovation economics (Nelson and Winter, 1982), a substantial number of geographers (Plummer and Sheppard, 2000; Markusen, 1994, 2003) acknowledge the value of case studies, enabling researchers to make more reliable assumptions on the grounds of theoretical frameworks. Further, any regional or spatial peculiarities can be discounted by the case study approach, making possible an in-depth analysis of dynamic perspectives (Boschma and Frenken, 2006). Consequently, the case study

approach can properly scrutinise the restructuring processes of the regional textile industry with the evolutionary perspective, thereby enriching theoretical and conceptual insights for frameworks of "innovation systems", and answering Feldman's (2001) question regarding the need to reveal the undiscovered story of the evolutionary process by which the RIS has evolved and shaped its model with policy support.

On the other hand, as with any other research method, the case study approach has some fundamental weaknesses. Several scholars have pointed out that the case study too often presents the situation through the eyes of the researchers, resulting in difficulties in the generalisation and crosschecking of their findings. Therefore, research outcomes and conclusions are often viewed as biased, personal and subjective (Jaeger et al., 2001; Sturman, 1999).

Moreover, there are also some criticisms and misunderstandings of the case study approach; Flyvbjerg (2006, p. 219) identified the five most common biases as follows:

1) Theoretical knowledge is more valuable than practical knowledge;
2) One cannot generalize from a single case, therefore, the single-case study cannot contribute to scientific development;
3) The case study is most useful for generating hypotheses, whereas other methods are more suitable for hypothesis testing and theory building;
4) The case study contains a bias toward verification;
5) It is often difficult to summarize specific case studies

Despite Karl Popper's falsificationism, using the example of a single black swan, the case study is an adequate scientific inquiry, delving into one specific phenomenon or case, thereby finding out the generic nature or revealing some singularities, which can suggest future studies for making theory (Flyvbjerg, 2006). In the same manner, Campbell (1975), Eysenck (1976), and Ragin and Becker (1992) conceded the significance of the case study approach as critical social inquiry.

As a result, notwithstanding the possibilities that some researchers can have distorted perspectives on their studies, the single case study with a long-term observation is a suitable approach for addressing the changed circumstances of the case area as to how the old industrial region has changed its industrial and business structure in accordance

with three different views, and how the government has affected the process of regional restructuring and innovation systems. Acknowledging the weaknesses of the case study approach, therefore, this study has taken the necessary steps to make the research as close as possible to one in which impartial and objective observations and generalisations are drawn.

4.2.2 Documentary analysis

Aggregate secondary data were collected from the National Statistical Office, the Financial Supervisory Service in Korea, the Korean Intellectual Property Office, the National Archives of Korea, and the Presidential Committee on Balanced National Development, etc. These made possible an analysis of the main industry trends in which the interpretation of the trends is aided with recourse to documents published by government ministries and government-funded research institutions, reports in the media, and original interview research. The latter drew on the informed opinions of government officers, public intermediaries, representatives of the textile association, and nine selected local textile firms.

Considering a long-term observation of the case area, analysing public and secondary data helps reveal how Daegu's textile industry has changed over time. Thus, we can comprehend 1) the evolution and self-efforts of each actor in the restructuring process on the basis of statistical data, and 2) the impact of policy on the restructuring process, as the secondary data (e.g., the National Statistical Office and Intellectual Property Office) clearly demonstrate the increased or decreased economic performances in the textile industry in Daegu. In particular, the National Archives of Korea provides the public with a variety of access to the accumulated and preserved archives, with over two million volumes, so it is extremely useful for collecting public data. Regarding the secondary papers published by the GRIs and government departments, the Presidential Committee on Balanced National Development, the Science and Technology Policy Institute (STEPI), and the Ministry of Science and ICT (Ministry of Science and Technology integrated with this ministry) frequently issue white papers on all policies relating to education, science and technology, and innovation as well as regional development. Hence, both public and secondary data can give the opportunity for

understanding the trajectory of the institutional changes in Daegu's textile industry over the last two decades.

4.2.3 Qualitative interview

This study conducted 45 face-to-face interviews with civil servants (7), academics (9), staff at government national–level funded research institutions (8), regionally-based research institutions (11), and CEOs and managers of innovative textile firms in Daegu (10), with each lasting an average of 60 minutes. The period for conducting the field interviews first lasted for six months from August 2015 to January 2016, and these interviews were supplemented by a further field research visit from October to December 2016. Therefore, a total of 8 months' field research was undertaken.

> Qualitative interviewing is particularly useful as a research method for accessing individuals' attitudes and values – things that cannot necessarily be observed or accommodated in a formal questionnaire. Open-ended and flexible questions are likely to get a more considered response than closed questions and therefore provide better access to interviewees' views, interpretations of events, understandings, experiences and opinions. They are also more open to hearing respondents' views 'in their own words', which allows for a more complex analysis. (Byrne 2004, p. 182)

As pointed out by Byrne above, qualitative interview research is frequently adopted in various social science disciplines (e.g., economic geography, and business research), which scrutinise the strategy, dynamic, and behavioural change of a company (Boyacigiller and Adler, 1991; Schoenberger, 1991; Parkhe, 1993) as well as the interplay of network relations and the understanding of the decision-making process (Yeung, 1995).

The most powerful type of data in qualitative research is that which is directly accessed via face-to-face interviews, by asking a set of questions, and producing insights which are rarely produced in questionnaire survey research. This way, the researcher can reveal hidden stories of specific incidents and decisions in more detail (Healey and Rawlinson, 1993). For example, in the case of the textile industry (i.e., industry-focused research), survey research is unable to identify the characteristics of various types of textile merchandise and the development processes which need additional

information and explanation. In this regard, the face-to-face interviews, rather than telephone and email surveys, are usually accompanied by opportunities to visit manufacturing factories, and to strengthen the relationship of trust between interviewer and interviewee, inducing informants to give more appropriate answers (Wilson, 1968). Moreover, in the qualitative interview, tape recording and note-taking are common, if permitted (Silverman, 1993), thereby making accurate records in the form of direct quotations from informants.

Yeung (1995, p. 329) also noted the advantages of qualitative interviews:

> A related merit of qualitative personal interviews points to the completion of questionnaires or interviewing cues. In most cases, much flexibility is open to the researcher during these interviews because the interviewing process is itself a social process involving the interviewer and the interviewee. One can choose to ask questions in a standard manner and flow across all cases. Or one can ask the same questions in a different manner and order throughout different interviews. A final possibility is that one can vary questions and probing according to the interview context, i.e. asking more and in greater detail if the respondent is more keen and friendly (e.g., my study).

To understand interview methods, Table 4-1 explains each interview method's features and required skills.

Table 4-1 Typology of interview strategies

Type of interview	Require skills
Structured interview	Neutrality; no improvisation; training to ensure consistency
Semi-structured interview	Some probing: rapport with interviewee; understanding the aims of the project
Open-ended interview	Flexibility; rapport with interviewee; active listening

Focus group	Facilitation skills; flexibility; ability to stand back from the discussion so that the ground dynamics can emerge

Source: Noaks and Wincup (2004) [cited by Silverman 2006, p. 110]

This study, inter alia, carried out two types of interview methods, namely, semi-structured and the open-ended interviews, to allow the interviewees the freedom to talk about the given questions and issues. In particular, the positions of interviewees vary; therefore, there are often different views in light of their positions, for instance between the central and regional policy makers. Thus, this research first collected whole interview data from interviewees, then carried out additional interviews with key stakeholders (e.g., textile industry experts and experienced policy makers), thereby excluding the highly subjective points of view collected from earlier interviewees, though some of the issues could not be triangulated completely. This interview technique can improve the validity and interpretation of what the researcher found by means of cross-checking (Marshall, 1989; Healey and Rawlinson, 1993). Also, given the research design investigating the diverse dimensions in the restructuring process and efforts, this study aims to have the same level of importance.

An elite is defined as a "group in society considered to be superior because of the power, talent, privileges, etc. of its members" (Hornby et al. 1983, p. 280); all the interviewees were from what are regarded as elite groups. The positions they held were as follows: 1) high-ranking government officials in the government bureaucracy, appointed by the Higher Civil Service Examination (*hangjunggosi*); 2) full-time university professors; 3) senior researchers and directors of research institutions (most of them hold a PhD degree); and 4) CEOs (founders) and directors in the private sector.

Compared to non-elites, obtaining contact to elite interviewees can be quite difficult, as they have a busy schedule (e.g., meeting, business trips, and so on), and "establish barriers that set their members apart from the rest of society" (Hertz and Imber 1993, p. 3). We can see the difficulties of making appointments with elite interviews through previous studies (e.g., Thomas, 1993; Welch et al., 2002). Therefore, the process of conducting elite interviews is time-consuming, and requires a significant amount of effort. In the personal experience of this author, requests for personal contact to elite

groups were frequently rejected, as they lacked interest not only in the research (including research survey and interviews), but in any unprofitable activities, in particular, business interests. From the total number of interview requests made, very few interviewees accepted. In addition, the research theme (the restructuring process of Daegu's textile industry) per se laid a burden on those who had been involved in the project (e.g., policy-makers, business groups, and researchers of intermediaries), as the outcomes of the first scheme (MP) were criticised by many observers. Therefore, asking interviewees was far more difficult, so the elite interviewees were approachable often only through an introduction by acquaintances. First, the author contacted close friends who were working in the government, the GRIs, and the National Assembly, and asked them for an introduction to relevant people, that is, people in Daegu's textile industry. In this way, I could contact and meet several people relevant to this research, and then the interviewee lists were expanded by those people's networks.

Because of the difficult access to the elite group, my behaviour tended to be one of adopting an entreating stance, and of avoiding difficult situations by asking critical and unfavourable questions (Cochrane, 1998; Thomas, 1993) in a context in which I had a relative lack of knowledge compared to those in the elite group. One of the ways to succeed in elite interviews, therefore, is for the researcher to acquaint himself or herself with the relevant knowledge in order to reduce his or her knowledge gaps with the interviewees (Yeung, 1995; Welch et al., 2002), thereby showing confidence regarding the interviewee's field. In that case, if the interviewer sympathises with the interviewee's interests and problems in the business sector or policy-making process, the interviewee is likely to disclose more valuable information and stories. So, insider-like and even emotional or personal approaches could elicit more relevant answers to potentially difficult questions. Thus, to understand the overall textile industry and products, before conducting the field interviews, I subscribed to a number of textile-specialised newspapers and magazines for two years; thus, I could relatively easily understand the process of textile manufacturing when visiting the interviewees' factories during the field work. My personal experiences of the manufacturing sector (semiconductor manufacturing) also helped uncover the manufacturing process of textile industry. With regard to the interviews with policy-makers, I read almost 50 years of white papers on science and technology policy and regional innovation policy

published by the government and government research institutions, and then double-checked their contents with close friends and researchers working in the public sector, before conducting the interviews with policy-makers.

Although the nature of the elite interview gives rise to difficulties, conducting interviews with elite groups, (especially business sector) has significant advantages (Dexter, 2006; Moyser and Wagstaffe, 1987; Schoenberger, 1991; Healey and Rawlinson, 1993; Markusen, 1994; Yeung, 1995; Welch et al., 2002; Smith, 2006).

The following Table 4-2 summarises the advantages of the elite corporate interview using a number of quotations from scholars.

Table 4-2 The advantage of the elite corporate interview

Author(s)	Description
Fothergill and Guy (1990, p. 44)	"We can find out directly about the reasons for managers' decision rather than merely infer causation from statistics"
Markusen (1994, p. 478)	"Methodologically, evidence to test these newer theories has come increasingly from qualitative data, especially from interviews of firms and other industrial and regional actors such as trade associations, business service providers, labor unions, and economic development officials - what Massey and Meegan (1985) call intensive as opposed to extensive research. This makes sense because a key focus in recent theory is the degree to which firms are "embedded" in local economies, through relationships with competitors, customers, suppliers, regional business organizations, and public sector forums (Granovetter 1985; Har- rison 1992; Best 1990). Data on such connections are impossible to find in secondary sources and difficult to evoke even in surveys."

Yeung (1995, p. 313 and 314)	"It provides much flexibility both in the conduct of data collection and subsequent analysis." "Interviewing is probably the most useful and direct method. The beauty of this method lies in its validity (i.e. dealing directly with decision makers and the richness of information collected) and reliability (i.e. replicable in practice)."
Healey and Rawlinson (1993, p. 345)	"Qualitative findings may be used to extrapolate beyond the data and to "make modest speculations about likely applicability of the findings to other situations under similar, but not identical conditions. Extrapolations are logical, thoughtful and problem-oriented rather than purely empirical statistical and probabilistic (Patton 1986) [cited by Sykes 1991, p. 7]."
Sykes (1991, p. 8)	"The main reason for the potential superiority of qualitative approaches for obtaining information is that the flexible and responsive interaction which is possible between interviewer and respondent(s) allows meanings to be probed, topics to be covered from a variety of angles and questions made clear to respondents."
Schoenberger (1991, p. 180 and 188)	"The goal of such an interview [the qualitative corporate interview] is to understand the firm's observed behavior (regarding, for example, its locational strategies) in light of the firm's own history and circumstances and in the context of other considerations such as the firm's competitive strategy, relationship to its markets, product technology, production methods, labor relations, the behavior of competitors, and the like."

"The richness of detail and historical complexity that can be derived from an interview-based approach allows one to reconstruct a coherent representation of how and why particular phenomena came to be."

Source: Author

The aforementioned advantages could be seen during the interviews with the elite policy makers, giving rise to answers regarding, for instance, the reasons why specific policies had been devised and identifying the key aim of the regional restructuring policy. Likewise, elite interviews in the public sector can easily gain valuable, accurate, and detailed information through the experiences and viewpoints of the elite interviewees and provide hidden stories regarding events that occurred during the shift of the policy direction (e.g., regional-focused policy from national one) and the transitional periods of the local textile industry.

Therefore, all the interviewees were chosen from central and local policy-makers, scholars, local business groups, and diverse stakeholders, in an attempt to maintain the balanced views between central and local perspectives. Also, most of the interviewees were in some way directly involved in the restructuring that had taken place over the last two decades. Thus, this study was able to ascertain useful facts about the evolution process of the local textile sector and the textile stakeholders including invisible effects and outcomes, which could not have been obtained through quantitative outcomes.

On the other hand, part of the lack of visibility here relates to the suggestion made by one interviewee that the problems facing the Daegu textile industry and other older industrial regions are serious enough to present an impediment to statistical research on local firms through either survey and interview approaches, thereby hampering the policy making process (Interview: Member, National Assembly, October 2015). The

problem is compounded by the small size of many of the businesses involved and their informal status, as the textile industry in Daegu consists of mostly small-sized firms (87% of total enterprises) with fewer than 50 employees, most of them subcontractors. The data provide only a partial picture as, for purposes of tax avoidance, many other small firms are not officially registered. As a result, the companies that benefit from public funds and other support are often drawn from a small pool of larger, more successful corporations, which poses problems in the formation and evaluation of public policy. Inevitably, under such circumstances, many local textile firms do not want to have interviews with outsiders, in particular for the purpose of research. Given human nature, it can be easily understood why lagging companies in the local business sector refused the request to participate in research-purpose interviews, even though I had attempted to contact those companies several times via face-to-face and phone-call approaches.

As a result, this study analyses nine innovative firms that are considered to be regional "star" enterprises, that is, businesses with relatively stable conditions with innovative outcomes that had introduced new products into the market. In the initial stage of the field research, I attempted to make contact with 20 local firms, and successfully met representatives from 13 companies. Yet, the public information (e.g., sales figures, patents, number of employees) of four companies (apparently unregistered small companies) were restricted, and therefore, have been excluded from the empirical research (the list of interviewees was also deleted) for the purpose of validity and reliability. For this reason, this research could gain information, such as the condition and backgrounds of those whose businesses underperformed, from regional policy makers, two local intermediaries, and other innovative companies. Once interviews had been conducted with local innovative companies, they have frequently exemplified a couple of bankrupt companies, which disappeared at the restructuring stage, for vaunting their achievements and business strategies. Such collective excitement around the local business sector clearly helps explain why many uncompetitive textile firms in Daegu have vanished, and why other local firms have been surviving.

Thus far, section 4.2 has described three research methods, and the means used to approach research subjects and questions. The following section 4.3 will critically examine the methodological drawbacks of this study, especially with regard to innovation studies, and will suggest a couple of supplemental methods as a remedy for compensating for these matters.

4.3 Methodological issues for innovation studies

Regarding the measurement of tangible and intangible outcomes from innovative activities, learning processes, and knowledge transfer activities, it is difficult to trace these definitively through quantitative measures. For instance, the R&D and technical support are not 'an instantaneous event' (Bessant and Rush 1995, p. 98), but rather require a substantial amount of time. Moreover, it is not easy to measure the time-consuming tasks in uncertain environments or to specify the tangible outcomes from innovation processes because the process itself comprises many 'informal and intangible relations' (Cumbers et al. 2003, p. 1692). Indeed, the international organisations, such as the European Commission, also acknowledged that evaluation of the innovation systems consisting of complicated ingredients seems difficult, stating that it is

> …extremely difficult to determine the cause and effect of innovation inputs and outputs. Impact assessment is about attributing results, and measuring policy outcomes seeks to attribute additionality. This is rarely easy and attribution of results to one actor rather than another may be contested. (Innovating Regions in Europe 2008, p. 11)

Therefore, this study fully recognises that there have been obstacles in providing a complete analysis of the relationship between the innovation system and the upgrade process of regional industry, and the innovative performance of regional textile firms, although the qualitative elite interview provides partial solutions. Moreover, the nature of the regional restructuring process itself is unlikely to reveal the changed circumstance of the region immediately.

To mitigate such methodological shortcomings, this longitudinal study first needed to look at a steady change in the regional textile industry to see how the declining industry

has upgraded its structure and continually contributed to the local economy. Indeed, the Daegu region has been slowly and steadily transforming its industrial structure on the basis of support from the government and intermediaries along with self-improvement efforts over the last two decades. As a result, the industry still plays an important role not only in the local economy, but also in Korea's export contribution, though the scale of the textile industry has been reduced.

In order to figure out the innovative story of regional actors in the restructuring process, therefore, this study uses mainly interviews with well-known innovative firms and industries and public sector representatives to assist in the interpretation of secondary data provided by national institutions relating to these agencies' activities in the fields of technology creation and transfer.

Another methodological issue regarding this research is related to limited approaches to analysing the firm level innovation and its behaviours. The most popular standard manual in innovatory activities at the firm level is the "OSLO" manual produced by the OECD for measuring a company's innovativeness. Although most OECD countries employ such an innovation survey form, the questionnaire of the OSLO manual for the innovatory process and product is strongly dependent on respondents who answered the survey forms in each company. Here, as a few questions arise regarding whether the respondent fully understands innovatory activities (though the manual gives a detailed account) or is even a suitable position for answering the questionnaire, some doubts might be raised concerning the reliability of the results of the survey. Moreover, the OSLO manual might be useful for analysing the overall condition of the nation's macroeconomic and specific industrial sectors that are related to more fashionable and high-technology industries given the innovative activities and number of companies, whereas in the case of an unfashionable and small size-dominated sector like the textile industry, it is unlikely that proper information could be gained by means of the manual. Indeed, this study looked at the survey result of Korea's OSLO with regard to the KIS manual (the Korean Innovation Survey, made by STEPI) from 2002 to 2014, accruing a small number of data in Daegu's textile business. Thus, instead, this research focuses on the qualitative research as a better approach, as follows:

> To fully understand the forces affecting innovativeness in small businesses, quantitative research is often less valuable than qualitative research mainly because there is little guidance regarding what factors to measure. Supporting this, Rogers and Shoemaker (1971) provide pages of potential variables that have been tested for their impact on either individual or organizational adoption in prior research. In fact, Rogers (1995) identifies the large number of variables and contrary findings across studies investigating them as one of the fundamental problems in this research area. (Hausman 2005, p. 774)

Hence, several previous studies on innovation systems have been analysed mainly by using qualitative research. In particular, the case study approach has been widely employed with a single place, either region or country, and one particular industrial sector, such as biotechnology and solar PV (see Table 4.3). Of course, there are some exceptional cases, such as studies by Nelson (1993) and Asheim and Isaksen (2002), which are likely to corroborate the conceptual/theoretical framework (i.e., NIS / RIS), drawing a comparison between several countries or regions.

Given that there is a relatively small number of empirical studies about the restructuring of old industrial regions in the context of the developmental state, such as Korea, Japan, and Taiwan, an in-depth single case study approach with interviews with the qualitative elite is likely to contribute more to academic circles to enrich theoretical and empirical perspectives. Thus, this study may provide insights into certain phenomena in which many NICs are now encountering the urban decay of older industrial regions that used to play a pivotal role in the early phase of the economic growth of their countries.

Meanwhile, Tödtling and Trippl (2005) pointed out that there is no ideal model for regional industry and innovation policy, so this thesis does not intend to recommend best regional policy strategies to other countries. Instead, it gives an opportunity at least to consider the influence of top-down policy on circumstances, which helps to revitalise the older industrial regions.

Table 4-3 Empirical studies of industrial upgrade, regional restructuring, and innovation systems

Author(s)	Theoretical approach	Case area(s)	Research method	Date of Publication
Freeman	National Innovation System	Japanese industrialisation	In-depth case study, Interviews, analysis of aggregate secondary data	1987
Nelson et al.	National Innovation System	13 different countries (U.S., Japan, Germany, U.K, France, Italy, Sweden, Canada, Australia, Korea, Taiwan, Brazil, Argentina)	In-depth case study, analysis of aggregate secondary data, comparative analysis.	1993
Asheim and Coenen	Regional Innovation System	Nordic clusters – furniture industry in Denmark, wireless communication industry in Denmark, food industry in Sweden, food industry in Norway and electronic industry in Norway	Analysis of aggregate secondary data, comparative study.	2005
Asheim and Isaksen	Regional Innovation System	Norwegian industrial clusters – shipbuilding industry in Sunnmøre, mechanical engineering in Jæren and electronic industry in Horten.	Analysis of aggregate secondary data, Comparative study.	2002
Park	Regional Innovation System	Korean RIS	Analysis of aggregate secondary data.	2001
Gress	Regional Innovation System	Solar PV industry in Korea	Analysis of aggregate secondary data, In-depth case study, Interviews	2014
De Bruijn and Lagendijk	Regional Innovation System	Portugal Lisbon	Quantitative analysis – statistical analysis, analysis of	2005

			aggregate secondary data,	
Cooke	Regional Innovation System	Biotechnology cluster: U.K Cambridge and US Cambridge, Massachusetts	Analysis of aggregate secondary data, comparative study.	2002

Source: Author

On the other hand, to compensate for the methodological shortcomings, this research employs a novel method, in that it uses the inductive method for tracing common or specific features of innovatory firms, thereby ascertaining which factors have influenced the innovativeness in such firms. Basically, this research selects the case companies in light of their innovative performances, such as patents, and new technologies and products through advice from those local institutions and textile associations that had information about which local firms have relatively outstanding technologies and have introduced new products into the market. Therefore, everyone can check on the published numerical results (e.g., a number of patents and sales figures through national institutions like the statistical office). Yet, there is less known about the story regarding "how" (and with whom) the low-tech SMEs could develop new products and conduct technological, process, and management innovation. When digging into such invisible factors, it is important to collect hidden stories in each company through interviews, whereby this study can find some common factors that help the company's innovation activities (e.g., the collaboration with local intermediaries). In a similar vein, Hausman (2005, p. 773) also highlighted how for the investigation of innovation at the firm level, it is necessary to conduct inductive research, as follows:

> Unfortunately, the literature does not provide sufficient detail for deductive model development; hence we used an inductive, multiple informant procedure similar to that utilized by Rogers and Shoemaker (1971) and Rogers (1995).

To conduct the inductive research, the critical incident technique (CIT) is employed. The CIT demands an investigation of behaviour changes in specific subjects (e.g., organisations and humans) since the subjects were influenced by particularly critical

events. Therefore, the methodology is widely used in the field of psychology and business studies (Flanagan, 1954; Chell, 2004).

In this vein, Evers (2011, p. 507) pointed out that in the case study, the CIT is useful for:

> generating mechanisms and dynamic capability building processes, case study method was the chosen strategy (Eisenhardt, 1989; Yin, 1994; see also Sullivan-Mort and Weerawardena, 2006) with the critical incident technique (CIT) as the main tool for data analysis. (Chell, 2004; Flanagan, 1954)

Therefore, the CIT is likely to give us more crucial and more accurate information about the dynamics (i.e., the innovation process) of the local company and intermediaries after they have experienced the restructuring process.

Chapter 5 TEXTILE INDUSTRY IN DAEGU: THE FIRST GOVERNMENT-LED REGIONAL RESTRUCTURING

5.1 Daegu's textile industry in the past and now

The Daegu region is located in the south-east of Korea (see Figure 5-1) around 240 km away from the capital city of Seoul, and has a long history of textile production dating back to 2,000 B.C. (Daegu Metropolitan City 2016). The origins of the textile industry in modern times date back to the mid-1950s, when several textile firms began their business based in the Daegu region including Samsung Electronics as the 'mother company' (Cheil Industries Inc.).

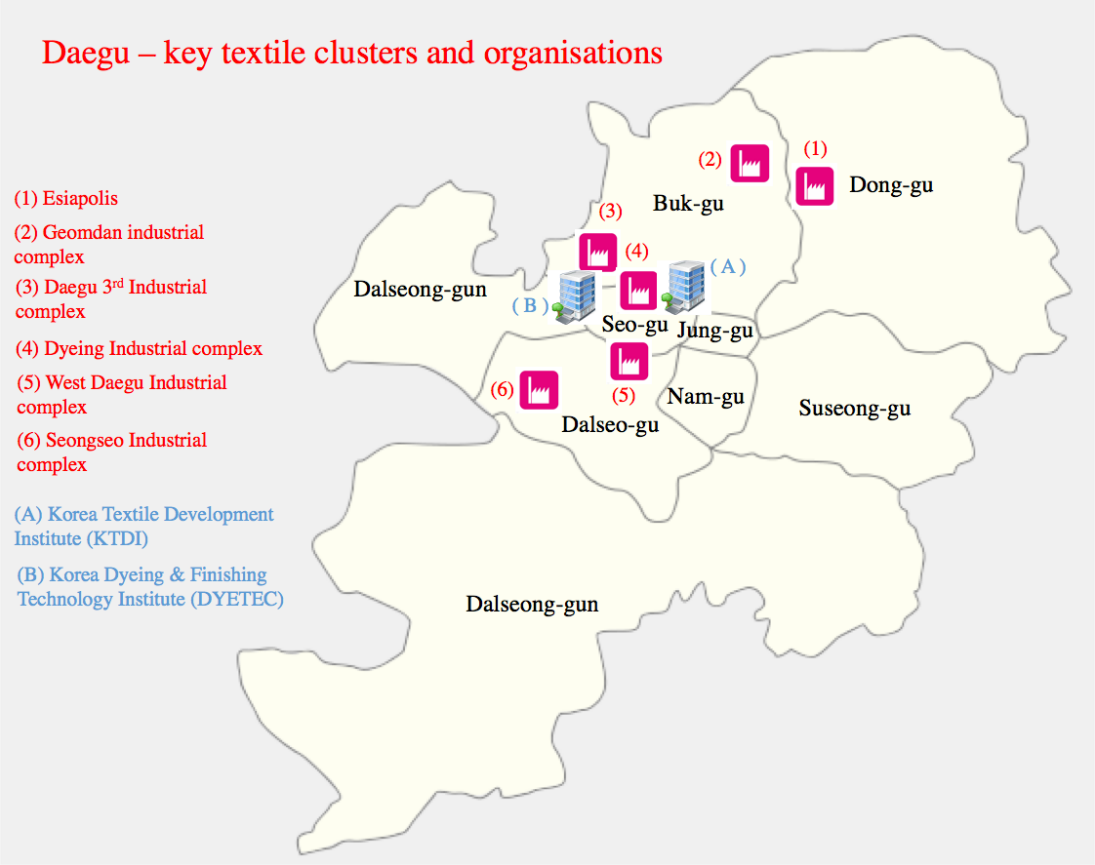
Figure 5-1 The location of Daegu region

Source: Author

Korea's and Daegu's textile industries were one of the driving forces towards industrialisation from the early 1960s to the late 1980s in the transition from the import-substitution to the export-oriented economy. So, Daegu has several textile agglomerations, where the local textile corporations are mostly located in six separate industrial complexes (see Figure 5-2).

Yet, since the mid-1960s, once the textile industry started undergoing difficulties, it became the subject of policy interventions by the central government. For example, in 1967, there was an issue in which the demand for cotton goods decreased significantly, resulting in an excessive supply. To resolve the issue, the government enacted a temporary law (called *seomyugongeopsiseol imsichochi)* to reorganise the textile industry. The main aim of the Act was to enforce changes with respect to outdated textile equipment and to support the production of new textile fabrics, thereby reducing the output of cotton fabrics and increasing that of chemical fibres. Because of unfavourable circumstances in the domestic market due to increasing labour and raw material costs, ten years later, in 1979, the government legislated to foster the modernization of the nation's textile industry (called *sumyugongup geundaehwa*); again, the aim was to change obsolete facilities, support technological development, and nurture human capital (Korea Institute for Advancement of Technology, 2011).

Figure 5-2 The location of Daegu's key textile clusters and organisations



Source: Author

In 1986, the government integrated several industrial promotion laws which supported specific industries into a single united law, called the Industrial Development Law (*Gongup baljeon beop*). Subsequently, the textile and dyeing industries were selected for "rationalisation programmes", which are

> custom-designed to the needs of individual industries and aim to provide temporary boosts for industries which need import substitution, capacity upgrading, and improvements in international competitiveness, on the one hand, and temporary protection for 'declining' industries which need a smooth phasing-out, on the other. (Chang 1993, p. 142)

Therefore, the textile and dyeing industries were generously subsidized by the government in order to upgrade industrial capacity and improve international competitiveness (Korea Institute for Advancement of Technology, 2011; Interview: Directors of local intermediaries, November 2015). Such generous government favours to the local industry, however, inevitably led to a strong dependence on the

central rather than local government, resulting in political lock-ins among regional stakeholders (Cho and Hassink, 2009; Interview: Owner, Daegu textile company, October 2016).

For the past three to four decades, then, the industry has been experiencing a steady decline in its scale and competitiveness due to the emergence of low-labour cost neighbouring countries like China and Vietnam (Interviews with local textile companies, December 2015). In addition, the Asian financial crisis in 1997 aggravated the condition of the regional textile industry, resulting in the bankrupting of as many as 203 textile firms, as was reported by Korea Financial Telecommunications and Clearings Institute at that time (Korea Institute for Advancement of Technology, 2011). Therefore, the structural change in the local textile business sector led to it being divided into four different groups – 1) a substantial number of manufacturing plants in local textile firms crossed into other low-labour countries, 2) uncompetitive firms in terms of technology and finance exited the industry, 3) some textile firms including those who belonged to the previous 2nd group diversified or newly entered into other lucrative businesses like service niches, and 4) the remaining companies became involved in restructuring (and then eventually segmented into two business types, see Chapter 7) (Interview: CEO, Daegu textile company, October 2016).

Notwithstanding the market retrenchment resulting from unfavourable external and internal occasions at the end of the 1990s, this unfashionable and low technology industry still played an important role in the regional economy in the early 2000s based on the number of employees and corporations involved (see Table 5-1).

Table 5-1 The background of Daegu's key manufacturing industry from 1999 to 2004

Type of industry	Number of establishment			Number of employees		
	1999	2001	2004	1999	2001	2004
Textile industry	1,223 (42%)	1,226 (40%)	943 (32%)	46,213 (43%)	41,626 (41%)	29,791 (30%)

Manufacture of fabricated metal products	270 (9%)	345 (11%)	500 (17%)	7,522 (7%)	8,887 (8%)	12,948 (13%)
Manufacture of motor vehicles, trailers and semitrailers	250 (9%)	267 (9%)	236 (8%)	14,342 (13%)	13,139 (13%)	13,620 (14%)
Other industries	1,136 (40%)	1,230 (40%)	1,292 (43%)	38,001 (37%)	38,809 (38%)	41,927 (43%)
Total	2,879 (100%)	3,068 (100%)	2,971 (100%)	106,708 (100%)	102,461 (100%)	98,286 (100%)

Source: The National Statistical Office, 2016

For this reason, Daegu's textile industry has been the target of the nation's first regional restructuring, aiming for a structural upgrade to a high-value business. The following section will expound on why Daegu's textile industry was important and why it was selected to be the first subject of this policy. It also will briefly address the restructuring process of the local textile industry from its initial stage.

5.2 The outset of a restructuring process in the local textile industry

The influence of the textile industry in Korea has been significant in not only the local (see Table 5-1), but also the national economy (see Table 5-2, the industry's contribution to the nation's exports). Therefore, the central government could not look on the textile industry as being merely local, as it was also regarded as a crucial basic industry in national and regional terms given the demand for its produce emanating from other industrial sectors, such as the vehicle manufacturing industry.

Table 5-2 The leading industry shares of Korean exports

	2000	2005	2007	2011

Rank	Industry	Proportion (%)	Industry	Proportion (%)	Industry	Proportion (%)	Industry	Proportion (%)
1	Machinery	19.8	Machinery	28.1	Machinery	30.2	Machinery	31.9
2	Semiconductor	15.1	Semiconductor	10.5	Chemicals	10.8	Chemicals	11.8
3	Textile	10.9	Chemicals	10.5	Semiconductor	10.5	Shipbuilding	10.2
4	Chemicals	9.1	Motor	10.4	Motor	10.0	Semiconductor	9.0
5	Motor	7.7	Communication device	9.7	Communication device	8.2	Motor	8.2
6	Home appliances	5.9	Shipbuilding	6.2	Shipbuilding	7.5	Steel	6.9
7	Shipbuilding	4.9	Steel	5.9	Steel	6.2	Communication device	4.9
8	Steel	4.6	Home appliances	5.2	Home appliances	3.6	Textile	2.9
9	Communication device	4.6	Textile	4.9	Textile	3.6	Home appliances	2.4

Source: Korea International Trade Association; Korea Institute for Industrial Economics and Technology, 2016

Political issues have also had a bearing on Daegu's textile industry. Daegu is regarded as the home region of successive regimes as, for a long period of the military

dictatorship, that is, from the 1960s to the early 1990s, three Korean presidents – Park Jung-hee, Chun Doo-hwan, and Roh Tae-woo – were born in Daegu Metropolitan Area. The 11th president, Park Geun-Hye, who is a daughter of former President Park Jung-Hee, and who was impeached in March 2017, was also born in Daegu. Therefore, the textile sector, as the region's key industry, has been receiving preferential treatment from the central government (Kim et al., 2003). There is, of course, already sufficient rationale for supporting the industry, which has historically contributed to the economy as a protected industry by the government's planned economy, yet politically generated benefits to the local textile industry should not be overlooked. For instance, the first restructuring process was triggered by the presidential election pledge of Democratic Party President Kim Dae-jung with the aim of appeasing the electoral demands of local inhabitants in Daegu, who mainly supported the opposing Conservative Party. After winning the presidential election, therefore, the President and his administration devised a revitalisation plan for Daegu's textile industry involving the "carrot" of significant financial support for the local industry, widely seen as a conciliatory gesture towards local inhabitants (Interview: Senior Policy Maker, November 2015). Hence, due to such economic and political reasons, the national government had to initiate a restructuring scheme for Daegu's textile industry partly to avert the possibility of the sudden collapse of such a key regional and national industry, and also to aid the industry's transition to higher value-added production under the framework of RIS (Interviews: Senior Policy Makers, October 2015).

The restructuring project in Daegu's textile industry lasted from 1999 to 2012 as part of the Promotion Policies of Innovative Local Industries (*jiyeoksanupjinheung*) , which was the government's ambitious plan for upgrading the nation's lagging regions. The first restructuring scheme (called the "Milano Project", MP) ran from 1999 to 2003 and was designed specifically to provide a soft-landing following the Asian financial crisis in 1997, and to alleviate a situation of regional industrial lock-in based on overspecialization in mature middle-stream activities, such as weaving and dyeing, as described by Cho and Hassink (2009). The MP was supported by an unprecedented subsidisation from the central and local governments and the private sector (see Table 5-3).

Table 5-3 The expenditure of the restructuring scheme (Unit: million US Dollar ($), %)

Period	1999 – 2003 (5 years)	2004 – 2008 (5 years)	2009 – 2012 (4 years)
National expenditure	337 (54%)	128 (70%)	20 (54%)
Regional expenditure	47 (8%)	28 (15%)	8 (22%)
Private investment	240 (38%)	26 (15%)	9 (24%)
Total	624 (100%)	182 (100%)	37 (100%)

Source: KTDI, 2009; Seo, 2010

Indeed, Daegu's textile industry was selected as the government's first post-developmental restructuring process and was the emblem of the new phenomenon in Korea, under which new attention was being paid to balanced national development as a new growth engine for the nation's economy. However, the results of this first scheme were not as good as the policy makers anticipated and so, for the second scheme, the budget to support the industry was significantly reduced (see Table 5-3). With a limited budget and with criticism from the policy makers, it was inevitable the changes in the behaviour of regional interests would be required – a feature that will be analysed in more detail in Chapter 6.

The next section will explain the institutional and business conditions of Daegu's textile industry, thereby helping us understand the local innovative milieu before analysing empirical studies in Chapters 6, 7, and 8.

5.3 Institutional and business environments in Daegu

This section provides the background of Daegu's institutions and businesses, thus giving readers related information, and thereby helping them understand the case region and its context. First, the section looks at the condition of the local business sector, which consists almost entirely of SMEs. Whilst medium- and smaller-sized firms are regarded as a driving force for national and regional economic climates as well as innovation systems, most of the existing studies regarding the Korean economy

tend to concentrate mostly on large-sized business groups (c*haebols*) and their performances, and to consider how such large corporations could rapidly catch up with international leading groups regarding turnover and technological advancements by the government's plenary hospitality (Nugent and Yhee, 2002; Choi, 2003). The rationale of such an academic ethos was strongly concerned with the unprecedented success story of Korea's economic growth and the rapid transformation of its industrial structure from the agriculture-oriented to the technology-intensive industry under the developmental state and the national innovation model.

Yet, the reality of the business sector in Korea is somewhat different. The proportion of SMEs to all registered corporations in Korea accounts for approximately 99.9% in the national economy while its share of total workers occupies 88.7% of the nation's labour market as well. Notwithstanding this national business environment and structure, the academic attention to SMEs still tends to neglect their important roles in the economy and innovation activities (e.g., the creation of a new market and new products).

Returning to the case region, as can be seen in Table 5-4 below, SMEs in Daegu have been playing a pivotal role in the local economy. In particular, micro-small firms (less than 50 employees) account for the highest proportion in Daegu's economy, which infers that a substantial number of local firms must be subcontractors and family enterprises with relatively simple and low-level fabrication techniques rather than advanced ones. Therefore, given their scale, most of the corporations did not possess R&D departments and research team, meaning that other components, which can disseminate and create relevant knowledge and technology (e.g., intermediary and university) in the local business sector, are indispensable to boosting innovation activities and to improving technology advancements.

Moreover, there were the hazards of entrepreneurship in Daegu's textile industry in the early period. For instance, the owners (earlier generations) of regional textile companies were seemingly obsessed with an obsolete way of thinking, which involved adhering to the mass production system as proponents of the Fordism-era without any attempt to improve and to replace worn-out technology and equipment, thereby

hampering firms' innovation and hindering the restructuring process [Interview: CEO (2nd generation), local textile firm, October, 2016]. Before the restructuring, namely, during the Asian financial crisis at the end of the 1990s, the ethos of regional textile businesses was somewhat parsimonious regarding investments for equipment upgrade and R&D activities, which directly and indirectly resulted in the delay to the industrial upgrade. Therefore, the structure of Daegu's textile sector in the beginning stage of the restructuring lay in faithful suppliers as a middle-stream realm for supporting the higher-stream, with concentrations on mass production and based on relatively inexpensive goods [Interviews with local stakeholders – intermediaries, firms and association, November 2015; October 2016].

Hence, considering the outdated structure of the local textile sector of Daegu, and the role of the government (Chapter 8) and tech support-intermediaries (Chapter 6) in the restructuring process, research is required that could help explain how local SMEs have been gradually transformed into higher value-added manufacturers with assistance from those two actors (Chapter 7).

Table 5-4 The state of manufacturing industry in Daegu

	Micro-small firms (10 – 49)	**SMEs (50 – 199)**	**Large firms (over 200)**	**Total**
No. firms	2,857	402	49	3,308
(%)	86.3%	12.2%	1.5%	100%
No. employees	56,983	34,675	20,600	112,258
(%)	51%	31%	18%	100%
Value added (Million KRW, %)	4,218,304	3,229,336	2,240,510	9,688,150
	43.6%	33.3%	23.1%	100%

Source: National Statistical Office, 2016

On the other hand, given that old and peripheral regions are suffering from a lack of appropriate agencies that might boost the regional economy, and of innovative activities due to the low level of absorptive capacity in the business sector, this study also needs to explore the overall condition of regional institutions in Daegu.

Arguably, Daegu is better situated than other older regions, as there are some textile-specialised intermediaries and associations that were established by government initiative with steady financial supports (see Chapter 6 for more detail). Nonetheless, the ability to conduct research and innovation activities within the region is still quite weak compared with other major cities in Korea (e.g., Seoul and Daejeon). According to the data provided by the MSIT in Korea, the key ingredients for conducting R&D activities and knowledge creation in Daegu are severely lacking (see Table 5-5) considering the scale of the city (Daegu has the 4th highest population in Korea).

Table 5-5 The number of research organisations & researchers

	Public research institutions		**Universities**		**Private sector (Business entity)**		**Total budget of R&D (a hundred million Won)**
	No. Ins.	No. researchers	No. Ins.	No. researchers	No. Ins	No. researchers	
Seoul	116	5,674	91	37,878	7,810	63,922	96,356
Daejeon	32	10,089	21	7,635	1,113	14,461	63,330
Daegu	28	879	14	3,703	1,242	6,043	9,705

Source: The Ministry of Science, ICT and Future Planning, 2015

Looking at only public research institutions, Seoul as a capital city of Korea possesses 116 institutions, and another two cities, namely, Daejeon and Daegu have 32 and 28 organisations respectively. Yet, interestingly, while Daejeon has merely four more agencies than Daegu, the total number of researchers is not proportionate (being 10,089 vs 879 respectively). According to Table 5-5, the number of other institutions having the role of knowledge-creation and dissemination in Daegu (i.e., universities and private sector laboratories) is similar, implying that regional competence in

research and in innovation is likely to be insufficient and the focus will be on research at a basic level.

Indeed, the above data bears out the legacy of the previous developmental state, as over ten thousand researchers who are working in GRIs are intensively located within 32 organisations in Daejeon to maximise research and innovative competence by the agglomeration of relevant actors, e.g., more highly educated workforce, more research agencies, more universities, etc. Considering the number of researchers (almost double compared with Seoul), we can easily conjecture that research institutions located in Daejeon have been taking on significantly important R&D projects so as to ensure the nation's science and technology competitiveness. As seen in Chapter 3, the origin of such agglomerated space in Daejeon was derived from the previous developmental state model. The central government (the Park Chung-hee administration) in the 1970s deliberately built a science park city in the Daedeok district in Daejeon to gather together in one specific place scattered national key innovative actors in the science, technology, and engineering fields. In doing so, the government anticipated maximising the nation's R&D and technological competitiveness, thereby quickly reducing the huge gaps in the levels of technology compared to other developed countries, especially Japan. Since then, most of the prestigious national S&T research organisations and one of best research-oriented universities, KAIST (Korea Advanced Institute of Science & Technology) have moved to or have newly set up at Daejeon with a crucial mission to ensure the nation's comparative advantages in specific R&D fields, such as telecommunications. Since the Roh administration (for which a key presidential mission was the decentralisation system), a paradigm shift from a selected development strategy to balanced development has meant that many state-owned enterprises and research institutions are steadily moving into other local districts from the capital area. However, many national focal research centres of Daejeon, e.g., ETRI (Electronics and Telecommunications Research Institute), KARI (Korea Aerospace Research Institute), KRICE (Korea Research Institute of Chemical Technology) remain there.

Returning to the case region, once the central government started attempting to upgrade the nation's industrial structure during the 1970s, the textile industry in Daegu

began enjoying economic and industrial prosperity due to Korea's export-oriented policy combined with the relatively low labour costs. Given the sectoral profile that is peculiar to Daegu and to Korea's textile industry at that moment, the main concern was how to provide a stable source of textile-workers for the factories where the primary industry in the region involved sewing activities and so entailed the need for lots of skilled labour. Given this circumstance, a textile-support intermediary, the Korea Textile Development Institute (KTDI), was established in 1977 by the government initiative aiming to achieve such a goal under the Industrial Technology Innovation Promotion Act (later the Korea Dyeing & Finishing Technology Institute, DYETEC, also founded in 1994 under the aforementioned act). Unlike GRIs, the role of those sectoral-specialised institutions, which were founded by the Industrial Technology Innovation Promotion Act particularly for stimulating industrial sectors, were slightly different. In the case of GRIs, the agency has been playing a leading role in the development of new technology with sufficient financial and human resources in most high-tech sectors to achieve national-level technological advancements, whereas sectoral-specialised institutions focus on supporting SMEs in specific fields (Um and Kim, 2015). Therefore, KTDI (and DYETEC) was designed mainly to help regional-based textile SMEs. With the beginning of the restructuring, however, the government demanded that the agency, as a key knowledge provider, became actively involved in the process of manufacturing technology for regional SMEs. As most of the financial support came from the central government, the SMEs could not deny the government's policy orientations, and so attempted to improve their roles (see Chapter 6 for more detail). Arguably, a structural change in the agency was needed due to an upsurge in demand, which facilitated technological dissemination into the regional industry.

Hence, the case study perfectly provides information about how those three actors (i.e., government, intermediaries, and local firms) have been central to the evolution since the outset of the restructuring process. Chapter 6 will discuss the intermediaries' view of the textile agency as an ugly duckling due to its insufficient technology transfer to local SMEs in the initial stages. So, this study will explore whether the agency is still struggling to fulfil its changed duty or to show a better performance. The evolution of local SMEs under these unfavourable environments will be analysed in Chapter 7. As

a key unit of the regional economy and innovation systems, the improvement of local SMEs' technological and market competitiveness would contribute to a structural advancement in the regional textile sector, so this thesis will examine whether local SMEs have successfully been transforming their obsolete structure. Then, finally, the role of the government will be considered in Chapter 8. The restructuring scheme of Daegu's textile industry was regarded as a first national-led work designed to alleviate regional disparity. Therefore, tracing the government's effort in this regard will give us insights into how to change the role of the government in relation to economic and innovation systems in the post-developmental era.

The following section 5.4 will give suitable reasons why Daegu's textile industry is an appropriate case for filling the knowledge gaps identified in the literature review chapter with regard to the theoretical and methodological paucity in the field of geography and innovation studies.

5.4 The rationale for the case region selection

There are many stories in Daegu's textile industry about the significance of its ample history and its role in the economy, where it has acted as a driving force towards industrialisation, and this has made it possible to look at the trajectory of the industry chronologically. Therefore, the case region can offer the best example to address the given research aims, which review the revitalisation process of the old industrial region, thereby also providing an opportunity to compare the role of the government in the early developmental period and in the later post-model, drawing on the evolutionary process of the regional innovative actors (i.e., intermediaries and corporations).

Since the early 1960s, Daegu, as one of the older industrial regions in Korea, has led the manufacturing and export of low-value-added textile products, exploiting relatively cheaper labour. Yet, since the 1990s, the industry has suffered from various unfavourable environmental conditions (e.g., the emergence of neighbouring latecomers like China, the Asian financial crisis in 1998, and the abolition of textile quotas by the World Trade Organization in 2005) with the resurgence of free market capitalism (i.e., neoliberalism) [Interview: local textile company, November 2015). Such a changed milieu inevitably affected the regional industry (e.g., a significant

reduction in the industry's scale), and so local textile interests had to change their behaviours and make structural improvements in order to survive.

Given the limited resources (e.g., work force, finance, and technological competence) to stimulate the textile sector in the lagging region, which generally suffered from institutional thinness, the government's involvement in the revitalisation process was imperative. Yet, the problem was that the government could no longer operate tactically with the previous model of developmentalism (e.g., market intervention) due to the changed environment in the global market and the imposition of regulations from supranational organisations. As a result of that changed milieu, indirect ways of nurturing and tying relevant innovative actors (the betterment of RIS) in Daegu through public policy had emerged as a new measure to revive the stagnant industry. As seen in Chapter 3, for example, the government attempted to provide enough human resources in the regional industry by specific initiatives (e.g., BK21[11] and NURI[12]), and to pave the way for the structural change of the textile industry, moving towards a higher value-added business by exploiting government agencies. Therefore, the case region can be used to explore the role of the government in bringing about change since the outset of RIS.

Furthermore, Daegu's textile industry can provide empirical and theoretical contributions in connection with analysing Korea's RIS, regional development, and post-developmental model. In this regard, there is a lack of research about the local textile industry after the significant structural change at the end of 1990s and the beginning of the 2000s. Although Cho and Hassink (2009) have already analysed this region, giving instructive insights, they dealt with merely the initial stage of the restructuring process. Questions still arise as to how the local textile sector improved its (technological and market) competitiveness, and how it survived in a fiercely

[11] Brain Korea 21 (BK21) is a human resource development programme initiated by the Korean government.

[12] The New University for Regional Innovation (NURI) programme is designed to strengthen the competitiveness of local universities and to foster regional development by cultivating excellent human resources.

competitive market after losing the cost advantage and suffering diverse difficulties. According to the Korean news media and this previous study on Daegu's textile industry (Cho and Hassink, 2009), the government's efforts to stimulate the regional industry have been fruitless due to political lock-ins (e.g., a conflict between private and public sector) and the neglect of regional interests at the first stage (i.e., the MP). Therefore, policy makers also are reluctant to mention the MP (Interview: Senior Policy Maker, October 2015). Meanwhile, other media outlets and (mainly local) researchers held an opposite view, arguing that the government's supportive policies contributed to an industrial transformation towards high-value products for textile firms in Daegu. They argued that without the initial support during the MP, it would have been much harder for the industry to undergo its transformation. Keeping an objective point of view, this thesis attempts to discover unknown stories regarding Daegu's textile industry and actors by means of collecting and examining ample data and resources, thereby figuring out the impact of innovation systems on the revitalisation of the old industrial region.

Hence, this case study allows an investigation of the rise and fall of the industry over the last five decades and provides insights into how the local textile industry was undermined and then revitalised by innovation systems with the focus on the evolutionary processes of three key actors. Given that restructuring can take a long time, the research needs to reflect the recent situation of the local industry by means of more up-to-date data (i.e., a follow-up study). Understanding longitudinal events (i.e., restructuring process) is often likened to Hegel's Owl of Minerva, in which it is difficult to figure out phenomena before a significant amount of time has lapsed. Therefore, this study inevitably needs to explore the recent condition of the industry and the evolutionary process of the three key actors.

Chapter 6 THE ROLE OF LOCAL PUBLIC INTERMEDIARIES IN THE RESTRUCTURING PROCESS

6.1 Introduction

Notwithstanding the popularity and significant contributions of the RIS and SIS literature, this thesis addresses three limitations of both approaches: the near exclusive focus on high technology and on growing or otherwise dynamic industry sectors in Western market economies; the lack of research on top-down models of RIS/SISs, such as those found in East Asian developmental states; and the paucity of detailed consideration of the institutional content of RIS (Ter Wal and Boschma, 2008) including the role of public intermediaries (Howells, 2006; Inkinen and Suorsa, 2010; Rantisi, 2014; Smedlund, 2006).

Korea is widely recognized as a developmental state (Amsden, 1989; Wade, 1990; Woo-Cumings 1999), but it was also an enthusiastic adopter of the RIS concept in regional policy (Gress, 2015; Park, 2001; Sonn and Kang, 2014), as the white paper on Regional Industrial Policies explained in the literature chapter:

> [T]he main aims of regional industrial policy are to strengthen the footing of regional industries, and to improve autonomous innovation capability for the upgrade of declined industries toward high-value added one, thereby pursuing the goal of the nation's balanced development on the basis of Regional Innovation Systems. (White Paper on Regional Industrial Policies, Ministry of Trade, Industry and Energy, 2013: Author's own translation)

Previous studies have paid attention to how national-level policies and institutions have played a role in economic transformation, but have neglected regional and sectoral level policies and institutions in the revitalisation of old industries supported as part of earlier developmentalism (Cho and Hassink, 2009). Yet, it remains unclear whether old industries can be modernised, especially in light of doubts over the suitability of developmental state capabilities to effect transitions from factor- and investment-driven industrialisation to innovation-driven industrialisation (Lenway and Murtha, 1994, p. 528). Thus, one purpose of this chapter is to update the earlier work of Cho and Hassink (2009) to reveal the mixed fortunes of public intermediary

institutions in effecting the revival of the Daegu textile industry and some of the wider challenges facing the developmental states of East Asia.

In addition, this chapter offers an empirical contribution that the findings indicate how local public intermediaries have themselves evolved and have proved pivotal in upgrading industry in an old industrial region. By doing so, it can enrich the extant literature on the approaches both of RIS and SIS, as the local textile intermediaries were established only to offer support to the textile industry under the SIS (see Chapter 2), and play the role of middleman between NIS and RIS. Therefore, the organisations also are closely connected not only to the government, but also to the local textile firms and their innovation activities as one key knowledge provider. In this regard, the intermediaries can also be regarded as one of the regional innovative actors under the RIS.

In the next section, this study explains the alteration that occurred in Korean innovation systems, then presents the case study of Daegu's textile industry, focusing on the role of public sector intermediaries. It draws on interviews with textile companies and representatives from various public sector bodies as well as secondary data.

6.2 From national to regional innovation systems

Theoretically, innovation systems can be described as the means by which combinations of existing resources – such as organisations, knowledge, human resources, etc. – are able to improve national, regional, and firm competitiveness. Several scholars (Edquist and Johnson, 1997; Freeman, 1987; Lundvall, 1992; Nelson, 1993) have drawn attention to the systemic properties associated with innovation performance to highlight concerns about making the best use of existing resources and institutions. In this vein, several theoretical and conceptual formulations of 'innovation systems' have emerged to stress the geographic scale under consideration - such as the ideas of the NIS (Edquist, 1997; Freeman, 1989; Lundvall, 1992; Nelson, 1993) and the RIS (Braczyk et al., 1998; Cooke et al., 1997; Malmberg and Maskell, 2007) – and the particular industries under consideration - such as the idea of the SIS (Breschi and Malerba, 1997; Malerba and Orsenigo, 1990).

Since the mid-1990s, particular attention has been focused on the regional scale under the concept of RIS, which appears to have prevailed in both academic analysis and policy formulation and implementation. Here at least some of this focus on the region appears to have been a response the increasing demand for new policies to address regional inequalities and divergence (Asheim et al., 2011a). As Lundvall and Borrás (1997) have pointed out, regions are increasing their responsibilities in economic coordination by means of local networks of relevant actors, industrial clusters, and the synergy effect among organisations. In other words, regions are described as the key drivers of innovation (Asheim et al., 2011b).

The RIS concept is not totally new, but instead, appears to have evolved out of Alfred Marshall's concept of the industrial district or industrial agglomeration developed in the late 19th and early 20th centuries. Although Marshall's idea about the role of innovation at the regional level was neglected for a long time, the concept of the industrial district was revived during the 1980s and 1990s notably in economic geography scholarship, which applied his idea to the economic successes of regional concentrations of industries, such as post-Fordist, SME-rich regions in Italy (Emilia-Romagna) and Germany (Baden Württemberg). Moreover, the RIS concept is also regarded as an extension of the NIS concept (Cooke et al., 1997) because of the conceptual similarities, such as an emphasis on the role of learning processes and the reciprocity between embedded institutions within regions. Hence, the RIS encompasses the various approaches mentioned above, such as innovation systems and industrial districts along with other conceptual frameworks.

Asheim et al. (2011b) elaborate upon this latter point to suggest that the strength of the RIS concept is that it expounds on networking, learning, and social and institutional interaction. The cluster literature, including Porter's work, concentrates primarily on private sector actors and only on the role of clusters in explaining competitive advantage at the regional and city levels, as pointed out by Humphrey and Schmitz (2002).

The recent ethos of innovation systems scholarship might be characterised as one in which non-linear processes and the intertwining of pivotal actors regardless of

geographical boundaries - e.g., subnational, national, international dimensions – have been taken seriously within an evolutionary perspective (Bessant and Rush, 1995; Edquist, 1997; Tödtling and Trippl, 2005). On the one hand, this has blurred any conceptual distinction between NIS and RIS, while on the other hand, regional competitiveness and stimulating interaction among regional actors emerges as a key ingredient for securing national competitiveness, given the complex and nested interactions among systems operative on different geographic scales.

For these reasons, and for the reason noted in the introduction relating to the concept's salience to policy formation and implementation in Korea, it is appropriate to provide an understanding of the changing fortunes of most of the regional industries in Korea (including the case of Daegu's textile industry examined here) since these are especially susceptible to financial aid and specific policies devised by the central government (Kim, 2007). Indeed, this research goes one step further to provide a more in-depth analysis of the institutional basis of adjustment, as the central government has sought to come to terms with the unwinding of concentrations of industry promoted under previous developmental state policies through a more thoroughly regional approach. In order to do this, it is important to consider the role of intermediaries including public intermediaries within the innovation process.

As seen in Chapters 2 and 3, most of the GRIs and other public institutions were established to facilitate the nation's rapid economic growth by achieving technological advancement within the NIS, and not for strengthening regional competitiveness and dynamics in the early developmental period. Yet, shifting paradigms in the socioeconomic status towards neoliberalism and a region-oriented growth policy means some of the public institutions (particularly sectoral-support agencies) in Korea have been changing their roles, as they tend to get more deeply involved in the knowledge circulation process of regional industries (e.g., knowledge creation, dissemination, and commercialisation) from a passive attitude, which could be administrative support and manpower support and nurture. Therefore, regional intermediaries that previously used to belong to an NIS re-emerged as a pivotal node of interaction between regional and sectoral ingredients, thereby steadily incorporating

this into an RIS and an SIS. Analysing such a transition process from an NIS to an RIS (and an SIS) and a role change also will be developed in this chapter.

6.3 The trajectory of the local institutions

6.3.1 The genesis of the institution-led restructuring, 1999 – 2003

Learning processes involving actors are emphasized as part of a well-functioning NIS and RIS (Lundvall and Borrás, 1997). However, in general, old industrial regions are considered to present unfavourable environments for such learning processes, with reform being subject to industrial and institutional inertia. The characteristics of old industrial regions are described as including an adherence to traditional industrial structures and obsolete technologies, with a dearth of new knowledge, new enterprise, and institutional actors (Tödtling and Trippl, 2005).

In line with the emphasis found in the literature, most governments have supported the restructuring processes and NIS/RIS with public policy (Bessant and Rush, 1995; Tödtling, 1992). The involvement of the Korean government in the nation's economic reform process is notable in this respect given its explicit adoption of the ideas contained within the NIS/RIS literature (Science and Technology Policy Institute, 2011). At its outset, the MP focused mostly on the establishment of an infrastructure for imbuing innovation competence and for upgrading existing textile companies and their products, for instance, the new product development support centre at KTDI and the dyeing and design commercialisation support centre at DYETEC. Therefore, these two agencies were likely to be key actors of the MP as the most powerful regionally-based textile-support intermediaries.

Along with a series of other public agencies supporting innovation and the competitiveness of a range of key industries, both tech-intermediaries, KTDI (see Figure 6-1) and DYETEC (see Figure 6-2) were established in 1977 and 1994 respectively under the Industrial Technology Innovation Promotion Act (*Sanup kisul hyuksin chockgin beop*). Such sector-specialised public institutions are referred to as "Specialised Technology Support Institutions (STSI) (*jeonmoonsengsanyeongooso*)",

and they are established to support the manufacturing technology to (mainly regional) SMEs, and are under the control of the Ministry of Trade, Industry, and Energy.

Figure 6-1 KTDI site

Source: Daegu Newspaper (http://www.idaegu.co.kr)

Figure 6-2 DYETEC site

Source: The Industry News (http://tinnews.co.kr)

Like other STSI, Daegu's two institutions had strong recourse to the subsidies of the central government, as the financial condition of the host region (Daegu) had been insufficient owing to the limited tax revenues, and the institutions themselves lacked the ability to conduct the external projects ordered by the private sector. In addition to the lack of a sufficiently robust financial condition, at the outset of the restructuring project, the scale of the human resources of these institutions also was modest. Therefore, their self-sufficiency was limited when compared with GRIs, as a result of a lack of highly-educated human resources involved in R&D tasks and other knowledge creation work (Interview: Senior Researcher, National–level funded Research Institute, November 2015).

According to Um and Kim (2015), the average annual budget of STSI was 25 million US dollars in 2012, whereas the GRIs under the control of the Prime Minister's Office was 262 million US dollars, an almost tenfold difference. This, in turn, is partly a result of the dynamics of the local labour market rather than a consequence of the appointment of staff nationally, as a senior researcher of local intermediary suggested during an interview:

> Local highly-educated people, with at least a master degree related with textile industry are reluctant to work in the local textile industry in that there are no competitive advantages in terms of income and welfare benefits compared to other industrial sectors. Technician and production workers also tend to move other industrial sectors frequently because of the high intensity of work, the working conditions and the quite low salary. Overall, local job seekers deem the textile industry unstable and as a fading industry in Korea … Job seekers have learnt a lesson from previous experiences in which corporations were vulnerable to closure and downsizing in the economic crisis. (Interview: Senior Researcher, Regionally-based Public Intermediary, November 2015)

For such reasons, the R&D activity and workforce pivotal to technological improvement in the textile industry has instead been absorbed into public institutions and the larger textile companies and not the majority of small firms that exist in the region. One interviewee (CEO, local textile, October 2016) also complained about labour problems and the low-level of research ability in local industry

> There are a couple of universities having textile and textile-related departments in Daegu, but a large number of graduates of the department leave the region to seek better jobs in the metropolitan area. In doing so, they are willing to change their career. In other words, they do not care about whether the job is related to their major (textile) in the university, but instead do care about job security. Therefore, many students get jobs in the public sector (e.g., civil servant) or in large-sized corporations undertaking no textile-related businesses. Under these circumstances, the majority of R&D workers employed by local firms hold only bachelor degree-level qualifications, thereby suffering fundamental difficulties to conduct technological development in the local textile business.

Given this picture, in some respects, the national government had little choice in its efforts to enhance knowledge creation and dissemination centred on local firms, but instead had to focus on the two local-tech intermediary bodies due to their relatively well-organised highly-educated and experienced staff and research equipment. Therefore, two intermediaries were selected to function as a key node of the restructuring process and the RIS in supporting local textile industries by the huge amount of the government subsidies (see Table 6-1).

The top priority of the first stage was to pave the way for restructuring the local textile structure towards higher-value added products; therefore, the establishment of a hard

infrastructure (research centres) within two intermediaries was one of the main projects. In this way, the research centre could focus more on the process of prototype development, reducing the technological and production burdens experienced by local SMEs. With limited financial and technological resources, the development of the new product itself was a difficult task for most of the local textile firms. In this regard, the government subsidies were also distributed across the local private sector to support their R&D and equipment upgrade.

As a result, the goal of an upgrade in the local textile industry structure has been pursued mainly by the two intermediary organizations of KTDI and DYETEC, with the result that the numbers of employees at both increased markedly - from 55 employees in 1997 to 93 employees in 2004 at KTDI, and from 32 employees in 1998 to 105 employees in 2003 at DYETEC (Seo, 2010).

Table 6-1 Major projects of local intermediaries in the first restructuring scheme (1999-2003)

	Project	**Managing institution**	**Outcome**
Supports for textile product quality improvement	the new product development support centre	KTDI	Patent application: 4 Prototype production: 5,756
	the dyeing and design commercialisation support centre	DYETEC	Software setup: 69 firms Inkjet textile printer setup: 10 firms
	the knitwear test product centre	DYETEC	Prototype production: 1,262 Joint technology development: 9

	the textile information support centre	KTDI	Web-p. production: 922 Information education: 1,222 workers
	KTDI project assistance	KTDI	R&D projects: 76 Patent application: 21
	DYETEC project assistance	DYETEC	R&D project: 63 Patent application: 15
Supports for technological development and productivity improvement	Textile material development	Loan (3 million US dollars)	Beneficiaries: 54 firms
	Dyeing process technology development	DYETEC (loan: 7.4 million US dollars)	Beneficiaries: 64 firms
	Support for productivity improvement	Loan (40 million US dollars)	Beneficiaries: 94 firms

Source: Seo, 2010

6.3.2 In a transitional period, 2004 – 2013

Having synthesized the reportage, secondary data, and interviewees' views about the institution-led restructuring process of Daegu's textile industry, this study now turns to discuss the intensification of the restructuring process since 2004.

The preceding discussion has provided a vivid picture of some of the limitations of the developmental state, as approaches to the design of institutions and policies so successful in the promotion of industries have proved less successful regarding the

restructuring and revitalising of industries. Yet, this research suggests that it is the institutional legacies of the developmental state that have proved important in recent industrial restructuring. Commenting on a recent publicly-fund project in Daegu, one government officer described how

> basically the central government respects local stakeholders' demands and generally tends to accept their postulated claims as well. However, there is some conflict in terms of the long-term perspective. For instance, the bottom-up approaches are likely to focus on local firms' requirements, inevitably concentrating on the short-term outcomes in that the top priority of these (small-sized) firms is to survive in the fierce business environment. Thus, the central government carefully seeks how to fundamentally transform the old industrial area on the basis of sustaining their traditional key industry. Hence, some public projects related to regional industries are carried out by the central government alone without even local consortium and local government expenditure. In this vein, Daegu's new support scheme (the commercialisation support project for the mixed textile material during the 3rd stage) also was subsidised mainly from the central government for continually pursuing its successful industrial change to being based on high-value added industrial structure through stable financial aids (Interview: A senior civil servant, December 2015).

As noted, although the regional demands are favourably reflected in policy orientations, Korea's central policy-makers, especially a few elite government officers, tend to preferentially provide a blueprint for a region's future industrial structure (Interview with a national-level senior policy maker, November 2015), with a view to financing several long-term projects in the blueprint.

The second stage of the upgrading process began with a jaundiced view, as the first restructuring scheme (the MP) finished in 2003 with somewhat disappointing results given the scale of funding channelled through it (Cho and Hassink, 2009; Seo, 2010). However, such results were inevitable considering the relation of local stakeholders. For example, Cho and Hassink (2009, p. 1192) noted the dissonance between diverse interest groups in the Daegu innovation system, including between business leaders (e.g., the Daegu Textile Association) and intermediary research and development institutes during the first restructuring stage. In particular, the local business group was dissatisfied, as they did not want to lose their influence in the restructuring process, to the local intermediary yet two intermediaries had guided the first stage of the process

by distributing government aid. Thus, neither of key local textile actors facilitating regional restructuring and innovation were compatible, thereby destabilising the ongoing upgrading process.

Furthermore, a substantial number of local firms did not explore measures to guard against difficult industrial circumstances after the Asian financial crisis in 1997. Instead, those firms eagerly anticipated receiving financial aid from the central government as usual (Interview: Owner, Daegu textile company, October 2016). Indeed, the government and financial groups supported a bailout for local textile firms in order to alleviate their financial burden, meaning that local textile interests could not avoid criticism due to the focus of public attention and censure. Therefore, the ramifications of the restructuring programme associated with the MP have inevitably had negative implications for subsequent initiatives designed to promote restructuring. These include significantly reduced financial support – the budget was reduced by 71% from the first scheme to the second scheme.

Along with such negative publicity, Daegu's textile industry has continually had to contend with factors unfavourable to its renewal. First, there was great upheaval in the textile market in 2005 globally due to the World Trade Organisation's (WTO) ending of textile quota arrangements (Interview: Executive Manager, Daegu textile company, October 2016). Until that time, domestic textile firms (especially cotton and woollen goods) had supplied their merchandise to domestic industries (e.g., automobile seat) as a sheltered industry. The local textile industry was naturally severely affected by the market liberalisation associated with the elimination of quotas, and it underwent a huge loss of price competitiveness compared to the textile industries in China and India. One interviewee, citing figures from the 2004/2005 period, underlined this point, noting how the average labour cost per hour in Korea was roughly 5.32 US dollars whereas that in China was only 0.69 US dollars (Interview: Director, Local Intermediaries, December 2015).

Second, after the second upgrading stage, central government policy-makers sought to encourage the growth of new dynamic industries by means of the extension of regional, rather than national, industrial policies. However, the capacity of regional policy as an

effective tool to promote major industrial restructuring continued to be debated. The first regional policy involved support for only four regions and four industries, and has been considered insufficient to facilitate self-sustaining regional economic development. During the first phase of regional industrial policy under the Kim Dae-jung administration, only four regions and their respective key industries (namely, Daegu: textiles, Busan: footwear, Gwangju: optical electronics, and Gyeongnam: mechanical industry) received support from central government.

Subsequently, the Roh Moo-hyun administration [2nd phase] devised a new regional industrial policy, entitled "Regional Strategic Industry" (*Jiyeok jeonrak sanup*) on the basis of the Special Act on Balanced National Development (*Gyoonhyung baljeon teuckbyeol beop*). In order to attempt the balanced national development as the foremost mission during Roh Moo-hyun's presidential term, the Roh administration extended the policy benefit (such as financial aids) to all regions of Korea except the capital area. Embracing the regional stakeholders' demands meant that, in addition, each region could decide four strategic (or high-potential) locally-based industries given their economic and industrial milieu. In this context, Daegu also began to seek new regional key industries and announced four strategic industrial sectors as follows: mechatronics, electronic information (nano technology, mobile), bio-industry, and textile.

According to an interviewee from among the policy makers in the government-funded research institution (October, 2015), it is as a result of this search at the regional level for a measure of industrial diversification. After the relative failure of the MP, central and regional policy makers considered that Daegu needed new dynamic industries to sustain the regional economy. Indeed, some indigenous manufacturers of fabricated metal and motor vehicles and trailers had been increasing their share of the local economy regarding the number of firms and employees (see Table 6-2). Although the textile sector has been maintaining a stable position in the local economy (the second highest percentage of a number of firms and the highest percentage of the number of employees), other indigenous industries have been showing high levels of success with high value-added products in comparison to the traditional textile industry. The result is that the textile industry's status as the key industry in Daegu has been questioned.

Table 6-2 The state of local business sectors in Daegu Metropolitan Area in 2012

Type of business	Number of companies		Number of employees		Amount of value added (US Dollar)	
	Figures	Percentage	Figures	Percentage	Figures	Percentages
Textile goods & manufacturing	623	19.3%	17,226	16.2%	1,102	12.7%
Metal processing & manufacturing	658	20.4%	17,147	16.1%	1,388	15.9%
Machinery & equipment manufacturing	491	15.2%	15,788	14.8%	1,544	17.6%
Automobile & trailer manufacturing	299	9.2%	16,756	15.7%	1,461	16.7%
The rest of the business sectors	1,159	35.9%	39,588	37.2%	3,226	37.1%
Sum	3,230	100%	106,505	100%	8,721	100%

Source: Korea Industrial Complex Corporation, 2014

Third, in 2007, DYETEC had a surtax refund problem, with a requirement to pay roughly US$1.7 million to the central tax office (May 2016 exchange rates). In order to pay this charge, DYETEC not only had to use its emergency budget, but also had to lay off around 20 employees and reduce the salaries of the remaining employees. Nevertheless, it was in this crisis that DYETEC had to rethink its organisation and activities. According to the Director of DYETEC

> The institution was almost bankrupt after paying the tax. So managers and employees had a long discussion as to how to solve this difficulty. On the other hand, this crisis gave the opportunity for our workers to take time for self-examination as to what was wrong and create a task-force team for management innovation. In particular, we attempted to reduce financial aids from central and regional governments. Aid was like two sides of a coin in that researchers wanted to show the short-term outcomes in order to obtain such public funds. However, such fund-seeking research projects hampered the long-term research projects which generate the pivotal and key knowledge. So, we decided to change everything including the ethos of seeking funded-research after the financial crisis. Rather than the short-term projects, our research teams concentrated on long-term research and focused on local firms' real demands with research commissioned for the technological support and transfer to local firms. In addition, focusing on local firms' demands helped to create a good network between the agency and local firms, thereby improving our relations (Interview: Director, DYETEC, December, 2015).

These three unfavourable factors with a poor performance along with the failure of the MP actually meant that the local atmosphere surrounding the Daegu textile industry changed significantly with the sense of an impending crisis. Since the Roh administration, moreover, a revised regional policy cultivating new strategy industries in the Daegu region has induced a change in the previous inertia of local textile stakeholders, as textiles is no longer the only key industry in Daegu (Interview: CEO, Daegu textile company, October 2016). In this vein, since 2004, the distribution of the government aid to not only the textile industry, but also to other industrial sectors in Daegu directly impinged upon local intermediaries in that the problem common to those local-based intermediaries in Korea is a strong dependency on the central government due to the low level of financial self-sufficiency including limited tax-collecting authority. The poor financial condition of regional governments derived, in turn, from a governance structure which remained highly centralised until the beginning of the 2000s (Hassink, 2001; Kim, 2007). Therefore, these intermediary institutions' main goal – in particular, small-sized regional-based institutions – has been how to gain as much financial aid as they can from government's public projects. In some ways, the asymmetric authority between the central and regional governments engenders the legacy of the developmentalism to local-based intermediaries that have often been poorly focused on their main aim to support local SMEs and increase industry competitiveness.

In terms of the local private sector, the textile industry that remains in Daegu is composed predominantly of small companies (see Table 6-3) after significant retrenchment from 1997 to the mid-2000s. The vast majority of the firms that survive today have fewer than 50 employees, with nearly half having fewer than 20 employees.

Table 6-3 The distribution of firm sizes by employment in Daegu textile industry, 2014

Employment scale	Number of enterprises
10 – 19	301
20 – 49	224
50 – 99	64
100 – 199	12
200 – 299	1
Total	602

Source: The National Statistical Office, 2016

This remaining size distribution of textile companies revealed in the table above is also related to the processes affecting different segments of the industry locally leading up to the present day. The first group of companies exited the industry altogether. Being only weakly competitive in terms of technology and capital, they went bankrupt at the outset of this period. A second group can be regarded as made up of the diaspora of owners of textile enterprises that have since moved their production facilities overseas. Some of these firms have retained only their head-office in Daegu while moving production to China and Vietnam in search of lower labour rates. In general, this group can be seen as remaining wedded to an ethos of the Fordist mass production model. A third group diversified out of the textile industry into other lucrative manufacturing or service niches locally. In particular, it seems that a number of businesses invested in businesses such as hotels partly due to the cash-based economy surrounding such activities and the possibilities of tax avoidance. The final group is represented by those companies that remain as the local textile industry albeit that this group includes innovation-oriented firms and public project-seeker firms (Interview: CEO, Daegu

textile company, October 2016). As a result of these different strategies deployed by local textile companies, the number of textile firms and employees in Daegu has declined markedly, thereby steadily losing political and economic influence for the local industry, which historically had enjoyed considerable power.

With regard to policy perspective, the successor administrations to President Kim Dae-Jung – under President Roh Moo-Hyun and Lee Myung-Bak – have steadily advanced the restructuring process progressing to the second scheme from 2004 to 2008 and to the third scheme 2009 – 2013, despite the lack of any significant tangible outcomes from the MP with unfavourable environments. In particular, President Roh underscored the importance of regional development for ensuring the nation's overall development, continually emphasising the need for balanced national development (Seo, 2006; Interview: Policy makers, the government department, October 2015) with RIS-related ideas featuring prominently in the nation's regional policy. The government policy has evolved along with regional industrial circumstances in which the central policy makers and government-fund research centres evaluated the upgrading schemes in Daegu's textile industry after finishing each stage, and then revised its support schemes given changed regional environments and insufficient factors detected by the previous stages (Interview: Civil Servant, December, 2015).

Thus, there are three phases of the upgrading processes to Daegu's textile industry as part of the overall plan. The first government policy focused on the establishment of the infrastructure and the relief funds to local SMEs. On the basis of work force and equipment reinforcement during a previous stage, the second scheme was launched with the aim of improving the soft factors, which supported product planning, marketing, and prototype development for SMEs. Then, in the third phase, the policy makers pursued the industrial transformation towards more valuable businesses through the distribution of R&D projects (see Chapter 7 for more details), which generally required collaboration with other industrial sectors to create new material that can be applied in diverse industrial sectors (Interview: Senior Policy Makers, both National – and Regional levels, November, 2015).

During this time, policy makers had urged the structural change and the elimination of obsolete textile products and the move toward high value added goods in Daegu's textile industry, with public policy aiming to improve the R&D and regional innovation capacity. If the first phase of the restructuring process was likely to construct the basic infrastructure that focused on a hardware perspective, the second phase was seemingly designed to bolster the software of companies as represented by the R&D capacity and business networking – with local intermediaries seeking to orient their functions toward SMEs. Subsequently, the third stage seemed to pursue the high-value added businesses on the basis of the previous government's patronage of the local industry.

6.4 The advancement of local intermediaries

From now on, this research will scrutinise both the tangible and intangible outcomes in the Daegu's textile industry through the three phases of industrial restructuring schemes, with a focus on the intermediaries' contribution. To a large extent, this reorientation and upgrading of Daegu's textile industry was an inevitable consequence of the remaining textile firms' and textile-related intermediaries' desire to survive. The changed behaviours of companies and intermediary institutions alike were precipitated by the need to survive and become technologically competitive as well as to restore their reputations from public criticism (Interview: Senior Regional-level policy-makers, December 2015).

Two textile intermediaries steadily began to play a key role as knowledge providers, which had a bearing on the R&D and technical development of companies when set against those that chose to relocate while remaining focused on low-tech and labour-intensive products and processes. Given that the local textile industry consisted mostly of small sized companies with little or no R&D activity and often no specific R&D departments and lacking in any technological advantage, local intermediaries KTDI and DYETEC, which had sufficient resources, were indispensable when SMEs were urging the new product development processes (Interview: CEO, Daegu textile company, October 2016). Therefore, they frequently collaborated with two local textile intermediary institutions. With abundant resources, such as research equipment and manpower as a result of government support for industrial upgrading under the

first phase of regional policy (the MP), these two institutions were transformed in the process of their collaboration with SMEs.

Beyond some of the specific policy incentives and the greater utilization of the resources of institutional intermediaries, such as KTDI and DYETEC, some indication of a transformation in the capabilities of these intermediary organisations themselves can be obtained by analysing patent data. Table 6-4 presents information on the number of patents of both key intermediary institutions. Patents provide a good indication of the applicants' innovation activities and new technology creation (Acs et al., 2002), albeit Pakes and Griliches (1980) also note that patents provide only an incomplete measure of innovation output and one that is silent regarding the economic impact.

Table 6-4 The number of patents in KTDI & DYETEC

Intermediary	The number of patents		
	1999 – 2003 (1st stage)	2004 – 2008 (2nd)	2009 – 2013 (3rd)
KTDI	23	17	50
DYETEC	18	25	68
Total	31	42	118

Source: The web of Korea Intellectual Property Right Information Service

The data in Table 6-4 were collected by analysing the Korea Intellectual Property Right Information service for all of those patents which were not finally rejected as null, withdrawn, and renounced in the application process. So, the table points to a steady increase in the research and technological competence of both intermediary institutions after 2004.

Since the outset of the 3rd stage, in particular, the two intermediaries applied almost three times the number of patents compared with the 2nd phase through conducting R&D projects. According to two local textile directors and ten interviewees from the

private sector (Interviews, November 2015; October 2016), many local firms that survived the restructuring were willing to become involved in government R&D projects with local intermediaries, whereby those companies would be able to develop new and significantly improved products, or at least acquire some tacit knowledge by means of the collaboration with other regional actors and so ensure the competitiveness of their businesses. These changed behaviours of the private sector facilitated the regional innovation, contributing to the creation of new knowledge.

Meanwhile, two local intermediaries also became stabilised as time went on. Acquiring knowledge and providing the tangible outputs of research (e.g., patents) are time-consuming tasks, with good performances from investment timing not being immediately obvious. The following Table 6-5 shows the number of R&D projects of those two intermediaries and the annual average number of visitors to them for using equipment and for consulting and acquiring their textile-related knowledge. It implies that two local groups (intermediaries and public sector) had actively conducted research collaborations or mutual exchanges of their knowledge with the private sector, resulting in a significantly increased number of patents at the 3rd stage stemming from the R&D in the 2nd stage.

Table 6-5 The number of R&D projects and visitors in KTDI & DYETEC

	1999 – 20003 (1st)	**2004 – 2008 (2nd)**
R&D projects	173	411
Annual average visitors	349	1,464

Source: Korea Institute for Advanced of Technology, 2011

In some ways, the increased number of visitors to those local intermediaries implies an improved relationship between local business groups and intermediaries even though both key local stakeholders came into conflict with each other in the first stage due to a tug of war over the restructuring process. Since suffering from reduced profitability, both groups realised the common and severe crisis in the local textile industry and entered into a symbiotic relationship to pursue the revival of the local

textile industry. This changed phenomenon was clear in the interviews with individuals from the private sector, as seen below.

During the interviews with nine local textile companies, all confirmed that they somehow intertwined with the two local textile intermediaries. In particular, five out of the nine companies (small-sized firms – fewer than 50 employees) frequently exploited the intermediaries' equipment once they were ready to produce the prototype goods and continue with the product test in order to minimize the impacts on manufacturing lead times. Considering the very limited production facilities of local firms, access to those institutions' facilities represented an important and previously underutilized resource in that there was no necessity for firms to divert investment and delay the production to install additional equipment when the institutions' advanced facilities could be rented. The remaining four firms out of the nine are mainly involved in public projects instigated by the central government. Those four companies (over 100 employees) are relatively large-scale, so that projects regarding the development of new fabric materials are mainly carried out by such well-established local companies along with local textile intermediaries to maximise research capability and efficiency.

There are some successful cases from those four companies in conducting public R&D projects –

1) Local company [A], established in Daegu in 1970 with around 200 employees, has successfully developed a new textile material which was used in the construction of Korea's first space launch vehicle in collaboration with the KTDI in 2013. The KTDI recognised the company's excellent research ability and their flagship item (glass fibre), so asked the company to develop a high strength fibre which would be compatible other industrial sectors [Interview: R&D director, Company A, October 2016]. Generally, the textile industry was regarded as a low-tech and mostly clothing-oriented business, yet local intermediaries and firms endeavoured to change this stereotype by means of the introduction of new fabric types of material that could be adopted by other industrial sectors, even the most privileged fields, such as the aerospace industry. This is exactly what the policy makers wanted.

2) With the KTDI and two other regional textile firms, Company [B] (founded in 1994, approximately 100 employees) also created a significantly improved textile belt. The new product is suitable not only in the textile sector, but also in other key domestic sectors, such as the semiconductor industry, as it has greater durability than steel, and resists up to 400 degrees Celsius. Before succeeding in the creation of the new textile belt, the domestic corporations relied completely on imported goods from foreign companies, so the KTDI broached the issue with local companies specialised in the textile belt field [Interview: executive manager, Company B, October 2016].

Some confirmation of these conjectures based on aggregate statistics was provided in the interviews. The products of the invisible nature of the improved relations, including collaborative research projects between local actors, are also not immediately apparent in the statistical data, though changes in the value-added provided by the National Statistics Office can provide an indirect indication.

On the one hand, this changed atmosphere, with the local textile industry increasingly engaging in collaborative activities, was related to government intervention. At the end of the MP in 2003, policy makers had evaluated and debated the outcome of the project with regard to the role of tech-intermediaries whose mission was to promote technology creation, transfer, and commercialisation for local SMEs. According to the interview with a policy maker, who was involved in the nation's regional policy since its beginning in 1997:

> After the first stage of the restructuring project, the central-level policy makers realised that there was a problem in which local intermediaries themselves could be involved in the public R&D project as the main actor. The main aim of the intermediary was to resolve the real demand from local SMEs with their technological resources, yet it has been relatively neglected in that the local agencies tended to participate in public-funded R&D to fulfil only their demands (Interview: Senior Policy Maker, National-level funded institution, November 2015).

The central government therefore modified the role of public R&D support for which local SMEs had to be the main recipient: local intermediaries could only be involved in the public-funded project as a participating agency. Local firms sought to meet their

desire to develop competitive and differentiated products by using the existing public intermediaries.

After the third stage of the restructuring, furthermore, regional policy has shaped the transformation of the textile industry in some specific ways. For example, the Minister of Trade, Industry, and Energy announced a new big project for Daegu through a preliminary feasibility study conducted by government-funded research institutions since 2008. As part of this, the central and local governments initiated 'the commercialisation support project for the mixed textile material' (*super sojae yoonghab sanuphwa*) from 2010 to 2015 [the third restructuring stage]. The main aim of this project was to pursue the transformation of local industry into an ostensibly non-garment industrial structure by stabilizing the financial position of companies when targeting support for basic infrastructure and R&D activities. So as to smoothly transform the local business structure, the two local intermediaries provided technical advice, market analysis, and technical textile goods development for the local SMEs.

As a result, a number of local textile firms have transformed into, or combined their garment-manufacturing business with, 'technical' or higher value-added businesses. Following this government scheme, the number of technical textile firms and employees in Daegu rose steadily from 316 in 2011 to 413 in 2014, and from 6,681 to 7,852 respectively. In addition to an increase in the scale of technical textiles, the average turnover for each firm also increased along with the extension of the local technical textile market. This implies that local technical textile firms are more likely to conduct knowledge exchange with other firms in certain specific ways (see Table 6-6).

Table 6-6 The state of technical textile firms in Daegu and neighbouring cities

	2011	**2012**	**2013**	**2014**
Number of firms	316	328	336	413

Number of employees	6,681	7,021	7,369	7,852
Average turnover per each firm (million US Dollar)	5.1	5.1	5.3	6.0

Source: The Korea Textile Development Institute, 2015

6.5 Conclusion

This chapter has discussed the role and evolution of the intermediaries by providing both tangible and intangible outcomes, whereby it also can confirm the transformation of the local textile industry in Daegu.

The purpose of upgrading the old industrial regions varies depending on the social and economic environments in the regions. In the case of the textile industry in Daegu, the main aim of the restructuring was the transformation of the local textile structure from investment- and manufacturing-based businesses to innovation- and technology-based businesses. Namely, the gradual transformation of the regional industrial structure towards more valuable businesses is a matter of the highest priority by means of the effective utilization of the given intermediary agencies [Interview: Senior Policy Maker, November, 2015]. Policy makers realised there would be an inevitable consequence of the decreasing scale of the domestic and local textile industry in the contemporary economy, and that the mass production approach no longer offered a comparative advantage. For the reason, the policy support to the local textile industry has been tailored to meet particular needs in each stage of the restructuring process (i.e. infrastructure in the first, software and R&D in the second, and commercialisation in the third stage).

With such policy support, the local intermediaries have been changing their behaviours. Unlike the initial stage, which was not compatible with the local business group, since the second phase of the restructuring, both key local textile stakeholders needed each

other for alleviating unfavourable internal and external factors which significantly undermined the situation in the local textile industry. So, the changed ethos of the local textile industry with the crisis consciousness engendered the improvement of the relationship between the local stakeholders, thereby vitalising research collaborations and other knowledge exchanges.

In this regard, Table 6-6 could be one of the key results indicating the structural upgrade of the local textile industry. Yet, the data only represents the condition of the technical textile business in Daegu that gave a partial result of the restructuring process, even though upgrading the local textile business model was a key policy aim. Therefore, another data Table 6-7 is provided for showing the betterment of the overall local industry in terms of financial stability. The table below shows that local textile firms have strengthened their financial stability through the restructuring. Although the government helped reduce their financial burdens at the outset of the restructuring process, local firms paid close attention to the aspects of business management and market competition. The number of bankrupt firms and the debt ratio of the remaining firms in the local textile industry has decreased markedly over time. In addition to financial ability, notwithstanding a significant cutback in the scale of the local textile industry through the approximately 20 years of restructuring, the remaining firms have been attempting to ensure the survival of their business by means of factory automation and technological advancements that also resulted in an increase of the gross value added per capita.

Table 6-7 The recent evolution of Daegu's textile industry

	1998	**2000**	**2004**	**2008**	**2009**
The number of bankrupt firms	203	73	55	16	4
Debt ratio	-	508.7%	199%	187.5%	171.9%
Profitability	-	2.59%	0.14%	4.07%	4.74%

Gross value added per capita (million US Dollar)	-	4.8	5.1	6.1	6.1

*: 1) Debt ratio = (debt / net worth) * 100

2) Profitability = (operating profit / sales) * 100

Source: Korea Financial Telecommunications and Clearing Institute; the Bank of Korea; the National Statistical Office

Hence, this study can identify positive signals regarding the extent to which the local textile firms have been steadily improving their capabilities by the data demonstrating the transitional phenomenon of the local textile industry.

The following Chapter 7 examines the evolution and innovative activities of local textile firms using the case study approach for dealing with the second sub-question: How have the local textile companies transformed their businesses into higher value businesses?

Chapter 7 THE MARKET SEGMENTATION IN THE LOCAL TEXTILE BUSINESS

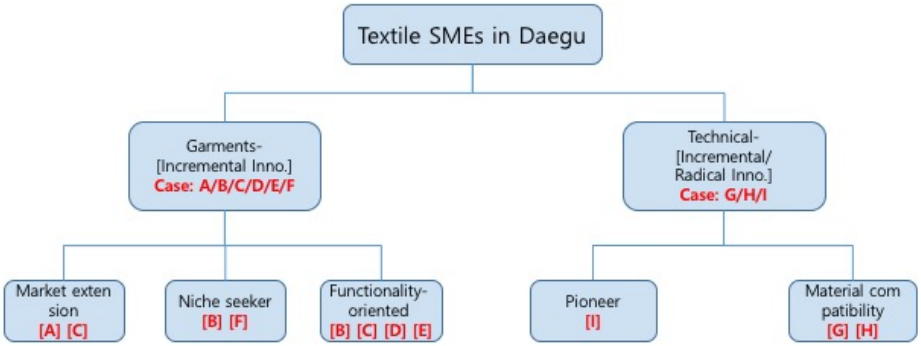
7.1 Introduction

The previous Chapter 6 examined the role of local public intermediaries and their contribution to the restructuring process, whereas the purpose of this chapter is to interpret the innovative strategy and the recently changed milieu of the local textile businesses with both tangible and intangible outcomes.

The business structure of Daegu's textile industry is dominated by SMEs (mostly micro enterprises with fewer than 50 employees), and it became segmented after a significant retrenchment from the end of the 1990s to the mid-2000s. This raises the question of how local companies have had their market competitiveness strengthened by the RIS. To answer this question, nine innovative corporations in Daegu have been selected for the case study approach. They are regarded as regional "star" enterprises recommended by the textile association, news-media, and other local textile stakeholders due to their financial stability and prominent performances (e.g., the introduction of innovative products into the market and the successful development of new textile materials). Therefore, a case study of the companies gives details of the restructuring and innovation process at the firm level.

On the one hand, as a result of the restructuring process, local textile companies are mainly divided into two groups: garment producers and technical-oriented producers. This inevitably means that there are different innovative strategies that strengthen their market, product, and technology competitiveness depending on the main merchandise (see Figure 7-1). Thus, this chapter will explore how six garment, and three technical-oriented corporations have evolved.

Figure 7-1 The types of local innovative companies in Daegu



Source: Author

With regard to the firms' conditions and achievements, the interviews focused on the analyses of intangible factors (e.g., hidden story and process and management innovation), whereas public data provides the statistical information of case companies, such as annual turnover, patents, and the number of employees. All data can be acquired from the Small and Medium Business Administration, the Financial Supervisory Service, and other public organisations.

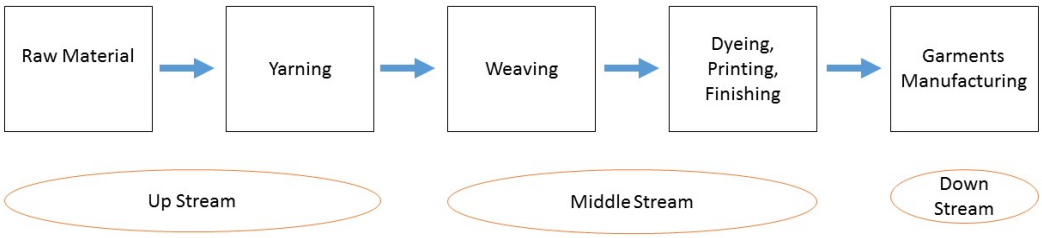
On the other hand, there is a deep-rooted prejudice against the low-tech sectors, which are perceived as obstacles to economic growth. However, information about the contribution of low-tech sectors to the national economy was given in the literature review in Chapter 2 (see Maskell, 1998) and in Chapter 5 (see Table 5-2). With this evidence in mind, this study goes one step further to disclose the contemporary industrial circumstances in the low-tech sectors, which involve more complicated and integrated systems. It may help to overcome the prejudice that the low-tech sectors – such as the textile industry - are likely to suffer from due to an obsession with employing out dated manufacturing and business methods without any technological improvements.

Nowadays, companies in the low-tech sectors cannot avoid the fierce competition in the volatile global market. Therefore, R&D activity, technological development, and innovative activities are imperative factors in their survival. Given such a changed environment, the analysis of the case of textile companies in Daegu will be addressed in the following section 7.2, thereby identifying and discussing the SMEs' innovative ways within the local textile sector, and the ways in which a measure of market segmentation has emerged in the local industry.

7.2 Company case study

First of all, an investigation of the stream of the textile industry is required to understand its manufacturing processes for those who are unfamiliar with the industry (see Figure 7-2 below).

Figure 7-2 The manufacturing process of textile industry



Source: Author

The interview with a director of the local textile institution [Interview: technical textile director, the local textile intermediary, November 2015] revealed that the textile business in Korea possesses a secure structure of all streams of textile manufacturing, which is quite rare, and indeed, is found in only a few countries, e.g., Italy and Japan. In Daegu, especially, the most competitive part is the middle-stream manufacturing,

as they have a quite well-established dyeing-specialised industrial cluster at a nearby DYETEC consisting of approximately 150 dyeing companies (see Figure 7-3).

Figure 7-3 Dyeing cluster in Daegu

(Figure has been removed as third party copyright material)

Source: The Industry News (http://www.tinnews.co.kr)

Meanwhile, the major textile company in Korea generally concentrates on the initial part (the development of raw materials), which requires a higher level of advanced technology and time-consuming research.

The purpose of the upgrade of older industrial regions varies depending on the social, economic, and regional milieus. With regard to the textile industry, Gereffi (1999, p. 39) commented:

> The industrial upgrade of the apparel industry might be a series of role shifts involved in moving from export-oriented assembly to more integrated forms of manufacturing and marketing associated with OEM and OBM export roles, respectively.

In this vein, it is also important to check the goal of the restructuring process in Daegu. Interviewees (Interview: Central-level policy Makers, 2015 November/December) confirmed that the upgrading of the textile industry in Daegu aims to achieve the incremental change of the industrial structure towards more valuable businesses (such as technical and functional textiles) mainly by means of the RIS institutions (with the NIS and SIS).

Policy makers and local textile interests already recognised and experienced the need for structural change, mainly because of losing the labour-cost advantage; therefore, they attempted to transform the fundamental business model towards a higher-value one to accompany technological and quality advancements as well as material compatibility with other industrial sectors. This implies that textile material is capable of being employed not only in garments, but also as a key component in various sectors (i.e., textile materials frequently were employed in vehicle, aerospace, and other

industrial sectors) [Interview: local textile company; intermediary; local-level policy makers, November, 2015]. Hence, the main concern of this chapter is to examine how local textile firms have changed their attitude and strategy for securing their competitiveness.

7.2.1 Apparel-oriented firms

Under the generous policy support, garment-oriented textile companies in Daegu strived to help their business survive mainly by adding special functions into the fabric, which are meant to act as incremental innovations. Given the relatively low R&D capacity of the local companies, the development of new functional fabrics for specialised customers is one of the main ways of improving an enterprise's competitive power. There are six case companies, all of which sought niche and lucrative markets to ensure the continuity of their business; therefore, this research will reveal the strategies they employed to secure their businesses.

Table 7-1 below summarises the condition of the case corporations in terms of financial and R&D activity (volition).

Table 7-1 The condition of garment-oriented firms in 2015 [Unit: One million Won]

	Year Established	Turnover	Number Employed	R&D expenses	R&D expenses / Turnover	Number Patents (5 years)
A	1994	39,640	105	1,296	3.3%	5
B	1998	7,303	38	313	4.3%	2
C	2003	20,625	45	837	4.1%	7
D	2005	13,754	54	1,532	11.14%	14
E	2004	3,288	30	250	7.6%	8
F	2010	14,000	130	122	0.9%	-

Source: The Financial Supervisory Service, 2016

<Case company A>

The case firm [A] was established in 1994, and their flagship product is women's clothing made from polyester fabric. The owner (founder) of the company had around 20 years' experience working for one of the major textile firms in Korea before founding his own business, and therefore, he had ample expertise in this industry.

This company has two main advantages – 1) It has steadily been endeavouring to reinvest business profit in the R&D department (R&D intensity is roughly 3.3%) due to owner's strong research volition, which has resulted in the continual development of new fabrics. Even though regional clothing-textile firms rarely carry out and pay attention to R&D, since 2000, company A has constantly been spending over 3% of the total turnover on R&D to secure product competitiveness and to enlarge existing merchandise ranges.

Figure 7-4 Fabric ranges

(Figure has been removed as third party copyright material)

Source: The Industry News (http://www.tinnews.co.kr)

2) Another prominent strength is its ability to identify trends in the current apparel market through frequent participation in overseas fashion and textile exhibitions (e.g., in New York and Milan). Therefore, the company can identify a fashionable trend, and rapidly reflect it in its clothes and fabrics. The well-trained workers and new manufacturing equipment means the company can cater for rapidly changing trends and thus can easily imitate the current fashion items.

This company used to focus only on the domestic market, yet they realised the market extension was crucial to their business. At the same time, the owner's son, having gained experience of studying aboard in the US, joined the company as a global sales representative in the mid-2000s. This proved to be a milestone in that the company made inroads into overseas markets under the direction of the owner's son, which also inevitably led to huge investments, given family ownership, to enlarge their foreign markets and promote their products as well.

After reviewing the features of SMEs in the previous section, it can be seen that while major corporations possess well-established management systems, making it difficult to change the existing business structure, it is relatively easier for the owners of SMEs to alter their operations. Consequently, efforts to enlarge the global market and to improve the quality of the polyester fabric with steady R&D investment eventually enabled them to make several contracts with multinational corporations. In particular, one of the largest companies in the fashion industry, 'Inditex', which is a speciality retailer of private label apparel (SPA) in Spain, e.g., Zara and Mango, placed a large order with this company on account of its high performance and quality. Notwithstanding the high cost per yard of this company's fabric compared to the fabric of other companies, which are mostly made in low-labour cost countries, international leading corporations are less likely to consider its unit cost, but instead will pay more attention to the quality and the punctuality of the delivery date.

From the success of this company's market expansion to the overseas market, we can see that entrepreneurship is crucial in boosting business competitiveness in particular SMEs, as mentioned by Schumpeter. In this context, there is one more hidden story. Amid the global financial crisis in 2009, most of the local textile firms were reluctant to invest in their manufacturing equipment because of uncertain market conditions. The textile industry is vulnerable to the global economic environment, because the consumption of clothes tends to decrease significantly during an economic downturn, and thus the textile business is regarded as being sensitive to the economic cycle.

Yet, this company resolutely replaced worn equipment, spending roughly 2 million US dollars to increase the production capacity, thereby ensuring the company's manufacturing competitiveness. A result of farsighted investment, the new equipment eventually became a powerful tool which enabled the company to deliver mass orders to contractors on time, thereby gaining credibility from customers. Had the company been a large-sized business, it is probable that members of the board would not have accepted the owner's decision to invest in new equipment during a difficult and uncertain period in the global economy. However, a relatively flexible business structure is one of the advantages of SMEs, so in this case, innovative activity

eventually resulted in more opportunities to seize reliable and big contracts with multinational corporations.

With the reliability of its production capacity and product quality, the company earned 95% of its turnover from overseas markets. Such an achievement and a stable growth in the firm's sales figures over the decade meant that company [A] was considered by the Small and Medium Business Administration to rank among "the world class 300 SMEs in Korea".

<Case B>

Company [B] was established in 1998 and currently has approximately 40 employees. Their main product is a functional fabric, which they have successfully developed in 2005 with an emphasis on eco-friendly products. The development of the eco-friendly fabric was largely reflected the owner's philosophy of taking an interest in environmental friendly products (EFP) for the benefit of the plant and of future generations.

Following the launch of the fabric, the company received much attention from customers owing to an environment-friendly atmosphere as well as the global environmental regulations. Meanwhile, the burgeoning interest in EFP goods had created a new niche market in the textile sector because of expected potential customers from the hospital and infant clothing businesses.

In general, the yarns for chemical fibres are extracted from petroleum, whereas the EFP fibre gains its yarns from environmentally friendly agricultural products (see Figure 7-5) that are extracted from corn (see Figure 7-6), sugar cane, and maize, so that garments made from the eco-friendly material are unlikely to have a negative effect upon the wearer's body and skin.

Figure 7-5 The process of deriving EFP fibre from corn

(Figure has been removed as third party copyright material)

Figure 7-6 EFP (corn) fabrics

(Figure has been removed as third party copyright material)

Source: Aving Global News Network (http://kr.aving.net)

Moreover, all EFP fibres can decompose if buried, thereby reducing the environmental pollution. For these reasons, several domestic apparel companies, which target their final goods (clothes) in baby, infant, and hospital-related markets, prefer to utilise the EFP fibre as a raw material. Given that a considerable number of babies nowadays suffer from various kinds of skin disease, and have an atopic reaction to certain fibres, parents are inevitably eager to search for EFP garments, which are less harmful to their baby's skin.

Along with the eco-friendly material, company [B] continually focuses on the development of health-related functional fibres to ensure the company retains a share of the market for functional fabrics. For example, another flagship item of this company is a breathable fibre intended for use in the hospital uniform (e.g., patient gown) market. The existing goods are mainly made using cotton fibres, and so have inherent shortcomings, such as no quick-dry cooling, leading to the risk of mould growing on the clothing. The sanitary aspect of uniforms is essential to patient welfare as well as to medics; thus, in order to remedy the aforementioned problem, this company attempted to make a functional (breathable) fibre, so allowing the company to apply for several patents.

In turn, focusing on niche markets in functional (health-related) and eco-friendly fabrics resulted in an improvement in company [B]'s business competitiveness, leading to the company being given an award as an "Advanced Technology Centre" by the Ministry of Trade, Industry, and Energy in recognition of the effort the company has made in the continual technological development of eco-friendly goods.

<Case C>

This company was first founded in 1981, and then re-established with a new name in 2003 after a restructuring process. This means that the company is by no means a new

corporation in the local textile sector. In the beginning of the company's business in the 1980s, there were two different business models, namely, textile and motor maintenance, yet the owner (founder) decided to focus only on the textile business. Therefore, a site previously used for the motor business was replaced with a textile research centre to meet the massive demand from a specific customer (the Korean Procurement Service), who asked this company to develop significantly improved functional fabrics.

A specialised uniform market, such as for military and police uniforms, is the main target business of this company; therefore, it particularly requires outstanding performances of heat-resistant and high-strength material in light of the particular nature of the jobs, where the wearers will frequently face dangerous situations while doing their duty. Therefore, the company utilises aramid fibre, which is widely used in the aerospace and military-related industry owing to its vastly superior heat-resistant properties and its durability (see Figure 7-7).

Figure 7-7 Military uniform textile material

(Figure has been removed as third party copyright material)

Whilst its fabric (aramid) cost per yard is relatively high, most of the customers, who are government agencies in Korea and in foreign countries, tend to seek high-quality uniforms for their employees. Therefore, technological improvement is crucial for meeting the customers' specific requests and high standards, while cost is a relatively unimportant factor.

Another advantage, which contributes to the business competitiveness of this firm, is that they can deal with the entire textile manufacturing process, from textile weaving to garment manufacture, meaning that they can buy raw materials (upstream) from domestic major companies. So, the company can offer a tailor-made product to meet diverse customers' demands whereby the clients can design their own textile goods (e.g., bag, scarf, clothes, so on) and indicate their personal preference regarding fabric and functionality. As discussed previously, most of the local firms in Daegu focus on

the middle-stream of activities. Given the circumstances, providing a customised service is likely to help promote awareness of the company's brand in the domestic market.

On the other hand, there is a specific occasion by which company [C] became widely known to both domestic and international customers. The owner of this company has accompanied the president's on overseas visits several times to deal with not only diplomatic matters, but also economic promotions at foreign markets. Therefore, the president went abroad accompanied by ministers and businesspersons.

Therefore, the company was able grasp the opportunity to promote their products. For instance, they had struggled to sign contracts with customers in Latin American countries because of a lack of brand recognition. Thus, the president's overseas trips offered a window of opportunity for signing contracts with foreign customers in that the companies accompanying the president on the trip had been chosen by the government based on product excellence. Thus, foreign customers tended to have high regard for those companies' goods because to a certain extent, they were guaranteed by the Korean government. In particular, one element of the trip was to help construct business networks between visiting and host corporations, thereby providing ample opportunities to meet up with high net worth customers who would frequently sign long-term contracts for mass orders.

As a result of such excellent opportunities, the company successfully achieved supply contracts with around ten corporations in Latin American countries in 2015 and the amount of exports rose to approximately 70 million US dollars. Given the size of the company, the stable supply to foreign countries for years ahead has helped earn steady profits and promote brand awareness to other oversea countries. At the same time, the company can also invest in new equipment and R&D projects.

<Case D>

Company [D] had been in the textile business since 1953, but like company [C], the corporation was re-established in 2005 after a restructuring process. The former business model of this firm was a typical garment industry with over 2,000 employees

in the company's heydey. However, the company reduced the size of the workforce to 50 employees, and then changed the main product lines to focus on technical and functional textile goods.

A noteworthy trademark of the company is the R&D intensity of over 11%. Given that for local textile firms, R&D expenditure is usually 0.8% of their sales (Interview with the textile association, November, 2011), such a high figure for R&D expenditure is remarkable. In addition, R&D employees account for approximately 30% of the overall workforce, which indicates the importance the company dedicates to the R&D capability and technological developments. As a result of a strong R&D competence, 14 patents have been secured over the last 5 years, leading to two flagship developments.

One is a functional fabric with significantly improved waterproof properties and vapour permeability. This merchandise has been supplying several manufacturing companies who produce outdoor clothing (e.g., winter sports) and protective clothing (e.g., employees' uniforms in shipbuilding yards). An antibacterial fabric is another key product, having an outstanding performance of high durability with excellent deodorisation and antifouling properties against external contamination (see Figure 7-8). These functions are suitable mainly for the medical field and other fields that require a high-standard of hygiene, such as the food industry. According to a director of the local textile association [October, 2016], company [D] was the first local textile firm to successfully develop medical-purpose textile clothes, so the company could register a trademark for this fabric.

Figure 7-8 Antibacterial fabric products

(Figure has been removed as third party copyright material)

Source: Yeongnam Newspaper (http://www.yeongnam.com)

This company has frequently conducted diverse research collaborations mostly with universities. Due to strong research competence, the research team of the company had already perceived that they needed to develop new or improved products, so the research department directly contacted professors who would have the necessary

knowledge and access to the relevant technologies. Due to having a sufficiently large research team (13 out of 50 employees), they were easily able to find suitable professors or professional people at the universities, and to state clearly what kind of knowledge they were looking for. This is a crucial point, as many small-sized firms not only in the local textile industry, but also in most of the low-tech sectors did not realise what kind of technology (knowledge) they needed to carry out R&D activities. In contrast, this company [D] and its research centre took a proactive approach; the team had a clear idea of their conceptualised items, and then looked for experts in academic fields like microbiology to develop them.

<Case E>

Company [E] was founded in 1981 with a focus on dyeing and processing, and by 2016, had 30 employees.

Figure 7-9 Sites in company E

(Figure has been removed as third party copyright material)

Source: Korean Society for Industry & Academy Collaboration (http://www.ksanhak.org)

Since 1996, the company has been operated by the owner's son. In the recent atmosphere in the textile industry, dyeing and processing is regarded as a crucial part of the middle stream, which also entails having advanced knowledge and a skilled work force that has technical expertise. These processes are less a reflection of factory automation, because of their peculiar nature, which still requires sufficient manual labour to meet customised orders. Therefore, in many developed countries, the textile industry retains manufacturing plants for dyeing and processing in their home country, even though other parts of production (e.g., sewing factory) have been moved to other foreign countries that have cheap labour cost.

After losing the cost advantage in the local textile industry, the company decided to focus on more valuable products rather than competing with other neighbouring countries regarding cost. Therefore, the research centre was established in 2005 with

six employees dedicated to conducting R&D tasks. Given the total number of employees (only 30 workers) in the company [E], this was a risky decision in terms of the company management because the research workforce generally received a higher salary than did technicians and operators. Nonetheless, the young CEO who had succeeded to the company after his father, faced up to the reality of the industrial environment in Korea and Daegu, where domestic textile companies were stuck in the middle stream between advanced countries and second movers. Therefore, he decided to improve the company's research competence. Thus, company [E] has been concentrating only on specialised orders, in which customers have two types of demands: 1) mass-produced product requiring relatively low skills, and 2) small quantity batch production that is much more complicated than the first type of order regarding the installation of equipment. However, even though the latter order requires a highly skilled workforce and production is more time-consuming due to equipment installation, the company accepted only the second type of orders. By doing so, the company was able to improve the workforce's technical skills through complying with customers' demands, which eventually helped to alter the main product line to one that requires more advanced technologies, but that also yields higher values. As a result, although the overall manufacturing capacity has been reduced in response to flexible customer requirements, the annual turnover has dramatically increased due to these higher value orders.

On the other hand, the company had completed several public projects for creating new textile goods, which generally required the participation of around 30 stakeholders in each task, thereby enabling the workers to establish research networks and earn tacit knowledge because of their common interests. When the research team in company [E] met some biologists in the project, they realised the danger of spreading viruses and bacteria, which cause almost 700,000 deaths per year in the world. Therefore, the company attempted to develop an antibacterial textile with those biologists who were working in the university sector (Ulsan National Institute of Science and Technology) and in government institutions (Korea Institute of Ceramic Engineering and Technology other institutions). Basically, the project for the development process of new textile goods requires cooperation between all textile streams from yarn production to the final procedure along with other related institutions because of its

segmented process in the sector. For example, while this company has sufficient knowledge about dyeing and processing, there is a lack of other technological and scientific information, which is needed for making new products. In other words, the large-scale government projects help not only to strengthen the network of participants, but also to boost knowledge circulation through the cooperation of diverse stakeholders in the domestic textile circle. Therefore, the public project per se acts as a node of an innovation network, and this company utilised these opportunities effectively when producing new merchandise.

<Case F>

While company [F] is relatively new, having been established in 2010 with 130 employees, the annual turnover is already approximately 13 million US dollars.

Figure 7-10 Sites in Company F

(Figure has been removed as third party copyright material)

Source: Hankookilbo (http://www.hankookilbo.com)

The key product of this company is microfibre cloths, made with an ultrafine fibre, for cleaning glasses and accessories such as watch and necklaces (see Figure 7-11).

The company's business strategy for extending the market share is to provide a high-quality product at a reasonable price compared to existing expensive products, most of which are made by Japanese companies. In addition to price competitiveness, this company targets a niche market with an emphasis on design and customised services to meet various customers' demands, as most of the leading companies in the sector pay less attention to product design. The company's owner had significant experience of working in the textile and trade businesses before establishing her own company, so she had already understood how to exploit the well-equipped infrastructures allocated in Daegu. Therefore, although the company's business strategy for targeting the niche market is quite a simple and basic approach in some ways, the company has a high level of turnover.

Figure 7-11 Main products

(Figure has been removed as third party copyright material)

Source: Hankookilbo (http://www.hankookilbo.com)

The locational advantage also is regarded as one of the important factors in the success of the company. Legally, any company within the industrial complex can get tax benefits, and easily secure professional employees from the college of Korea Textile and Fashion Polytechnic, which is located next to this company. In terms of technological support, two local intermediaries (KTDI and DYETEC) help analyse the products and then give feedback about any weakness of the products compared with the products of other rival companies, whereas other local companies frequently have research collaborations with this company. In this way, the company's owner acknowledges that the company's location is the paramount factor in facilitating its innovative activities.

With a less technological focus, company [F] made a notable effort to move into designing, which is closely related to the dyeing and processing technology, to provide a differentiated service. Therefore, they devote more time to design issues and tailored demands for international customers, which in 2016, numbered approximately one thousand. For this reason, this company recruited a substantial number of designers and sales and marketing personnel to target oversea markets, rather than focusing on production and the R&D team, who account for merely 20% of the total workforce. This is possible due to the technological supports (or research collaborations) from local tech-institutions and other local companies.

Regarding the sales promotion strategy, on the other hand, the company, as a newcomer to the market, attends around 30 textile exhibitions in the EU and the US each year. Instead of investing substantially in R&D, attendance at international textile exhibitions is crucial for improving business competitiveness. Meanwhile, with help from KOTRA, the company has also been able to invite potential customers to promotions of their latest model. Owing to such efforts in marketing and designing, their products are received with great enthusiasm in the microfibre market, in particular luxury brands like Louis Vuitton and OMEGA, as these expensive brands

want to provide some unique and customised cleaning clothes (e.g., engraved with customers' name) with their main merchandise.

7.2.2 Technical-oriented companies

This section will now analyse the specific characteristics of technical-oriented textile firms in Daegu. Since the restructuring process of the local textile industry by internal and external factors (e.g., increased labour cost, eliminated textile quotas, and new neighbouring competitors), a considerable number of local garment firms have been transforming their businesses to focus on technical-oriented textiles. Of course, this does not mean that they have completely changed their business structure, and indeed, most of the technical textile firms still tend to maintain their cloth-related business as a steady source of cash income; however, they have also steadily expanded into new business models (technical one) to reduce the business risk. Given the circumstance of being in transition, there are not yet many tangible outcomes and widely known innovative activities among these firms. Therefore, this study has chosen to focus on just three companies that have a long history in the field of technical textiles, and that have already introduced new and significantly improved technical textile goods into the market.

Table 7-2 The condition of technical-oriented firms in 2015 [Unit: one million won]

	Year Established	Turnover	Number employed	R&D expenses	R&D expenses / Turnover	Number patents (5 years)
G	1988	5,513	35	284	5.2%	-
H	1982	25,741	93	820	3.2%	10
I	1970	56,626	196	522	0.9%	2

Source: The Financial Supervisory Service

<Case G>

Company [G] was established in 1988 with a focus on the production of specialised endless felt for the textile manufacturing process. When the company was beginning its business, all domestic textile firms relied completely on imported endless felts from European and Japanese companies. This meant high prices, long delivery lead times, and the burden of stored goods. In order to remedy the adverse circumstances, the owner of this company decided to develop the localisation of endless felt, and finally succeeded in his goal. However, the company did not retain its huge profits for long, as Chinese companies were quick to catch up with the technical skills and so were able to offer that product at a reduced price.

The company, therefore, needed to seek alternative markets, and discovered that the endless felt could also be used in other industrial sectors after a process of refinement. Therefore, using technical advice and help from local textile intermediaries, the company attempted to develop multi-industrial endless felt. The research department in the company realised that aramid fibre has superb heat-resistant properties and tensile strength, so they believed that endless felt made from aramid fibre could be utilised in diverse sectors like the steel and paper making industries.

Figure 7-12 Site of company [G]

(Figure has been removed as third party copyright material)

Source: Maeil Newspaper (http://www.imaeil.com)

However, the problem is that the company lacked the technology and skills for making the endless felt. Given the size of the firm (35 employees and a relative lack of R&D work force and abilities), the research collaboration with other institutions was crucial.

After a seven-year investigation with a regional-based university, an industrial felt fabric was developed that could mainly be utilised in machines for making corrugated cardboard (see Figure 7-13). Before this company had developed this product, not only Korean firms but all foreign companies in the corrugated fibreboard industry had depended on one Japanese company, which had the exclusive technique for producing

single-facer felt that assisted in a quick paper feed. Therefore, this company's new item destroyed the Japanese firm's monopoly of the sector by providing a product at an even cheaper price.

Figure 7-13 Endless felts

(Figure has been removed as third party copyright material)

Source: Maeil Newspaper (http://www.imaeil.com)

With the expertise and skills necessary to produce the industrial felt fabric, the company continually launched new industrial felts, which were useable in the steel and electronics industries as well as being used for military-purpose clothing. To date, the two most prominent companies in the felt industry, in Germany and Japan, do not possess a multi-purpose product, as the German company's main product is an industrial felt for the woollen industry, whereas the Japanese firm focuses on producing paper industrial felt. Thus, this company is unique in making the felts for both sectors.

As a result, the change in the main product line and partial change of technique led to stable growth and market expansion, meaning the company has achieved a higher growth over the last two decades.

<Case H>

The flagship product of this company is a velvet fabric; indeed, the company's own velvet brand is widely known in the global market and is ranked first, having had the largest market share in the velvet section since the early 2000s. The owner's strong volition about R&D has contributed to these achievements, resulting in over 10 patents, which are deemed as core technologies for producing velvet fabrics.

Figure 7-14 Factories and shops in case company [H]

(Figure has been removed as third party copyright material)

Source: President Global Window Forum (https://president.globalwindow.org)

The company has been in business since 1960, but the current business model was formed in 1982. There are approximately 150 employees with a research team of 20 workers in 2016. Over the last 50 years, this company has been concentrating only on the production of velvet fabric as a source of steady profit which accounts for roughly 90% of the total turnover through overseas exports.

Regarding the business strategy, there was a turning point in the company's growth model (i.e., velvet product export). In the mid-1970s, the company was earning huge profits from the Middle East countries. However, there was a potential pitfall in that this company did not have the ability to produce the raw material of the velvet fabric (cellulose acetate fibre), and so was completely dependent on Japanese suppliers, who after witnessing the success of this company, went into the same business field. This meant the company could not receive sufficient raw materials in time from these rival companies, resulting in severe manufacturing delays. Therefore, a containment strategy by the Japanese corporations led to the necessity for the diversification and reform of the company's main products.

To resolve this matter, the company became immersed in the development of a new velvet fabric, using a domestic polyester thread, to achieve resource self-reliance. Meanwhile, this company also focused on resolving the drawbacks of existing velvet products (e.g., laundry problems) as at the time, velvet fabrics could only be dry-cleaned and could not even be hand-washed. After long-term research lasting 20 years, a new velvet product, made using a polyester thread, was successfully developed, and this supplanted the previous products and production methods, which had used cellulose acetate fibre from Japanese suppliers. In addition to this product innovation, the new item was able to significantly improve two aspects: 1) the price of polyester was lower than that of acetate, thus giving the company a price competitiveness in the manufacturing process; and 2) the item had improved persistence and flexibility, ensuring its washability and the preservation of the velvet colour after washing (see Figure 7-15). In turn, the firm has introduced more useful merchandise to customers and ensured the future success of the business.

Figure 7-15 Washable velvet products

(Figure has been removed as third party copyright material)

Source: Citymap (www.citymap.co.kr)

Since the 2000s, on the other hand, the condition of the company was made more complicated by the restructuring of the textile industry, so they tried to seek new business markets, which were able to use the velvet fabric as a raw material or use it in intermediary goods in other industrial sectors, thus diversifying their business model.

At that time, the new business development team in one of the major textile companies (SK) asked company [H] to collaborate in the production of a rubbing cloth for the LCD (Liquid Crystal Display) sector based on the velvet fabric. As the conglomerate did generally not pay attention to the smaller-scale businesses, which had an anticipated turnover of less than 50 billion Korean won (roughly 46 million US dollars), the team needed to find a client to whom they could sell their technology. In addition to this, in the 2000s, LG (one of the largest transnational companies in Korea) had built an LCD factory nearby. Thus, the owner decided to enter the technical textile sector as the first mover for a future growth engine, because most of the domestic textile firms in Korea did not realise that velvet would be required in the making of LCD panels as part of the process of cleaning them.

Despite the rapid movement into the market, the company was tardy in commercialising the prototype. However, meanwhile, the government coincidentally acknowledged the necessity of material localisation for reducing the dependency on imports regarding key manufactured parts, and the development of the LCD rubbing fibre was one of government's target projects. Therefore, this company participated in the project, and since then, the development process of the rubbing fibre has improved significantly. Given that it was a public project, it received significant financial and technical support from various institutions (e.g., large-size textile business corporations, universities, and public research agents). With regard to the technological entry barrier of the rubbing cloth, one Japanese company had already registered an international patent for a technique to produce such a cloth, but the new business development department (SK) helped company [H] to avoid the patented

technology through developing their own technique, which also successfully obtained a patent later

In turn, after over five years of research collaborations with diverse actors, this firm finally succeeded in the commercialisation of the rubbing fibre with another domestic small-sized IT company. As the major textile company, SK provided the original technology for the new rubbing fibre, for which they have the publication rights. Nonetheless, it led to a change in the business structure, and the discovery of a new and steady source of income that has led to a huge demand from buyers from the major domestic LCD companies like LG. With a penetration into the technical textile market, the proportion of technical fibres in the total sales turnover of this company is now approximately 50%.

<Case I>

Case company [I] was established in 1970, and is regarded as one of the largest/competitive SMEs (with approximately 200 employees) in Daegu on the basis of their main product lines, which are glass fibre and advanced composite materials.

Figure 7-16 Site of company [I]

(Figure has been removed as third party copyright material)

Source: Newsmin (http://www.newsmin.co.kr)

Having the advantages of long experience and a wealth of expertise about glass fibre, the company has been expanding their business model towards the renewable energy sectors due to the owner's entrepreneurship. The founder (owner) of this company had a strong business philosophy, which involved cultivating technological independence from other major and foreign companies, and investing over 3% of the annual turnover in R&D and equipment investments in order to retain product and technological competitiveness. As these capacities can facilitate business diversification, the company [I] consists of four affiliates according to its business purposes (e.g., energy, textile, precision machinery, and automobile).

The company's most lucrative business is manufacturing automobile parts whereby glass fibre is used in a unique technique for making automobile insulation (see Figure 7-17).

Figure 7-17 Insulation parts for vehicle

(Figure has been removed as third party copyright material)

Such items have been supplied to diverse domestic and international automobile corporations, as they have the advantage of outstanding durability and heat-resistance that is crucial for reducing the overall noise of vehicles.

Another main product is an advanced textile material that can be utilised in the blades of wind-driven generators and high-pressure vessels. Historically, the green-technology sector is dominated by a few international companies, yet this near oligopoly was broken after this company successfully penetrated the market with the new material. The technological competence required to produce unique cutting-edge fibre materials using glass-fibre resulted in the company obtaining the technical certification from the US, Germany, and other advanced countries in the green-technology sector, thereby contributing to the wider promotion of the company's products.

Last but not least, this company became very famous following the introduction of a textile material for the aerospace industry in 2013. The local textile intermediary KTDI recognised the company's excellent research ability and their flagship item (glass fibre), so asked them to develop a high-strength fibre which would be compatible for use in other industrial sectors (see Figure 7-18). This is a record-breaking occasion in that a newly developed textile material was successfully applied in Korea's first space launch vehicle as an important material part. Given that the aerospace industry is one of the most advanced technological fields, the technological superiority of this textile company astonished the world, and contributed to overcoming a prejudice about both SMEs and the low-tech sector.

Figure 7-18 The technical textile for the space launch vehicle

(Figure has been removed as third party copyright material)

Source: JoongAngilbo (http://news.joins.com)

7.3 Summary and Findings

7.3.1 Technology, innovation and patents in SMEs in the low-tech sector

Seven out of nine innovative corporations have applied for textile patents over the last five years. Yet, the influence of patents on technological development does not seem significant, even though the patent application is regarded as a good indication of knowledge creation (i.e., innovative activities). Interviewees demonstrated a common view that a patent in the textile sector is indefensible and is less useful for improving a company's technological competence and sales growth, unless it is related to the invention of new raw material that requires advanced technology, long-term research, and significant levels of research funding, with such circumstances occurring mainly in multinational and major corporations like DuPont.

The reason most of the managers in textile corporations have a lukewarm reaction to patent applications is that many of developing countries still tend to tolerate unauthorised use of patents for making imitation products. Indeed, an interviewee in the technical textile company [I] (Interview: October, 2016), which developed the new material for the aerospace industry, also commented

> The company does not feel a huge need to apply for the patent because of technological openness issue. If the company applies for the patent, our unique technology and skills are open to the public during the patent examination, thereby running the risk of the technology being leaked to other rival companies.

In addition to this problem of technology leakage, there is a perennial problem pertaining to the law of supply and demand during an initial stage, new and improved products are generally set at a higher price compared with existing goods. It indicates that if the customers and the market do not seek better goods due to an overinflated price, SMEs (particularly smaller-sized firms) have no alternative but to continually

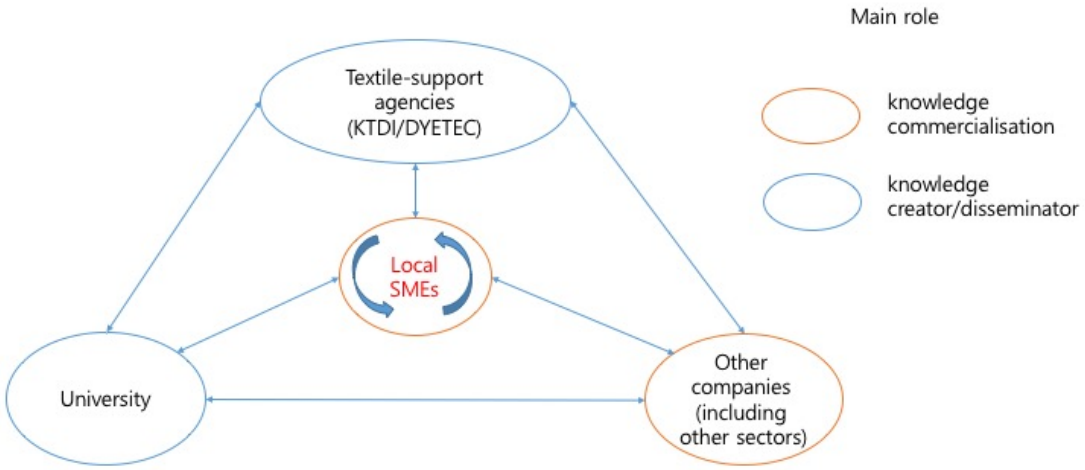
produce and maintain previous products rather than develop improved products, otherwise they might face severe financial difficulties. In other words, most textile SMEs, which suffer from a lack of financial resources, seek and produce the merchandise that will make instant profits rather than investing in innovation.

Under such circumstances, local textile companies, in particular garment-oriented businesses, tend to focus on the market extension towards overseas countries with slightly improved rather than totally new products. Therefore, the innovative activity of those companies inevitably prefers a partial change (an incremental innovation) that combines an existing technology and material in a somehow different way so as to form new products in light of global market trends. Apart from a few regional textile companies, most of the local businesses do not possess the technological competences required for creating totally new products, so the creation of trendy items in the fashion industry by making minor modifications of existing goods is more fruitful (i.e., focusing on commercialisation rather than on basic R&D). In this sense, as seen in company [F], many regional companies in a middle-stream position tend to focus on design and trademark registration rather than on the patent application. Therefore, it clearly demonstrates that smaller-sized firms carry out and focus on incremental innovation, rather than radical innovation on account of their nature (e.g., technological and financial deficits).

Despite some negative views of the patent process in the sector, several companies have actively applied for and registered their patents as an effective means of promoting their brand awareness. A semantic element of the patent is to manifest a differentiated product and process, so the patent per se implies the technological credit of the company. According to an interviewee from case company [D], when the company were promoting their products to other foreign companies in the exhibition, customers often asked them how they could trust the company's merchandise (i.e. quality of products) due to mainly the low level of their brand-power and credibility in the global market. Thus, they decided to exploit their patent records to demonstrate their technological excellence and so convince foreign customers of the superiority of their products. As a result, this patent-marketing yielded good results in that it gained the company several contracts at the exhibition.

In terms of technology development, all of the case corporations have somehow received help from two local textile intermediaries. The changed role of public R&D projects that dictate that the local company must be involved in the project as a key unit, whereas the intermediaries can be only a participating agency (see Chapter 6 for more detail) means that many local innovative firms became more eager to collaborate with other textile stakeholders to accomplishing ambitious aims. While some of firms have their own unique ways of making their main goods, most local SMEs have created new products due to research collaborations with others (e.g., universities and other major/SMEs). As seen in Chapter 3 (policy review), in particular, the relationship between university and industry was improved by the government initiatives, so regional universities as a beneficiary of the government scheme have steadily strengthened their research competence, and have been encouraged to collaborate with local SMEs. Under the improved environment in which the development of the RIS actors has been facilitated, the case companies, [E], [F], and [G] have received technological support from universities located not only in Daegu, but also in other provinces, such as Ulsan. Therefore, the knowledge flow of the textile industry in Daegu under the RIS (and government R&D schemes) can be illustrated as in Figure 7-19. Intermediaries and universities who have received financial subsidies for supporting SMEs are viewed as knowledge creators and disseminators, whereas local textile SMEs and other business groups (e.g., major/SME corporations in other sectors) not only share their knowledge with local textile firms, but also produce their own items by collaboration with other stakeholders under the RIS architecture. As the structural peculiarity of Daegu's textile industry mainly concentrates on the middle-stream, there is a limitation in exploiting such extensive knowledge. Therefore, companies in other sectors or other textile streams can also utilise the accumulated knowledge which has been created by public R&D projects and research collaborations with others.

Figure 7-19 The knowledge flow of the local textile industry



Source: Author

7.3.2 The emergence of younger generations in the local textile industry

With increasing collaboration, the improved atmosphere, which frequently comes and goes between local stakeholders, is closely related to the change of generations in Daegu's textile industry. An interviewee from company [G] had pinpointed that the previous generations, who had established their textile businesses in Daegu, were mostly too stubborn to change on account of their past achievements and high self-esteem. The older generations had steered their companies through difficult times, so they tended to draw heavily on their personal experiences (e.g., animal spirit), thus neglecting advice from others.

Such high self-esteem has been a serious impediment to forging good relations with other local stakeholders, especially with local intermediaries (Cho and Hassink 2009), thus hindering the overall revitalisation process of the local textile industry in some ways. In contrast, the younger generations are likely to be more open to having joint projects and collaborations with other parties, who have the knowledge and skills they need. Through conducting in-depth interviews with individuals from nine textile firms, this study identified several factors that have fostered the regional and industrial upgrade.

First of all, all the case corporations are operated by members of younger generations (2nd and 3rd) of owner families, except the newly-established company [F]. The corporate succession of such small-sized firms is one of the pivotal factors in facilitating innovative activities. According to a sales executive of company [A] (the owner's son),

> Most of the local textile firms in Daegu are of a smaller size. There are mainly two types of business owners. The first owner (founder) group does not have the will to cede the management rights to the next generation, so intend to wind up their businesses in the near future. In this case, there is no further investment in the company. Meanwhile, another type of owner wants to turn over the business to their son or daughter, and so invests widely in R&D, marketing, and equipment upgrades to strengthen corporate competitiveness. Most of the successful and innovative textile firms in Daegu belong to the second type in which the old generations (owners) also have paid more attention to and have more affection for their businesses (Interview: November 2016).

With the change of generations in the local industry, the entrepreneurship of those companies also has undergone a change in that most of younger generation have had experiences of studying abroad and have sufficient English skills, so that they tend to show great enthusiasm for R&D and international sales and marketing. Compared to their parents, who were given to generally focusing on the domestic market, the younger generations have the ambition of expanding their businesses towards the overseas market and the technical textile sector.

By conducting interviews with members of the younger generations of case companies [A/C/E/G/F], this study was able to show that the local (innovative) textile companies paid attention to the overseas market once the younger generations began to participate in their respective companies' management. The common reason for entering the global market is the limited domestic market. Their parents'/grandparents' generation were not very concerned about the market competition in that the central government had selected the textile and the dyeing industries as protected industries (see Chapters 5 and 6 for more detail). Therefore, most of the domestic textile firms could securely deliver their goods to other industrial sectors in Korea, which for various reasons needed textile materials for their final goods. After the Asian economic crisis and the end of textile quotas at the end of the 1990s and early 2000s, however, circumstances

constrained the local textile industry to enter into the unfettered free market, thus leading to the restructuring process.

Such external factors along with the change in the production system from one of Fordism to a more automated and customised system, because of losing the cost advantage, affected the domestic and local textile industry and led to demands for the reformation of companies' management. With regard to internal issues, since the free market liberalism in the 2000s, domestic clients are able to make better contracts with foreign neighbouring companies due to the price advantage. Besides, the attitude of the central government towards the textile industry in Daegu has also changed to become a more negative one. According to interviews with the central-level policy makers, the textile industry is no longer regarded as the only key industry in Daegu, because other endogenous industries have increased their importance in the local economy since 2000 (see Table 7-3 below).

Table 7-3 The industrial structural change in Daegu

Type of business	No. of firms		No. of employees	
	1999	2013	1999	2013
Textile industry	1,191	730	45,206	20,649
Fabricated metal products	270	687	7,522	17,717
Automobile parts	250	295	14,342	19,610

Source: The National Statistical Office

Therefore, the local textile firms and other stakeholders were required to make changes to their management behaviour and business profit models under the changed environments. Meanwhile, such difficult times in the local textile industry led to the emergence of the younger generations. Due to the crisis in their parents'/grandparents' businesses (i.e., financial difficulty), many members of the younger generations returned to Korea from overseas, and then participated in the family businesses and

improved their international sales and marketing departments owing to their overseas experiences. So, local companies have steadily paid more attention to the global market after the emergence of younger generations. In this sense, the restructuring between the end of the 1990s and the middle of the 2000s was also regarded as the period in which management was passed from the older generations to the younger generations, with this eventually becoming a turning point in the local industry.

This study also revealed the trend for companies to downsize following the emergence of the younger generations. Three [C/D/E] out of the nine corporations had changed their name after transforming their businesses from artisanal manufacturing to factory automation with a focus on technological competence. Company [D] is a typical case; it had significantly reduced the number of employees and then transformed its business to focus on the more valuable elements. The number of employees in company [D] in 1970-80s was approximately 2,000; however, the company steadily reduced the number of employees, ending up with approximately 50 in 2016. Notwithstanding the significant reduction in the workforce, the company's research team still accounted for over 30% of the entire workforce with the aim of targeting niche markets and providing improved goods to customers. Therefore, the emergence of the younger generations resulted in new dynamics in the local industry, a factor that was crucial to the restructuring process.

However, it should be borne in mind that the intention of this research is not to blame the older generations in the local industry. Rather, while it is recognised that the younger generations have produced a significant change in the local industry, boosting innovative activities, it is important not to underestimate the contribution of the older generations to the local economy and to their businesses. An interviewee in company [H], who had over 20 years' experience in the local textile industry, also highlighted that most of the successful textile companies in Daegu have a long history, which implies that such companies owe a great deal to the outstanding management ability of the older generations, who then turned their businesses over to the younger generations in a far better condition than had their parents' generation. The former generations' persistence is regarded as a key intangible factor in the survival of the small-scale local textile companies in the face of fierce competition in the market and

unfavourable external factors. Given the structure of SMEs, which are managed mainly by owners and a few directors, the older generations' entrepreneurship and insights have clearly contributed to the successful management of their companies. In this respect, one experienced professor in the local university pointed out that the younger generations, who have come into the company after their parents, do not have the same challenging spirit and tenacity for the company.

Hence, it is a false dichotomy to suggest that the younger generations always develop more innovative and creative ways, whereas the older generations are trapped in outdated ways of thinking and behaving. Instead, this study asserts that the beginning of the business management by the younger generations has also been accompanied by a change in the relations between local stakeholders (thereby facilitating RIS), and the stimulation of the business upgrade towards higher-value models and the market expansion under the well-established business structures made by their parents'/grandparents' generation.

7.3.3 Summary

This chapter has addressed the innovative and evolutionary methods of local textile companies with a focus on a micro dimension. Given that Daegu's textile industry is now in a transition towards a structural upgrade, the company case study approach was needed to analyse two different groups, namely, garment and technical-oriented corporations to trace the pathways of their evolution. Table 7.4 below summarises the features of how the case companies could strengthen their business competitiveness after the restructuring.

Table 7-4 The features of the nine case corporations regarding methods of survival

Case	Characteristics
A	collected trends in the fashion/textile industry from exhibitions substantial R&D and equipment investments during the recession, preparing for an uncertain future

B	targeted a specific niche market; the selection and concentration strategy for only eco-friendly goods
C	seized great chances, introducing their brands to overseas markets through the president's trip the expansion of business model towards technical textiles
D	transformed their business from mass production to technological products with a drastic retrenchment of its size
E	focused on small quantity batch production, thereby improving technological competence
F	concentrated on design and marketing exploited the well-established infrastructures and resources in the textile clusters of Daegu
G	the first to strike an unformed market using specialised products frequent research collaborations with other knowledge providers
H	long experience in velvet fabrics changed ideas of how to apply velvets to other industries under robust financial conditions
I	secured technological advantages in fibre fabrics (tech-oriented SMEs); made lavish investments in R&D / business diversification

Source: Author

Three main factors have facilitated the revitalisation of the textile industry in Daegu. The first one is a sense of crisis since the beginning of the restructuring process. The local textile industry used to depend strongly on the central government, thus creating inertia or a sense of political lock-in, as public policy had historically rescued Daegu's textile industry from unfavourable environments since the 1960s, e.g., "rationalisation

programmes" (see Chapter 6 for more detail). In the same manner, the first revitalisation scheme (MP) had bailed the local textile companies out of financial difficulties by the use of significant subsidies so that the proportion of such a bailout subsidy to the total working expenses in the first stage was approximately 40% (bailout for local SMEs: 250 million US dollars / total working expenditure: 624 million US dollars).

With the start of the second scheme, however, the local industry was criticised by policy makers and local citizens owing to the poor outputs of the first scheme, thus resulting in huge cutbacks in financial support. Moreover, the rapid growth in other endogenous industries, such as fabricated metal products and automobile parts (see Table 7-3), endangered the solid position of the textile industry in the local economy. Indeed, the local textile industry took a dominant position over other local industries under restructuring, indicating that local textile firms had to change their behaviours if they wished to survive in the market under unfavourable circumstances.

The second factor stimulating the regional upgrade was the advent of the younger generations, who led a change in business policy. Thanks to the overseas experiences of the younger generations, many local firms expanded their businesses towards overseas markets by targeting specific niche markets that could be identified mainly by firms participating in international exhibitions. In particular, such a strategy can easily find local clothing-oriented corporations in that the final products of the garment industry are less likely to accompany advanced technologies. Instead, quality improvements, punctual delivery, and functional fabrics are regarded as more important factors to foreign customers (Interviews with local firms and intermediaries, October 2016). Therefore, the local textile companies attempted to adopt the tailor-made strategy to meet various customers' demands with focuses on quality control and prompt delivery, rather than on cost, which had become largely irrelevant.

Last but not least, the public R&D projects under the RIS are crucial for improving technological development in the local corporations. The increasing importance of R&D and technological competence has prevailed mainly among technical-oriented companies for applying the textile materials to other industrial sectors. However, while

technological advancement is inevitable for transforming the low-tech industry into a high-value one, local textile firms did not possess sufficient ability due to a relative lack of R&D workers and of cutting-edge equipment. For this reason, the local innovative textile companies have been actively involved in government projects, which are aimed at developing new and improved textile materials or products by supporting financial aid, as public projects provide good opportunities to carry out research collaborations with diverse regional and national textile interests who generally have better research environments. Through such projects, local SMEs can gain not only research support from others, but also valuable insights through working with diverse participants. Indeed, case company [E] has developed new products by carrying out the government's project in conjunction with other institutions. Thus, public projects per se are playing the role of the node in fostering innovative activities in the local industry.

Chapter 8 THE ROLE OF THE KOREAN GOVERNMENT IN THE POST DEVELOPMENTAL ERA

8.1 Introduction

This chapter depicts the current role of the Korean national government, using the case of the restructuring process. The changes in policy measures to revitalise the regional economy and to facilitate innovation systems can show how the national government's participation in the regional economy changed after a seismic shift in Korea's socioeconomic milieu at the end of the 1990s. Compared to the majority of research analysing Korean society in the developmental period from the early 1960s to the late 1980s, there is a dearth of studies on the sequel to Korea's developmentalism (except for Shin and Chang 2003; Pirie 2007; Park et al. 2012; Chang et al. 2012; and Kim and Kim 2014), especially with regard to the role of public policy in regional issues. Thus, the aim of this chapter is to narrow this gap, thereby attempting to establish a normative model of the post-developmental state.

The previous two empirical chapters explained how intermediating agencies helped improve the local textile industry (Chapter 6), and how local textile firms strengthened their market and technological competitiveness (Chapter 7) mainly following the second phase of the restructuring in which the unfavourable circumstances inevitably triggered a survival motive in both regional interests (i.e. mediating agency) and the private sector. In addition, the previous chapters looked at the evolutionary process of two main regional actors in the restructuring process, whereas the primary concern of Chapter 8 is to ascertain the changed role of the Korean government in the post-developmental era (or in the Neoliberalism era), drawing on the 2nd and 3rd restructuring schemes in Daegu's textile industry. Thus, this chapter deals with the evolution of the Korean government system itself since the end of the 1990s. Therefore, it is necessary to employ a mixed narrative approach and an empirical study in order to explain the comparison between the early and later models of the government's measures against regional issues and innovation systems.

To understand system and regional development policies of the current Korean national government, this chapter first reviews the characteristics of the contemporary

socioeconomic status (referred to as the post-developmental state), providing an overall picture of how to work the regional restructuring process and innovation systems within the centralised government system in the following section 8.2. It may also explain why the Korean government has always played a crucial role when pursuing the nation's economic development and now regional revitalisation.

8.2 The emergence of the post-developmental era

As seen in Chapter 3, which discussed the developmental state and policy intervention, the earlier model of the developmental state mainly devoted limited national resources, such as financial aid, to selected industries and enterprises to enhance the nation's rapid economic growth and structural change.

However, beyond the success story of structural change and a rapid economic catching-up by state-led macroeconomic planning, there was some unavoidable damage. For example, one of the representative negative cases is that the previous "selection and concentration strategy" had inevitably resulted in severe socioeconomic disparities between thriving and decaying cities and in the nation's industrial structure, which included the business sector, between large- and small-sized corporations. In this regard, one interviewee noted

> Under "the Comprehensive National Territorial Plans" (*guktochonghapgyehack*) since the early 1970s, a number of manufacturing regions (e.g., shipbuilding industry in Ulsan, machine industry in Changwon, and electronics industry in Kumi) were deliberately developed by the central government to create large scale industrial clusters and expand the infrastructure facilities as the dynamic force of national growth. Meanwhile, the condition of unselected regions, where they did not have specific key industries contributing to the nation's trade surplus and where they were mainly unfashionable industries (e.g., agricultural industry), had been getting worse (Interview: a professor in the local university, November 2015).

Therefore, alleviating such regional matters and achieving a more balanced regional development became a priority of the policy making agenda after the Kim Dae-jung administration. There was a growing belief in academic and policy circles that

narrowing the gap in power between the capital area and the rest of the country was a viable option for sustainable economic growth. One interviewee commented

> Balanced development of different parts of the country (i.e., the upgrade of peripheral regions' competitiveness) will help reduce the problem of regional inequalities, and also provide a new (economic) growth engine. Given the relatively smaller size of the nation's territory, compared to neighbouring countries (e.g., China, Russia, and Japan), resolving uneven regional development is an imperative need (Interview: Central-level policy maker, November 2015).

On the one hand, because of the poor financial and innovative conditions of most of the regions in Korea under the deep-rooted centralisation, it was inevitable that the central government would be involved in the overall regional issues including the regional restructuring process, as local interests and authorities could not conduct an independent development themselves. In other words, the state-led model is still available for the economic development and the structural change at the regional level. Such a circumstance means that policy makers at the central level apparently do not give up their authority over the regions, keeping the strong bureaucracy, as mentioned by Hassink (2001, p. 1392)

> Central government officials are often not willing to give up decision-making authority to lower levels of government and are reluctant to devolve power to the regions, as they fear that regional policy-makers lack the capacity to devise and implement sound policies.

On the other hand, although the government still exerts a powerful influence over all the regions, the approach to regional policies was altered in light of the global atmosphere in which neoliberalism has dominated policy circles across the world (Peck and Tickell, 2002). Under the changed socioeconomic environment, it seems no longer acceptable or indeed possible to manipulate international financial markets (e.g., trade and foreign exchange controls), and to artificially nurture specific winning enterprises and industrial sectors in accordance with the government's macroeconomic plan on account of the regulations of supranational organisations, such as the World Trade Organisation (WTO) subsidies and countervailing measures. Therefore, the government-led regional restructuring work would not have been possible without changes in the previous form (i.e., developmentalism); thus, "regional-oriented" policy,

which hugely reflects the views of the local community, was initiated after the term of President Kim Dae-jung.

The initiation of the regional-oriented policy is deemed to be a seismic shift in the government system and the innovation systems, which saw the RIS emerge from the NIS (national-oriented innovation form). The local self-government system in Korea disappeared in the 1960s, during the Park Chung-hee government, but re-emerged during the political decentralisation in the mid-1990s. Over the last three decades, there have been no regional authorities even though local elections were resurrected in 1995. This means that local residents could not elect their own mayors, governors, and councillors until 1995. An interviewee also mentioned that President Kim Dae-jung made a decision of major political significance

> The regional policy in Korea was divided two periods based on before and after the Kim, Dae-jung administration. Before his regime, the impact of nation's industrial and economic policy on regional socioeconomic was puny. Indeed, the government could not pay attention to regional issues. Instead, the policy maker has focused the establishment of (hard and soft) infrastructure necessary for the nation's industrialisation by the end of the 1970s, and the rearrangement of industrial clusters and key industries until the end of the 1980s. In the 1980s, a massive investment in the heavy and chemical industry without strict regulations during the earlier industrialisation period resulted in overlapping investment and a large number of insolvent companies, thereby reducing the industrial competitiveness, and hampering economies of scale. Therefore, rearranging the industrial structure was a top priority. However, at the same time, since 1980, the regional disparity between urban and rural areas emerged as a significant socioeconomic issue. Many provinces (i.e., small- and medium-sized cities and farming and fishing towns), which have not received sufficiently policy benefits from the central government, demanded the industrialisation of rural and peripheral communities to the central government. So, small- and medium-sized industrial clusters located in a few industrial cities were rearranged into several provinces […] the Kim Dae-Jung administration marked a beginning period of regional policy. The Asian economic crisis at the end of the 1990s was a trigger for balanced regional development, thereby seeking endogenous regional development that also contributes to the national economy. Therefore, the government has initiated the cluster-oriented regional development in older industrial areas, and established Regional Innovation Systems (RIS) through university reform and institutional supports for self-sustainable growth in regions, and for boosting the existing clusters. This regional policy referred to "the promotion policies of regional strategic industry

(*jihyukjeonrackjinheungsanup*)", which was regarded as the first regional industrial policy. (Interview: Senior policy makers, December 2015)

As seen above, the Asian financial crisis in 1997 was deemed as a radical event which led to structural changes in both the public and the private sectors. I also alluded to the negative consequences of the Asian economic miracle (e.g., Korea's rapid economic growth, called "the Miracle of the Han River"), thereby stopping the benefits of the previous developmental state model, which had been hailed as a panacea for economic and industry restructuring over the past few decades. Choi (2012, p. 87) described this situation, saying it was 'as if the failure of the crisis-afflicted Korean economy was predestined'. Neoliberalism, in turn, came with a newly devised framework in Korea's socioeconomic policies, as happened in Western countries with globalisation (Peck and Tickell, 2002).

However, it is not easy to quickly and completely transform the government and other related systems because of the embedded social practices. Arguably, even though a new wave of socio(political) economic systems came into the policy circles in Korea, the vestige of the previous developmental state still remains (see, e.g., Lee, 2009; Choi, 2012; Chang et al., 2012; Park and Lepawskey, 2012). My own experience, which was gained through a field study on the case region over eight months, also concurs with these studies. Policy makers and regional stakeholders strongly believed that it is impossible to radically transform the government system and policy-making process from a top-down to a bottom-up approach. Indeed, the regional restructuring scheme has been showing that it is closely related to the framework of the "post-" developmental approach (as seen in Chapters 6 and 7). In some ways, this contention that the government-led development model in Korea was not fading away and instead continually evolving is also supported by Yeung, who noted:

> Empirically the developmental state simply does not and cannot whither away completely in the East Asian economies. (Yeung 2016, p. 26)

Under the circumstances, a new type of developmentalism in East Asia is often linked with post-developmentalism (Yeung, 2016), the neo-developmental state (Cho, 2000), developmental liberalism (Chang et al. 2012), developmental neoliberalism (Park et

al., 2012), and new developmentalism (Bresser-Pereira 2011) in light of the contemporarily socioeconomic milieus. In particular, such a political phenomenon can easily be seen in middle-income countries where they have already accomplished some remarkable achievements with regard to the economic and industrial revolution (Bresser-Pereira 2011). Therefore, the recent stance of the Korean government regarding industrial and regional policy seems to be a combined structure, which is being intertwined with two forms of liberalism and developmentalism. This integrated government model is actually quite common, as has been argued by other researchers (Harvey 2005; Peck and Tickell 2002; Choi 2012; Park and Lepawsky 2012). In other words, neoliberalism per se is not a purely conceptual entity in that it is being combined with other frameworks as mentioned by Harvey

> Neoliberalization – opens up possibilities for developmental states to enhance their position in international competition by developing new structures of state intervention. (2005, p. 72)

Notwithstanding such academic explanations about neoliberalism, however, the problem is that most (East) Asian studies have a propensity to overemphasise neoliberalism without any consideration of the entrenched conventions (i.e., the developmental state). Exceptionally, a number of scholars have noted Korea's current government model. For example, this hybrid model of the Korean government is expressed as 'developmental neoliberalism' (Choi, 2012), which basically pursues market mechanisms with a burgeoning interest in lagging regions, yet its operation is still that of state intervention. In a similar vein, the term 'neo-developmental regime' is widely used (Cho, 2000), implying that while the state was principally pursuing the growth-oriented scheme, its policy-making manner became more democratic. Therefore, the state's overall regional policy since 1997 can be seen as a mixture of developmentalism and neoliberalism with a combination of top-down and bottom-up policies. In the next section, we will see how the government and innovation systems have been changed, and what the differences are between the previous and the current models.

8.3 Regional innovation system in the post-developmental era

As reviewed by Yeung (2016), Korea's conglomerates, such as Samsung and Hyundai, have possessed market and technological competitiveness in the global market since the Korean government intensively nurtured the system of picking winners, thereby eventually enabling the expansion of their businesses overseas on the grounds of established networks and product and research competence[13].

However, given the circumstances in uneven regions where they are suffering from a severe lack of resources and of innovative actors (e.g., research organisation, universities and labour market), the Korean state had an inevitable duty to partially intervene in improving the poor conditions of such regions. One local interest argued:

> Nobody paid attention to such decrepit industries and industrial regions, implying that there was almost no help from external forces (e.g., FDI). In this situation, the local textile stakeholders in Daegu have had a tendency to resort to the central government, though the level of the local authority has been steadily increasing. (Interview: local textile owner, October 2016)

SMEs- and low tech-dominated regions, such as Daegu, still need the help of generous support from the central government. The sudden collapse of the local economy and the labour market is also undesirable from a central government point of view, hence the pursuit of structural change by the promotion of other local industries or the upgrade of lagging industrial sectors. This task is one of the government's principal roles, as it has to intervene to protect them from the failure or fluctuations of the markets. Hence, the legacy of developmentalism, which has a strong central government with a higher level of resources, such as financial conditions and public research institutions, is by nature easily witnessed in entire regional policies (i.e., regional innovation and industry policies).

Under the circumstances, Korea's regional innovation system shows unique features compared to the Western economy countries. As seen in the literature (Chapter 2), the

[13] This does not mean all their business competence was derived from government aids.

concept of RIS has been widely used in Western decentralised countries (e.g., Italy, Germany, Sweden, and Norway), yet it is not completely applicable to a centralised country, such as Korea, owing mainly to the very weak authorities of the regions. In the following section, therefore, we need to look at the characteristics of Korea's RIS and the policy influence over the system.

8.3.1 The feature of Korea's regional innovation system

Under the centralised government system, Korea's RIS has been evolving in a unique way, and its conceptual meaning also is slightly different compared to the Western economy.

> At the end of the 1990s, a couple of government research institutes (GRIs) (e.g., Korea Institute for Industrial Economics and Trade) were conducting research on a Regional Innovation System (RIS), so as to pave the way for stimulating regional clusters. Yet, some of researchers argued that the framework of RIS was so vague it was not certain whether it could apply to Korea because there was almost no empirical evidence in the context of East Asia. The regional institutional condition of Korea was entirely different compared to well-renowned Western RIS cases (e.g., Silicon Valley), as there were almost no outstanding private research laboratories and research-oriented universities. Furthermore, most of the key regional industries were low-tech sectors with a mass production system that was far away from any innovation activities. In the meantime, the Ministry of Trade, Industry, and Energy (MOTIE) was also looking for a new regional policy framework in light of President Kim Dae-jung's political commitment, in which the special law on balanced national development was legislated by the Kim administration with the aim of national unification. Thus, policy makers needed a more regional-oriented policy tool which could show differentiation compared with the national industrial policy. Indeed, Korea's centralised government system could technically run the revitalisation process of all the regions by only the central-level initiative. Under the circumstances, the MOTIE and GRIs discussed the rationale of the RIS framework as a means of regional development and restructuring and then eventually accepted it in 2001, despite being conceptually obscure. Hence, the RIS has become a crucial policy tool, and has been at the forefront of the regional restructuring process. (Interview: a director of the government-research institution, December 2015)

In this regard, Korea's RIS is considered a more eclectic concept designed to deal with overall regional policies, whereas the conceptual meaning of RIS to Western scholars tends to accept more strictly that the system requires a properly functioning

institutional system and learning process between innovative actors within the regional boundary.

Therefore, Korea's policy-oriented RIS has been sensitive to each administration's policy directions. For example, there is a correlation between the Roh Moo-hyun (2003 – 2008) and the Lee Myung-bak (2008 – 2013) regimes with regard to their principal view of not only the process of regional development, but also the cognisance of RIS. For example, the RIS of the Roh administration was a means of balanced regional development by stimulating regional innovative actors.

> President Roh attempted to establish innovative nodes of each region equally under a policy line of 'Balanced National Development', thereby aiming at both remedying regional disparities and strengthening regional innovation competence. Thus, his government implemented the construction of "the Innovation Cities" (*Hyuksin dosi*) in 10 provincial cities where 175 public institutions located in the Capital area were supposed to move into those 10 regional cities to mitigate the centralisation of Seoul Metropolitan Area and the establishment of regional key nodes, as generally, public institutions possess much better research abilities than regional-based organisations. So, rearranging the existing public organisations in provincial cities to create regional dynamics was a way of improving the RIS (Interview: a senior civil servant, October 2016).

This study also can evaluate President Roh's strong belief in "balanced" national development, as the Presidential Archives (http://archives.knowhow.or.kr/) show that he frequently made public speeches about the nation's balanced development achieved through establishing a robust system of regional innovation that was the top priority of his administration.

In contrast, the RIS approach of the Lee regime was regarded as a way of achieving the nation's macroeconomic development by improving regional competitiveness, implying that the regional balanced development was applied selectively. To some extent, his government cared about regional equality, yet his basic political stance, which preferred a small government to a big one, showed a passive attitude to the issue of social inclusion (e.g., regional development, welfare, and so on). Unlike his predecessor, the overall regional policy was also concerned about the 'development' rather than the 'balance' (Cha, 2017). For this reason, his administration extended

regional economic blocs largely to facilitate the interplay between regional innovative actors, but it did not artificially take action to support the institutional setup of RIS (e.g., Innovation Cities in the Roh regime). Table 8-1 summarises the features of RIS in both the Roh and the Lee regimes.

Table 8-1 The feature of RIS in the Roh and the Lee regimes

Category	Element	The Roh regime	The Lee regime
Actor	Key innovation actor(s)	The central government	The central and local governments
	Key actor's attitude to regional innovation actors	Enthusiastic	Passive
System	The relationship between the central and local government	Hierarchic (the centralised system)	The decentralisation system
	Facilitator in regional innovation actors	The central-level public institutions	The local-level public institutions

Source: Adapted from Cha 2016, p. 50

8.3.2 Regional economic integration

Basically, Korea's policy orientation is very changeable, as the national government ministries tend to reflect the newly elected president's will in the policy. In 2008, President Lee Myung-bak, who came from the private sector (a former CEO of Hyundai Engineering & Construction), established the newly formed regional policy, focusing on enlarging the economic scale of the regions (i.e., regional economic integration or regional economic blocs). It was a top priority of the regional development policy in his regime from 2009 to 2013 (known as *kwangyeuk*

gyungjaekwon sundosanup yukseoung). The aim and characteristics of the regional policy in the Lee regime can be derived from the interview data.

First of all, the reason why his government concentrated on regional economic integration is that according to the Lee government,

> A former city-based regional development and innovation policy was inefficient for achieving fruitful outcomes in that a diversified investment into a relatively higher number of target regions (16) for gratifying regional demands was likely to present an obstacle for expanding the regional economic scale. Thus, the government viewed the enlargement of the economic size of each region as crucial for improving regional competitiveness (Interview: a senior civil servant, November 2016).

Because of President Lee's previous career in the private sector, his regime emphasised the actual growth, which was a slightly different view compared to that of his predecessor. The main aim of the regional policy of the previous government, that of Roh, was commonly referred to as a 'Balanced National Development Policy' (*Gukga Kyunhyung Baljeon*), which was designed to alleviate social and economic inequalities between the capital region and other regions. Yet, the Lee regime imposed de facto regional growth by promoting local strategic industries, thereby facilitating regional competitiveness. This growth-driven regional policy by the reformation of the regional economic bloc in the Lee regime was called the 'Regional Development Policy' (*jiyeok baljeon*). In this regard, one policy maker mentioned

> Binding large provincial cities and their neighbouring towns altogether may provide access to more innovative resources in the regions. One of the severe problems in Korea's regional innovation system is a lack of critical mass (e.g., work force, research organisations, etc.), making it difficult to conduct innovation activities. This hampers attempts to establish the well-structured form of RIS, so the structure of Korea's innovation system is strongly dependent on the NIS. In this regard, the aim of making large-sized provinces by regional economic integration is to alleviate the paucity of innovative resources, thereby easily providing access to innovative materials available in the surrounding cities due to improved networks. (Interview: a central-level policy maker, November 2016)

In addition to the issue of economic scale, the changed spatial structure was concerned with reducing the conflict between several neighbouring cities[14]:

> When each region selects up to four local strategic industries for applying the central government aid, a number of neighbouring cities often draw up a list of the same key industries, such as the automobile and bio-technology industries. As promising industries rather than unfashionable sectors are more likely to contribute to the local economy, regional stakeholders submit only particular industrial sectors, but with no consideration of their capacities. (Interview: a central-level policy maker, November 2016)

The dissonance between Daegu's and Gyungsanbuk-do's stakeholders was one of the representative examples. The two regions are quite close to each other. Technically, Daegu is considered to be part of Gyungsangbuk-do (Dongnam economic bloc in the Lee regime, see Figures 8-1 and 8-2). Therefore, some of the textile stakeholders in Gyungsangbuk-do had participated in the first restructuring process owing to geographical proximity, but most of the government subsidies were focused only on Daegu's stakeholders. One interviewee commented:

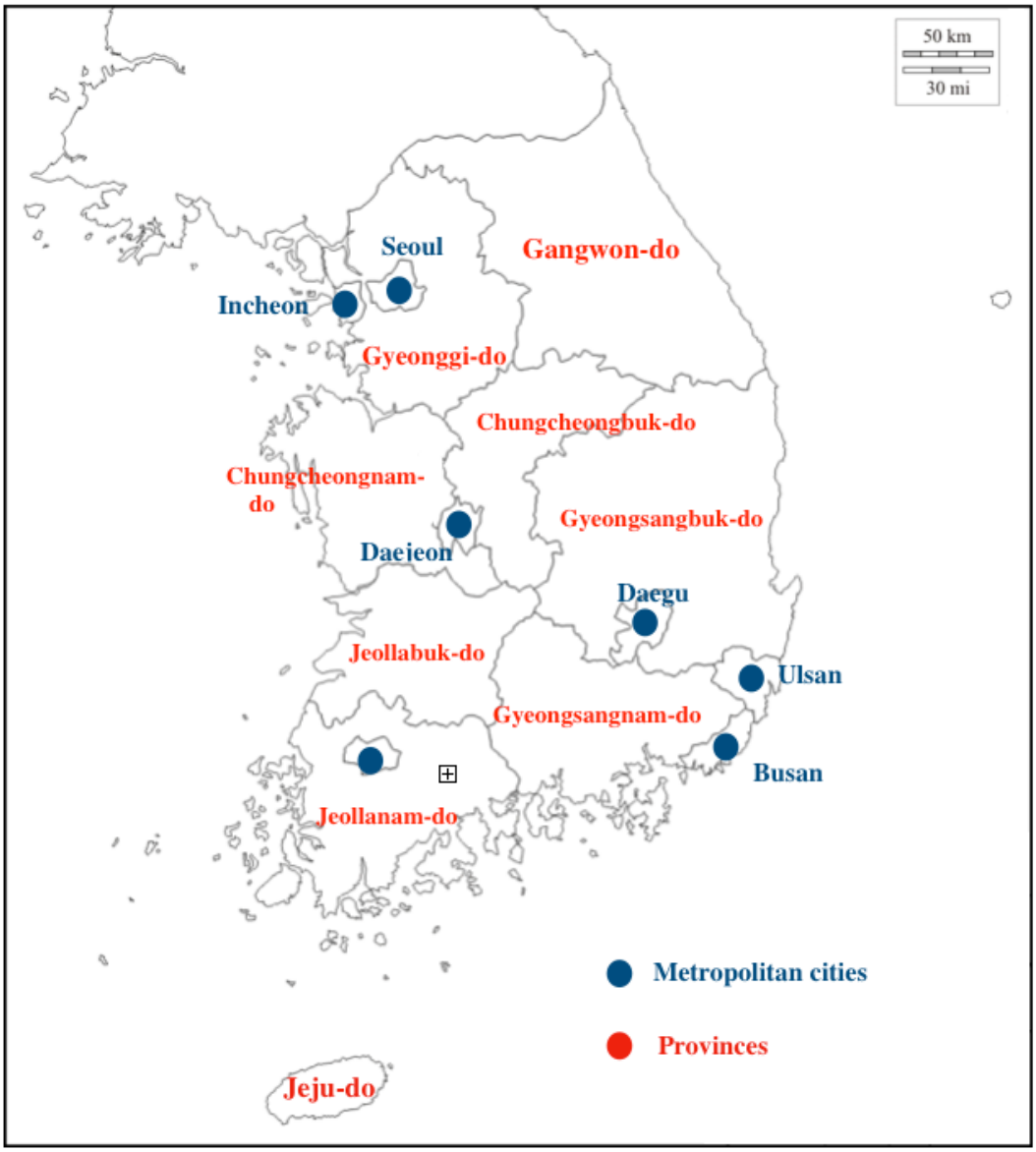
> There was budget squabbling between the two regions before initiating the 2nd stage of restructuring process. Because of the geographical proximity, Daegu's restructuring process inevitably was linked with the textile interests in Gyungsangbuk-do. However, most of the government subsidies in the first stage had been spent supporting Daegu's textile infrastructures (in particular two local textile intermediaries), while the textile stakeholders in Gyungsangbuk-do were comprehensively neglected. Under the circumstances, local policy makers in Gyungsangbuk-do did not want to contribute local expenditures to the second restructuring process. On the other hand, the position of Daegu's textile interests was slightly different. The textile industry occupied over 30% of Daegu's industrial structure, yet the proportion of Gyungsangbuk-do was less than 10%. Therefore, the over-allocation of the budget to Daegu's textile industry was an inevitable consequence. This budget dispute was quite serious then, as the provincial governor in Gyungsangbuk-do made a representation to the central government about the lack of regard for the provincial textile stakeholders. As a result, both regions decided after long negotiations that Daegu council would receive 20 billion Korean Won (approximately 18 million US dollars), and Gyungsangbuk-do council would receive 10 billion in the second stage of

[14] According to Cha (2016), the Lee regime's regional economic integration has aggravated the regional conflict between neighbouring cities for winning government projects

> the restructuring process. (Interview: a senior policy maker at a local institution, October 2015)

For these reasons, the Lee regime applied a different spatial structure, which was the distinctive feature of his government. Previously, the Roh government had implemented regional policies with a focus on sixteen administrative districts (seven metropolitan cities and nine provinces, see Figure 8-1), whereas the Lee regime approached it from a different perspective in which large metropolitan cities and neighbouring provinces were tied into a single economic bloc to facilitate regional economic growth and innovation systems. As a result, the central government had newly divided seven economic regions from the previously divided sixteen cities and provinces in accordance with geographical proximity as follows: Chungchung, Honam, Dongnam, Daegyung, Gangwon, Jeju, and the Capital Region (see Figure 8-2). The interesting thing is that the Lee administration regarded the Seoul metropolitan area as one of Korea's ordinary regions, which also needed to improve its urban and innovative competitiveness so as to compete with other global cities, despite suffering from the severe regional disparity between Seoul and other cities. It shows how much the Lee administration desired substantive regional development. In 2008, therefore, the government announced the revision of previous regulations (i.e., deregulation) in the Seoul Metropolitan area, such as the factory extension in cutting-edge industries and industrial state regulation in industrial clusters, which inevitably meant that local actors directly publicised their discontent. In some ways, there is a rational reason for deregulating the capital region. According to the OECD (2010), although the capital area in Korea was the third largest region with regard to its population and had the ninth highest figure of gross regional domestic product (GRDP) among the 324 regions of OECD member countries, its figure of per capita GRDP was relatively low. Given such statistical data, it is hard to judge whether the regulations in the Seoul region were appropriate or not. However, at least this study demonstrates President Lee's strong desire for the growth-oriented policy by the reformation of regional economic blocs, which was possible under the high degree of authority by the central government.

Figure 8-1 Sixteen districts in the Roh administration



Source: Author

Figure 8-2 Seven districts in the Lee administration

Source: Author

In terms of the influence of regional economic integration in Daegu's restructuring process, this study looks at "the commercialisation support project for the mixed textile material" (*super sojae yoonghab sanuphwa*) from 2010 to 2014. As seen in Chapter 6, the 1st and 2nd stage of the restructuring processes focused on the establishment of infrastructures in local intermediaries and the support of technological advancement including R&D in the private sector leading to the structural change of the local industry. The restructuring process of the 3rd stage during the Lee regime was targeted at specific niche products (i.e., the development of new and improved textile materials

for adaptation to other industrial sectors, such as vehicle, shipbuilding, and sports equipment). In other words, the 3rd stage had a definite purpose, which was to develop technical textile goods, thereby completely transforming the nation's and the region's textile structure. In this regard, while previous regional policies were principally designed only for targeted local stakeholders, the changing policy opened the door for everyone, which united all the textile actors in Daegu's textile restructuring process regardless of their home regions. This was closely influenced by the Lee administration's policy direction (regional economic bloc and actual growth). According to a director of a local intermediary organisation (Interview, November 2015), as a result, on average, five provinces and cities per year have participated in the new government project of Daegu's textile industry for 5 years (four regions in 2010 / five regions in 2011 / five regions in 2012 / six regions in 2013 / five regions in 2014).

During the third stage of the restructuring process, two local intermediaries (KTDI and DYETEC) participated again as the main institutions, receiving massive financial aid (roughly 52 million US dollars) for setting up new production facilities including the equipment for evaluating the performance reliability of textile goods from the central government (Korea Institute of Science Technology Evaluation Planning, 2009). In addition to the infrastructure support, a substantial R&D budget (see Table 8-2 below) for the private sector was also arranged by the central government in light of the research competence of each actor. This was divided into three different levels: 1) upstream, major company-dominated (raw material; yarn); 2) middle stream, SMEs-dominated (fabrics, dyeing, finishing); and 3) downstream, both major and SMEs-dominated (garments, sewing, and manufacturing).

As there is no major (*chaebol*) textile company in Daegu, the government R&D fund distributed funds to several large-sized textile corporations (e.g., Kolon) located not only in Daegu and Gyungsangbuk-do, but also in the capital regions, so as to maximise the technological advancement of each textile stream. Therefore, the specialisation of R&D has been conducted according to the textile stream.

The large companies that had sufficient research ability took responsibility for creating new materials of technical textiles which especially required an advanced technology and time-consuming research. The mission of the improved competence in the middle stream was given to mainly local tech-intermediaries and medium-sized corporations possessing moderate research capacities, as discovering original technologies for technical textiles was the main aim of the project. Finally, local SMEs (i.e., small-sized corporations) focused on the stimulation of the downstream in that the commercialisation process of technical textile products mainly occurs in this final stage by means of the new combination of existing technology and products.

Table 8-2 The allocated budget of Daegu's new scheme by the central government.

	Category	**Government expenditure [million US dollar]**
R&D	Up-stream	28
	Middle-stream	17
	Down-stream	32

Source: Korea Institutes of S&T Evaluation and Planning, 2009

Consequently, the commercialisation support project for mixed textile materials (especially, Aramid fibre and Ultra High Molecular Weight Polyethylene) has continued for 5 years with diverse textile participants (i.e., regional and sectoral innovative actors) rather than the previous regional restructuring projects. Given the nature of technological development and innovation activities whose outcomes were not instantly apparent, we cannot exactly justify whether this project was successful or not. But, as can be seen in the following Table 8-3, the local textile actors have produced some clearly visible outcomes, and it seems to be progressing in terms of technological competence.

Table 8-3 The outcome of the commercialisation support project for the mixed textile material

Performance indicator	Number of cases	Priority
Prototype development	265	High
Commercialisation	16	High
Patent application	63	Low
***SCI paper publication (*Science Citation Index)**	61	Low

Source: Ministry of Trade, Industry, and Energy, 2016

Regarding the qualitative analysis of this project, this study exemplifies the interview data of a local textile stakeholder:

> The commercialisation support project for the mixed textile materials showed a moderate result in term of quantitative perspective. However, there was almost no outstanding and international patent which could be the yardstick of technological competence. Furthermore, there was limited research on the development of new technical products. The participants tended to focus merely on how to commercialese aramid fibre, as the material could easily be obtained from a couple of large-sized textile companies. The development of original technology was also relatively neglected (of course, it is generally more time-consuming work). On the other hand, this project was led mostly by the textile stakeholders in Daegu and Gyungsangbuk-do, although it opened the door to other regional textile actors. To improve the technology competitiveness of technical textiles, for which the development process is more complicated, the textile stakeholders in all regions would need to work together. (Interview: a senior researcher of the local institution, November 2015)

Up to now, this section has described regional economic integration and its influence on the restructuring process of Daegu's textile industry. The extension of regional economic blocs in the Lee administration was designed to stimulate the collaboration between neighbouring regional innovative actors, thereby improving the condition of RIS. This study does not judge whether his new approach to regional policy was

worthwhile or not. Instead, this chapter highlights that RIS and regional policies were altered by the central government's force. The following section will mainly address the legacy of the previous developmental state that has still had huge influence on the policy-making process for regional issues.

8.3.3 The legacy of the developmental state

The concept of the "21st Century Developmental State" was resurrected by Peter Evans (2008) who reformed the old platform, which focused on growth-oriented policies, with less attention paid to social inclusive policies (e.g., welfare). His re-conceptualisation of the post-developmental state has largely the following hallmarks:

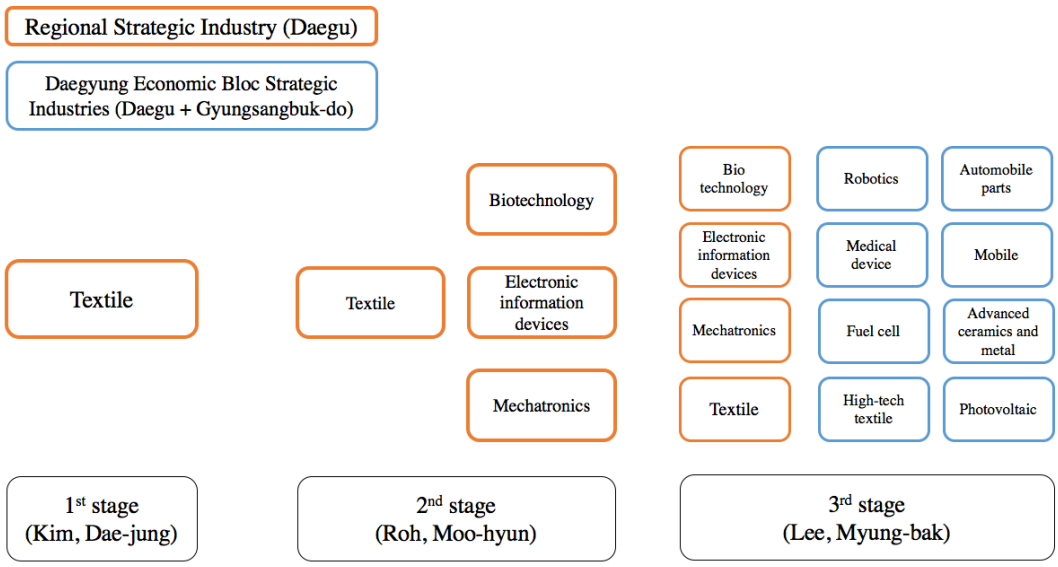
> (1) Capable public bureaucracies are even more important than we thought they were. Without competent, coherent public bureaucracies, capability-expanding public services will not be delivered;
>
> (2) The ability of the state to pursue collective goals coherently, rather than responding to the subjectively defined immediate demands of individual members of the elite, or particular elite organizations, is even more essential than earlier work on the developmental state suggested;
>
> (3) "Embeddedness" – the dense sets of interactive ties that connect the apparatus of the state, administrative and political, to civil society – not only becomes more important, but must focus on a broad cross-section of civil society rather than focusing simply on industrial elites;
>
> (4) The problem of state effectiveness is even more clearly a political problem, and state–society relations are at the heart of the politics involved. (Evans, 2014, pp. 90-91)

Similar to his contention, these legacies of the earlier developmental state can be found in the policy-decision-making process of the regional restructuring and innovation systems in Korea.

The post developmental state model materialised after the Kim Dae-jung administration with an attempt to change the policy line towards decentralisation, yet the administrations of both Kim and his successor the Roh have seemingly sustained the state-led (regional) approach for preventing a sudden collapse of regional

economies under the financial crisis (Interview: a professor, November 2015). However, this does not mean that these administrations adhered only to the earlier developmental state model. For example, as seen in Chapter 6, President Roh expanded the target areas of the government restructuring project from only four lagging regions to all regions apart from the capital area in light of burgeoning demands from local stakeholders regarding the extension of policy beneficiaries. It seems a typical bottom-up approach in which local actors asked and decided to select their strategic industries themselves, and then the central government accepted it. In this regard, four local industries in Daegu were selected as new regional strategic industries in the second stage of the regional restructuring process (and then eight industries more were added during the Lee regime because of the expansion of regional economic blocs – Daegu and Gyungsangbuk-do).

Figure 8-3 Daegu's strategic industries in the restructuring project



Source: Author

Yet, although the central government has mostly accepted the demands of regional stakeholders, the policy decision-making process has been led by the visible hand of the central-level policy makers (i.e., high-ranking government officials). This study discovered the aforementioned phenomena through a number of interviews with those who were working in government bodies. They mentioned that there is still a strong legacy of the authoritarian state in that although the substantive form of regional policy

has been changing to the bottom-up approach, the central government has been participating in overall policy decision-making processes as a mediator or a final decision-maker, in particular, when regional actors cannot arrive at a consensuses of opinion. For example, one interviewee exemplified

> With Daegu's textile industry, Busan's shoe industry was selected as the first target industry for the regional restructuring scheme at the end of the 1990s according to the policy rule in which only one industry was permitted per lagging city. Therefore, local stakeholders in Busan wanted the automobile, distribution, or ICT industries to be selected as their strategic industry rather than the low-tech shoe industry, considering its growth potential. Yet, the local government in Busan eventually selected the shoe industry as their target restructuring sector rather than those prospective industries on account of the state's tacit enforcement. The central government worried about the overlapping investments of Busan's wished industries (e.g., automobile) with other neighbouring regions; therefore, the local government felt constrained to comply with the central government's plan. (Interview: a manager of the local intermediary, November 2015)

In addition to this, some regional policies and schemes are pushed forward by the central government, rather than by regional authorities owing to the nation's future new dynamics. Of course, all regional policies are accompanied by local stakeholders, but the central government tends to control the overall management as seen in the case of "the commercialisation support project for the mixed textile material" (*super sojae yoonghab sanuphwa*) from 2010 to 2014 (see Chapters 6 and 8). The government documentary about this regional upgrade project (data from: National Science and Technology Information Service 2017) clearly evinces that it was planned by a "top-down approach" from the Ministry of Trade, Industry, and Energy to transform the current textile structure towards an advanced model through financial support for infrastructure and R&D projects. Therefore, the working expenses of the project were mostly supported by the central government (the central government: 81 million US dollars / the local government: 15 million US dollars / private sector: 33 million US dollars).

But, there is a question regarding why regional authorities had to share the budget of the central-led scheme when the central government initiated only new regional-related plans. According to an interviewee,

> The Ministry of Strategy and Finance highly recommends that all regional projects should involve the regional expenditure (roughly 10-20% of the total budget), to persuade local stakeholders to participate in the project, thereby stimulating the interplay between the central and local interests. (Interview: a senior civil servant, December 2016)

Therefore, the meaning of the central-led project is not that regional actors do not completely attend the scheme. Instead, it means the central government mainly devises and handles specific initiatives (especially long-term projects for the state's future competitiveness) with relatively less consideration of regional factors. This is directly linked with another interviewee's view (and as seen in Chapter 6):

> Basically the central government respects local stakeholders' demands and generally tend to accept the claims they postulate as well. However, there is some conflict in terms of the long-term perspective. For instance, the bottom-up approaches are likely to focus on local firms' requirements, inevitably concentrating on the short-term outcomes in that the top priority of these (small-sized) firms is to survive in the fierce business environment. Thus, the central government carefully seeks how to fundamentally transform the old industrial area on the basis of sustaining their traditional key industry. Hence, some public projects related to regional industries are carried out by the central government alone without even expenditure by any local consortium or local government. In this vein, Daegu's new support scheme (the commercialisation support project for the mixed textile material during the 3rd stage) also was designed by the central government to continually pursue its successful industrial change to the base of a high-value added industrial structure through stable financial aid. (Interview: a senior civil servant, December 2015)

Through elite interviews, this study also can find evidence of bureaucratic authoritarianism during the evaluation process of government projects. One senior policy maker identified its problems as follows:

> The government report on the performance analysis of government projects (i.e. project evaluation) has a tendency to decide the budget of subsequent projects whether it needs to increase financial subsidies or not (i.e. the budget deliberation). Therefore, sometimes, the Ministry of Strategy and Finance has already set up the conclusion of the projects in order to handle the budget (mainly for the budget cuts), thereby wielding huge influence upon the policy-implementing agencies once they make the interim report of the public projects. I [interviewee] had realised this issue already, and so strongly complained about the interim reports

> having a fixed conclusion when I attended the regional policy-making meeting with other officials and policy makers. (Interview: a senior researcher of the government-funded institutions, November 2015)

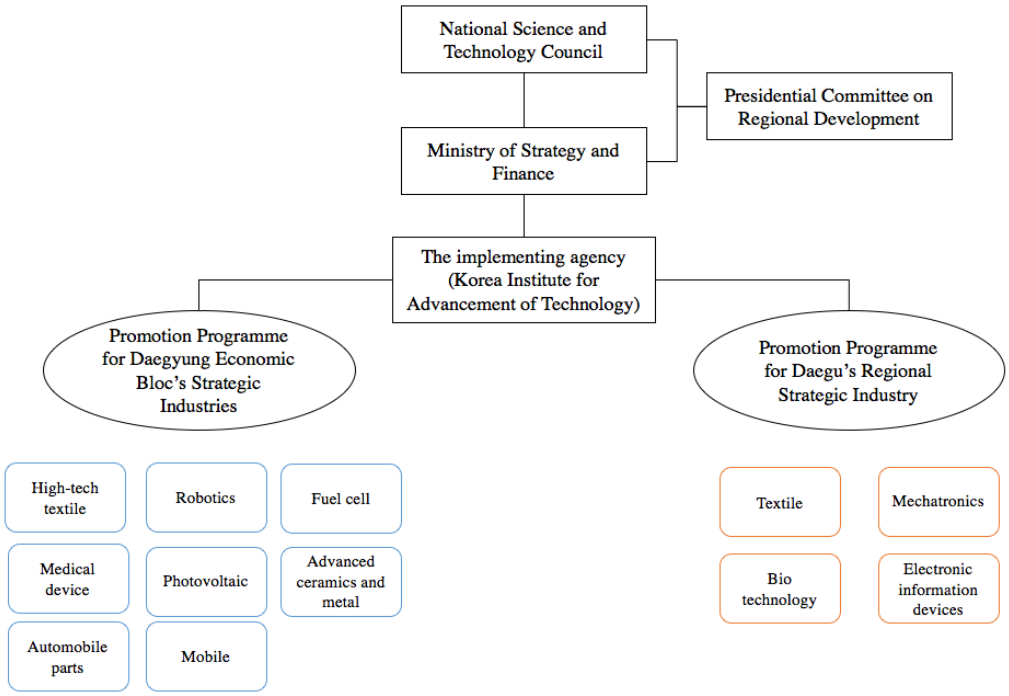
As seen in the interview data, in some ways, the mixed format of the policy decision-making process between the top-down and bottom-up approach in the current government system means that the power of the state bureaucracy has been strengthened further, in order to mediate in the dispute between the central and the local government, or to make the final decisions. These political phenomena often can be seen in those countries which used to be developmental states and are in a transition period in the neoliberal era (Evans, 2008, 2014; Cho, 2000; Chang et al., 2012; Park et al., 2012).

On the other hand, there is an independent organisation of regional policy co-ordination at the central level of the Presidential Committee on Balanced National Development (PCBND), which was established in 2004 (its name was changed 'the Presidential Committee on Regional Development' in 2009). The principal role of this organisation is seen as being an advisory committee for the president, but practically, it copes with a comprehensive regional policy like policy planning, measurement, project management, and evaluation.

Just as the EPB consisted of multiple ministries, the PCBND was also composed of around 30 diverse members including ministers from 12 government departments and other external experts (e.g., professors and civic organisations) so as to collect extensive opinions from all walks of life. However, two key organisations (EPB and PCBND) had distinct levels of authority to implement relevant policies. The EPB had authority for policy planning and budget execution, whereas the PCBND lacked the responsibility for such functions. The PCBND seems to be like a more presidential advisory body. So who does have such budget and policy responsibilities for regional industrial (innovation) policies? According to one of the interviewees (Interview: a senior civil servant, December 2016), the MTIE (formerly the Ministry of Commerce, Industry, and Energy; Ministry of Knowledge Economy) in 2004, created and operated a support division of regional development projects. This division conducts the legislation, budget allocations, and regional industrial and innovation policy with the

cooperation of the PCBND and the Ministry of Strategy and Finance. Therefore, the restructuring project of Daegu's textile industry is also being led by the central level (see Figure 8-4), implying that the central initiative for regional policies (e.g., restructuring) will remain until such time as regional governments themselves can operate their schemes with local public finance.

Figure 8-4 The budget flow of Daegu's regional restructuring programmes



Source: Author

Indeed, according to the website of the Ministry of Trade, Industry, and Energy, there were basically four regional development and innovation plans under supervision by the MTIE in 2016, and the ratio of the central government's expenditure to all regional projects occupied around 75% of the total budget (see Table 8-4).

Table 8-4 The budget support to regional development policy [million US Dollar]

Projects	The central gov. expenditure	The local gov. expenditure	Total

The promotion programme for regional strategic industry	192	75	267
The promotion programme for regional economic cooperation	174	52	226
The support programme for regional innovative cities	11	3	14
The support programme for regional indigenous industry	55	8	63
Total	432	138	570

Source: MTIE, 2016

As seen in the table above, the most significant reason why aspects of the developmental state have a legacy is due to the funding condition of local authorities. A senior researcher stated

> While the central government steadily delegates power to local authorities, the long history of centralisation in Korea may directly and indirectly hamper such a local self-governing system. In particular, the budget issue always engenders the local stakeholders' dependency on the central government. Notwithstanding the re-emergence of the local self-government system in the mid-1990s, the authority of local governments is circumscribed, resulting in the asymmetric structure of the tax-collecting system which shows an imbalanced tax-levying authority between the central and the local levels. Hence, the limited tax-collecting competence of local authorities eventually resulted in the financial dependence on the central government, and it would not ever change the government system towards the decentralisation unless the government tax system were to be changed. (Interview: a senior policy maker in the local agency, October 2015)

To sum up, this section demonstrates the legacy of the developmental state in the current government system and the regional restructuring process. Compared to the early model in the 1960-80s, although the Korean state nowadays does not intervene in the free market and the private sector directly, all regional projects are being operated by policy makers at the central level mainly because of their sufficient

financial resources. Given that the government subsidies for regional revitalisation in lagging regions represent an exceptional clause under the WTO role, there are seemingly no physical obstacles to facilitate the regional upgrade process by the central-led scheme, which now provides new equipment and technical resources under the pretext of an initial infrastructure investment.

Thus, Daegu's regional restructuring project seems still to be led by the central government, which plays the role of conductor, whereas regional governments and stakeholders are regarded as the members of the orchestra which follow the conductor's (the central level) directions. In some ways, this interplay between central and local interests is crucial, but one local policy maker who was worried about regional autonomy commented:

> The authority of the central government since the Lee Myung-bak regime seems stronger than before the earlier two regimes, so the state is required to wind down its authority over regional-relevant policies. (Interview: a senior researcher of local intermediary, November 2016)

Yet, on the other hand, most of the policy makers belonging to the central level argued that the local competence to conduct the regional restructuring process is still quite weak; thus, policy interventions from the central level are inevitably required until the regions themselves can manage their resources and their stakeholders properly.

Hence, there are many drawbacks regarding the current government system, which clearly shows the state's bureaucratic authoritarianism and its prodigious authority over all policy-making processes. Although the power of the central government has been diminishing since the end of the 1990s, the government can somehow exert political and financial power through the control of fiscal policy. It may be one of the representative phenomena that the former developmental states have been experiencing.

8.4 Conclusion and Discussion

This chapter interpreted the current role of the Korean government in regional revitalisation and development in the neoliberal era. By doing so, we can ascertain that

there are different approaches between the earlier and the current government systems (i.e., the post-developmental state) in advancing policy directions for achieving the state's goals, such as regional restructuring. There are, of course, some limitations in that the distinctions of the current government model are drawn from an analysis only of regional policies. Notwithstanding such limitations, however, this chapter can provide evidence of the changing attitude of Korea's policy implementation and innovation systems.

The main aim of the previous developmental state focused on the improvement of macroeconomics, whereas the latest government model is focused on alleviating regional economics, which derive from the earlier model, by establishing and facilitating regional key nodes (tech-intermediaries and other government agencies). In order to do so, the central government had devised policy measures like the regional economic integration and the relocation of public organisations (i.e., the Innovation City project) into local cities and provinces.

With regard to the legacy of the developmental state, most public funds for regional restructuring and development schemes still came from the central level under the asymmetric structure of the national finance system. Furthermore, the entire budget allocations are also made by policy makers at the central level. Therefore, in some ways, we can still see the phenomenon of state-led regional economic planning. Table 8-5 summarises the features of the current government system compared to the earlier developmental state model.

Table 8-5 The role of government in the early and latest developmental states

	The early developmental model	**The latest developmental model**
The main target	Focused on macroeconomic circumstances so as to achieve an independent economy by means of structural changes in	Paid more attention to regional economics by establishing regional innovative nodes, thereby stimulating innovation

	nation's major industry and economy	activities between local interests
The role of state	Commander / Supervisor	Facilitator / Conductor
Key policy measures	The market distortion (import substitution), selection and concentration strategy, carrot-and-stick approach, the utilisation of national-level research institutions	Legitimate subsidies under the WTO rule, supports for soft-infrastructures (R&D) through public projects, the utilisation of regional-based intermediaries
Key players	The EPB, Picking winners (conglomerates)	Presidential advisory bodies with various ministries, mostly local SMEs and stakeholders
Process of policy making	Top-down	A mixed approach between top down and bottom up
Key innovation systems	National Innovation Systems	A hybrid of NIS and RIS models

Source: Author

For these reasons, Lim (2010, p. 188) highlighted how, as always, the Korean government has been playing a pivotal role at the forefront of policy implementation:

> Even with change, the reform process in Korea continues to reflect the legacies of the developmental state, with the state still playing an important role in planning, implementing and sustaining economic reform.

Under such socio-political circumstances, this research principally asserts that the Korean government system presents a hybrid of developmentalism and neoliberalism, thereby attracting the academic interests of many scholars wanting to find a connection between the past and the more recent model. In this vein, this chapter may help enrich

understanding by suggesting the peculiar characteristics of the later form, which have the legacy of the developmental state. Interestingly, Korean scholars (such as Choi 2012; Lim 2010; Park et al 2012; Cho 2000), who fully understand Korean history and society including social conventions and other elusive aspects, have never underestimated the power of the state and of a robust bureaucracy.

In this regard, one question arises from some Western scholars' negative view of developmentalism: Does the (post-) developmental state currently hamper the process of structural changes and of the nation's economic growth? Since the Asian financial crisis, the developmental state or the state-led planning model in East Asian countries tended to be criticised as if there were inherent critical weaknesses in such government models (Choi 2012; Weiss 1997, 1998).

According to Weiss (1997, p. 5),

> …they should not be taken to imply that the East Asian region as a whole – as opposed to some parts of it – is inherently fragile. The Western media has certainly helped to propagate this image, offering up every crisis emanating from the region as somehow portending the end of the 'East Asian miracle'

A number of Western researchers' arguments seem to suggest that the government system, especially in East Asian countries with a high degree of state authority, is inoperative for the current economic system, predestining it to be eventually harmful to a nation's economic dynamics.

Yet, this study already corroborates some positive evidence of the current government system, which was modified in light of the contemporary socioeconomic milieu. The approach employed by the post-developmental state does not technically mean the central government wields absolute influence on all societies, with no consideration of other domestic and international actors as had happened in the past. Arguably, it was possible that the past developmental state could be operated with the West's connivance, as most of the developed western countries after the post-war period have somehow acquiesced in the apparently irrational measures of such a growth model in the Asian countries due to their political and economic benefits. Therefore, the

supranational organisations (e.g., WTO, IMF, World Bank, etc.) have less control over the East Asian developmental states.

As seen in the previous empirical chapters, the post-developmental state has been focusing mostly on regional economics (e.g., uneven regional development) for alleviating social inequalities, and playing a mediator and facilitator role in boosting the national and the regional economies through stimulating innovation systems (Kim, 1997; Weiss 1997, 1998), whereby 'in sustaining high-wage economies, one of the most important of these support systems is the relationship between government and business, which underpins the national innovation system' (Weiss 1997, p. 10).

In addition to this, the state's relatively dominant position presents coherent plans for long-term economic projects, such as some ways of regional restructuring. Compared to the Korean centralisation system, the case of the German scheme of textile industry revitalisation shows the importance of policy consistency

> On the other hand, textile companies complain that local and regional policymakers showed too little interest in their industry (company interviews), as can be illustrated by citing from the same speech: "Many local politicians dreamt about attracting so-called 'future industries' and had no understanding of textile interest… Also, state (Lander) policy showed no interest in our industry for a long time. (Hassink 2007, p. 1158)

German policy makers were not too concerned about their lagging textile industry because of the obsession with promising businesses. In contrast, Korean policy makers at both central and regional levels were paying huge attention to such older industries in that the upgrade of lagging regions and industries was principally targeted by presidents' pledges; therefore, achieving the balanced development became the top policy priority of each regime not only for remedying regional grievances, but also for stimulating the nation's overall economic growth since President Kim Dae-jung's regime. This does not mean that the approach used in Korea's policy-implementation under the (post-) developmental state is better than that of other countries, or promises better results. Instead, at least this research advocates that Korea's revitalisation project could last over the past two decades only with stable support from the central government's strong will. Therefore, the government-led economic planning under the

post-developmental state is still an acceptable way to achieve the betterment of the regional-level economics which have influenced Korea' RIS and have been evolving in light of the current socioeconomic situations.

To sum up, the main contention of this chapter is that we can easily witness the central government's visible hand in the process of regional development. In the same manner, innovation systems also have been continually changing in their form from a linear innovation model to a model based on non-linear inter-organisational interactions in a way which can be widely integrated with other national and regional interests.

Chapter 9 CONCLUSION

9.1 Introduction

The aim of this thesis has been to examine the changing fortunes of the old textile industry in Daegu and its long-term revitalisation process with an analysis of three different aspects. Most of the literature about the revitalisation of older industrial regions tends to focus on the role of one single or two actors, for instance, the reciprocity between local universities and firms, or local agencies and firms. Given that the contemporary industrial forms consist of multi-dimensional factors, however, the existing studies seem to be insufficiently convincing about the reality of the restructuring process of older industrial regions. In particular, there has been a lack of any consideration of policy leverage, which is regarded as part and parcel of regional development and innovation (Coenen et al., 2016). As has been seen, there are properties that are peculiar to the traditional role of the Korean government in the developmental period, as discussed in Chapters 2 and 3, and so the investigation of the influence of public policy upon the restructuring process is inevitable given Korea's politically centralised system.

Hence, this thesis has examined the restructuring process of Daegu's textile industry on two different geographical levels with one industrial sector – macro (government), micro (local SMEs), and the regional-based textile industry. With regard to the systems approach, a key actor of each dimension can be closely connected with geographical innovation systems (NIS and RIS) and sectoral innovation system (SIS), so the contribution of innovation systems to the regional restructuring is also analysed in Chapters 6, 7 and 8. In addition, the role of the central government is discussed in depth in Chapter 8, as it can be argued that Korea's innovation systems are closely intertwined with the central government, which presents a unique innovation model in Korea.

In terms of the methodological issues, (statistical) measurements of innovation processes, which determine the cause and effect relationship of innovation input and output, remain elusive owing to the peculiarity of their non-measurability given that the innovation systems are influenced by innumerable intangibles (e.g., tacit

knowledge and social custom) and due to their formal and informal relations (Bessant and Rush 1995; Cumbers et al. 2003; Innovating Regions in Europe 2008). In this respect, the longitudinal study can somehow alleviate such a critical issue through scrutinising a substantial number of incidents that affected the national and regional economy.

Finally, the long-term observation of the regional restructuring process can provide policy implications for those countries that are suffering from similar difficulties (e.g., uneven regional development) after achieving successful industrialisation.

9.2 Summary of empirical findings

Based on evolutionary and innovation systemic views, there are four broader contributions to debates that flow from the findings regarding the changing fortunes of the Daegu textile industry and its restructuring.

First, this study was at least partly oriented to highlighting the continued neglect of old and/or low-tech industry sectors in academic and policy studies addressing the process of innovation and industry upgrading and, by extension, the neglect of old and peripheral industrial regions (Doloreux and Dionne, 2008). The low-tech nature of some industry sectors continues to be misunderstood (Maskell, 1998). Maskell's study of the Danish furniture industry clearly showed just how this low-technology industry played a pivotal role in the national and local economy. Indeed, the European furniture industry has outperformed many high-tech industries in terms of economic benefits and employment records; thus, he has commented: 'It is not at all obvious that the low-tech path will always lead directly to misery, while shifting to the high-tech one guarantees a golden future' (Maskell 1998, p. 115).

In addition to this, there is a dearth of studies analysing the innovation process of SMEs in low-tech sectors. Whilst SMEs are a key component of national and regional economies (for instance, 99% of registered companies in Korea are SMEs), the policy makers and academic scholars have paid less attention to the role of such smaller sized companies. In the meantime, companies belonging to the low-tech sector are massively under pressure due to the reform of the nature of the industrial sector, which is moving

towards more heterogeneity and higher valued-added manufacturing. Otherwise, those low-tech sector corporations may steadily disappear from the market. For instance, the textile industry nowadays connotes not only the garment business, but also the parts and material sectors, in which many textile materials, such as glass-fibre, are widely exploited in the manufacture of significant components of other industrial sectors, such as the automobile and aerospace industries. Whereas the clothing companies also complied with an upsurge in demand for special functionality with regard to existing products, they also added antibacterial and environment-friendly properties. Given the circumstances, the innovative methods of those two groups (i.e., clothing- and technical-oriented) inevitably are divided. However, these issues appertaining to the changing environments in low-tech sectors are hugely neglected. Therefore, analysing the innovation and restructuring processes of SMEs in the textile sector clearly contributes to the enrichment of empirical and theoretical research with valuable policy implications. Specifically, this thesis provides a number of insights which might overcome the prejudice about low-tech sectors, as these have steadily been undergoing a transformation into knowledge-intensive businesses by means of the incremental innovation activities of relevant "homogeneous" and "heterogeneous" actors. As the contemporary textile sector has become more complex and has been frequently crossed with other sectors (e.g., a combination of textile materials and the aerospace industry), it is also one low-tech sector to have played a role in simultaneously transforming the industrial and the regional model. In this vein, this study has introduced a number of successful cases involving the creation of new technical textile products, implying that the low-tech sector is no longer a simple structure that requires technological advancement and R&D efforts. Thus, all these issues were clearly addressed in Chapters 6, 7, and 8, thereby revealing how the structure of the textile SMEs in Daegu has been reformed and progressed.

Second, and most specifically regarding the content of developmentalism, this thesis highlights the role that regional-based public institutions have played when mediating in Korea's innovation systems (NIS, RIS, and SIS) by the state's steady support, often including strong-arm tactics.

Historically, the Korean government has fully exploited policy-bridge and science and technology (S&T) intermediaries, such as ETRI (Electronics and Telecommunications Research Institute) and STEPI (Science and Technology Policy Institute). These government-funded intermediaries have contributed to the rapid development of domestic industries giving an important role to technology development, technology transfer, and foresight and diagnostics. However, there have been a paucity of studies about local-based and sectoral-specialised (e.g., automobile, shipbuilding, textile, so on) intermediaries, except the cases of Techno-parks (Seo, 2006) and the agglomerated science and technology park of Daeduck in Daejeon (Kim et al., 2014). Consequently, this research sought to trace the role and evolution of local public intermediaries in Chapter 6 where it has provided an answer to the following question:

(RQ 2) How have local intermediaries themselves evolved and then stimulated the revitalisation of Daegu's textile industry?

At the outset of the restructuring process (i.e., MP) there were no tangible outcomes for either local business groups or agencies. Nevertheless, in the face of internal and external factors, after the second scheme, local stakeholders appeared to have steadily contributed to an evolution in the RIS that resulted in positive effects on the productivity and innovation record of the local textile industry with the industrial restructuring in Daegu's textile industry. The modification of regional policies involving the government's harsh pressures was somehow a trigger for changes in intermediaries' fundamental roles, as seen in Chapter 6. In the same manner, the tax investigation and other unfavourable environments (e.g., the end of textile quota) also made sense of the crisis. For these reasons, local textile intermediaries had attempted to reduce dependency on the government through conducting management innovation and improving the relationship with local business groups so that the relations between the intermediaries and the business sector were seen as conflictive in the first restructuring stage. Thus, Chapter 6 described the evolutionary process of the local tech-intermediaries and their changing roles with subsequent tangible and intangible outcomes.

Third, the innovation activities and restructuring efforts of local textile firms were discussed in Chapter 7 to answer the following research question:

(RQ 3) How have local textile companies transformed their businesses into high value added ones?

Considering the very limited resources of SMEs, in particular in the low-tech sector, there remains the question of an evolutionary process as to how these corporations have developed a record of innovation and have improved their market competitiveness. To answer the question, Chapter 7 elucidated the innovation process of the local textile SMEs in Daegu with help from other innovation systems. The chapter also scrutinised the segmented market in the local textile businesses, which are divided into garment- and technical-oriented businesses on the basis of their embedded (technological) capacities. The findings of this research clearly explain the hallmarks of the strategy by which the local textile companies have developed new and better products and have strengthened their technological competence (i.e., innovation capability) using nine case corporations. Thus, the research clearly provides evidence of the phenomenon of market segmentation during the restructuring process.

Having analysed those innovative companies, on the other hand, this research has also delved into under researched subjects. For instance, the local SMEs were largely reluctant to apply for patents on account of technology leakage once, despite an awareness of the importance of patents in the global market. Meanwhile, some of the local companies were utilising patents as a promotion tool, which highlights their predominance over the technological competition. In addition, the emergence of younger generations in the local textile business was seen as a new driving force in facilitating the restructuring process, as they were more open minded about research collaborations and sought to expand their business market across the global economy using their overseas experiences. In this manner, mutual exchanges of technological knowledge between local firms and knowledge providers (e.g., university and research institution) or between inter- and intra-firms (e.g., textile firm and electronic firm) were apparently revitalised by younger generations in order to overcome unfavourable environments and scant resources to conduct R&D activities, thereby accomplishing

cost- and time-saving measures. Thus, Chapter 7 provided details of the transformation process of the local textile SMEs.

Fourth, and more broadly, the study was framed to examine the role of public policy in transforming old industrial regions in the context of the (post-) developmental state. Korea is renowned as a successful example of developmental state policies in which the central government has strongly promoted a national industrial transformation through the revitalisation of a few industrial provinces (e.g., the shipbuilding industry in Ulsan and the machinery industry in Changwon). Much less is known about how the current government system has contributed to the national and regional economies, in particular the upgrade of lagging industrial regions. Thus, Chapter 8 interpreted the current government system in the era of neoliberalism, and so provided an answer to the question below:

(RQ 4) How has the post developmental state in Korea affected the restructuring process of the old industrial region?

Government at all levels and through important publicly-funded institutions supports the nation's restructuring processes primarily by way of financial and technological support so as to lead through their initiative, though over the time period considered here, this support has evolved to become more tailored to industry users. While elements of neoliberalization have been apparent, in other respects, given the character of developmentalism in the past, there seems little question that the state, and, indeed, the central state, continues to be important with regard to industrial reorganisation and the fortunes of particular regions. Arguably, the bureaucrats as the ruling group of the policy decision-making process, are unwilling to radically reform the social structure towards neoliberalism because of the worry related to their exclusive authority (Park and Lepawsky 2012). The same conclusion was reached by Hassink (2001, p. 1392), who concluded that

> central government officials are often not willing to give up decision-making authority to lower levels of government and are reluctant to devolve power to the regions, as they fear that regional policy-makers lack the capacity to devise and implement sound policies.

Even in a context of neoliberalisation, then, 'no one can deny that the major policies for overcoming the economic crisis were carried out by the government, regardless of the highly neoliberal content' (Choi 2012, p. 103). To this extent, to dismiss or downplay the continued effects of developmental state policies in the industrial transformation in Korea would be a mistake. Therefore, this research has underlined the continued importance of central government policy directions and the transformations of central government institutions due to the restructuring of the old low technology textile industry of Daegu to produce a new mixed model of the post developmental state.

In general terms, there remains an immense institutional legacy of the developmental state that resides in formal institutions and their capacity as well as many of the conventions and norms surrounding business organisations (Kim, 1999). At the same time, the policy-making process embraced a wide range of opinions from local stakeholders. Yet, this research also found that regional upgrading processes are mainly designed by the central government and are mostly for the purpose of initiating long-term projects coherently.

Public policy, including the financial aid associated with it, was found to be of paramount importance in the restructuring of an old industrial region. While external private sector stimuli (Yeung, 2016) and elements of neoliberal policy orthodoxy (Kim, 1993) may have transformed Korea into a distinctly post- or neo-developmental state (Cho 2000; Kalinowski 2015; Yeung, 2016), contrasts here should not be overemphasised. This research was able to find important historical echoes of the concerted role of central government at moments of economic crisis. For instance, one of the hallmarks of the industrial policy after the oil crisis in 1973 was that President Park Chung-hee's regime carried out extensive government intervention in both domestic and international capital markets through intervening in the tariff and tax system, interest rate subsidies, and exchange rates (Chang, 1993).

In the same manner, to date, central government policy makers have been at the forefront, using public intermediaries and policies to orchestrate the upgrading process. Therefore, this study asserts that developmentalism proves to be not at all antithetical

to neoliberalism to the point that Korea's recent trajectory has been described as one of 'developmental neoliberalism' (Choi, 2012; Park and Lepawsky, 2012). Therefore, Chapter 8 attempted to establish a normative framework of the post-developmental state by analysing the case of the regional textile restructuring process in Daegu.

Hence, through the answers to the three questions (RQ 2, 3, 4), this study can offer clear and valid answers to the main research question from three different perspectives (i.e., government, intermediaries, and firm level):

(RQ 1) How have Korean innovation systems contributed to the revitalisation of an old textile industry in Daegu in the context of the (post-) developmental state?

9.3 Contribution to the literature

According to Edquist (2004, p. 488), the framework of innovation systems seems to employ a grounded theory approach:

> Theoretically based empirical work is the best means by which to straighten out the SI (Systems of Innovation) approach conceptually and theoretically; the empirical work will, in this way, serve as a 'disciplining' device in an effort to develop the conceptual and theoretical framework.

In this respect, this theory-oriented empirical study contributes to the betterment of the existent framework of SI through providing the aforementioned findings derived from the long-term observation of Korea's innovation system and regional restructuring process in the context of the post-developmental state.

In particular, this research had integrated both SI and evolutionary approaches that have different natures, as explained below:

> Whilst systems of innovation approaches have a strong focus on the institutional setting of a particular country/region and the way it influences actors and networks involved in the innovation process, evolutionary approaches take networks and sectors as key units of analysis and look at their characteristics and specific evolution, including how institutions have co-evolved with the emergence of a new sector. (Uyarra 2010, p. 119)

With regard to institutional settings and its influences, Chapter 2 (literature review) and Chapter 3 (policy review) presented the process of institutional arrangements (i.e., setup of innovation systems) for the nation's industrial and economic development. Indeed, the construction process of most of the government-funded research organisations and relevant systems with the government's powerful authority in the early period of the developmental state contributed to paving the way for the NIS, which later would impinge upon other systems (RIS and SIS), and so is regarded as a key node of Korea's innovation system.

Meanwhile, the empirical chapters (mainly Chapters 6 and 7) disclosed the evolutionary processes of the textile industrial sector. In particular, tracing the trajectory of the transformation process of low-tech business groups and sector-specialised (textile-support) agencies is important in that few studies on this topic exist. Thus, this study found that the Korean RIS had emerged during the evolutionary process of local stakeholders, because policy makers needed the synthetic system to manage local innovative interests. It is directly linked to the lack of research in academic circles regarding how RIS and each innovative component had been evolving, as pointed out by Asheim et al. (2011), Feldman (2001), and Werker and Athreye (2004). In this regard, this research presents not only the reformation process of each innovative actor, but also gives the reason why the RIS has been introduced in policy circles through showing the entire history of the Korean RIS. As a result, this study answers a number of previously unanswered questions, for example, regarding 1) why the Korean RIS has been showing the strong nature of policy tools, 2) why local stakeholders needed to be strengthened in their relations, and 3) how all innovative actors had attempted to revitalise the local textile industry.

With regard to the conceptual contribution, the Korean RIS and its components had shown a strong connection to the central government and its policy measures, thereby presenting a relatively new form. This kind of state-led innovation model is referred to as a "regionalised national innovation system" (Asheim and Isaksen, 2002) or "dirigist RIS" (Cooke 1998). However, although those two studies mentioned the state-oriented RIS model, they lacked explanations and evidence. In this respect, this

research clearly presents findings on the relationship between local and national actors and their reciprocities.

Further, this study goes one step further by observing a new innovation system form. Most of the studies on innovation systems have examined only one individual model (e.g., single RIS), or two-mixed model (e.g., NIS with RIS, such as the regionalised national innovation system). However, this research introduces "a triple helix of NIS-RIS-SIS innovation structure", drawing on the restructuring process of the older textile industrial region. There are strong interconnections among innovation systems. For example, the key sectoral actor (local textile intermediaries) has changed from nurturing skilled personnel in the textile sector to R&D and technology support under institutional backup from the central level (NIS). Also, the interplay between the SIS (e.g., intermediaries) and the RIS has facilitated the stimulation of RIS, in particular, regional textile firms, as local business groups have been transforming their business model toward higher value-added products with the coevolution of both the NIS and the SIS. Hence, the evolution and the reciprocity of these three innovation models have resulted in a structural change in the older textile region, with one result being the phenomenon of market segmentation.

In terms of policy perspectives, on the other hand, this study has expounded the role and upgrade of public policy in the context of the post-developmental state, providing significant policy implications for those countries suffering from similar regional issues following successful industrialisation (i.e., latecomer economies). For example, the expansion of policy beneficiaries from only one key industry per region to up to four indigenous industries by accepting regional demands was somehow regarded as the evolution of public policy that happened due to the evaluation of the first restructuring stage. In this manner, the changed method of participating in public R&D projects in order to focus on demands that are more business-oriented and tailored to the local industry (e.g., promotion of specific textile material) is also seen to stem from the government's trial and error strategy. Therefore, these policy lessons may help reduce some of the need for trial and error among latecomer economies when applying regional policies.

Another policy lesson is the positive outcome of the government-led regional economic planning. Indeed, the top-down approach is widely accepted in policy circles, as reviewed by Amin (1999, p. 365), even though many others (notably Tödtling and Trippl, 2005), have argued that there is no a one-size-fits-all policy in regional issues (i.e., no one size fits all)

> The common assumption in both approaches (Keynesian and neoliberal), despite their fundamental differences over the necessity for state intervention and over the equilibrating powers of the market, has been that top-down policies can be applied universally to all types of region. This agreement seems to draw on the belief that at the heart of economic success lies a set of common factors (e.g. the rational individual, the maximizing entrepreneur, the firm as the basic economic unit and so on).

This study fundamentally agrees on the diversity of each region, yet the key contention here is to stake out some advantages of top-down policy under the centralised government system so as to implement policy consistently in the case of necessary long-term economic planning (e.g., the restructuring of lagging regions and industries). Specifically, whilst the current policy-making process has widely embraced the diverse opinions of local and other stakeholders, the task of huge time-consuming and financially demanding works inevitably requires the top-down approach. For this reason, the government has been acting as a mediator (Rodric, 1994) and a facilitator (Kim, 1997) to accomplish such policy initiatives. As seen in the restructuring process of Daegu's textile industry, the consistent policy support for the regional restructuring over the last two decades eventually produced a partial structural change toward high value-added business exactly as the government intended. This study assumes that if Korea's policy makers had not paid attention to the local textile industry, as occurred in the case of the German policy-makers, the restructuring and revitalisation process of the textile industry in Daegu would be slower or even would be completely static. Therefore, presenting the overall picture of the situation under the government's high level of authority was crucial (or a necessary evil) for time-consuming initiatives.

The final contribution is that this study helps to overcome the prejudice against the recent state-led growth model in East Asian countries (i.e., the post-developmental

state) and the low-tech industrial sector, which is regarded as a hindrance to economic growth.

The Western media attributed the collapse of the East Asian economy in the end of the 1990s to the state-led macroeconomic planning. However, as seen throughout the thesis, the state-led restructuring process has shown some positive perspectives; therefore, the post-developmental state model should be re-evaluated. Furthermore, the state-led economic planning (i.e., government intervention) can easily be found in the contemporary global economy outside of East Asia and in some of the most advanced countries (such as trade protectionism in the US during the Trump regime, according to CNBC 2017). This phenomenon is not at all new among Western economies. According to Mazzucato (2011), the US government itself has been playing a key role in the economy and in the private sector through conducting risk-tasking work and supporting specific tech businesses; hence, it is called "the entrepreneurial state". Others (notably Block, 2008) also disclosed the role of the US government, which has been expanding its financial and technological support to the private sector to facilitate technological advancement and commercialisation, which is referred to as "a hidden developmental state". However, in some aspects, there is an exceptionally distorted perspective in the East Asian state-led model.

9.4 Further studies and research limitations

As mentioned in Chapter 4, first, there are limitations regarding the methodology of this research. Having analysed and considered the innovation activities of nine case companies, it provides only partial information and still neglects the condition of companies that have been suffering from a business transformation and a lack of (financial and technological) resources. Attempts to make contact with regional lagging corporations were unsuccessful, with all requests for interviews being rejected. For the reason, this research could gain necessary information about the background story of such struggling companies from other local SMEs and institutions, whose businesses generally have a long history in Daegu, and thereby are ideally positioned to perceive the changing fortunes of local business groups through the local buzz.

Given the importance of the reciprocity of each component within innovation systems, the social network analysis is considered a good method to capture an actor's relations with other regional interests and autonomies (Leydesdorff and Fritsch 2006; Leydesdorff et al., 2006; Shapiro et al., 2010). However, the lagging and peripheral regions and their main industries are frequently populated by companies operating in the informal economy (Interview: Member, National Assembly, October 2015), so the survey method, which is required to investigate how each local actor connects with others, using the roster-recall methodology, also has some limitations. A substantial number of local companies had not officially registered their businesses and still tended to prefer cash transactions with other textile interests, resulting in the low rate of survey response. This indicates a fundamental difficulty in approaching regional companies as a key unit of the innovation system; therefore, interviews and other public data were employed as main data resources for discovering how firm-level innovation has been conducted. Despite providing in-depth information about cause and effect, this research has limitations when it comes to reflecting the condition of local SMEs. Hence, one suggestion for future research would be the application of diverse methodological approaches, thereby enriching the knowledge about regional innovation and the restructuring process.

In the context of Korea's restructuring process, there is still a dearth of empirical studies. At the end of the 1990s, the Korean government decided to initiate the (re)vitalisation of old industrial regions in four selected provinces (i.e., Daegu: textile, Busan: shoe, Gwangju: optical electronics, and Gyeongnam: mechanical industry). Although all of them have received sufficient policy beneficiaries and institutional support, less is known about the current industrial structure and the outcomes for the regions. Investigating the restructuring process of four regions may help provide more evidence of the role of the government, of supportive institutions, and of overall innovation systems.

Regarding research on the low-tech industrial sector, there is a lack of empirical research compared to that for fashionable industries, resulting in several stereotypes, such as cognitive lock-ins, of which one example is considering the low-tech sector to be like stagnant water preventing the stimulation of the economy and halting

technological development (Maskell, 1998; Von Tunzelmann and Acha, 2005). This negative view could be found when I was in Daegu for the field study. There were many instances during conversations with local inhabitants (not for interview purposes) when the textile industry in Daegu seemed to enjoy a love-hate relationship with society. On the one hand, the inhabitants in Daegu are nostalgic for the heyday of the local textile industry, but on the other hand, they acknowledge that the industry also was a major obstacle in stimulating the local economy due to its functional obsolescence. For this reason, most of the citizens were eager to nurture other cutting-edge industries in Daegu rather than the textile sector, even though there has been both a transformation and a structural change in the local textile industry by means of multiple collaborations of inter- and intra-innovative resources, as seen in Chapters 6 and 7.

Hence, Von Tunzelmann and Acha (2005) urged the need for reflection on the change of the current sectoral atmosphere into the existing industrial taxonomy, which resulted in the cognitive bias of the low-tech sector, furnished with some authentic evidence. According to them,

> Conventionally, sectors of all types were supposed to be recognizably different from one another not only in the goods and services they produced but also in the technologies and processes they used to produce them. However, the boundaries have blurred over historical time in both dimensions. Technologies originally developed for one set of products spill over into use in the production or "architecture" of other sets of products. Moreover, new technologies more often tend to supplement and complement old technologies rather than replace them. (Von Tunzelmann and Acha, 2005, p. 409)

In this regard, the technological advancement of the chemical sector has eventually led to the development of artificial fibres in the textile sector, which has contributed to the new development of diverse technical textile goods. Therefore, given the changing nature, one recommendation to academic and policy circles is to pay more attention to such low-tech sectors; thus, demonstrating how the nature of the low-tech sector could or could not be transformed may help directly overcome the prejudice over these sectors.

Last but not least, according to the cluster life cycles and the evolutionary perspective, industry-specialised regions are predestined to encounter restructuring issues. In the context of the post-developmental state, the government is likely to be continually involved in the restructuring process with relatively higher authority over the policy-making process. Meanwhile, the change in socioeconomic circumstances in heading toward a neoliberal economic orthodoxy imposes a measure of legal control from supranational organisations. These circumstances tend to somehow engender a hybrid of the government system (i.e., between developmentalism and neoliberalism) as seen in the case of Korea having a strong legacy from the past developmental state. However, much less is known about the current role of such a government system in the process of not only regional upgrades, but also national growth; therefore, this study suggests there is a need for further investigation of how the post-developmental state has been influencing the national and regional economies.

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APPENDIX: LIST OF INTERVIEWS

(Removed interviewees' names were treated as confidential)

No	Name	Organisation	Position	Date of interview
1	-	Korea Research Institute for Human Settlement	Senior researcher	25 August, 2015
2	-	Korea Textile Development Institute	Manager	27 August 2015
3	-	Daegu Technopark	Senior researcher	27 August 2015
4	-	Korea Textile Development Institute	Senior researcher	27 August 2015
5	-	The National Assembly of The Republic of Korea	Senior assistant	10 September 2015
6	-	Yeungnam University	Professor	15 September 2015
7	-	Gyeongbuk Technopark	Manager	17 September 2015
8	-	Korea Textile Development Institute	Senior researcher	5 October 2015

9	-	Yeungnam University	Manager	6 October 2015
10	-	Korea Dyeing & Finishing Technology Institute	Senior researcher	2 November 2015
11	-	Daegu Gyeongbuk Development Institute	Research fellow	2 November 2015
12	-	Science and Technology Policy Institute	Associate Research Fellow	13 November 2015
13	-	Kyungpook National University	Professor	19 November 2015
14	-	Kyungpook National University	Professor	20 November 2015
15	-	Daegu Gyeongbuk Development Institute	Senior researcher	2 December 2015
16	-	Korea Research Institute for Human Settlement	Senior research fellow	4 December 2015

17	-	Korea Institute for Industrial Economics & Trade	Research fellow	8 December 2015
18	-	Gyeongbuk Technopark	Associate researcher	9 December 2015
19	-	Kangwon National University	Professor	11 December 2015
20	-	Ministry of Trade, Industry & Energy	Deputy director	14 December 2015
21	-	Daegu Technopark	Senior researcher	16 December 2015
22	-	The National Assembly of The Republic of Korea	Senior assistant	17 December 2015
23	-	Korea Institute for Advancement of Technology	Head manager	17 December 2015
24	-	The Small and Medium Business Administration	Secretary	18 December 2015
25	-	The Ministry of Science, ICT and Future Planning	Deputy director	18 December 2015

26	-	Gyeonggi Technopark	Head manager	22 December 2015
27	-	Hanyang University	Associate professor	22 December 2015
28	-	Daegu University	Professor	28 December 2015
29	-	Korean Apparel Industry Association	Team Manager	28 December 2015
30	-	Local textile firm A	Director of R&D centre	17 October 2016
31	-	Local textile firm B	Executive Vice President	21 October 2016
32	-	Local textile firm C	Senior Advisor	25 October 2016
33	-	Local textile firm D	Director	3 November 2016
34	-	Local textile firm D	Director	3 November 2016
35	-	Local textile firm E	Sales Manager	18 November 2016
36	-	Local textile firm F	Director of R&D centre	22 November 2016

37	-	Korea Fashion News	Writer	1 December 2016
38	-	Korea Textile & Fashion Polytechnic University	Professor	5 December 2016
39	-	Local textile firm G	CEO	8 December 2016
40	-	Local textile firm H	CEO	13 December 2016
41	-	Local textile firm I	CEO	16 December 2016
42	-	Korea Aerospace Research Institute	Associate research fellow	20 December 2016
43	-	The Ministry of Science, ICT and Future Planning	Deputy director	21 December 2016
44	-	SPRU, University of Sussex	Research fellow	23 December 2016
45	-	The Ministry of Public Administration and Security	Secretary	28 December 2016