FACTORS AFFECTING THE DEVELOPMENT OF SHENZHEN AS A GLOBAL CITY IN INNOVATION AND R&D ACTIVITIES

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2024

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by

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Thesis submitted in fulfilment of the requirements
for the degree of
Master of Arts

May 2024

ACKNOWLEDGEMENT

Many people have contributed to the completion of this thesis in many ways. The writing of this thesis has provided me with a valuable learning experience with many challenges that have nurtured my personal growth in many ways.

Firstly, I would like to express my most sincere gratitude to my supervisor, Associate Professor Dr. Sharifah Rohayah Sheikh Dawood, for her patience, enthusiasm and valuable guidance throughout my graduate study. She has always encouraged me and reviewed my manuscripts at various stages of my research, and she has been generous in providing feedback and guidance. Her enlightened teaching and guidance helped me to overcome many challenges and problems throughout my research.

I am grateful to all the respondents who participated in the survey with amazing interest and whose views and responses have greatly helped the outcome of this study. I would also like to thank Dr. Nooriah Yusof and Dr. Mohammad Javad Maghsoodi Tilaki from the Geography Section, Faculty of Humanities, Universiti Sains Malaysia for their valuable comments, suggestions and inspiration on my research project. I would also like to thank my friends and classmates at Universiti Sains Malaysia for their support and companionship in helping me to overcome my setbacks.

Finally, my heartfelt gratitude goes to my parents who have always given me their endless love and unstinting support. I owe it to them that I have been able to study productively in the pursuit of my goals. My parents have always encouraged me and celebrated with me the moments of progress.

TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

LIST OF ABBREVIATIONS

APS	Advanced Producer Services
FDI	Foreign Direct Investment
GIS	Geographical Information System
GaWC	Globalization and World City
ICT	Information and Communication Technology
ISIC	International Standards on Industry Classification
KDE	Kernel Density Estimation
KMO	Kaiser-Meyer-Olkin
MNCs	Multinational Companies
OECD	Organization for Economic Co-operation and Development
PCT	Patent Cooperation Treaty
RIS	Regional innovation systems
UNESCO	United Nations Educational, Scientific and Cultural Organization
SPSS	Statistical Package for the Social Sciences
SMEs	Small and Medium-sized Enterprises

FAKTOR MEMPENGARUHI PEMBANGUNAN SHENZHEN SEBAGAI BANDARAYA GLOBAL DALAM AKTIVITI INOVASI DAN R&D

ABSTRAK

Inovasi menjadi enjin berkuasa untuk mengekalkan dan menggalakkan daya saing serantau. Untuk meneroka prestasi inovasi serantau dan kemakmuran adalah penting untuk mencapai pembangunan wilayah yang seimbang. Adalah mencabar untuk meneroka sumbangan faktor keadaan tempatan kepada inovasi bandar. Penyelidikan ini membina rangka kerja untuk penyelidikan tentang persatuan dengan inovasi dari perspektif bandar global. Ia bertujuan untuk menganalisis faktor pengaruh inovasi bandar dan bertindak balas terhadap batasan kajian sedia ada. Industri ICT digunakan untuk kajian kes di Shenzhen, China, di rantau Asia Timur. Data primer dan sekunder digunakan untuk meneroka kesan jarak geografi Pihak Berkepentingan dan campur tangan koperasi dan kerajaan terhadap inovasi. Keputusan menunjukkan bahawa faktor kesan yang mempengaruhi inovasi dan kapasiti R&D bandar global menekankan kepentingan kedekatan geografi pihak berkepentingan, hubungan kerjasama, dan campur tangan kerajaan tempatan. Penyelidikan menekankan bahawa pencapaian inovasi dan kemakmuran bandar global adalah hasil interaksi pihak berkepentingan dengan keadaan setempat (serangkaian sumber kepakaran, kemahiran, kemudahan fizikal, dan pembiayaan). Kesalinghubungan antarabangsa bandar-bandar global dalam inovasi dianggap sebagai hubungan kerjasama antara syarikat multinasional dan pihak berkepentingan inovasi tempatan. Walau bagaimanapun, firma tempatan dan multinasional berbeza dalam penggunaan dan berkongsi sumber ini, perbezaan paling asas ialah pengaruh

strategi korporat, rangkaian kerjasama dan modal sosial ke atas konfigurasi proses inovasi dan R&D. Penyelidikan ini mencadangkan bahawa dalam pengurusan inovasi dan penggubalan dasar, terutamanya di bandar global dengan pencapaian inovasi yang cemerlang, Bandar ini mungkin mendapat manfaat daripada memperluaskan kedalaman dan keluasan rangkaian kerjasama pihak berkepentingan berdasarkan konfigurasi yang berbeza.

FACTORS AFFECTING THE DEVELOPMENT OF SHENZHEN AS A GLOBAL CITY IN INNOVATION AND R&D ACTIVITIES

ABSTRACT

Innovation become a powerful engine for sustain and promote regional competitiveness. To explores regional innovation performance and prosperity is crucial achieve balanced regional development. It is challenging to explore the contributions of local condition factors to city innovation. This research constructs a framework for research on associations with innovation from a global city's perspective. It aims to analyse the affect factors of city innovation and respond to the limitations of existing studies. An ICT industry is used to case study in Shenzhen, China, in the East Asia region. The primary and secondary data were used to explore the effect of Stakeholder geographic distance and cooperative and government intervention on innovation. The results show that the effect factors affecting the innovation and R&D capacity of global cities emphasize the importance of geographical proximity of stakeholders, collaborative links, and local government interventions. The research emphasizes that the innovation achievements and prosperity of global cities are the result of the interaction of stakeholders with local conditions (a series of resources of expertise, skills, physical facilities, and funding). The international connectivity of global cities in innovation is considered the collaborative link between multinational companies and local innovation stakeholders. However, local and multinational firms differ in their use and share these resources, the most fundamental difference is the influence of corporate strategy, collaborative networks, and social capital on the configuration of the innovation and R&D process. This research suggests that in innovation management

and policymaking, especially in global cities with outstanding innovation achievements, The city may benefit from expanding the depth and breadth of stakeholder collaboration networks based on differentiated configurations.

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Over the past two decades since the beginning of the 21st century, comprehensive progress has been made in globalization and urbanization. Promoting innovation and competitiveness has become the common pursuit of authority and stakeholders in cities (Širá et al., 2020). Foreign Direct Investment (FDI), Multinational Corporations (MNCs) production transfer, and the function of advanced producer services (APS), such economic activities bring capital, labour, and services to many regions. With it comes, cross-border transactions and networks are formed between cities. Industries are widely affected of globalization. At present, many cities in the developed and developing countries are adopting and developing the global city, at varying extents and magnitude, as a viable urban development strategy. The city authorities relies on many conditions to develop a city that are cheap labour, markets, foreign direct investment (FDI) and MNCs. These cities are characterized by industrialization and fast economic growth and the rise of cities that are the node for colossal resource, economic and social transformations. As the nodes of these key structures, global cities play the role of "command and control" centres. It is easy to understand that global capital, MNCs and labour into the nodes. Over the last decade, with cities are moving into the post-industrial period. attention has shifted to important businesses that include overseas operation and investment by MNCs, APS, and international financial centre operations. Those businesses activities are carried out disproportionately in a few large cities. Much of the scholarly effort has been made to establish the global city rankings that reflect and indicate business of APS (Cheng & LeGates, 2018; Choi et al., 2006; Derudder & Witlox, 2005; Hoyler et al.,

2018; Mahutga et al., 2010; Scholvin, 2019; Sigler et al., 2021; Taylor & Aranya, 2008; Yang et al., 2017; Zhu et al., 2022) It reflects the importance of APS and infrastructure construction in global cities. With the transformation of the world's industrial structure, the challenge of a new round of technological revolution and industrial transformation, the knowledge-based economy has become a new engine of world economic growth and their has gradually occupied a leading position in the world economy (Shearmur, 2012). Chen (2008) points out that the important roles of technology strength, international knowledge connectivity, social capital, and university strength in attracting R & D investments. Science and innovation during the last decades since the period of cities into the post-industrial has gained wide discussion in academic (Peralta, 2015). In this regard, it is considered timely to review the expansion of the global city theory especially within the context of an emerging economy from the east Asian countries. The extant literature ignored the global cities and innovation relations that the key to understand innovate development and R&D activities in global cities(Meyer, 2015). It is important to study how R & D location decisions are made at some geographic level of analysis. The increasing importance that cities as global innovation hub has been evident in previous studies from many countries (Du et al., 2022; Engel et al., 2018; Malik et al., 2021), and examining the locational decision of R & D firms in relationship with the role of global knowledge networks have become an interesting research agenda especially with respect to its connection to global cities. Besides, the inter-firm connection with the surrounding environment especially in terms of collaboration with local institutions, the local supplier bases, the academic and research institutions, and the availability of human capital, such conditions have profound impact on the locational decisions of firms (Du et al., 2022).

The Chinese central government stated a policy in 1978 that makes Chinese cities joining the world economy. The Chinese economy has gradually been integrated into the world economy. As the first special economic zone in Shenzhen, Guangdong Province, it reflects the vision of the country's modernization drive. The local government adopts preferential measures and policies to attract and encourage FDI to promote the development that an export-oriented economy activity. As a pioneer city in modernization, Shenzhen has grown from a small village of fewer than 30,000 people in more than 40 years to become competitive and influential in multiple dimensions (infrastructure, economy, politics, society, and culture). Globalization and world city (GaWC) is the main think tank for global city network research. In the global city rankings released in 2018, Shenzhen entered the Alpha- ranks (see Table 1.1 below). The ranking is based on the office network of APS (banking, insurance, accounting, advertising, law, consulting) in cities around the world as indicators, emphasizing the interaction and connectivity between cities. The study of world cities began with the identification of “command and control centres”(Friedmann & Wolff, 1982), which analysed the characteristics of the city that from a perspective in structural transformation of the economy. The global city theory proposed by Sassen (1991) considered that global cities are used as production sites and services for financial and professional service industries and proposed the formation of cross-border transactions between global cities.

In short, with the proliferation of economic globalization, global cities occupy a large amount of capital in the world economy, especially the development of financial centres. In addition, the production and operation of MNCs, FDI and APS, and the construction of infrastructure are essential to promote the growth and development of global cities. Some scholars do not focus on the ranking of global

cities and turn to research on the growth and development of these global cities, as well as the exploration of global city functions (Chubarov & Brooker, 2013). Both of Olds & Yeung (2004) and Chubarov & Brooker (2013) emphasize the exploration of ways to form global cities, especially emerging global cities, and the role of national and city levels in promoting the growth of global cities.

Table 1.1 The World According to GaWC 2018

Alpha ++	Alpha +	Alpha	Alpha -
London	Hong Kong	Milan	Amsterdam
New York	Beijing	Chicago	Stockholm
	Singapore	Moscow	New Delhi
	Shanghai	Toronto	Santiago
	Sydney	Sao Paulo	Johannesburg
	Paris	Frankfurt	Dublin
	Dubai	Los Angeles	Vienna/Wien
	Tokyo	Madrid	Montreal
		Mexico City	Lisbon
		KualaLumpur	Barcelona
		Seoul	Luxembourg
		Jakarta	Bogota
		Mumbai	Manila
		Miami	Washington (DC)
		Brussels	Prague
		Taipei	Munich
		Guangzhou	Rome
		Buenos Aires	Riyadh
		Zurich	Budapest
		Warsaw	Houston
		Istanbul	**Shenzhen**
		Bangkok	
		Melbourne	

Source: Retrieved from https://www.lboro.ac.uk/microsites/geography/gawc/world2018t.html

On the other hand, cities around the world have made continuous progress in science and technology, the fifth-generation mobile communication technology (5G),

biotechnology and other fast-developing high-tech industries. China has become a centre for R & D activities by foreign firms from Japan and the westem firms are also investing. Some of ICTs MNCs prefer to R&D investments and establish R&D centres in China (Wang & Lin, 2013), and these among others are companies like IBM, Microsoft, Motorola, Apple, Nokia, Sony, Toshiba, Hitachi, Fujitsu, NEC, and Samsung.

This study focus on knowledge creation and R&D, new production technologies, products and services, and intensive R&D activities. The city has increased investment in R&D with the aim of commercializing scientific and technological achievements. In this respect, Shenzhen has experienced extensive development in terms of economic, political, cultural, and demographic. Shenzhen is an ICT hub and Global hub for hardware (Zacharias & Tang, 2010). Tech giants such as Huawei, ZTE and DJI were all founded in Shenzhen. The companies accounted for 90% of the total in terms of research expenditure in Shenzhen. In 2018, the number of PCT international patent applications in Shenzhen ranked first among Chinese cities for 15 consecutive years(Lin et al., 2018) (see Figures 1.1 and Figures 1.2 below).

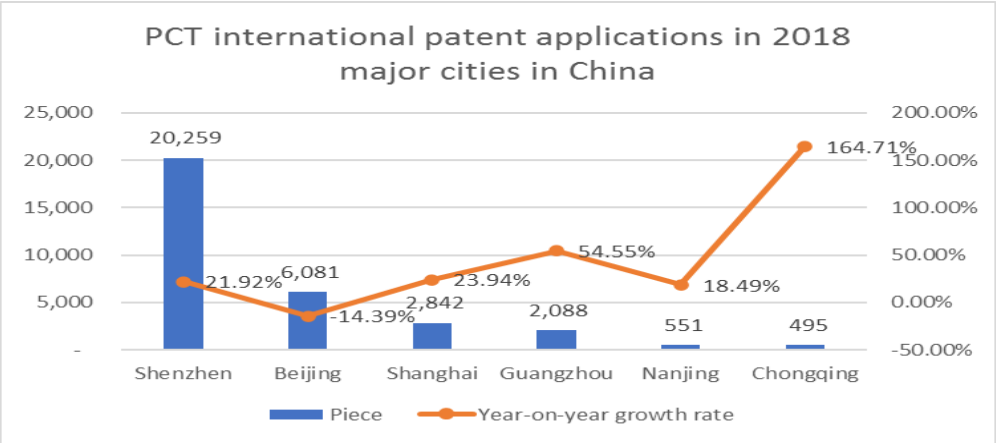

Figure 1.1 PCT international patent applications in China,2018

Source: Compiled and analyzed by author from World Intellectual Property Organization (WIPO)

In 2019, comparing patent innovation in several key international cities/regions: Tokyo, Silicon Valley, New York and Israel, Shenzhen is second only to Tokyo, Japan, in terms of PCT patent publication quantity (Figure 1.2).

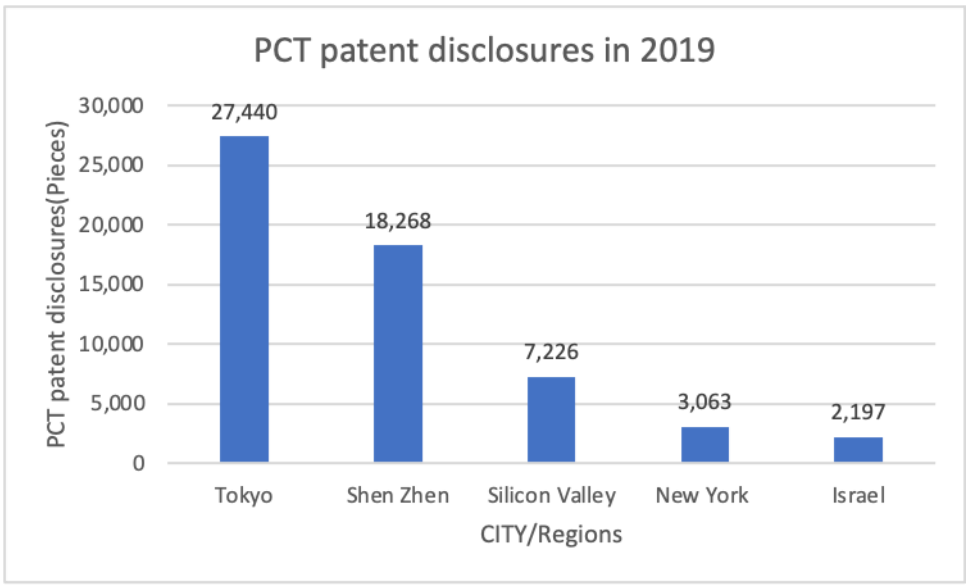

Figure 1.2 PCT patent publication quantity in 2019

Source: Compiled and analyzed by author from World Intellectual Property Organization (WIPO)

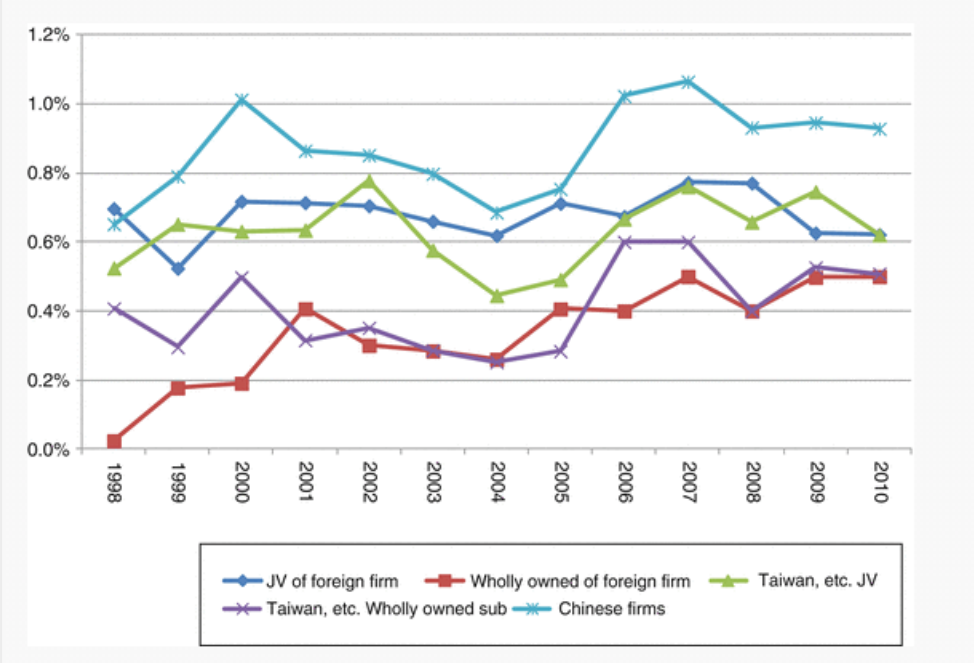

Figure 1.3 Trend of R&D/Sakes by ownership type

Source: Adapted from Motohashi (2015)

The figure（Figure 3.1） above shows the trend of R & D in China by ownership of various countries. The figure (Figure 1.4) below shows the external and total R & D by ownership type in China.

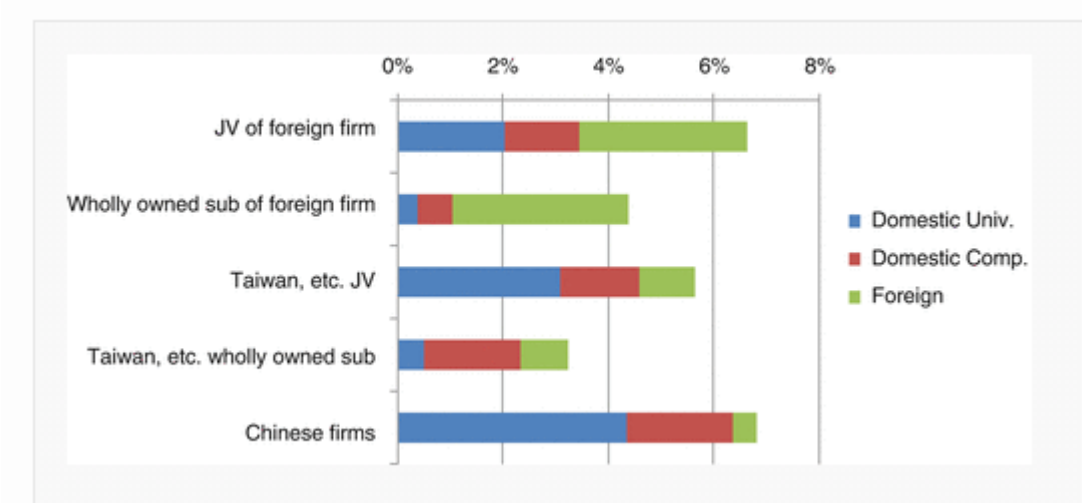

Figure 1.4 External R&D expenditures
Source: Adapted from Motohashi (2015)

In recent years, on the one hand, the favourable environment for the production network dominated by MNCs has encountered unprecedented challenges. These challenges come from rising production costs related to rising labour costs (Yang, 2015) . On the other hand, knowledge-intensive industries become the new engine that growth for the world economy, and knowledge has become a key element of competitiveness. In the dimensions of enterprise development and contribution to the industry, it is inseparable from the knowledge creation of technology and innovation activities. In sum, the exploration of global urban development, especially the global cities of emerging economies, and the exploration of global urban functions, still have potential dimensions that need further research. This research therefore intends to explore the relationship between the clustering of R&D units and innovation, and the impact on the innovation capacity of firms and cities. This research will explore growth in unique functions of China's global cites that from the actors who universities, research institutions, city government, enterprises with R&D

services, and clusters of high-tech parks as well as intensity of intra-city collaborations in the context of globalization and in the context of economic structural transformation.

In sum, there are still potential dimensions of global city development, particularly the exploration of innovation and R&D activities in global cities in emerging economies, that require further research.

1.2 Problems Statements

Innovation is essential to economic activities because it is the force of economic benefit where production needs, such as those for product, process, and services, are satisfied. Innovation in a broad sense can be understood to include product, process and services innovation, and it assumed a number of forms, like "the new commodity, the new technology the new services (Morgan, 2007)." Innovation actors have promoted to their region innovation because the region can meet their needs for learning, investment, and collaboration when they develop a deep interaction and technical connection to the region. Many researchers pay increasing attention to the interaction that innovation with their region (Healy & Morgan, 2012; Rodríguez-Pose et al., 2021). And there is an agreement among researchers that this interest is a reaction to knowledge economically driven processes of globalization.

In recent years, cities around the world have entered the post-industrial era. Cities rely on technological strength and knowledge creation capabilities to promote innovation. Firstly, firms meet challenges that include resource and environmental changes, resource depletion and strict environmental protection policies. It means

urban areas are challenged by production costs related to labour costs (Yang, 2015), labour shortages and rising raw materials due to production activities dominated by MNCs (Zacharias & Tang, 2010, p. 219). Industrial and manufacturing companies no longer rely on access to cheap land and labour to reduce costs but depend more on their ability to innovate. In this regard, it is practical to investigate and explore the characteristics of regional development based on the knowledge economy (Breschi & Malerba, 2001). The ability of firms and key stakeholders to continuously transform information and knowledge into effective new products and services has increasingly become central to successful competition in the modern economy. In this respect, specifically on R&D activities– which is significant to the firm's growth & regional innovation development.

In addition, MNCs dominate the global economy with their superior technology and knowledge base, and in addition, MNCs seek lower production costs, higher profits, and growing markets. Of the 1,000 largest global companies regarding R&D expenditures, 94% run R&D abroad (Jaruzelski et al., 2015). Taking into account the superior technology in MNCs, the local expects innovation actors to learn and own their technology from MNCs, and hopes them to absorb their knowledge spill-overs from MNCs (Fu & Gong, 2011).

There are imbalance in knowledge creation and innovation capacity in different regions. The promotion of R&D activities contributes to narrowing the gap in knowledge production between cities/regions. In 2019, PCT patent publications in several international cities/regions are compared (Figure 1.5), with increasing growth rates in cities/regions: New York (+30.79%), Israel (+6.24%), Tokyo (+4.99%), and decreasing growth rates in cities/regions: Shenzhen (- 9.86%), and Silicon Valley (-

14.93%). However, Shenzhen was second after Tokyo in terms of the number of PCT patents although Shenzhen has an advantage in terms of the number of PCT patents. The fact that Shenzhen has an advantage in the number of PCT patents is an indication of Shenzhen's position as China's Silicon Valley, meaning that it has a strong capacity for innovation. Just as Hong Kong is known as international financial centre, there are a large number of financial services even has many international financial companies. In contrast, only limited progress has been made in some key areas of the industry (Sun & Grimes, 2016), e.g., both hardware and software services are relevant to sustain development in the ICT industry (Lin et al., 2011).

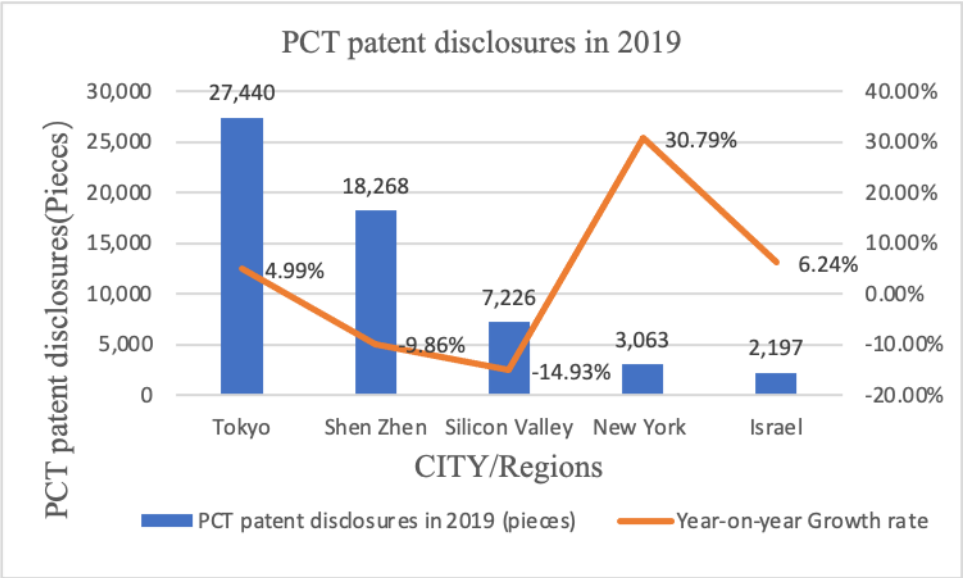

Figure 1.5 PCT patent publications in several international cities or regions

Source: Compiled and analyzed by author from World Intellectual Property Organization (WIPO)

Shenzhen, China, is a rapidly urbanising city. Having grown from a fishing town in 1980 to a modern metropolis specialising in electronics and telecommunications, the city government has sought to establish it as a technology hub. According to UNESCO City of Design (UNESCO, 2009), '*10 things to know*

about Shenzhen' Shenzhen is described as a city with a unique culture, high technology industries and innovation. It is important to explore further the factors that have contributed to this development. Shenzhen's R&D activities should be used to enhance future technological capabilities and innovation areas. The factors influencing R&D activities implies to be explored in a systemic model of a global city perspective. One of the thorniest questions in geography, economics and development studies is to find out why agglomerations of innovation emerge and flourish where they do. Why do MNCs establish R&D departments in a few regions? Furthermore, why are some regions more capable than others? In this regard, it is important to first explore the locational choices of MNCs' R&D departments and the spatial agglomeration dynamics of stakeholders in R&D activities.

Secondly, knowledge spillovers can be transferred from MNCs in the same industry and city to local firms through professional labour mobility, Imitation and competition, for example, new products created by MNCs force local companies to improve their technology (Caves, 1974; Fosfuri et al., 2001). In terms of knowledge mobility and configure resource stakeholders access innovation input through various of interaction. In addition, leading technology embedded in machinery and equipment imported by MNCs may be imitated and create new innovations in the host country. In the past, the R&D process in firms took place within the firm and was done by one firm alone. This closed innovation discouraged the inflow of external ideas and knowledge flows (David, 1986). In contrast, open innovation paradigm can understand as stakeholders breaks down traditional organizational boundaries, and allows for the transfer and flow that are ideas, information and knowledge through their cooperation and division (Chesbrough et al., 2007). Therefore, how stakeholders interaction with their region through specific connection to facilitate the transfer and

flow of knowledge, and the mechanisms of stakeholder collaboration must be considered as an important factor in facilitating knowledge creation and innovation.

The global economic slowdown caused by the ongoing outbreak of the Covid-19 pandemic and the ongoing crisis of Covid-19 has weakened the financial position of many businesses, negatively affecting their willingness or ability to sustain R&D and innovation. Governments in some regions have provided additional financial support to firms (Roper & Turner, 2020). In this regard, it is necessary to investigate the role that government play in further sustaining the innovative & R & D capacity of Shenzhen in the region.

In particular, what are the key actors/agents in Shenzhen and how can they effectively promote and enhance knowledge creation and innovation in the city? It could also be a prominent competitive advantage where in the development of the region. The research findings will expect to help stakeholders, especially the city government, to develop medium and long-term policies and plans to sustain and promote innovation.

According to UNESCO City of Design (UNESCO, 2009), '*10 things to know about Shenzhen'*: Shenzhen's unique culture is influenced by both Hong Kong and Western cultures. The fusion of different cultures has resulted in an open, tolerant and innovative city character. The transfer from closed innovation to open innovation, where stakeholders seek partners and where business relationships between economic actors are embedded in the concept of social capital (Putnam, 1995). In Putnam's (1995) proposed, trust relationships are emphasized, so that the business activities of economic actors rely on trust relationships to sustain them. In this research, does the promotion of cooperation between innovation actors in terms of R&D activities

innovation require trusting relationships to be sustained? Does the relationship of trust between R&D collaborations facilitate the relationship of collaboration and exchange between stakeholders?

The imbalance of innovation achievement in the globalizing world has attracted much scholarly attention(Crescenzi et al., 2012). The economic activities are increasingly based on innovative capacity rather than on mass production and cheap labour. The outstanding changes in innovation capacity in China, there is little research on the dynamics of innovation in global cities in these emerging cities. To respond to these issues, this research aims to examine factors of the innovation and R&D activities in Shenzhen, and identify the locational conditions under which technological innovation and knowledge creation occur, in order to understand how stakeholders, engage and interact to promote technological innovation and knowledge creation, and provide actionable policy implications to sustain and further promote the innovation and R&D activities in Shenzhen.

1.3 Research Questions

This research will be answered based on the following questions:

i. How is the geographic proximity dynamic of the stakeholders? What is their locational strategy in innovation and R & D activities?

ii. How the activities of key stakeholders' collaborative mechanisms influence the development of Shenzhen as a global city in R & D innovation and services?

iii. What role does the government play in further sustaining the innovative & R & D capacity of Shenzhen in the region?

1.4 Research Objectives

The research objectives are as follows:

1. To evaluate the geographic proximity dynamic of the stakeholders. And analyse their locational strategy for innovation and R & D activities.
2. To analyse the role of key stakeholders' collaborative mechanisms in developing Shenzhen as a global city in innovation and R & D activities.
3. To investigate the role of local government in further sustaining the innovative functions of Shenzhen in the region.

1.5 Scope of the study

The scope of this study is to examine the development of innovation in global cities. This research focuses on the systemic patterns of R&D activity development in Shenzhen, China. The study aims to understand the geographic agglomeration dynamics, firm location strategies and collaboration mechanisms of key stakeholders in Shenzhen's R&D activities (MNCs' R&D centres, local firms' R&D departments, R&D services related firms, universities/research structures, government). In summary, the antecedents and consequences considered in this study are highly relevant and policy influential. It is an important addition to the literature on R&D activities in global cities. For example, stakeholder collaboration mechanisms are considered at the micro-firm level in this research. The use of patent data as a dependent variable to measure collaboration in R&D activities was found to have limitations. Some actual patterns of collaboration have been overlooked in past studies. Therefore, further exploration in this section is necessary in the next study. I

will assess the geospatial concentration of MNCs R&D sectors and localised stakeholders (universities, research institutions, companies providing R&D services and government) as important features of global cities, with multinational R&D centres and local corporate R&D sectors as participants in R&D activities being selected as the main targets for assessment. I also focus on stakeholder collaboration in basic scientific research, create new products and improve new processes. As well as potential contribution of local government in further sustaining and facilitating collaboration between other stakeholders.

The formation of scientific knowledge and innovation is increasingly global, yet highly concentrated in a few regions or cities. New actors, particularly in Asian countries, are giving birth to an increasing number of inventions and patents. These were once the almost exclusive domain of developed economies. The case study is from Shenzhen, China, an emerging economy. Dense and excellent-connected region like Shenzhen can often evolve into important local and international innovation hubs. This study is under the China scenario of emerging Asian economies because China is one of several important emerging economies under the influence of economic globalization.

Data was collected from Shenzhen through quantitative approach using questionnaire method, in addition to secondary data (public government reports, journals, magazines). The survey was conducted from a region of intense ICT and R&D activity. The units analysed were individuals, including management of corporate R&D departments, skilled workers, researchers from universities/research institutes, and government officials. Responses were received from these key informants.

The research is limited to R&D activities in the ICT industry in Shenzhen. The ICT R&D sector was used to investigate and explore the objectives of this research. The largest R&D expenditures are focused on a few industries in the world, especially in ICTs, pharmaceutical and biotechnology sectors (United Nations Conference on Trade and Development, 2020). Shenzhen known as the technology hub and global cities, specializing in electronics & telecommunications, and the ICT R&D sectors would be a good example of a mechanism to analyse the collaboration of key stakeholders.

ICT industry is industries that representative knowledge intensive. This research adopts the United Nations' International Industry Classification (ISIC) standard. ICT firms include hardware equipment and software services. First, hardware equipments include computers and electronic components, communication equipment and audio, video equipment. Second, software services include computer related services, communication services and software publishing. For the purpose of business profitability and daily life, R&D staff continuously improves the appearance and performance of ICT products. ICT R&D innovation are made to achieve purpose that create and innovate the appearance and performance of all ICT components, and update software services.

1.6 Significance of the Study

The findings are expected to reveal how emerging global cities are relying on their R&D and innovation advantages to maintain global city competitiveness and do not necessarily see themselves as marginalised in financial development.

The exploration of the "global city" literature should promptly pay attention to R&D activities and innovative. R&D development increasingly affects urban income distribution. Cities all over the world should not ignore the importance of R&D/innovation activities to economic development in the context of expanding R&D investment.

1.6.1 Theoretical contribution

Dynamics of global city formation are always the focus of global cities research (Chubarov & Brooker, 2013). In recent years, with the development of a knowledge-based economy many studies make efforts to explore global cities and innovation in diverse disciplines (Csomós & Tóth, 2016), this study can benefit to fully understand the dynamics of innovation in global cities. Rapid urbanization and the wave of knowledge economic in China cities provide a unique context to investigate the dynamics of innovation in global cities. This research not only contributes to the scholarship on global cities innovation, especially in terms of how innovation actors interact with local conditions through specific global cities environments. This research provides an analytical framework for the development of global cities in R&D and innovation that other scholars can use to analyse their cities.

Besides three categories of factors (namely geographical proximity, interactive network, and government intervention) presented in previous study on the dynamics of innovation, this research also incorporates social capital factors into investigating affect factor of innovation in global cities. Especially, this study focuses on the role of social capital as moderator on the relationship of interactive factors and affect factor

of innovation in global cities. Therefore, it broadens the literature relating to association between global cities and innovation.

1.6.2 Practical contribution

This research through exploring the salient factors which influence innovation activities in global cities, this study can help the local governments conduce innovative policies and urban planning to enhance the innovative capacity of the city. this study can provide the experience of the developing country in other regions to enhance their innovative capacity. The findings are expected to reveal how emerging global cities can rely on their unique advantages to fight for global cities and are not bound to perceive themselves as holding marginalized positions in the development of the financial.

This research focuses on the role of firms' sense as perspective on the condition of global cities and R&D investment intentions of firms to Shenzhen. By examining the relative importance of each dimension from firms' perspective, urban planners and city authorities will understand the important determinants of select intentions of firms. This research investigates the innovation actors' interaction with the global city’s environment, and some suggestions for the collaboration network in global cities can be concluded.

1.7 Organisation of Thesis Chapters

This thesis is divided into five chapters and the thesis is organised as follows.

Chapter 1: Chapter 1 presents a brief background in this research, the problem statement, the research questions, the research objectives, and the scope of the study, and finally the research implications of the study.

Chapter 2: Chapter 2 contains theories and literature related to global cities and innovation from previous studies to strengthen the theoretical framework of the study. Most of the topics will cover the factors influencing R&D activities in global cities. Also, the experiences of innovation development in other parts of the world are discussed. This chapter reviews the relevant literature and how various theory supports the objectives of this study.

Chapter 3: The main body of Chapter 3 will cover the research design, detailing the study sites, describing the research methodology, sample selection, the data collection methods, the tools that would use for data analysis and statistical analysis.

Chapter 4: Chapter 4 presents the findings and discussion on the data analysis of the Shenzhen case study. It reports on the profile of the respondents, a summary of the findings, and the interviews conducted by the Shenzhen stakeholders, followed by a discussion of the findings.

Chapter 5: Chapter 5 reports those research findings. It summarizes the main research findings, implications, limitations, and recommendations for future research of this study. This research will help policymakers in Shenzhen in developing medium and long-term planning for R&D activities/innovation development.

CHAPTER 2

THE DYNAMICS OF INNOVATION AND R&D ACTIVITIES IN GLOBAL CITY

2.1 Introduction

This chapter will review previous research on the multiple impacts of global cities in the development of R&D activities/innovation. Global cities act as centres for the coordination and control of global capital, such as information, knowledge and technology. At the same time, R&D activities/innovation development is a learning process that relies on fast and easy access to information, exchange of ideas and knowledge generation, which requires knowledge exchange, interconnection and cooperation between different key stakeholders. Among these interconnected stakeholders are local firms or MNCs, public or private research institutions, universities and other higher education institutions, companies providing consultancy or technical services, local governments and policy-making bodies. As all these key stakeholders are concentrated within cities, the geographical proximity of firms facilitates the exchange of information and experience between firms, and global cities provide better opportunities for learning and informal exchange.

Knowledge creation and its application in the marketplace has become a major source of competitiveness in economically developed regions of the world. Past research has shown that firms' R&D activities and innovations tend to form spatial agglomerations in a specific geographical area. The development of innovation within a region has its own specific nature and mode of operation, and some of the unique innovation advantages of a region are based on immovable elements that corporate R&D centres and international R&D by multinational companies usually find when

making their R&D location choices. The choice of certain regions as R&D locations by companies includes, in addition to their internal strategies, factors external to the company, which, at the same time, influence and contribute to the innovative development of a region. In this regard, it is necessary to examine factors at the global city level.

Finally, the innovative development of a region cannot be achieved without government intervention and organisation.

This research begins with a definition of world cities and global cities. This is followed by a critical review of the mechanisms of stakeholder cooperation in R&D activities/innovation. Another overview of Shenzhen, China, an emerging international city, concludes with the construction of the theoretical framework for this study.

2.2 Global city formation and Innovation and R&D activity

2.2.1 Global city formation

In the past four decades, extensive research on the reorganization of the world economy and "global cities" (Sassen, 1991) has provided the basis for the formation of global cities. Economic globalization has led to a system where economic power is concentrated in several keys "global cities". Scholars are not new to this area of exploration. The symbol of the global city is the visible physical feature of the headquarters of MNCs, the financial centre, the concentration of APS and the international airport.

In the context of the structural adjustment of the world economy, (Friedmann & Wolff, 1982)carried out pioneering work on the study of world cities. They believed that world cities are "the main places for the concentration and accumulation of international capital", and cities are closely connected, and they exist in " core and semi-core regions"(p. 59). In (1986), Friedman proposes that world cities are linked to the structural transformation of economies and that global capital is largely concentrated in world cities. On the other hand, Sassen (1991) making a difference global cities from world cities, and believes that global cities are a new type of economic coordination unit. Some production activities move to regions with lower labour costs, while economic activities in cities upgrade to knowledge-intensive industries, where global cities serve an organisational role in these different types of economic activities. The commanding heights play a role to provide companies with financial and advanced services, as well as a key market for capital (Sassen, 1991). Sassen (1991) argued that APS can help MNCs to operate their business activities more conveniently, while the global city also has various infrastructures to serve its control functions.

Sassen (1991) argued that the transformation of cities such as London, New York, Tokyo, Hong Kong and Frankfurt will converge. Sassen's arguments illuminate global cities from the perspective of structural economic transformation. King also supports Sassen's view that global cities share a common structural identity (King, 1990, p. 154), which are recognised in the global city's literature. Global cities have been recognized for their actors as coordination and control in the world economy, but scholars have pointed out that when the theory of integrating all global urban economic structures into global cities tends to be consistent, one should proceed with caution. Olds & Yeung (2004) propose a pathway for differentiated development of

global cities, particularly the role of nation states in consciously contributing to global city formation. Olds & Yeung (2004) investigate the case of Singapore in the Asia-Pacific region, where once global economic flows converged in Singapore, the Singaporean government adapted development through state power policies aimed at creating interactive economic relations with developed economies, prompting Singapore to capture profits from other parts of the world.

In this respect, global city formation (e.g., New York and London) is a product for which world economic restructuring and the operation of the APS. Other emerging global cities have involved themselves in the changing space of global economic flows and sought explicit gains through state power.

2.2.2 Factors Affecting Global Cities Formation, Innovation and R&D activity

Currently, innovation-driven growth and development is a major driver for countries and cities around the world (Yang, 2017). An very unbalanced geographic representation of innovation is the result of the effects of globalisation and the internationalisation of R&D. (Stek, 2020). Cities and regions increasingly have a significant role in determining how new knowledge is created and disseminated in the global economy. The success of a select group of extremely inventive clusters, such Silicon Valley in the US and Zhongguancun in Beijing, draws attention to the connection between creativity and city/regional prosperity. Urban environments and innovation are tightly correlated, and Florida et al. (2017) unpack Jacobs'(1969) insights on cities, suggesting that cities and regions provide the basic platform for innovative activity, with cities aggregating a variety of firms, talent and related

regional knowledge institutions. Ning et al. (2016) examine the extent to which industrial agglomeration in Chinese cities affects urban innovation. The had this to the notion that FDI plays a major role in knowledge spillovers and enhances local innovation. Spatial agglomeration and knowledge spillovers generated in urban environments of a certain size and density are the basic drivers of innovation.

Global cities are on the rise in several regions of the world, leading to these global cities attracting foreign direct investment, which will lead to an increase in employment and economic activity in global cities. Some companies are considering larger cities (e.g.: global cities) in the location investment phase. R&D activities, among other things, are one of the most significant components of business activity that can stand alone in terms of location. The selection of location results in a location that is forward-looking and relevant for the firm, as well as being closely linked to its productivity, or its sustainable profitability. Global cities, with their unique resources and conditions, attract a concentration of key players such as new customers and producers in the city, with collaborative mechanisms between the players, thereby facilitating the spillover of expertise and diffusion of innovation and stimulating the occurrence of innovation. This study argues that among the locational factors for locating a firm's R&D activities is related to the city's innovation collaboration mechanisms.

Csomós & Tóth (2016) claimed that global cities carry most of the R&D activities of MNCs. A number of scientific articles are used to quantify R&D activities. The number of articles produced by MNCs reflects the R&D status of the city. Global cities, especially metropolitan areas are characterised by a high degree of interconnectedness to local and global markets; a cosmopolitan culture; a rich supply