ESSAYS ON THE EXPORT PERFORMANCE AND PROVINCIAL GROWTH OF CHINA

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ABSTRACT

Key terms: Exports, FDI, determinants, disparity, causality, economic growth, convergence, China

This dissertation investigates the determinants of China's exports and regional economic growth; the direction of causality between foreign direct investment (FDI) and exports; and convergence analysis among Chinese provinces.

The study firstly discusses the evolutional process of China's foreign trade regime through comparing the strategies and policies before 1978 with those after 1978. It is emphasised that the export-promotion development policies result in the recent basic export patterns and characteristics. Furthermore, the study reviews the existing literature on exports, FDI, and convergence/growth determinants in the case of China.

The empirical work comprises three parts. Firstly, fixed-effects ordinary least squares (OLS) and random-effects generalised least squares (GLS) panel data estimators are applied to test the determinants of provincial exports from 1994 to 2003. It is found that FDI, geographical location, investment in manufacturing innovation, and human capital have significant influences on regional export performance. Secondly, the augmented Dickey-Fuller (ADF) tests are carried out to test stationarity and the Granger causality tests are conducted to test the causal direction between FDI and exports, based on monthly national data from January, 2002 to June, 2006. The empirical results indicate that there is a one-way complementary causal link from FDI inflows to China's export flows. Thirdly, three methods, beta convergence, sigma convergence, and Markov Chain analysis, are used to do convergence debate among China's regions and the standard OLS cross-section and random-effects GLS panel data are applied to test the conditional convergence. The results suggest that the convergence hypothesis does not hold in China between 1994 and 2003 and there is a sign of conditional convergence, conditioning the explanatory variables such as exports, human capital, and population growth.

OPSOMMING

Sleutelwoorde: Uitvoer, Direkte Buitelandse Investering (DBI), Determinante, Dispariteit, Kousaliteit, Ekonomiese Groei, Konvergensie, Sjina.

Hierdie proefskrif ondersoek die determinante van Sjina se uitvoer en provinsiale ekonomiese groei, die rigting van oorsaaklikheid tussen direkte buitelandse investering en uitvoer, asook die konvergensie van ekonomiese groei tussen Sjina se provinsies.

Die studie bespreek eerstens die evolusionêre ontwikkeling van Sjina se buitelandse handelsbetrekkinge deur die strategieë en beleide voor 1978 met dié van na 1978 te vergelyk. Dit word beklemtoon dat daardie uitvoerbevorderingsontwikkelingsbeleide die huidige uitvoerpatrone en –einskappe tot gevolg het. Die studie gee verder 'n oorsig oor die bestaande literatuur van Sjina se uitvoer, DBI en konvergensie en determinante van ekonomiese groeikoerse.

Die empiriese werk bestaan uit drie dele. Eerstens is vaste-effek gewone kleinste kwadrate skatters (OLS) en ewekansige-effek algemene kleinste kwadrate skatters (GLS) op paneeldata toegepas om die determinante van provinsiale uitvoer vanaf 1994 tot 2003 te toets. Daar is bevind dat DBI, geografiese ligging, investering in nywerheidsinnovasie en menslike kapitaal 'n betekenisvolle invloed op provisiale uitvoerprestasies gehad het. Tweedens is die Dickey-Fuller (ADF) toets uitgevoer om vir stasionariteit te toets en Granger kousaliteitstoetse om die rigting van oorsaaklik heid tussen DBI en uitvoer te bepaal. In hierdie geval is maandelikse nasionale-vlak data vanaf Januarie 2002 tot Junie 2006 gebruik. Die resultate toon dat daar 'n eenrigting komplimentêre kousale verband bestaan tussen DBI invloei en Sjina se uitvoervloei. In die derde plek is drie metodes, naamlik beta-konvergensie, sigma-konvergensie en Markov-ketting analise gebruik om die konvergensie van inkomstevlakke tussen Sjina se provinsies te bepaal. Die standaard OLS-kruissnit en ewekansige-effek GLS paneeldata-regressies is gebruik om voorwaardelike konvergensie te toets. Die resultate toon dat die konvergensie-hipotese nie vir Sjina in die periode 1994 tot 2003 geld nie. Daar is wel tekens van voorwaardelike konvergensie waarvolgens veranderlikes soos uitvoer, menslike kapitaal en bevolkingsgroei provinsiale groeikoerse verklaar.

ABBREVIATIONS AND ACRONYMS

ADF: the Augmented Dickey-Fuller

AIC: Akaike's information criterion

ASEAN: Association of Southeast Asian Nations

CPC: Communist Party of China

ETDZs: Economic and technology development zones

EU: European Union

FDI: Foreign direct investment

FIEs: Foreign-invested enterprises

FTAs: Free trade areas

FTCs: Foreign trade corporations

GDP: Gross domestic product

GLS: Generalised least squares

Hong Kong SAR: Hong Kong special administrative region

HTDZs: High technology development zones

MNEs: Multinational enterprises

MOFT: The Ministry of Foreign Trade

NIEs: Newly industrialising economies

OCCs: Open coastal cities

OEZs: Open economic zones

OLS: Ordinary least squares

RCA: Revealed comparative advantage

R&D: Research and development

SC: Schwarz criterion

SEZs: Special economic zones

SSB: State Statistical Bureau of China

TFP: Total factor productivity

WTO: World Trade Organisation

LIST OF FIGURES

PAGE

Figure 2.1: Exports by region, 1994-2003 (as % of total).....29

Figure 5.1: FDI inflows in China, 1985-2005.....78

Figure 5.2: The plots of logarithms of FDI inflows and exports, Jan 2002-Jun 2006.....85

Figure 6.1: Plot of the log of initial per capita GDP with average real GDP growth rate per capita, annual average 1994-2003.....103

Figure 6.2: The dispersion of real per capita GDP in China, 1994-2003.....106

Figure 6.3: Lorenz curves for regional inequality in China, 1994, 1999 and 2003.....108

LIST OF TABLES

PAGE

Table 1.1: China's regions.....5

Table 2.1: China's open economic zones.....19

Table 2.2: The key laws and regulations for FDI in China.....21

Table 2.3: Export volumes (billions of US$) and shares of world exports (percent), 1970-2003.....23

Table 2.4: Export growth (percent), 1970-2003.....24

Table 2.5: The products of China's exports ranked the ten highest RCA indices in 1980.....26

Table 2.6: The products of China's exports ranked the ten highest RCA indices in 1997.....26

Table 2.7: FDI inflows, total exports, and exports structure, 1980-2004.....28

Table 2.8: China's trade with the United States (billions of US$).....31

Table 2.9: China's top export destinations in 2005 (billions of US$).....31

Table 3.1: A selection of studies on China's export performance from different perspectives.....36

Table 3.2: Studies on FDI to China.....39

Table 3.3: A selection of empirical studies on the relationship between FDI and exports in the case of China.....43

Table 3.4: A selection of empirical studies on the convergence of Chinese provinces.....48

Table 4.1: Provincial exports in China, 1994-2003.....51

Table 4.2: The rank of the best and worst performers in export values, 1994 and 2003.....53

Table 4.3: Regional distribution of inward FDI and exports in China

LIST OF TABLES (continued)

PAGE

(million US$).....60

Table 4.4: Description of variables.....67

Table 4.5: Random and fixed effects panel data regression results.....70

Table 5.1: ADF unit root test.....86

Table 5.2: Results of Granger causality test.....88

Table 6.1: Provincial average growth rates of real per capita GDP in China, 1994-2003.....92

Table 6.2: The rank of the best and worst performers in real per capita GDP, 1994 and 2003.....93

Table 6.3: Test for absolute convergence: dependant variable real GDP growth rate per capita, annual average 1994-2003.....102

Table 6.4: OLS cross-section regression results, dependant variable real GDP growth rate per capita.....104

Table 6.5: The random-effects GLS panel data regression results, dependent variable real GDP growth rate per capita.....105

Table 6.6: Markov Chain transition matrix for provincial per capita GDP (relative to China average), first-order, time-stationary, states: 4.....112

LIST OF CHARTS

PAGE

Chart 2.1: The linkages between China's export policies and patterns.....33

Chart 7.1: Structural layout of this study.....116

TABLE OF CONTENTS

PAGE

ACKNOWLEDGEMENTS.....i

ABSTRACT.....ii

OPSOMMING.....iii

ABBREVIATIONS AND ACRONYMS.....iv

LIST OF FIGURES.....v

LIST OF TABLES.....vi

LIST OF CHARTS.....viii

CHAPTER 1: INTRODUCTION

1.1 PROBLEM STATEMENT.....1

1.2 OBJECTIVES.....2

1.2.1 General objectives.....2

1.2.2 Specific objectives.....3

1.3 BACKGROUND.....3

1.3.1 General information of China.....3

1.3.2 Historical background.....6

1.4 METHODOLOGY.....7

1.4.1 Literature survey.....7

1.4.2 Empirical investigation.....7

1.4.2.1 Determinants of exports.....8

TABLE OF CONTENTS (continued)

PAGE

1.4.2.2 Causality test....10
1.4.2.3 Convergence/growth determinants....11
1.4.2.4 Data....13
1.5 DIVISION OF CHAPTERS....13

CHAPTER 2: CHINA'S EXPORTS: HISTORY, TRENDS AND CHARACTERISTICS

2.1 INTRODUCTION....15
2.2 THE EVOLUTION OF CHINA'S FOREIGN TRADE REGIME....15
2.2.1 Pre-reform period (before 1978)....15
2.2.1.1 Characteristics of pre-reform trade regime....15
2.2.1.2 Consequences of pre-reform trade policies....16
2.2.2 Post-reform period (after 1978)....17
2.2.2.1 Decentralised responsibility....17
2.2.2.2 Reform of the foreign exchange....18
2.2.2.3 Open economic zones (OEZs) in China....18
2.2.2.4 Liberalisation of foreign direct investment (FDI)....20
2.2.2.5 Duty exemptions....22
2.2.3 Conclusion....22
2.3 KEY TRENDS AND CHARACTERISTICS OF CHINA'S EXPORTS....22

TABLE OF CONTENTS (continued)

PAGE

2.3.1 China's export growth.....22

2.3.2 Commodity structure.....24

2.3.3 Export by type of ownership.....27

2.3.4 Geographical distribution.....29

2.3.5 Export destinations.....30

2.4 SUMMARY.....32

CHAPTER 3: LITERATURE REVIEW OF CHINA'S EXPORTS, FDI AND SPATIAL CONVERGENCE

3.1 INTRODUCTION.....35

3.2 UNDERSTANDING CHINA'S EXPORT PERFORMANCE.....35

3.3 UNDERSTANDING FDI TO CHINA.....37

3.4 THE LINK BETWEEN FDI AND EXPORTS IN CHINA.....41

3.5 UNDERSTANDING PROVINCIAL GROWTH AND CONVERGENCE IN CHINA.....45

3.6 SUMMARY.....49

TABLE OF CONTENTS (continued)

PAGE

CHAPTER 4: THE DETERMINANTS OF CHINA'S PROVINCIAL EXPORT PERFORMANCE

4.1 INTRODUCTION.....50

4.2 CHINA'S PROVINCIAL EXPORT PERFORMANCE.....50

4.3 CONCEPTUAL MODEL.....53

4.4 THE DETERMINANTS OF CHINA'S PROVINCIAL EXPORT PERFORMANCE.....55

4.4.1 Foreign direct investment (FDI).....55

4.4.1.1 Theory and empirics.....55

4.4.1.2 The stylised facts of FDI and exports.....57

4.4.2 Coastal location.....63

4.4.2.1 The geographical economy of China.....63

4.4.2.2 Coastal advantages in China.....63

4.4.3 Innovation in manufacturing.....65

4.4.3.1 Theory and empirics.....65

4.4.3.2 Innovation in manufacturing in China.....65

4.4.4 Human capital.....66

4.4.4.1 Theory and empirics.....66

4.4.4.2 Human capital in China.....66

4.5 ESTIMATION OF THE DETERMINANTS OF PROVINCIAL EXPORT PERFORMANCE.....67

TABLE OF CONTENTS (continued)

PAGE

4.5.1 Variables.....67

4.5.2 Data.....67

4.5.3 Empirical model and methodology.....68

4.5.4 Empirical results.....69

4.5.5 Conclusion and policy implications.....71

4.6 SUMMARY.....71

CHAPTER 5: THE CAUSAL RELATIONSHIP BETWEEN FOREIGN DIRECT INVESTMENT AND EXPORTS IN CHINA

5.1 INTRODUCTION.....73

5.2 LITERATURE REVIEW.....73

5.2.1 Theoretical considerations.....74

5.2.2 Empirical evidence.....75

5.3 FDI IN CHINA.....76

5.3.1 The key trends of FDI in China.....77

5.3.2 The determinants of China's FDI.....79

5.4 METHODOLOGY.....82

5.4.1 ADF test.....82

5.4.2 The Granger test.....83

5.5 EMPIRICAL RESULTS.....85

TABLE OF CONTENTS (continued)

PAGE

5.5.1 Data....85

5.5.2 Results of the ADF test....86

5.5.3 Results of Granger causality test....87

5.6 SUMMARY....88

CHAPTER 6: ECONOMIC DISPARITIES ACROSS CHINESE PROVINCES

6.1 INTRODUCTION....90

6.2 OVERVIEW OF PROVINCIAL DEVELOPMENT IN CHINA....91

6.3 BETA CONVERGENCE....94

6.3.1 Economic growth theory and empirical modelling....94

6.3.2 Estimators....96

6.3.3 The determinants of provincial economic growth....97

6.3.3.1 Initial provincial GDP per capita....97

6.3.3.2 Export performance....97

6.3.3.3 Other determinants....99

6.3.4 Empirical results....101

6.3.4.1 Data and variables....101

6.3.4.2 Empirical results for unconditional and conditional convergence....102

6.4 SIGMA CONVERGENCE....106

TABLE OF CONTENTS (continued)

PAGE

6.5 MARKOV CHAIN ANALYSIS.....109

6.6 SUMMARY.....112

CHAPTER 7: SUMMARY AND CONCLUSION

7.1 INTRODUCTION.....114

7.2 SUMMARY.....117

7.3 CONCLUSION.....121

REFERENCES.....124

Chapter 1: Introduction

1.1 Problem statement

At the end of the 1970s, China was poor, over-populated, short of human capital and natural resources, and was constrained by an ideology hostile to markets and to opening the economy. After over two decades, China has experienced an exceptional economic expansion with nearly 10% average annual GNP growth (Eichengreen *et al.*, 2004). This growth is unprecedented in world history. As a result, China has transformed itself from a poor, centrally planned economy to a lower middle-income, emerging market economy.

The rapid economic growth of China followed systemic economic reforms, which started in 1978. One particularly important pillar of these reforms was China's "open door" policy. The increasing openness of its economy has been a driving force behind China's exceptional growth performance, especially due to growing exports. From a rank of thirty-second in export volume in 1978 to the world's fourth largest exporter in 2003, the expansion of China's exports has been significant (Lardy, 1992a; b; Wolf, 2003). Between 1980 and 2002, China's share in global exports rose from 1.2% to 5.5%. From 1993 to 2002, the volume of Chinese exports rose at an average annual rate of 17.3% (Wolf, 2003). There was also a significant shift in the commodity composition of China's exports. Manufactured exports have grown more dramatically, 18.8% on average during the period 1980 to 2000. The share of exported manufactured goods in total exports increased from less than 50% in 1979 to over 90% in 2004, which has reversed China's traditional export emphasis on natural resources and agricultural products (Lai, 2006).

Although national export growth rates have been noticeable since 1978, it is also true that export performance has varied widely across China's regions. Coastal provinces outperform the inner areas. In terms of export volume, during the period 1986 to 1998, exports of the coastal area accounted for 85.45% of total exports (Zhang and Song, 2000). The first question therefore asked is: what drives China's exports, especially coastal provinces, to do so well?

During the process of identifying the determinants of special or regional export performance, an important economic indicator emerges, which is foreign direct investment (FDI). All the data indicate that in the case of China, FDI and exports have moved together over time and regions since the beginning of reforms. The nature of the relationship between these two variables is "inextricably associated with questions about precedence and time" (Zhang and Felmingham, 2001: 83). The direction of causality between FDI and exports is so important that it is considered as being central to designing a country's development policies and strategies (Zhang and Felmingham, 2001). Therefore, the second question asked is: does FDI lead exports, or vice versa?

It should be noted here that, in recent years, an important feature of China's economy is not only that the export disparity among China's regions has become wider but also that the income gap among regions has widened noticeably (Chen and Fleisher, 1996; Yao and Zhang, 2001a; Zhou, 2004). The problem of regional inequality is reflected in the State Council and the Central Committee of the Chinese Communist Party's efforts to promote the development of West China (Lin, 2001). Therefore, after the Chinese government has intensified its efforts to narrow the income gaps among China's provinces, has there been convergence in China? What is the role of exports in China's provincial economic growth? This is the third aspect that this study will attempt to discuss.

1.2 Objectives

The research objectives are divided into general objectives and specific objectives.

1.2.1 General objectives

With reference to the above formulation of the problems, the general objectives of this research are to study the determinants of China's exports and regional economic growth, to test the direction of causality between FDI and exports, and to perform the convergence analysis among Chinese regions.

1.2.2 Specific objectives

The specific research objectives are to:

1) Describe the development of China's trade regime, especially export-promoting development strategy.
2) Describe the trends and characteristics of China's export performance since 1979.
3) Provide the literature reviews, including recent extensions and views, on China's export performance, inward FDI, the relationship between FDI and China's exports and convergence debate in the case of China.
4) Identify the determinants of China's provincial exports using panel data during the period of 1994 to 2003, especially the FDI-export linkage.
5) Describe the recent trends and determinants of FDI in China after China's WTO accession.
6) Study the Granger causality between exports and FDI using monthly data during the period January, 2002 to June, 2006.
7) Carry out convergence analysis with multiple measures (beta-convergence, sigma-convergence and Markov Chain analysis) and identify the determinants of provincial economic growth in China for the period 1994 to 2003, especially the impact of exports on growth rates, using cross-section and panel data.
8) Describe China's national success and provincial experience in economic growth, export performance, and FDI.

1.3 Background

1.3.1 General information of China

China, (People's Republic of China; PRC), is situated in eastern Asia, bounded by the Pacific in the east. It is the third largest country in the world, next to Canada and Russia and has an area of 9.6 million square kilometres or one-fifteenth of the world's land area. Its total population of 1.2869 billion (July, 2003) is about 22% of the total population of the world (http://www.china-tour.net).

China has 23 provinces, 5 autonomous regions, 4 municipalities (provincial level cities) and 2 special administrative regions - Hong Kong and Macao. The capital of China is Beijing. Table 1.1 provides a general introduction to every region in China. It should be noted that coastal (eastern), central and western regions refer to the three economic zones classified by the Chinese government (Yao and Zhang, 2001a; b). Among them, central and western regions usually are called by a joint name - inner areas.

Table 1.1: China's regions

Province	Capital	Important cities	Total population (2003) Unit: 10000
Eastern (coastal) zone			
Beijing			1456
Tianjin			1011
Hebei	Shijiazhuang	Baoding, Cangzhou	6769
Liaoning	Shenyang	Dalian, Jinzhou	4210
Shanghai			1711
Jiangsu	Nanjing	Suzhou, Nantong	7406
Zhejiang	Hangzhou	Huzhou, Ningbo	4680
Fujian	Fuzhou	Xiamen, Quanzhou	3488
Shandong	Jinan	Jining, Tai'an	9125
Guangdong	Guangzhou	Shantou,zhenzen	7954
Guangxi	Nanning	Beihai, Guilin	4857
Hainan	Haikou		811
Central zone			
Shanxi	Taiyuan	Datong, Yuci	3314
Inner Mongolia	Hohhot	Baotou, Hailiar	2380
Jilin	Changchun	Siping, Liaoyuan	2704
Heilongjiang	Harbin		3815
Anhui	Hefei	Huangshan, Bengbu	6410
Jiangxi	Nanchang	Juijiang, Jingdezhen	4254
Henan	Zhengzhou	Kaifeng, Luoyang	9667
Hubei	Wuhan	Huangshi,Shashi	6002
Hunan	Changsha		6663
Western zone			
Sichuan	Chengdu	Leshan, Nanchong	8700
Chongquing			3130
Guizhou	Guiyang		3870
Yunnan	Kunming	Pu'er, Lijiang	4376
Tibet	Lhasa		270
Shannxi	Xi'an	Lintong, Yan'an	3690
Gansu	Lanzhou	Baiyin, Dingxi	2603
Qinghai	Xining		534
Ningxia	Yinchuan	Shizuishan	580
Xinjiang	Urumqi		1934

Source: China Statistical Yearbook, 2003.

Note: Before 1987, there were 29 provinces, provincial level cities and autonomous regions. In 1988, Hainan, previously part of Guangdong Province, became a separate province. In 1997, Chongquing, which used to be part of Sichuan Province, was granted the status of provincial level city (Zhou, 2004). For political and economic reasons, Taiwan Province is excluded here.

1.3.2 Historical background

For centuries China stood as a leading civilisation, outpacing the rest of the world in the arts and sciences. But in the 19th and early 20th centuries, China was beset by civil unrest, major famines, military defeats, and foreign occupation. In 1949, the Communists under Mao Zedong established the People's Republic of China. In the same year, the Chinese economy closed its door to the western countries.

It is appropriate to consider the years 1956 to 1978 as covering the essence of the Maoist period. In effect, 1949 to 1955 corresponds to the establishment of state power by the Communist Party of China (CPC) and the construction of the new democracy. Most of the time during the Maoist period, the Chinese police were extremely politicised. In other words, "economics gave way to politics as the priority aims and preferred means in state policy" (Chen, 2002: 571). With fears of foreign invasion, the Chinese government placed emphasis on the strategy of self-sufficiency and political isolation of the country was legitimised. Because the country had a strong aversion to foreign trade, China's trade regime prior to 1978 was an extreme version of import substitution. For more than twenty years, China's economy was characterised by an introverted development strategy. Until the end of the 1970s, it was not surprising that China was one of the most closed economies in the world (Chen, 2002).

Mao's demise in 1976 created an opportunity for fundamental changes in Chinese policy. Deng Xiaoping, the country's late paramount leader, who has been described as the architect of modern China, succeeded in setting the country on the road to socialist modernisation. He has ushered China into a new historical period (http://www.anoca.org/china/party/deng_xiaoping.html).

In 1978, under Deng Xiaoping's leadership, "the Eleventh Central Committee of the Communist Party of China put the reform of the economy and opening up at the head of the agenda and the Council of State issued the first official documents on the reforms in 1979" (Bettelheim, 1988: 15). The changes that the economy and society of China have experienced go far beyond simple "adjustments", which can be said to constitute a new revolution. More than twenty years later, China has become more and more integrated into the global economy. The Chinese economy is fundamentally different from what it was when Mao, the founder of the CPC, died (Bettelheim, 1988: 15).

1.4 Methodology

This study will make use of a literature survey as well as an empirical investigation. The literature survey will provide the background through an overview of the existing knowledge on China's economic and export performance, and will generate a number of hypotheses to be tested by using data on China's economic and export performance.

1.4.1 Literature survey

The literature survey will be contained in chapters 3 to 6 of this study. Chapter 3 will provide the literature review on four topics in China. These include export performance; the performance, determinants and impacts of foreign direct investment; the relationship between FDI and exports; and spatial convergence in China. Furthermore, from chapters 4 to 6, each chapter will provide the theoretical considerations and empirical evidence from other countries to each relationship between different variables. The literature review in chapter 4 focuses on examining the determinants of provincial exports. Chapter 5 emphases the causal relationship between exports and FDI and chapter 6 discusses the existing studies on the convergence debate and the determinants of regional economic growth, especially the export-growth link.

1.4.2 Empirical investigation

Empirical methods will be used to achieve each of the three general objectives (see section 1.2.1). Sections 1.4.2.1 to 1.4.2.3 will describe the methods to be used to 1) find the determinants of provincial exports; 2) test the causality direction between FDI and exports; and 3) do convergence analysis and identify the effect of exports on provincial growth.

1.4.2.1 Determinants of exports

The empirical investigation will start from chapter 4. Chapter 4 will test and estimate the significance of the determinants in explaining Chinese provincial export performance between 1994 and 2003. In particular, the relationships between FDI inflows, technological factors, geographical effects, and exports will be tested explicitly. Fixed-effects OLS and random-effects GLS panel data regressions will be used and compared to estimate the determinants of provincial exports in China. The empirical framework is as follows with STATA 9.0:

The long-run relationship between the dependent variable and its explanatory variables will be tested in the following panel data model:

$$y_{it} = \alpha + x_{it}\beta + v_{it} \tag{1.1}$$

For $i = 1,.....N$ and $t = 1,.....T$ and where i and t denote cross-sectional unit and time respectively, y_{it} represents a dependent variable in the theoretical model. x_{it} are all explanatory variables that can vary over t and i. α and β denote a constant and a vector to be estimated, and v_{it} is the error term.

In the case of panel data, more complex estimation strategies have to be followed, such as using GLS panel data estimators. With panel data, there are two estimation approaches: fixed and random effects estimations. To illustrate their implications, consider the following (Naudé, 2004: 831).

Equation (1.1) can be written in the following manner to illustrate the different estimation options when a panel of data is available (showing that panel data models have complex error structures).

$$y_{it} = \alpha + x_{it}\beta + c_i + u_{it} \tag{1.2}$$

Where c_i = unobserved region characteristics, e.g. due to initial technical efficiency, which are constant over the period, and influence y_{it}; and u_{it} = an idiosyncratic error term with variance δ_u^2 with the usual properties (Naudé, 2004: 831).

From equation (1.2) the so-called "between" estimator[1] is OLS applied to the following equation:

$$\bar{y}_i = \alpha + \bar{x}_i\beta + c_i + u_i \tag{1.3}$$

Where $\bar{y}_i = T^{-1}\sum_{t=1}^{T} y_{it}$ and so on. It should be noted that the "between" estimator is not consistent because $E(\bar{x}_i c_i) \neq 0$ (Naudé, 2004: 831).

The fixed effects (or "within") estimator[2] is obtained by using OLS to estimate (Naudé, 2004: 831):

$$(y_{it} - \bar{y}_i) = (x_{it} - \bar{x}_i)\beta + (u_{it} - u_i) \tag{1.4}$$

The random effects estimator is a weighted average of the estimates produced by the between estimator (1.3) and within estimator (1.4) (Naudé, 2004: 832).

$$(y_{it} - \theta\bar{y}_i) = (1-\theta)\alpha + (x_{it} - \theta x_{it})\beta + (1-\theta)c_i + (u_{it} - \theta\bar{u}_i) \tag{1.5}$$

where $\hat{\theta} = 1 - \sqrt{\dfrac{\hat{\delta}_u^2}{T_i\hat{\delta}_c^2 + \hat{\delta}_u^2}}$

It should be noted that the fixed-effect estimation can only include the explanatory variables that can vary over time and regions, which means that time-constant factors and geographical determinants can not be included in the explanatory variables (Naudé, 2004).

[1] The between estimator uses only the variation between the cross-section observations.
[2] The within estimator uses the time variation within each cross section of observations (Naudé, 2004: 831).

1.4.2.2 Causality test

Chapter 5 will evaluate the causal link between inward FDI stock and exports in China, using the monthly time-series data after China joined the WTO in December, 2001. The methodology of this chapter will include two parts. One is the augmented Dickey-Fuller (ADF), which can test if the used time series is stationary. The other is the Granger causality test, which can test if there is a lead-lag relationship between the dependent and independent variables. The regression equations of the two tests are as follows:

- **The equations of the ADF test**

The ADF test of stationarity for a variable y is based on the following equations:

$$\Delta y_t = \mu + \beta y_{t-1} + \sum_{j=1}^{m} \delta_j \Delta y_{t-j} + u_t \quad \text{(excluding time trend)} \tag{1.6}$$

$$\Delta y_t = \mu + \lambda t + \beta y_{t-1} + \sum_{j=1}^{m} \delta_j \Delta y_{t-j} + u_t \quad \text{(including time trend)} \tag{1.7}$$

Where m is the lag length of the dependent variable and should be long enough to permit a white-noise error term. Chapter 5.4.1 will provide further information of this method.

- **The equations of the Granger test**

The Granger causality test assumes that the information relevant to the prediction of the respective variables, x and y, is contained solely in the time series data on these variables. The test involves estimating the following regressions:

$$y_t = \sum_{i=1}^{n} \alpha_i x_{t-i} + \sum_{j=1}^{n} \beta_j y_{t-j} + u_{1t} \tag{1.8}$$

$$x_t = \sum_{i=1}^{m} \lambda_i x_{t-i} + \sum_{j=1}^{m} \delta_j y_{t-j} + u_{2t} \tag{1.9}$$

where it is assumed that the disturbances u_{1t} and u_{2t} are uncorrelated (Gujarati, 1995: 620). The details about this methodology will be discussed in chapter 5.4.2 with software EVIEWS 3.0.

1.4.2.3 Convergence/growth determinants

The purpose of chapter 6 is to discuss the regional convergence debate between the coastal and inner regions in China and to identify the determinants of regional economic growth, especially the impact of export performance on growth rate during 1994 to 2003. Three methods, beta-convergence, sigma-convergence and Markov Chain analysis, will be adopted to do convergence debate. Among them, two different econometric estimations including OLS cross-section and random-effects GLS panel data estimators will be used to test conditional convergence among Chinese provinces with STATA 9.0.

- **Absolute convergence**

Convergence can be tested by regressing average annual growth rates of GDP per capita (y_i) on the log of initial GDP per capita (y_{i0}). In other words by estimating:

$$y_i = \alpha + \beta y_{i0} \tag{1.10}$$

If $\beta < 0$, it suggests that there is 'β-convergence' (absolute or unconditional convergence) and that poorer countries and regions will subsequently grow faster (Barro, 1997).

- **Conditional convergence**

The random-effects GLS panel data approach has been discussed in 1.4.2.1. The single point, period-average and cross-section OLS regressions for conditional convergence will be described here.

In practice, equation (1.10) is implemented in an ad hoc fashion following the approach of Barro (1991), namely to estimate a conditional convergence equation, consisting of (1.10) extended by a number of variables, most notably investment (s_k), human capital (s_h), population growth (n), and a number of other conditioning variables.

The resulting equation to be estimated can be expressed as follows:

$$\ln y_{i(t2)} - \ln y_{i(t1)} = -(1 - e^{-\beta T}) \ln y_{i(t1)} + \alpha_i X_i + \varepsilon_i \tag{1.11}$$

where y = per capita GDP of country i

X_i = a vector of determinants of economic growth rates

ε_i = an error term with the usually assumed properties, including E (X_i ε_i) = 0.

The parameter β can be interpreted as the rate of convergence to the steady state (Barro, 1997).

- **Sigma-convergence**

Results on sigma convergence can be obtained from calculating the changes in the standard deviation of per capita income and population across Chinese provinces from 1994 to 2003.

- **Markov chain analysis**

Markov chain analysis allows one to quantify the dynamics of the regional income distribution. The use of Markov chain techniques requires the distribution to be made discrete, i.e. each region is assigned to one of a pre-specified number of groups based on its relative GDP per capital level. Letting f_t denote the vector of the resulting discrete distribution at period t and making the assumption that the distribution follows a homogenous, stationary, first order Markov chain process, the evolution of the discrete distribution can be characterised as follows:

$$f_{t+x} = M f_t \tag{1.12}$$

where M is the x-period transition matrix that maps the distribution at time t into period $t+x$. Each element of the transition matrix, m_{ij}, in the transition matrix denotes the probability of a region having a GDP per capita that leads it to be located in income group i of the discrete distribution at period t, to make the move to income group j in period $t+x$ (Naudé and Krugell, 2006: 7). As $x \to \infty$, the distribution can converge to the ergodic distribution or the steady state distribution. The more detailed discussion of this method will be provided in chapter 6.5 with R function software.

1.4.2.4 Data

The data of this study originates from the China Statistical Yearbook[3] complied by the State Statistical Bureau (SSB) of China and the websites of SSB (http://www.stats.gov.cn; http://www.mofcom.gov.cn; http://www.fdi.gov.cn). When the regression analyses are at the provincial level, it should be noted that Tibet and Qinghai are omitted, because of lack of data. Chongqing and Sichuan Province were only separated in 1997 and will be included as one combined province in this study to make the number of observations consistent before and after 1997. Also, for political and economic reasons, Taiwan Province will be excluded.

This study will use annual provincial data from 1994 to 2003 in both chapters 4 and 6. In chapter 5, monthly time series data for the period from January, 2002 to June, 2006 will be used in the Granger causality analyses.

1.5 Division of chapters

The main objectives of this study are to identify the determinants of China's exports, test the direction of causality between FDI and exports, and do convergence analyses and test the impacts of regional export performance on China's provincial economic growth.

Chapter 2 will examine the evolutionary process of China's foreign trade regime and discuss the key trends and characteristics of China's exports to provide some interesting and important lessons for other developing countries.

Chapter 3 will contain the literature survey on China's export performance, inward FDI, the relationship between FDI and exports in China, and convergence among Chinese regions to provide the background of China's FDI, economic, and export performance.

[3] Various years of the Chinese Statistical Yearbook are published by China's National Bureau of Statistics (NBS). NBS is in charge of statistics and economic accounting in China as an agency directly under the State Council. Various years of the Chinese Statistical Yearbook are therefore regarded as the official statistical data in China (http://210.72.32.6/cgi-bin/bigate.cgi/b/g/g/http@ 210.72.32.26/english/aboutnbs.htm).

Chapter 4 will carry out the empirical investigation on the determinants of China's provincial export performance from 1994 to 2003, especially the FDI-exports linkage.

Chapter 5 will evaluate the causal relationship between exports and FDI inflows at the aggregate level during January 2002 to June 2006 in order to provide information about the lead-lag relationship between the two economic indicators.

Chapter 6 will estimate whether there has been spatial convergence in China and test the determinants of China's regional economic growth, especially export-growth linkage during the period 1994 to 2003.

Chapter 7 will contain a summary and conclude this study.

Chapter 2: China's exports: history, trends and characteristics

2.1 Introduction

In chapter 1, it was pointed out that China's rapid economic growth over the past decades has been associated with the significant growth in exports. The process of export performance in China can provide a number of interesting and important lessons for other economies, in terms of the reform strategy to be pursued, its pace, sectoral emphasis, sequencing, and key components. According to this objective, this chapter is structured as follows: it will examine the evolutionary process of China's foreign trade regime in section 2.2 and discuss a number of key developments central to its export success in section 2.3. The chapter will conclude with a summary in section 2.4.

2.2 The evolution of China's foreign trade regime

China has transformed itself from a closed, centrally planned economy to an open, emerging market economy. Its transitional experience proved to be a successful way of catching up with the developed countries in terms of per capita income. China's trade policy shift from self-reliance or import substitution prior to 1978, to openness or export-led after 1978, has played a critical role in the convergence process (Yao and Zhang, 2001a; b; Yao, 2006). To assess the contribution of the Chinese export-oriented development strategy, it is useful to review the path that China has taken in this direction.

2.2.1 Pre-reform period (before 1978)

2.2.1.1 Characteristics of pre-reform trade regime

Before the implementation of the economic reforms in 1978, China's economy was characterised by an inward-focused development strategy (Poncet, 2003). The Soviet-style central planning system dominated China's commodity trade. As Fung (1996: 7) pointed out, "international trade was just an extension of the domestic planning process". To highlight the nature of the pre-reform trade regime, a few characteristics are summarised as follows.

- The Ministry of Foreign Trade (MOFT) monopolised trade through national foreign trade corporations (FTCs). The State Planning Commission set "preliminary annual and long term targets for broad categories of imports and exports. On the basis of the State Planning Commission's targets, the MOFT then prepared more detailed plans and sent these plans to the FTCs". Any firm or individual could not trade any goods without the intermediation of FTCs (Fung, 1996: 7).

- There was no close link between the world and domestic prices of tradable goods. According to the foreign trade plan, the FTCs bought fixed quantities of imports at the world price, and sold them to domestic firms at planned prices determined by a state, which did not vary with world market prices or domestic demands. Similarly, the FTCs bought fixed quantities of exportable goods from domestic suppliers at planned prices and sold them to foreign affiliates at the world market prices (Fung, 1996).

- China's trade regime prior to 1978 was an extreme version of import substitution. The Chinese authorities thought that "the purpose of importing.....is to lay the foundation of China's industrial independence, so that in the future China can produce all of the producer goods it needs and will not have to reply on imports from the outside" (Lardy, 1992).

- Inside the country, the emphasis was placed on a self-reliance strategy by the Chinese authority, which means the ability for the country to support itself with its own resources (Poncet, 2003). The consequence of this strategy was that international trade was regarded only as a residual so that principles of comparative advantage, economies of scale and specialisation were completely neglected in the production process.

- Foreign exchange was tightly controlled by the government. The state fixed the exchange rate at an overvalued level. All foreign exchange resulting from exports was retained by the state. Individuals had limited rights to hold foreign currency (Wei, 1993; Lardy, 2003).

2.2.1.2 Consequences of pre-reform trade policies

During the three decades of inward-oriented trade policies, the volume of China's trade had grown relatively slowly. China's share of global trade dropped from 1.5% in 1953 to only 0.6% in 1977 (Lardy, 2003: 5). Not only the volume, but also the commodity compositions of foreign

trade were completely "adverse for the efficiency of domestic resource allocation and economic growth" (Lardy, 2003: 5), particularly on the export side. China did not concentrate on exporting labour-intensive products but on exporting significant quantities of capital-intensive goods (Lardy, 1992a; b). As Lardy (2003: 4) states, by the end of the 1970s "a significant share of China's exports consisted of goods for which China did not enjoy a comparative advantage in production and producers of export goods had no economic incentive to expand their international sales".

2.2.2 Post-reform period (after 1978)

The disastrous economic situation in the late 1970s taught the Chinese leadership an important lesson that economic development was the key to maintaining its power (Qian and Wu, 2003). Most Chinese were also stunned by the fast economic development of "Asian tigers" (Hong Kong, Singapore, South Korea, Taiwan Province of China) during 1970s. The information arriving from Chinese neighbours provided strong evidence in favour of export-led development strategy (Qian and Wu, 2003).

In December 1978, the Eleventh Central Committee of the Communist Party of China (CCP) was widely regarded as the beginning of reform and opening up. Since then, China switched course and launched an export-promotion trade regime. A variety of instruments were employed to improve its export performance. Some of the key elements include:

2.2.2.1 Decentralised responsibilities

The task of increasing exports was decentralised to local authorities, industrial ministries, and production enterprises. While the central government continued to have direct control on certain specific commodities, most trade was decentralised and increasingly market determined. The implementation of this policy caused the provincial and city governments to become deeply involved in the development process in general and export promotion in particular (Panagariya, 2003).

Simultaneously with the decentralisation of trade rights, the system of physical planning of foreign trade was gradually dismantled in the 1980s and by the late 1990s was largely abandoned. In the process of decentralising, the Chinese government has improved the administrative system

that governed foreign trade through more effective management of custom duties, taxes, and credits (Shi, *et al.*, 1987; Lu, 1995; Lardy, 2003).

2.2.2.2 Reform of the foreign exchange

A further element in the export-oriented strategy was to provide incentives to exporters for engaging in foreign trade, which was achieved mainly through the reform of China's foreign exchange system. Beginning in the early 1980s, exporters were allowed to "retain a share of their foreign exchange earnings, which gave them the ability to finance imports without the need to seek permission to purchase foreign exchange" (Lardy, 2003: 7). Furthermore, and most importantly in the long run, the Chinese government substantially devalued the domestic currency from a nominal exchange rate of RMB (Renminbi: Chinese currency) 1.5 to one US dollar in 1979 to RMB 8.7 in 1994 (Lardy, 2003). The reason behind the sharp devaluation was a merging of the official exchange rate with the market rate[4] (World Bank, 1994).

2.2.2.3 Open economic zones (OEZs) in China

Since the beginning of economic reforms, China has set up a variety of open economic zones (OEZs[5]), which have been designated for the purpose of stimulating exports and attracting foreign investment (Wei, 1993). Foreign investors in OEZs have been provided with a more liberal investment, trade regime, and special tax incentives than in the rest of the economy. These zones have helped to serve as "focus points for investment from both domestic and foreign sources" and have played a key role in catalyzing economic development in the case of China (Panagariya, 2003: 2).

Table 2.1 summarises the various types of economic zones and the preferential policies that have been offered by the Chinese government during the reform period. It reveals that the OEZs have provided many economic incentives to foreign investors which have not been available in Chinese inland provinces (Panagariya, 2003: 3). Therefore, the coastal provinces have benefited from these special favourable policies.

[4] China adopted the planning-market double track system at the outset of reform. In 1994, China unified the official and market exchange rate by merging the former with the latter (Lu, 1995).

[5] OEZs include special economic zones (SEZs), open coastal cities, and various development zones (Wall, *et al.*, 1996).

Table 2.1: China's open economic zones

Type of open economic zones and abbreviations	Preferential policies
Special Economic Zones (SEZs)	Four SEZs were established in 1980, three (Shenzhen, Shantou and Zhuhai) in Guangdong Province near Hong Kong SAR, and one (Xiamen) in Fujian Province, close to Taiwan Province of China. In 1988, Hainan Province became the fifth SEZ. SEZs have enjoyed considerable autonomy in their investment policies regarding both infrastructure projects (provided they can be financed locally) and investment approvals (for projects worth up to $30 million). They have offered preferential income tax treatment and exemptions from import licenses as well as tax and tariff concessions for raw materials and for intermediate and capital goods (concessions for the latter were rescinded in 1996). Within SEZs, sales of locally produced goods have been free from duties and taxes, and sales of imported goods have been subject to a reduced tariff, with full tariffs and duties applying to sales outside SEZs (except exports).
Open Coastal Cities (OCCs)	In 1984, 14 cities in the coastal regions with already established industrial bases and infrastructure were designated open coastal cities and opened for foreign investment. Although not separate customs areas, and less having fewer independent and tax policies than other regions in China. Several OCCs and the surrounding countries have created larger development areas, such as the Pearl River delta and the Yangtze delta (including Shanghai).
Economic and Technology Development Zones (ETDZs)	Within the 14 OCCs, special areas were set aside for ETDZs, offering tax incentives similar to those in SEZs. Further ETDZs in the Yangtze valley, as well as in border and inland cities, were subsequently approved by the State Council. The largest ETDZ, the Pudong New Area (Shanghai), opened in 1990.
High Technology Development Zones (HTDZs)	HTDZs emerged in the early 1990s. Similar in most respects to ETDZs, HTDZs have placed particular emphasis on attracting investment in high-technology industries by providing additional tax concessions.
Free Trade Areas (FTAs)	The first two FTAs were established in the early 1990s in Pudong and Shenzhen, and a number of others have been opened since then. Exports and imports can be traded freely within FTAs, and enterprises are free to engage in bonded entrepôt trade as well as export-oriented production.

Source: Tseng and Zebregs, 2003: 80-81.

2.2.2.4 Liberalisation of foreign direct investment (FDI)

China's opening to FDI was symbolised by the promulgation of the "Chinese-Foreign Joint Venture Law" on 1 July, 1979, which provided a basic framework for the establishment and operation of foreign economic entities (see table 2.2; Zhang, 2002; Tseng and Zebregs, 2003). Since then, the FDI regime has been liberalised gradually in terms of export-promotion FDI policies (Zhang, 2002).

Table 2.2 shows the key laws and regulations pursued by the Chinese government in various yeas. It provides the message that the Chinese legal framework for FDI has been progressively codified and clarified (Tseng and Zebregs, 2003).

It should be noted that the FDI policies and procedures started with the creation of SEZs in the southern provinces of Guangdong Province and Fujian Province in the late 1970s, followed by the fifth SEZ in Hainan Province and OCCs in China's coastal regions in the 1980s (see table 2.1). Because of the accepted practice of experiments from OEZs, FDI promotion policies started to spread to other provinces. This reflects the incremental nature[6] of the reform process in China (Tseng and Zebregs, 2003).

[6] China adopted the gradual or phased approach to economic transition. This approach, which takes the form of "incremental reform", focuses upon local experiments that, if successful, are expanded to include the rest of the economy. This strategy relies on there being scope to reap large productivity gains from the first, partial reforms. These, in turn, raise incomes, so building momentum for further more difficult reforms in a self reinforcing process (Harvie, 1999).

Table 2.2: The key laws and regulations for FDI in China

Effective date	Laws and regulations	Impact
1979.07.01	Sino-Foreign Equity Joint Venture Law	It specified a variety of incentives and terms for joint ventures
1983.09.20	Regulations for the Implementation of Sino-Foreign Equity Joint Venture[1] Law	It provided greater detail on operations and preferential policies for joint ventures.
1986.04.12	Foreign Investment Law	It formally permitted the establishment of wholly foreign-owned enterprises outside the SEZs.
1988.04.13	Sino-Foreign Cooperative Joint Venture[2] Law	It provided further incentives for foreign investment, particularly for FDI using advanced technologies or production for export.
1990.12.12	Regulations for the Implementation of Foreign Investment Law	It abolished the stipulation that the chairman of the board of a joint venture be appointed by Chinese investors and provided for protection from nationalisation.
1999.06.25	Guideline Catalogue of Foreign Investment Industries	It encouraged greater geographic dispersion of FDI inflows in China and promoted FDI inflows in targeted sectors and industries, such as export-oriented and high-technology industries, agriculture and infrastructure.

Source: Lin, 2001; Tseng and Zebregs, 2003.

Note: Foreign-invested enterprises include wholly foreign-owned enterprises, equity joint ventures and co-operative joint ventures (Yao, 2006).

1. In an equity joint venture, Chinese and foreign investors operate the venture and share the risks, profits, and losses. All the parties agree on the equity share of each party, and profits are distributed in proportion to these shares.

2. In a co-operative joint venture, the Chinese partner provides land, natural resources, labour, and equipment or facilities, while the foreign partner provides capital or technology, key equipment, and materials. Both parties decide on the proportions in which products, revenue, and profits will be distributed (Tseng and Zebregs, 2003: 72).

2.2.2.5 Duty exemptions

Another important policy supporting the export-led strategy is the duty exemption system (Panagariya, 2003) or duty drawback system (Lardy, 2003). This system, which was introduced in 1984, rebates import duties on raw materials, parts, and components used for export processing, "allowing export processing to take place at world prices, free from tariff or domestic pricing distortions" (Lardy, 2003: 8). This initiative greatly contributed to China's export processing programme.

2.2.3 Conclusion

The evolution of China's trade regime conveys a message that all the policy packages have led to an improvement in the institutional supporting systems for export-oriented activities. China has benefited greatly from the clarification of signals sent by its policy reforms (Panagariya, 2003). Once the reform process began, the whole country headed towards changing the economy's orientation. According to the Chinese leadership, trade liberalisation was one of the top priorities in the marketisation of the Chinese economy (Lu, 1995).

2.3 Key trends and characteristics of China's exports

With the shift in the development strategy from import substitution to export promotion since 1978, China has become the exporting centre of the world (Zhang and Song, 2000). What are the main features of China's export performance during the reform period? What are the growth trends and the degree of integration into the world economy on the export side? What interesting and important lessons can China's export experience offer to other countries? This section will describe these aspects of China's success in export performance since the beginning of the country's reform and opening of its economy.

2.3.1 China's export growth

Since launching the reform programme in the late 1970s, China has experienced exceptional growth in its economy, averaging 13.6% per year from 1980 to 2000, which is far higher than the world average of 5.9% over the same period (Yue and Hua, 2002). However, the record of China's exports has been even more spectacular. As shown in tables 2.3 and 2.4, the results are

indeed significant by both absolute and relative measures in terms of export volume, share in world exports, and growth rate. It is also clearly seen from the two tables that, in recent years, Chinese exports (including Hong Kong SAR) have shown a steady expansion and have grown much more rapidly than other East Asian countries' exports (Adams, *et al.*, 2006).

Table 2.3: Export volumes (billions of US$) and shares of world exports (percent), 1970-2003

	1970		1980		1990		1995		2000		2003	
World	298	100	1922	100	3378	100	5079	100	6387	100	7453	100
China	2	0.8	18	0.9	62	1.8	149	2.9	249	3.9	438	5.9
Hong Kong	2	0.8	20	1.0	82	2.4	174	3.4	202	3.2	224	3.0
China+HK	5	1.6	38	1.9	144	4.2	322	6.3	451	7.1	662	8.9
South Korea	1	0.3	17	0.9	65	1.9	125	2.5	172	2.7	194	2.6
Malaysia	2	0.6	11	0.6	29	0.9	74	1.5	98	1.5	99	1.3
Philippines	1	0.3	6	0.3	8	0.2	17	0.3	40	0.6	37	0.5
Thailand	1	0.2	6	0.3	23	0.7	56	1.1	69	1.1	81	1.1
Singapore	2	0.5	19	1.0	53	1.6	118	2.3	138	2.2	144	1.9
Indonesia	1	0.4	25	1.3	26	0.8	45	0.9	62	1.0	61	0.8
Taiwan	1	0.5	20	1.0	76	2.2	111	2.2	147	2.3	134	1.9
Japan	19	6.5	130	6.8	288	8.5	443	8.7	479	7.5	472	6.3
US	43	14.3	226	11.7	394	11.6	585	11.5	781	12.2	724	9.7

Source: IMF, International Financial Statistics, various years; Adams, *et al.*, 2006: 97.

Note: The numbers in the first column under each year are the export volumes (billions of US$) of the different countries. Each country's share of global exports (percent) is shown in the second column.

Table 2.4: Export growth (percent), 1970-2003

	1970-1980	1980-1990	1990-1995	1995-2000	2000-2003
World	18.6	11.3	8.2	4.6	5.1
China	20.6	12.3	17.5	10.1	18.8
Hong Kong	20.7	14.2	15.0	3.0	3.5
China+HK	41.3	26.7	16.1	6.7	12.8
South Korea	30.8	13.1	13.1	6.4	4.0
Malaysia	18.8	9.7	18.5	5.6	0.4
Philippines	17.4	3.5	15.4	16.4	-2.4
Thailand	22.3	12.7	17.9	4.0	5.3
Singapore	24.9	10.0	16.1	3.0	1.5
Indonesia	31.3	0.2	11.4	6.2	-0.6
Taiwan	26.5	13.5	7.7	5.6	-3.5
Japan	19.1	7.9	8.6	1.6	-0.5
US	16.6	5.6	7.9	5.8	-2.9

Source: IMF, International Financial Statistics, various years; Adams, *et al.*, 2006: 98.

2.3.2 Commodity structure

The rapid expansion of China's exports has been accompanied by a significant shift in the commodity structure which is more in line with China's relative resource endowment. From the principle of comparative advantage, as a labour-abundant less developed country such as China, the export shift from natural resources and agricultural products to labour-intensive products is likely to favour the significant export growth (Yue and Hua, 2002).

From a perspective of trade history, export composition reflects the traditional development ladder (Vernon, 1966; Adams and Ichimura, 1998), starting with raw materials and foodstuffs (resource-intensive products) in the lowest income countries, then increasing strongly in the manufactured mass production products (mainly labour-intensive products) and finally turning to high-technology and capital goods (tech- or capital-intensive products) as the economy's productive power matures (Adams, *et al.*, 2006).

A classical measurement, "revealed comparative advantage (RCA)[7]", developed by Balassa (1965) has been frequently used to assess whether the export pattern of a country is congruent with the country's factor endowments-based comparative advantage (Yue and Hua, 2002; Adams, *et al.*, 2006). From the comparison of tables 2.5 and 2.6, the changes among the top ten products with the strongest RCA in 1980 and 1997 indicate that China has moved from a position of exporting resource-intensive primary products at the beginning of its reforms to one of comparative advantage in labour-intensive manufacturing products in the 1990s.

In the new century, China's exports of manufacturing products continue to increase rapidly (see table 2.7). By 2004, the share of manufacturing products in total exports rose to over 90% (Lai, 2006). Among the manufacturing products, clothing and footwear still remain quantitatively important. Recently, China has started to pursue the new development strategy, which focuses on the transition from labour-intensive manufactured goods export expansion to high-technology or capital-intensive manufactured exports. High-technology exports such as office machines, telecom and electrical machinery have increased at a rate of 15% per year between 1995 and 2001 (Adams, *et al.*, 2006).

[7] Simply stated, the RCA of country j in the trade of product I is measured by the item's share in the country's exports relative to its share in world trade. That is, if X_{ij} is the value of country j's exports of product I and X_{tj} is the country's total exports, then its RCA index is: $RCA_{ij}=(X_{ij}/X_{tj})/(X_{iw}/X_{tw})$,
where the subscript w refers to world totals. The index RCA_{ij} has a relatively simple interpretation. If it takes a value of less than one (which indicates that the share of product I in country j's exports is less than the corresponding world share), this implies that the country has a revealed comparative disadvantage in the product. Similarly, an RCA index greater than one implies that the country has an advantage in the product (Yue and Hua, 2002: 278).

Table 2.5: The products of China's exports ranked the ten highest RCA indices in 1980

Rank	Name and product category		RCA	Share	Factor proportion
1	Silk	(P)	76.66	1.17	Resource-intensive
2	Crude animal materials	(P)	16.56	1.42	Resource-intensive
3	Tea and mate	(P)	11.69	1.18	Resource-intensive
4	Jute	(P)	11.19	0.12	Resource-intensive
5	Made-up articles of textile	(M)	10.85	3.15	Labour-intensive
6	Oil seeds and oleaginous fruit	(P)	9.18	0.50	Resource-intensive
7	Vegetable, roots, and tubers	(P)	9.01	1.44	Resource-intensive
8	Cotton fabrics	(M)	8.86	3.61	Labour-intensive
9	Clothing accessories of textile fabrics	(M)	7.99	0.82	Labour-intensive
10	Eggs and yolks	(P)	7.30	0.39	Resource-intensive

Source: Yue and Hua, 2002: 280.

Note: (P) means the product belongs to primary category and (M) means it belongs to manufacturing category

.

Table 2.6: The products of China's exports ranked the ten highest RCA indices in 1997

Rank	Name and product category		RCA	Share	Factor proportion
1	Silk	(P)	18.21	0.17	Resource-intensive
2	Briquettes; coke	(P)	10.03	0.43	Resource-intensive
3	Article of apparel and clothing	(M)	7.21	1.77	Labour-intensive
4	Pottery	(M)	6.88	0.74	Labour-intensive
5	Travel goods	(M)	6.38	1.82	Labour-intensive
6	Footwear	(M)	5.61	4.47	Labour-intensive
7	Crude animal materials	(M)	5.57	0.37	Resource-intensive
8	Clothing accessories of textile fabrics	(M)	5.47	0.81	Labour-intensive
9	Undergarments	(M)	5.27	3.13	Labour-intensive
10	Toys, games, and sporting goods	(M)	5.24	4.31	Labour-intensive

Source: Yue and Hua, 2002: 280.

Note: (P) means the product is primary goods and (M) means it is manufactured goods.

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2.3.3 Export by type of ownership

As discussed in section 2.2.3.4, "equity joint venture companies, cooperative joint venture companies, and wholly foreign-owned enterprises have been the main forms of FDI entering China" (Tseng and Zebregs, 2003: 72). They are called by a joint name - foreign-invested enterprises (FIEs). Along with the export-oriented strategy (see section 2.2), the stylised facts of exports, FDI, the exports generated by FIEs and the share of manufacturing exports in total exports in table 2.7 may provide some important information as follows:

- China's strategy to open its market for foreign investors is concurrent with and reinforced by its effort to promote exports (see section 2.2.2.3 and 2.2.2.4; Yao, 2006).

- FDI is directed into FIEs (Tseng and Zebregs, 2003). Therefore, the FDI boom in China has led to the rapid development of FIEs since the start of economic reform. The export promotion FDI strategy resulted in the sharp rise of export by FIEs. By 2003, the exports made by FIEs accounted for half of China's total exports (China Statistical Yearbook, 2004; Lai, 2006)

- In accordance with the industrial composition of FDI, exports by FIEs are also largely in labour-intensive manufacturing industries, especially in clothing, footwear, and toys (Sun, 2001). FIEs have contributed to a large and growing proportion of China's manufacturing exports.

- As a result of the establishment of a programme of export processing (see section 2.2.2.5), exports created by FIEs are predominantly manufactured products assembled from "imported parts and components supplied by or purchased from foreign enterprises" (Zhang and Song, 2000: 387). In 1995, export processing already accounted for half of all exports and 90% of FIE exports (Zhang and Song, 2000). By 2002, processed exports reached $180 billion and accounted for 55% of total exports (Lardy, 2003).

Table 2.7: FDI inflows, total exports, and exports structure, 1980-2004

Year	FDI inflows (billions of US$)	Total exports (billions of US$)	Exports by FIEs in total exports (%)	Manufactured exports in total exports (%)
1980	0.4	18.2	0.0	49.7
1985	1.7	27.4	1.1	49.4
1986	2.0	30.9	1.6	63.6
1987	2.4	39.4	3.0	66.5
1988	2.8	47.5	5.2	69.7
1989	3.1	52.5	8.3	71.3
1990	3.5	62.1	12.5	74.4
1991	4.4	71.8	16.8	77.5
1992	11.0	85.0	20.4	79.9
1993	27.5	91.8	27.5	81.8
1994	33.8	121.0	28.7	83.7
1995	37.5	148.8	31.7	85.6
1996	41.7	151.1	40.7	85.5
1997	45.3	182.7	41.0	86.9
1998	45.5	183.7	44.1	88.8
1999	40.3	194.9	45.5	89.8
2000	40.7	249.2	47.9	89.9
2001	46.9	266.2	49.0	90.2
2002	52.7	325.6	52.2	91.2
2003	53.5	438.2	54.8	92.1
2004	60.6	593.3	57.1	93.2

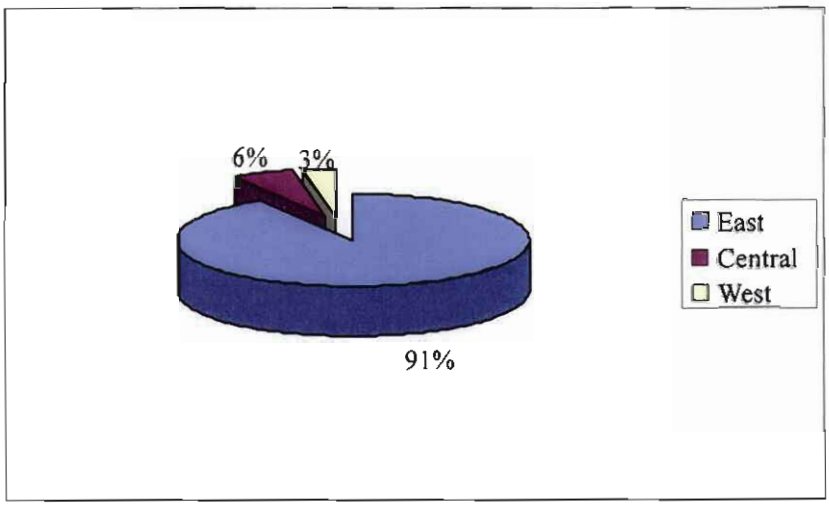
Source: China Statistical Yearbook, various years; Yao, 2006: 344.

Note: The data for 1980 is the annual average for the period 1978 to 1984.

2.3.4 Geographical distribution

Another important characteristic of the export performance in China is its uneven distribution in the three regions: eastern (coastal), central, and western areas (Zhang and Song, 2000; Sun, 2001; Yao, 2006). Figure 2.1 illustrates the geographic pattern of China's exports between 1994 and 2003. It tends to be highly concentrated in the eastern (coastal) provinces and major metropolitan areas, which accounted for over 90% of the total exports in China during the period 1994 to 2003. The huge disparity of export performance among Chinese regions is the result of a variety of factors.

Figure 2.1: Exports by regions, 1994-2003 (as % of total)



Source: Author's calculation from China Statistical Yearbook, various years.

It is widely accepted that this pattern stems from the selective open-door policy pursued by the Chinese government (Zhang and Song, 2000; Sun, 2001; Yao, 2006). As was discussed in section 2.2.2.3 and 2.2.2.4, the coastal provinces, where the OEZs are located, have benefited from the "preferential policies" that allow the FIEs in these coastal provinces to operate in a more relaxed institutional environment.

From the point of view of topography, geography also affects provincial export performance through physical location. The low cost of water transport makes the coastal areas better suited to be platforms for producing manufactured exports where they are situated along navigable

rivers that flow to the sea. As most FIEs in China are export-oriented, FIEs would prefer provinces that provide easier access to sea transport (Démurger, 2001; Démurger, *et al.*, 2002a; b).

2.3.5 Export destinations

Most of China's export partners are developed countries and Asian newly industrialising economies (NIEs[8]). The share of the developed countries and the NIEs in China's export destinations in 2000 were 56.3% and 26.7%, respectively (Yue and Hua, 2002).

Among the developed countries, there is a disparity between the export growths to different markets. Japan's share of China's total exports has declined since 1980, while that of the US has increased substantially (see table 2.8; Lu, 1995). By the end of 2005, as shown in table 2.9, the US has become the most important export market for China, which accounted for 21.4% of all exports from China.

Table 2.9 illustrates the recent increase in both exports and trade surplus with the US, which has created a set of challenges for the Chinese authorities and also fueled several trade disputes with the US.

[8] NIEs include South Korea, Singapore, Taiwan Province and Hong Kong SAR.

Table 2.8: China's trade with the United States

(billions of US$)

	2000	2001	2002	2003	2004	2005
US Exports	16.3	19.2	22.1	28.4	34.7	41.8
US Imports	107.6	109.4	133.5	163.3	210.5	243.5
Total	123.9	128.6	155.6	191.7	245.2	285.3
US Balance	-91.3	-90.2	-111.4	-134.9	-175.8	-201.7

Sources: US International Trade Commission; US Department of Commerce; and US Bureau of the Census.

Note: US exports reported on an FOB basis; imports on a general customs value basis.

Table 2.9: China's top export destinations in 2005

(billions of US$)

Rank	Country/Region	2005	Share of total (%)
1	**US**	162.90	21.4
2	**EU**	143.71	18.9
3	**Hong Kong SAR**	124.48	16.3
4	**Japan**	83.99	11.0
5	**ASEAN**	55.37	7.3
6	**South Korea**	35.11	4.6
7	**Taiwan Province**	16.55	2.2
8	**Russia**	13.21	1.7
9	**Canada**	11.65	1.5
10	**Australia**	11.06	1.5
	Total exports	762.00	100

Source: China's Customs Statistics, 2006.

It should be noted that there are important discrepancies between China's trade statistics and American data. According to China's Customs Statistics, in 2003, the total trade with US was $126 billion and the trade surplus was $59 billion (Schindler and Beckett, 2005). On the other hand, US reported total trade with China of $191.7 billion and that China's surplus with the US was $134.9 billion (see table 2.8). The discrepancy between the two reported trade balances is as high as $75 billion.

The primary reason for the discrepancies in the bilateral data is the "unique" trade relationship between China and Hong Kong (Schindler and Beckett, 2005). Among Asian NIEs (South Korea, Singapore, Taiwan Province and Hong Kong SAR), Hong Kong remains China's largest export destination (see table 2.9) and also the largest trade partner in 2005 (China Statistical Yearbook, 2006). The bulk of trade between Hong Kong and China involves re-exports. That is, much of China's international trade is trans-shipped through Hong Kong (Fung, 1996; Schindler and Beckett, 2005).

In the year of 2003, Hong Kong reported $124 billion of re-exports that originated in China and $91 billion of re-exports to China that originated in one of China's trading partners (Schindler and Beckett, 2005). Schindler and Beckett (2005) considered that Hong Kong's role as an "intermediary" makes accurate reporting of bilateral trade difficult, because exporters often do not know if goods shipped to Hong Kong will remain there or be re-exported to another destination. Thus, if a commodity is exported from the US to China through Hong Kong, it may mistakenly be reported by the US as an export to Hong Kong, and/or mistakenly reported by China as an import from Hong Kong. Such misreporting can have a significant distorting effect on reported bilateral trade. Fung (1996) also reported that if these re-exports are taken into account, the bilateral US-China trade deficit (using the US trade data) must be adjusted downward by about 35 per cent.

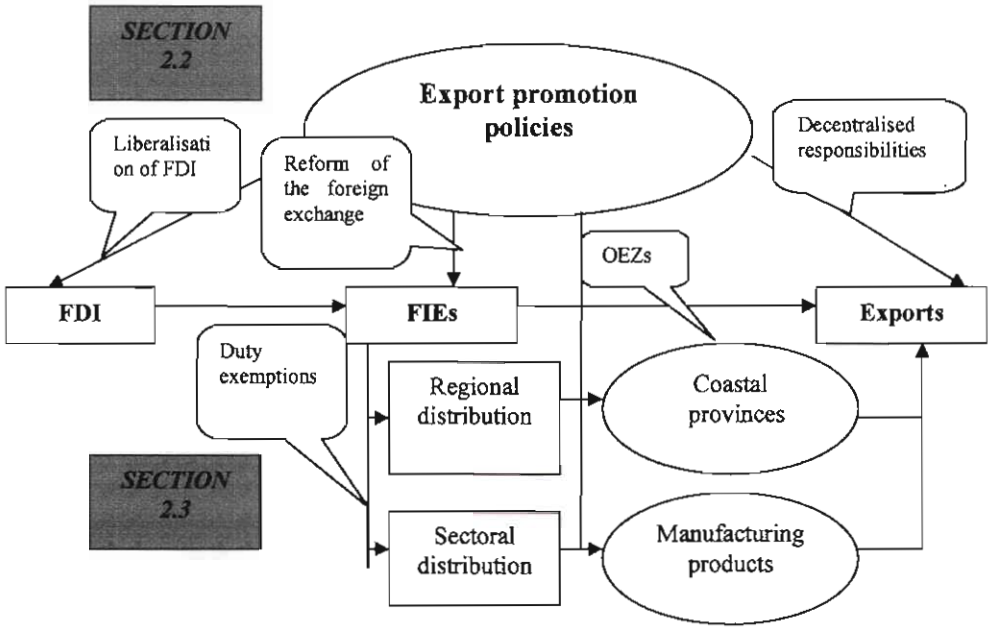
2.4 Summary

The objective of this chapter is to discuss the history, key trends, and characteristics of China's export performance. For this purpose, the structure was arranged around two aspects.

The first aspect was about the evolutionary process of China's foreign trade regime through comparing the strategies and policies before 1978 with those after 1978. The second aspect focused on the key trends and characteristics of China's exports since 1978. It is the

export-promotion policies discussed in the first aspect that result in the basic export patterns discussed in the second aspect. The apparent linkages between them are shown in chart 2.1.

Chart 2.1: The linkages between China's export policies and patterns



Some conclusions and implications can be drawn:

Firstly, China's experience proves that the export promotion development strategy is a good way to spur the economy. Since the beginning of the reforms and opening-up the economy, the Chinese government's efforts in formulating this strategy have been quite substantial in terms of policy coverage and determination for changes. The experiences of China's dynamic regional neighbours (Asian tigers) also played a major role in convincing the Chinese government to pursue such a strategy (Harvie, 1999), which, indeed, resulted in a large increase in external trade and foreign investment in China.

Secondly, labour-intensive manufacturing goods exports have played a leading role in sustained high export growth in China's experience. With a relatively cheap, literate and adaptable workforce, China will remain an attractive destination for FDI from labour-intensive industries

in other countries (Harvie, 1999). However, in the long run, it can't continue to support sustained high export growth when the per capita income level and/or market share reaches a high level and the country losses comparative advantage to countries that are less developed (Lai, 2006). Therefore, there is a development tendency for China's exports to move up the technological ladder into the more technologically-intensive productions, which must rely on new reforms that might be more painful and costly.

Thirdly, the establishment of OEZs, which reflects the incremental nature of the reform process in China, provides a new angle for studying the dynamics of and interrelationship between reform and development. But it also highlights some problems, especially the rising development disparities by focusing on specific regions (coastal area).

Fourthly, from an international perspective, China has emerged as a major source of the US imports, leading to the rapidly growing bilateral trade surplus with the US, which rapidly resulted in new barriers to China's exports to the US and pressures from the US to allow the appreciation of the Yuan[9] in recent years. Such barriers and restrictions may also affect the flow of Chinese exports toward other potential markets, causing other importing countries to impose their own trade barriers on the same types of products (Bown and Crowley, 2005).

Lastly, it can be realised that inward FDI is closely associated with exports during the whole reform period in the case of China. What is the role of FDI in China's export sector? This will be the main objective of chapters 4 and 5 of this study.

In the next chapter, this study will provide an overview of the previous studies on China's exports, FDI, and spatial convergence from different perspectives to explain the contributions of the empirical work in chapters 4, 5, and 6.

[9] On July 21, 2005, the Chinese government announced that it would no longer peg the Yuan to the US dollar. The new policy entailed an immediate appreciation of 2.1% of the Yuan relative to the dollar and the possibility of further increases over time (Bown, *et al.*, 2005).

Chapter 3: Literature review of China's exports, FDI and spatial convergence

3.1 Introduction

The objective of this chapter is to review the literature on China's exports, FDI, and convergence. The chapter is structured as follows: section 3.2 contains the literature survey on China's export performance. Section 3.3 reviews the literature on China's FDI, focusing on its performance, determinants and impacts. A literature review on the link between inward FDI and China's exports is contained in section 3.4, which is approached from a "cause" perspective of exports. Section 3.5 reviews previous studies on provincial growth and convergence, considering the impact of China's exports. The chapter concludes with a summary in section 3.6.

3.2 Understanding China's export performance

A large number of studies have focused on China's export performance, especially its exceptional growth since 1978. Table 3.1 contains a selection of literature on this issue from different perspectives. Chapter 2 of this study discussed the changes of foreign trade regimes before and after 1978 and a number of key developments to China's export success, which were summarised from the main findings provided by the exiting literature.

It should be mentioned that the studies of China's exports in the reform period often use the historical experience of other East Asian countries, such as Japan, South Korea, Taiwan Province of China, and Singapore, as the empirical reference system (for example, Lai, 2006). It can be said that China's export-promotion development strategy was partly inspired by the success of this strategy pursued by other East Asian countries in the post-war period (Breslin, 1999). However, China is much bigger than other East Asian countries in both area and population. Furthermore, state planning has a long history and played a much more important role in China than in Japan, South Korea, Taiwan Province, and Singapore, which give reasons why China cannot completely copy the export strategy of other East Asian countries (Lai, 2006).

Deng Xiaoping's famous phase "crossing the river by groping for stones" clearly describes China's process of reforms and opening of its economy, which was not guided by a well-founded theory or a pre-determined blueprint at the beginning of the reform (Qian, 2003). Therefore,

economists name the Chinese model a gradual or phased approach (Harvie, 1999; Murrell, 2003). In the process of making structural changes in trade and integration with the global economy, the Chinese government also uses "incremental reform" through local experimentation and trial (Thomas, 1996: 9), such as the selective geographical targeting (the establishment of SEZs), gradual decentralising responsibilities and double-track exchange rate system before 1994 as discussed in chapter 2.2. These policies are different from the institutions found in other East Asian countries, but they fit the economic and political reality in China.

Table 3.1: A selection of studies on China's export performance from different perspectives

Author(s)	Perspective
Lu (1995)	The reforms of China's foreign trade policy
Fung (1996)	The features of China's trade: high incidence of re-exports through Hong Kong, high degree of trade related to foreign investment and large amount of "illegal" trade
Breslin (1999)	The role and significance of the processing trade in boosting Chinese exports
Yue and Hua (2002)	Export patterns and the shift from a heavy industry-oriented development strategy to a comparative advantage one
Lardy (2003)	The competitiveness effects of China's trade liberalisation
Panagariya (2003)	The changes of foreign trade policies before and after 1978
Wolf (2003)	China's trade position in the world
Wu (2003)	Uneven export performance among the Chinese regions
Schindler and Beckett (2005)	Hong Kong plays a prominent role as a re-exporter of a large percent of trade bound for or coming from China.
Adams, *et al.*, (2006)	The recent trends and characteristics and the measurement of competitiveness of China's exports
Lai (2006)	The basic similarities and differences in terms of export development strategy and patterns between the East Asian and China from the macroeconomic point of view
Rodrik (2006)	China's success in exporting consumer electronics from the point of view of export structure

3.3 Understanding FDI to China

The literature concerning China's FDI since 1978 can be grouped into three categories as shown in table 3.2.

The first category focuses on the economic changes after 1978. It usually reviews the evolution of China's FDI policy during the post-1978 period and/or analyses the key trends and patterns of FDI (see part 1 of table 3.2).

Tracing the process of FDI policies, it is widely accepted that attracting FDI has been regarded as a key pillar of China's opening-up policies from the beginning of reforms (Wei, 1995; Huang, *et al.*, 2004). The common approach to discussing the evolution of FDI promotion strategy is to divide the whole progressive process since 1978 into several stages, following the development of preferential measures catering to attracting FDI (Ng and Tuan, 2001; Huang, *et al.*, 2004). The representative work on this issue is Ng and Tuan (2001). In their study, FDI promotion policies in China since 1978 are described by five major phases as follows:

- The initial period (1979-1986): the central government established the four special economic zones (SEZs). The amount of FDI was small and most FDI was located in the SEZs and other open cities in the coastal region (see table 2.1; Huang, *et al.*, 2004).

- Steady growth period (1987-1991): the fifth SEZ (Hainan) was established and "the design of FDI policy to attract targeted industries was considered" (Ng and Tuan, 2001: 1055). However, the amount of FDI was still small (Huang, *et al.*, 2004).

- Rapid growth period (1992-1994): Deng Xiaoping's "South Tour"[10] in 1992 and a huge currency depreciation of Renminbi (RMB) resulted in a huge increase in the amount of FDI (Huang, *et al.*, 2004).

[10] Deng Xiaoping's famous Southern Tour in the spring of 1992 ushered in a new phase of FDI liberalization, "which was facilitated and accompanied by some important legislative and regulatory developments. Deng Xiaoping reaffirmed China's continued commitment to reforms and policies to open up the economy to the outside world" (Huang, *et al.*, 2004: 5).

- Mature period (1994-1999): FDI inflows slowed down because of financial contagions among the Asian countries. FDI policies were targeted for the preparation of the WTO entry.

- A new phase from 2000: FDI is entering a new era because China's economic recovery and the huge business opportunities provided by China's WTO accession. China's policy aims at "increasing aggregate demand, development of the great Western region, modernisation of state-owned enterprise systems, advancement of hi-tech industries, and expansion of the service sector" (Ng and Tuan, 2001: 1056).

According to the FDI promotion policies in different periods, inward FDI should have its specific trends and patterns during each stage. The recent studies such as Ng and Tuan (2001), Yao (2002), Zebregs (2003) and Huang, *et al.*, (2004) provide useful information on the trends and characteristics of inward FDI through describing the volume, sources, geographic distribution, and composition of FDI. Chapter 5.3.1 of this study will summarise their work and analyse the latest available data (China Statistical Yearbook, 2004; 2005) to draw the complete picture of FDI in China.

The second category analyses the determinants of FDI after reforms and opening up of the economy (see part 2 of table 3.2). Most of empirical studies agree that China's large domestic market, low wage costs, improved infrastructure, export-oriented FDI promotion policies, and ethnic links with overseas Chinese have been major factors in attracting FDI (see chapter 5.3.2; Zhang, 2001 a; b; 2002; 2005). Among these factors, selective FDI policies, the Chinese connections, and regional characteristics such as international trade and geographical location are also indicated as powerful explanatory variables for the uneven regional distribution of FDI in China (Zhang, 1994; Gong, 1995; Broadman and Sun, 1997; Wei, *et al.*, 1998).

The third category emphasises the impacts of FDI on China's post-1978 economic growth. The increasing role of FDI in improving productivity and economic growth has been widely documented in the literature in the case of China (see part 3 of table 3.2; Wei, 1994; Mody and Wang, 1997; Zhang, 1999; Démurger, 2000). Zebregs (2003) even quantified the contribution of FDI to economic growth. His empirical research suggested that "the contribution of FDI to long-run TFP growth was on average 2.5% a year in the 1990s and, during the same period, through capital deepening, the contribution of FDI to annual GDP growth was on average 0.4% a year". Thus FDI raised GDP growth during the 1990s by about 3% a year (Zebregs, 2003: 90).

The significantly positive relationship between FDI and growth can be found not only at the national level, but also at the provincial level (Chen, *et al.*, 1995; Zhang and Song, 2000). This implies that "provinces with larger inflows of FDI have tended to see both faster GDP growth and faster TFP growth" (Zebregs, 2003: 90). The channels through which FDI affects economic growth also can work on export performance, which is regarded as the link between FDI and exports and will be discussed in the next section.

Table 3.2: Studies on FDI to China

Part 1:

Trends, patterns and policy evolution of inward FDI in China		
Author(s)	**Periods**	**Perspectives and main findings**
Ng and Tuan, (2001)	Post-1978	1) Evolution of China's FDI promotion policy by stages 2) The role of FDI and its related policies especially in Guangdong Province 3) To measure the ex-ante expectations of investors regarding the FDI policies in making investment decisions 4) To test empirically the effectiveness of the FDI policies
Yao (2002)	1990s	Recent trends and patterns
Tseng and Zebregs (2003)	Post-1978	Key trends and characteristics
Huang, *et al.*, (2004)	1985-2002	1) Evolution of FDI policy in post-reform China 2) Gini coefficient to reveal the spatial and industrial distribution of FDI

Part 2:

Determinants of inward FDI in China		
Author(s)	**Periods and Methods**	**Main findings**
Wei, *et al.*, (1999)	1985-1995 Panel data	The determinants of regional distribution of FDI: international trade, wage rates, R&D manpower, GDP growth rates, infrastructure, agglomeration, preferential policies and ethnic links with overseas Chinese.
Zhang (2002)	1987-1998; Cross-section and panel data	The determinants of China's FDI are market size, labour quality, infrastructure, and agglomeration economies. Regional distribution of FDI is determined by FDI incentive policy, historical-cultural links, and regional economic disparities.
Tseng and Zebregs (2003)	Post-1978	The factors are economic structure (including market size, abundant supply of cheap labour, infrastructure, scale effects, and preferential policies); cultural and legal environment (including shared cultural background and corruption and the legal environment).
Zhang (2005)	1980-2001; OLS time series data	Four determinants of the dominant FDI from Hong Kong and Taiwan: China's export-promotion FDI strategy, its large pool of cheap labour, Hong Kong and Taiwan's specific advantages in export-oriented FDI, and the Chinese connections.
Xing (2006)	1981-2002 Panel data	The real exchange rate between Yuan and Yen is one of the significant variables determining Japanese direct investment in China.

Part 3:

Impacts of inward FDI in China		
Author(s)	**Periods and Methods**	**Main findings**
Chen and Zhang, (1995)	Post-1978	1) FDI has played a dual role in post-1978 China. 2) FDI is positively associated with economic growth and total fixed asset investment in China. FDI also forces an increasing number of domestic manufacturers to compete globally. 3) FDI is associated with the accelerating coastal-interior disparity and worsening income distribution.
Zhang and Song, (2000)	1986-1997 Panel data	Increased levels of FDI positively affect provincial manufacturing export performance.
Tseng and Zebregs (2003)	Post-1978	1) FDI increases capital formation. 2) FDI leads to higher total factor productivity.
Zebregs (2003)	1985-1999 OLS 1995-1997 Panel data	1) The direct contribution of FDI works through the formation of capital and leads to the augmentation of the total capital stock. 2) The indirect contribution is the impact of FDI on TFP through the introduction of new technologies, managerial know-how, and other efficiency gains.

3.4 The link between FDI and exports in China

The theoretical explanations of the relationship between FDI and exports will be discussed in chapters 4 and 5 of this study. This section focuses on the overview of the previous empirical studies of the link between the two important variables in the case of China.

From the point view of methodology, the empirical work on this issue can be categorised into two research groups as follows:

The first research group is based on export supply regression models that identify the determinants or the motivations of export performance (for example, Wu and Cheng, 1999; Liu and Shu, 2001; Wu, 2003). Among different elements affecting export supply conditions, "the contribution of FDI to capital formation is included in order to include a technology-related element" (Fugazza, 2004: 2). This theoretical assumption has been well documented by the empirical studies in the case of China as shown in part 1 of table 3.3. From the different perspectives, for example: at the township-village enterprises' (TVEs) level, Wu and Cheng (1999); at the industrial level, Liu and Shu (2001); at the provincial level, Zhang and Song (2000); and at the three macro-regions' level, Sun (2000); and various econometric methods (for example: Liu and Shu (2001) applied cross-section estimator; Wu and Cheng (1999) and Sun (2001) used different panel data approaches), inward FDI in China is given the empirical evidence to help increasing "significantly the technological content of exports by supporting strongly the development of knowledge-based industries" in different periods since 1978 (Fugazza, 2004: 33).

In addition to the general consensus focusing on the critical role of FDI in Chinese exports, other factors, such as human capital, government assistance and transaction costs, have also been empirically suggested as explanations for divergence in Chinese regions' export performance (Zhang and Song, 2000; Sun, 2001).

It should be noted that the first research group has relied on cross-country/section data (Liu and Shu, 2001) or panel data (Wu and Cheng, 1999; Sun, 2001). In recent years, between these two data sets, an increasing number of studies have been in favour of panel data analysis (for example: Zhang and Song, 2000), as opposed to the cross-section analysis, because the cross-section approach has some serious econometric problems such as unobserved country effects and endogeneity (Naudé, 2004).

Table 3.3: A selection of empirical studies on the relationship between FDI and exports in the case of China

Part 1:

Determinants of Chinese exports, especially the impact of FDI on exports		
Author (s)	**Periods, Data & Methods**	**Main findings**
Wu and Cheng (1999)	1987-1994; TVEs data of 30 provinces; fixed-effect panel data approach	Positive factors: FDI, human capital, and government financial assistance. Negative factors: transaction costs and the unit labour cost.
Zhang and Song (2000)	1986-1997; provincial data; random-effect GLS, and pooled least-squares panel data estimations	Positive factors: FDI, provincial GDP growth, the share of manufactured products, and previous export performance. Negative factors: exchange rates.
Liu and Shu (2001)	1995; cross-sectional data at the industry level; two-stage least square cross-section method	Positive factors: FDI and firm size. Negative factors: domestic sales and R&D intensity.
Sun (2001)	1984-1997; three Chinese macro-regions at an aggregate level using provincial data; the two-step GLS panel data method	Positive factors: FDI and domestic investment and exchange rates.
Wu (2003)	1992-2001; provincial data; the maximum likelihood method	Positive factors: FDI, human and physical capital, labour input, non-state sector development, government spending, and infrastructure.

Part 2:

Causal link between FDI and exports		
Author (s)	**Periods, Data, & Methods**	**Main findings**
Zhang and Felmingham (2001)	January,1986-December,1999, national data and 1983-1998, provincial data; Granger and Sims tests	National, coastal, and western areas: two-way causal link between FDI and exports Central China: one-way causal link from exports to FDI
Liu, *et al.* (2001)	1984-1998; bilateral data for China and 19 home countries/regions; Granger causal test	One-way complementary causal link from inward FDI to exports
Liu, *et al.* (2002)	January, 1981 - April, 1997; quarterly data; multivariate Granger causal test	Two-way causal link between FDI and exports
Zhang and Witteloostuijn (2004)	1980-2003; annual data at the aggregate level; a co-integration and Granger causality approach	Two-way causal link between exports and FDI
Johnson (2006)	1980-2003; annual data at the aggregate level; Granger causality approach	Independence between exports and inward FDI

The second research group of the relationship between FDI and exports is to test directly the causality between exports and FDI in either a bivariate or a multivariate framework, which means that this methodology focuses on the question about precedence and time between these two variables.

Empirical studies of this issue provide mixed results as shown in part 2 of table 3.3. Liu, *et al.*, (2002) and Zhang and Witteloostuijn (2004) both found evidence for a two-way causal link between FDI and exports during the periods 1981 to 1997 and 1980 to 2003 respectively. However, using bilateral data for China and 19 trade partners from 1984 to 1998, Liu, *et al.*, (2001) indicated that there is only a one-way causal link from inward FDI to exports. Even

Johanson (2006) also used annual data at the aggregate level from 1980 to 2003, and had a conclusion that contradicted the work of Zhang and Witteloostuijn (2004) that exports and inward FDI are independent in the case of China. Zhang and Felmingham (2001) evaluated this causal link for the years 1986 to 1999 not only at the national level, but also at the regional level. The major findings of their study are that bidirectional causality applies to the whole country, high FDI recipient group (the Chinese coastal areas) and low FDI recipient group (Western China), while exports Granger cause FDI in the middle FDI recipient group (Central China).

It should be mentioned here that because this group has relied on time series data analysis, the choice of the data sets for a short period prefers monthly or quarterly data sets to yearly data sets because annual data is insufficient for short-run time series analysis and can easily lead to the spurious regression problem.

From the above review of the empirical literature on the relationship between FDI and exports in China, it can be concluded that the systematic empirical investigations of both determinants of provincial export performance and the causal direction between inward FDI and exports have been limited. Moreover, the existing work has not incorporated the influence of new policy regime changes (such as the transitional development strategy from labour-intensive goods export expansion to high-technology exports) into their models and information for the more recent and open period after China's WTO accession has not yet been included. Chapters 4 and 5 of this study aim to extend the existing literature by filling these gaps in the two empirical aspects.

3.5 Understanding provincial growth and convergence in China

In the empirical literature on China's economic growth, quite a few studies are related to the questions of Chinese regional convergence or divergence (for example: Wan, 1998; Li and Zhao, 1999; Fujita and Hu, 2001). The apparent widening disparity across China's provinces or groups of provinces (see chapter 6.2) has been the subject of extensive debate and research since 1978. This section intends to summarise these studies and then to distil the results on the convergence in China.

Table 3.4 provides the selected survey of the studies in convergence tests for China's provinces. Some main findings of the empirical work need to be discussed. For example, Li, *et al.*, (1998) found evidence for the conditional convergence among Chinese provinces but they also pointed

out that, although every province converges to its own steady state in China, the gap between the steady states of different provinces has widened. Chen and Fleisher (1996) suggested that their result of convergence is conditional on coastal location, which means that convergence happens within the coastal areas and inland provinces (including central and western areas) but not between the two regions. Many other studies, including Knight and Song (1993), Rozelle (1994), Jian, *et al.*, (1996); Yao (1999) and Yao and Zhang (2001a; b) also support that the divergence of the coastal and interior regions of China, particularly in the late 1980s and 1990s.

The first result to emerge from the existing literature is that, until the end of the 1990s, Chinese regions had converged into "three distinctive geo-economic clubs of economic growth", coastal, central and west. "Within each economic club, there was a tendency to convergence but, between the clubs, there was a tendency to divergence" (Yao and Zhang, 2001b: 182). The problem of inequality is between the coastal zone and the inland areas, particularly the western part of the country. Some other main results are summarised as follows:

- It can be seen from table 3.4 that sometimes the existing empirical studies have yielded inconsistent or even conflicting findings. This can be explained because some earlier studies may have been constrained by data shortage and quality, and the different data periods may also affect the conclusion on convergence or divergence. Most results of the empirical literature show an increase in cross-region income inequality during China's reform period.

- Methodologically, the empirical results of the existing studies are mostly based on two statistics, beta-convergence or sigma-convergence, which "draw inferences about whether relative incomes in China's provinces are converging or not" (Aziz and Duenwald, 2003; 31). These two methods will be discussed in more details in chapter 6 of this study (see chapters 6.3 and 6.4).

- It should be noted that, in the empirical literature, an augmented Solow growth model is employed to determine conditional convergence to answer the question about the origin and determinants of the economic inequalities. Echoing the growing concern about increasing regional disparity in China, the factors that can explain China's coastal-interior divergence have also become the focus of current debate in China. Various researchers have emphasised different particular factors. Among a broad range of determinants that have been put forward, a number of scholars have considered that the selective export-promotion development strategy at the beginning of economic reforms (see chapters 2.2.2.3 and 2.2.2.4) results in

present coast-interior divergence and they also provided empirical evidence that convergence is conditional on export performance (Chen and Feng, 1999; Fujita and Hu, 2001; Yao and Zhang, 2001a; b; Lin and Li, 2003;). Because the majority of the empirical work in this area uses data for the period before the end of the 1990s, one of the objectives of chapter 6 in this study is to test whether exports are still the vital determinant of regional economic growth during more recent period (1994-2003) that has so far been neglected in convergence studies.

From the methodological perspective, cross-section (for example: Chen and Feng, 1999) or panel data approaches (for example: Zhou, 2004) are usually applied in this issue. The panel data approach has some advantages over the cross-section approach, which can control for the region-specific effects and which is less subject to serious biases caused by the selection of data periods (Yao and Zhang, 2001b: 168).

The results summarised above, although useful, do not provide a complete picture of the evolution of regional income differences over time, because beta- and sigma-convergence can only contain summary information about the distribution such as the mean and dispersion (Sakamoto and Islam, 2005: 1) and are unable to say "something about the dynamics of the entire cross-sectional distribution" (Naudé and Krugell, 2006: 6). To obtain such a picture, Markov Chain analysis suggested by Quah (1993; 1996a; b) can be used. Therefore, another objective of chapter 6 of this study is the use of multiple methods of convergence: beta-convergence, sigma-convergence, and Markov Chain analysis, which is necessary because results may be contingent upon the specific measures used for each (Hansen, 1995).

Table 3.4: A selection of empirical studies on the convergence of Chinese provinces

Author (s)	Periods	Methods	Main findings
Chen and Fleisher (1996)	1978-1993	β-convergence	Conditional β-convergence
Jian, *et al.*, (1996)	1985-1993	β-convergence δ-convergence	Absolute β-divergence; mixed process of δ divergence and convergence
Gundlach (1997)	1978-1989	β-convergence	Absolute β-convergence
Chen and Feng (1999)	1978-1989	β-convergence	Conditional β-convergence
Li, *et al.*, (1998)	1978-1995	β-convergence	Unconditional and conditional β-convergence
Fujita and Hu (2001)	1985-1994	Weighted coefficient of variation; the Theil index; β-convergence	Coastal-interior divergence; Absolute β-divergence
Yao and Zhang (2001b)	1978-1995	β-convergence δ-convergence	Absolute β-divergence and conditional β-convergence; δ-divergence
Zhang, *et al.*, (2001)	1978-1995	β-convergence	β-convergence
Démurger, *et al.*, (2002a; b)	1979-1998	β-convergence	Absolute β-divergence and conditional β-convergence
Zhou (2004)	1985-2001	β-convergence δ-convergence	Conditional β-convergence; mixed process of δ divergence and convergence

3.6 Summary

This chapter reviewed the existing literature concerning four topics: China's export performance, inward FDI, the relationship between FDI and China's exports, and convergence among Chinese regions. The literature survey provided the background to China's FDI, economic and export performance, and also generated a number of hypotheses to be tested in the next three chapters.

It can be realised that there is extensive literature on the performance of China's FDI and exports. However, the systematic empirical investigations on the relationship between inward FDI and exports are still limited. As far as the issue of convergence or divergence among Chinese regions is concerned, the methods in the existing studies are limited and cannot provide information about the dynamics of the entire cross-sectional distribution. Therefore, it is the objective of the next three chapters to fill the gaps in the existing literature.

Chapter 4: The determinants of China's provincial export performance

4.1 Introduction

Chapter 2 described the significant growth in China's exports of manufactured goods during the last nearly three decades. It also pointed out that the export performance has varied between China's different regions. Chapter 3 mentioned that the export-promotion strategy has focused on some selective regions since the start of China's reforms, which can result in the uneven provincial export performance.

This chapter will analyse the determinants of the provincial export performance within China using a panel data set covering 28 provinces from 1994 to 2003. The focus in this chapter will be on the impact of FDI inflows, technological factors, and the geographical effects on exports.

The chapter is structured as follows: Section 4.2 is an overview of China's provincial export performance. Section 4.3 discusses the different factors affecting provincial export performance, based on the economic theories. Section 4.4 tests and estimates the significance of the determinants in explaining Chinese provincial export performance between 1994 and 2003. The chapter concludes with a summary in Section 4.5.

4.2 China's provincial export performance

With more than two decades of reforms and openness, the values of exports have experienced a significant increase in all Chinese provinces, both initially rich and initially poor provinces. However, the extent of the improvement has differed substantially from province to province.

Table 4.1 shows the export performance of the 22 provinces (excluding Taiwan Province), 5 autonomous regions and 3 municipalities[11] (provincial level cities) between 1994 and 2003. It

[11] China has four municipalities: Beijing, Tianjin, Shanghai and Chongqing. It should be noted that Chongqing, which used to be part of Sichuan Province, was granted the status of municipality (provincial level city) in 1997. Therefore, in order to make the number of observations consistent before and after 1997, data for Chongqing are incorporated into those for Sichuan Province in this study.

can be seen that export performance has varied widely across China's regions. In order to make this point clearer, table 4.2 ranks the provinces according to the export values that are provided in table 4.1. It should be noted that the export gap between Guangdong and Tibet increased greatly from US$ 50153.63 million in 1994 to US$ 152727 million in 2003. This means that the export disparity became wider between 1994 and 2003.

The concentration of China's exports in coastal area is clear from both absolute (see tables 4.1 and 4.3) and relative measures (see chapter 2.3.4 and table 4.3). Further, the values of exports from the coastal area have grown at a faster rate (281.2%) than the export growth in both central regions (111.27%) and western provinces (158.14%) during the period 1994 to 2003, as indicated in table 4.1.

Table 4.1: Provincial exports in China, 1994-2003

Province	Export values 1994 (US$ million)	Export values 2003 (US$ million)	% change export values (94-03)
Total exports	**120995.3**	**438227.8**	**262.19**
Coastal zone	**106053.3**	**404277.2**	**281.20**
Beijing	8342.05	16886.82	102.43
Tianjin	2691.21	14349.40	433.20
Hebei	2302.66	5927.54	157.42
Liaoning	6053.20	14579.35	140.85
Shanghai	9157.22	48452.96	429.12
Jiangsu	6684.50	59113.02	784.33
Zhejiang	6084.99	41594.97	583.57
Fujian	6430.20	21131.73	228.63
Shandong	5865.36	26557.06	352.78
Guangdong	50198.50	152848.23	204.49
Guangxi	1290.38	1969.92	52.66
Hainan	952.98	866.20	-9.11
Central zone	**9860.65**	**20833.29**	**111.27**
Shanxi	653.97	2272.02	247.42
Inner Mongolia	474.41	1155.69	143.61
Jilin	1365.97	2182.28	59.76

Heilongjiang	1242.72	2874.26	131.29
Anhui	1046.41	3063.63	192.78
Jiangxi	805.39	1504.90	86.85
Henan	1012.80	2979.29	194.16
Hubei	1715.60	2655.37	54.78
Hunan	1543.38	2145.85	39.04
Western zone	**5081.42**	**13117.26**	**158.14**
Sichuan	1804.30	4793.70	165.68
Guizhou	304.08	587.98	96.36
Yunnan	965.26	1676.59	73.69
Tibet	44.87	121.26	170.25
Shannxi	957.90	1734.14	81.04
Gansu	346.87	877.20	152.89
Qinghai	126.27	273.89	116.91
Ningxia	109.23	511.95	368.69
Xinjiang	422.64	2540.55	501.11

Source: Author's own calculations using raw data from China Statistical Yearbooks (1994-2003) published by China's State Statistics Bureau.

Note:

1. The data for Taiwan Province are not included.
2. In 1997, Chongqing, which used to be part of Sichuan Province, was granted the status of municipality (provincial level city). In order to make the number of observations consistent before and after 1997, the information of Sichuan includes that of Chongqing during the whole research period.
3. The values of exports are provided in US dollars in China Statistical Yearbooks. According to Yao (2006), "Since they are measured in US dollars, most economic analysts do not bother to deflate the values in current prices into values in constant prices (Liu, *et al.*, 1997; Liu, 2000)".

Table 4.2: The rank of the best and worst performers in export values, 1994 and 2003

Rank	Best (1994)	Worst (1994)	Best (2003)	Worst (2003)
1	Guangdong (c)	Tibet (i)	Guangdong (c)	Tibet (i)
2	Shanghai (c)	Ningxia (i)	Jiangsu (c)	Qinghai (i)
3	Beijing (c)	Qinghai (i)	Shanghai (c)	Ningxia (i)
4	Jiangsu (c)	Guizhou (i)	Zhejiang (c)	Guizhou (i)
5	Fujian (c)	Gansu (i)	Shangdong (c)	Hainan (c)
Gap	50153.63 (US$ million)		152727 (US$ million)	

Note:

1. (c) means the province belongs to coastal area and (i) means it is a inland province.
2. Gap is the export gap between the best performer and its counterpart in 1994 and 2003, respectively.

4.3 Conceptual model

Two main kinds of components are the determinants of export performance, internal and external components. External factors focus on demand-side explanations, which are related to market access conditions and other factors affecting international demand. Internal factors refer to supply-side conditions, which affect the cost and characteristics of export products (Fugazza, 2004; Gouws, 2005). The objective of this chapter is to investigate the factors for explaining the divergence in the export performance among Chinese provinces. It is firstly assumed that the trade barriers and competition factors in the international markets are the same for the whole country. Then, all the influence of geography (including transport costs) is divided into internal factors. Particular attention is given to factors affecting supply conditions in this study.

Theories on the supply-side factors can be traced back to the classical school. At first, Smith developed the theory of absolute advantage to show the benefit of trade. In his theory, he singled out an economy's climate and soil as determinants of trade (Gouws, 2005: 56).

Subsequently, Ricardo put forward the "most important theory of the classical period" (Gouws, 2005: 56), the theory of comparative advantage, which suggested that "beneficial trade was possible even without absolute advantage" (Gouws, 2005: 56). It showed that "differences in labour productivity achieved by different technology are one of the main reasons why countries trade" (Gouws, 2005: 57).

Heckscher and Ohlin further realised that the Ricardian model ignores other inputs and differences in economies' resources and labour productivity cannot completely explain trade. They provided the Heckscher-Ohlin model, which is regarded as "the most complex and impressive theoretical structure" in international economics (Chipman, 1965: 479). The essence of this model is that "a country (or a region) will tend to export commodities that are intensive in factors that are possessed by that country (or region) in relative abundance" (Ray, 1998: 635). That is, the endowment of factors is considered as one of the most important determinants of comparative advantage.

Since the Heckscher-Ohlin model, new trade models have been developed. Many theories also look at ways in which comparative advantage could be created and thus many other potential determinants of trade have emerged (Krugman and Obstfeld, 2006). For example, the technology transfer theory (Puga and Venables, 1999) suggests that "a vibrant manufacturing sector can emerge in formerly agricultural or mining economies because of foreign investment, input trade, and learning spillovers across firms" (Gouws, 2005: 73). The theory of economies of scale suggests that geographic clusters can make firms operate more efficiently than firms that operate in isolation (Venables and Limão, 2001).

In summary, the theories about the supply-side factors determining trade (or exports) focus on exploiting the factors that can entrench a country or region's comparative advantage. Taking into account the theories in this field, a basic model of export performance from the supply-side perspective is as follows:

$$Y_{it}=f(R_{it}, T_{it}, G_{it,}, X_{it}) \tag{4.1}$$

Where Y_{it} is the export performance of country or province i in period t, R_{it} is a set of indicators of factor endowments, T_{it} is a set of indicators of technology, G_{it} is a set of indicators of geography and X_{it} is other explanatory variables.

4.4 The determinants of China's provincial export performance

As discussed in chapter 2, China's significant export performance is one of the most successful fields in China's reform and the opening of its economy to the outside world. However, through examining China's export volumes and patterns at the provincial levels in chapter 2.3.4 and section 4.2, it is also true that there is an increasing disparity of exports among Chinese provinces.

Therefore, the question that emerged is: what are the major factors that drive the divergence in China's provincial export performance? This study will consider an empirical model, based on the economic theories discussed in section 4.3, which includes a number of different explanations. Firstly, the determinants of export performance will be discussed and explored in this section.

4.4.1 Foreign direct investment (FDI)

4.4.1.1 Theory and empirics

Among the different factors affecting export performance, the impact of FDI on export performance needs particular attention.

Theoretical research on the relationship between FDI and exports has focused on the question as to whether FDI is a complement or substitute for exports. Based on the conventional Heckscher-Ohlin framework, Mundell (1957) developed a two-country trade model and argued that factor mobility across countries may substitute for trade if production functions are identical. Kojima (1975), however, provided a different example of a possible complementary relationship between FDI and exports, if FDI flows into foreign industries in which local investors have a comparative disadvantage.

During the early 1980s, the new trade theory emerged and generated "more realistic general equilibrium trade models which could handle increasing returns to scale, imperfect competition and differentiated products" (Johnson, 2006: 7). These new trade models distinguish between vertical and horizontal FDI (Johnson, 2006: 7). The former is likely to facilitate trade by increasing exports of capital equipment and factor services from the home country, and exporting

resource-based or labour-based products from the host country (Helpman, 1984). The latter is a substitute for trade, because the multinational enterprises (MNEs) produce the goods in the host country instead of exporting them from the home country (Horstman and Markusen, 1992; Liu and Chang, 2001).

It should be mentioned that the theoretical contributions have focused on the impact of outward FDI on source country exports (Johnson, 2006). However, in the case of China, outward stocks of FDI have been much smaller than inward stocks from 1980 to 2003 (Johnson, 2006). Therefore, the research effort into the effect of inward FDI on host country exports can be argued to be pertinent for this study.

From the theoretical point of view, inward FDI may contribute to the expansion of the host country's export sector both directly, through the establishment of foreign-invested enterprises (FIEs), and indirectly, by creating positive spillover effects from FIEs to domestic enterprises (Zhang and Song, 2000).

In a discussion of the direct effects of inward FDI on host country exports, FIEs act as the conveyer between FDI and commodity trade (Sun, 2001). For example, in China, the participation of inward FDI in China's exports is closely associated with export processing. It is a special category of exports which heavily depends on FIEs. As discussed in chapter 2.3.3, in this type of production, FIEs in China import duty-free materials, components, and parts for processing or assembly and subsequently re-export (Zhang and Song, 2000). FIEs constitute the main force driving the rapid rise of this particular category of exports (Yao, 2002). Thus, for the host country, inward FDI through FIEs can bring "the potential for enhanced market access for exports of components to global production systems and for exports of finished products to distribution systems" (Sun, 2001: 318-319).

From the new theory of endogenous growth, indirect effects of inward FDI involve the transfer and diffusion of technologies, management know-how, entrepreneurial skills, and labour training, which "represent something more than simple input of capital into a host country and may influence both the structure of the host economy and performance of host country firms" (Zhang and Song, 2000: 390). Furthermore, inward FDI through FIEs can also stimulate host country manufacturing exports by industrial linkage effects between FIEs and local firms. For instance, if export-oriented FIEs increase their purchase of inputs from the local firms as the foreign subsidiary matures, it can create a strong demand stimulus for local firms and improve the host

country's exports (Din, 1994). Such a relationship between a foreign subsidiary and its local suppliers is also an important potential source of technology spillovers (Zhang and Song, 2000; Sun, 2001).

Stern (1997) summarises the arguments for the complementary effect of inward FDI on the exports of the host country. According to his work, FDI and exports from the host country may be complementary, particularly if "the foreign interest is secured through the establishment of FIEs". Inward FDI brings with it "the expertise of the foreign partner in selecting and promoting exports on international market. In this way FDI enhances the recipient country's export performance" (Zhang and Felmingham, 2001: 83).

Similarly to the theoretical contributions, most of the empirical research has concentrated on the link between outward FDI and source country exports, especially focusing on this relationship in developed economies by using firm-level data (Johnson, 2006). Among the limited empirical work on the role of inward FDI in the host country export, O'Sullivan (1993) and Blake and Pain (1994) find the evidence that inward FDI is positively correlated with export performance in the host countries in Ireland and the UK, respectively. Recently, Johnson (2006) provided a study of a positive effect of FDI inflows on the exports of East Asian economies. As far as China is concerned (see table 3.3), inward FDI has been found to play an important role in China's export performance at the national level (Chen, *et al.*, 1995; Sun, 1998) or at the industrial level (Liu and Shu, 2001). This study's contribution is that it investigates the impact of FDI inflows on China's regional export performance, using provincial-level data for the period 1994 to 2003.

4.4.1.2 The stylised facts of FDI and exports

Since 1979, export-orientated FDI has been actively encouraged, especially in eastern (coastal) China (see chapter 2.2.2.4). From almost nil at the start of reform in the late 1970s (Tseng and Zebregs, 2003) to 54.74 billion US$, made China the world's largest recipient in 2002 (Huang, *et al.*, 2004), China's success in attracting FDI can be regarded as a "miracle" (see table 2.7).

However, it should be noted that almost all the major recipient provinces or cities of FDI are located in the coastal area (Lai, 2002). Thus, FDI is overwhelmingly located in the coastal region. The regional pattern of inward FDI is similar to the regional distribution of exports from China, as shown in table 4.3. During the 1980s and 1990s, the coastal area contributed more than 80% of all China's exports and attracted more than 85% of the total inward FDI.

The remaining noteworthy features of table 4.3 are summarised as follows: Firstly, the share in the total FDI of the central region doubled from 4% in the 1980s to 9.1% in the 1990s and further to 9.9% at the beginning of 21st century, which indicate the slow progress in the regional spread of FDI from the coastal region to the inland areas. But over the same time, the share of the western region still displayed a declining trend.

Secondly, compared with inward FDI, the disparity of regional export performance became wider, although exports from all provinces have experienced significant increases. In particular, while the two inland regions declined in their shares of total national exports, the coastal region kept on increasing its share, from 81% during the period 1983 to 1989 to 87.2% during the period 1990 to 1999 and further to 92.1% during the period 2000 to 2003. These are the same results as in tables 4.1 and 4.2.

Thirdly, Guangdong has been the largest exporter and also the largest FDI recipient at the provincial level, following the opening of China's doors since 1979. It alone accounted for 36.1% of the total export and 22% of the total inward FDI during the most recent years from 2000 to 2003 (see table 4.3). Guangdong's leading position can be explained by the fact that it was the "pioneering region designed to first open and receive FDI and to be provided with preferential tax treatments and direct authorities for approval of FDI utilisation" (Ng and Tuan, 2001: 1057). As was shown in chapter 2.2.2.3, at the beginning of economic reforms, Chinese authorities first set up four Special Economic Zones (SEZs). Among the four SEZs, three of them are located in Guangdong Province near Hong Kong SAR (see table 2.1). Because of its early opening and proximity to Hong Kong, Guangdong has maintained the leading edge over other Chinese provinces or cities by 5 to 10 years in FDI attraction and export expansion (Ng and Tuan, 2001: 1057).

It should be mentioned that throughout the period 1979 to 2003, Hong Kong SAR has always been the most important source of FDI in China[12]. Due to geographical adjacency to Guangdong Province, Hong Kong is the largest investor in Guangdong. Many export-processing arrangements exist between Hong Kong firms and factories in China, mainly in Guangdong (Zhang and Song, 2000), which accounts for the rapid rise of processing exports in China as a

[12] In recent years, the investment share of Hong Kong has experienced a continuous decrease, which seems to indicate that the "transfer of export-oriented labour-intensive manufacturing industry from Hong Kong SAR to Mainland China entered a 'saturation' stage" (Lai, 2002).

whole. In this regard, the Guangdong experience provides a significant demonstration that inward FDI is closely associated with exports.

Finally, running the simple regressions of the provincial export shares on provincial inward FDI shares during the second (1990-1999) and the third (2000-2003)[13] data periods in table 4.3, it is found that the correlation coefficients are 0.951 and 0.912 with *t* values of 15.69 and 11.32, respectively. These results also strongly suggest that inward FDI has a significantly positive link with exports.

In summary, it is expected that there is a positive association between provincial inward FDI and provincial exports in the case of China.

[13] The first data period of FDI is different from the first one of exports in table 4.3. The data sets have different starting years. Therefore, it is not possible to do regressions.

Table 4.3: Regional distribution of inward FDI and exports in China

(million US$)

Regions	Inward FDI						Exports from China					
	1979-1989		1990-1999		2000-2003		1983-1989		1990-1999		2000-2003	
	Value	Share	Value	Share	Value	Share	Value	Share	Value	Share	Value	Share
Coastal	***10774***	***91.0***	***252436***	***87.7***	***168318.3***	***87.4***	***162682***	***81.0***	***1095610***	***87.2***	***1171612***	***92.1***
Guangdong	5114	43.2	81797	28.4	42369.88	22.0	32949	16.4	471282	37.5	458654.76	36.1
Fujian	757	6.4	29319	10.2	13787.35	7.2	5808	2.9	68074	5.4	65334.27	5.1
Jiangsu	324	2.8	36980	12.9	34093.57	17.7	13038	6.5	93627	7.4	145576.81	11.4
Zhejiang	191	1.6	9415	3.3	11880.93	6.2	8017	4.0	78334	6.2	113424.76	8.9
Shanghai	1203	10.2	24033	8.4	17692.51	9.2	27978	13.9	111697	8.9	133466.35	10.5
Shandong	646	5.5	17492	6.1	17242.33	9.0	17767	8.8	75669	6.0	81314.40	6.4
Hebei	72	0.5	6047	2.1	3095.88	1.6	8597	4.3	22889	1.8	18187.24	1.4
Beijing	1256	10.6	11458	4.0	7367.76	3.8	5283	2.6	47650	3.8	53255.68	4.2
Tianjin	287	2.4	11822	4.1	6416.17	3.3	9948	5.0	38017	3.0	44098.98	3.5
Liaoning	459	3.9	12350	4.3	10796.36	5.6	29140	14.5	67651	5.4	48810.68	3.8

Guangxi	202	1.7	6216	2.2	1744.64	0.9	3138	1.6	13946	1.1	6201.65	0.5
Hainan	292	2.4	5507	1.9	1830.92	1.0	1019	0.5	6774	0.5	3286.36	0.3
Central	***470***	***4.0***	***26317.8***	***9.1***	***19013.89***	***9.9***	***28094***	***14.1***	***115017***	***9.2***	***63687.14***	***5***
Heilongjiang	97	0.8	3266	1.1	1318.91	0.7	4416	2.2	18328	1.5	7924.01	0.6
Jilin	16	0.1	2568	0.9	1109.94	0.6	3053	1.5	13135	1.0	6669.31	0.5
Shanxi	18	0.2	1282.8	0.4	883.90	0.5	1815	0.9	9586	0.8	6638.74	0.5
Henan	126	1.1	3627	1.3	1964.98	1.0	3604	1.8	13170	1.0	8298.60	0.7
Hubei	78	0.6	5408	1.9	5127.77	2.7	5111	2.5	16056	1.3	8485.90	0.7
Hunan	58	0.5	4507	1.6	3407.01	1.8	3640	1.8	14256	1.1	7346.65	0.6
Jiangxi	37	0.3	2449	0.9	3316.98	1.7	2419	1.2	8918	0.7	4793.33	0.4
Anhui	29	0.2	2687	0.9	1406.14	0.7	2735	1.4	12030	1.0	9971	0.8
Inner Mongolia	12	0.1	523	0.2	478.26	0.2	1301	0.6	9538	0.8	3559.6	0.3
Western	***584***	***4.9***	***9019***	***3.1***	***5170.25***	***2.7***	***10011***	***5.0***	***46312***	***3.7***	***36151.03***	***2.8***
Shaanxi	344	3.0	2413	0.8	1332.11	0.7	1436	0.7	9026	0.7	5528.41	0.4
Sichuan	124	1.1	4622	1.6	2944.40	1.5	3720	1.9	16110	1.3	13671.64	1.1

Yunnan	20.62	0.2	821	0.3	388.22	0.2	1514	0.8	8310	0.7	5525.45	0.4
Guizhou	35.25	0.3	362	0.1	136.72	0.1	520	0.3	3076	0.2	1872.14	0.14
Gansu	10.74	0.09	383	0.1	221.37	0.1	666	0.3	3150	0.3	2317.38	0.18
Ningxia	1.96	0.02	119	0.04	73.64	0.04	356	0.2	1495	0.1	1514.34	0.1
Xinjiang	52.45	0.46	299	0.1	73.79	0.04	1511	0.8	5145	0.4	5721.67	0.45
Total	***11828***	***100***	***287772.8***	***100***	***192502.4***	***100***	***2007.87***	***100***	***1256939***	***100***	***1271450***	***100***

Source: The figures before 1990 are from Sun's (2001) calculation based on MOFTEC (1984-1996) and China Statistical Yearbook (1984-1997). The figures after 1990 are the author's own calculation based on China Statistical Yearbook (1990-2004).

Note:

1. The data for Taiwan Province are not included. Tibet and Qinghai are excluded because of lack of data.

2. In 1997, Chongqing, which used to be part of Sichuan Province, was granted the status of municipality (provincial level city). In order to make the number of observations consistent before and after 1997, the information of Sichuan includes that of Chongqing during the whole research period.

4.4.2 Coastal location

In section 4.4.1, it was mentioned that the coastal area serves as the main export processing centre to facilitate FDI and export trade in China. Why do multinational corporations always choose the coastal area when they consider the locational distribution of their FDI programmes? What is the major factor underlying the increasing unbalanced regional distribution of exports in China? The answers may be found in the geographical economy of China.

4.4.2.1 The geographical economy of China

There are two geographical divides to characterise the wealth of nations. One divide focuses on the differences in ecological conditions: the temperate zone versus the tropical zone. The other one emphasises differences in the "ability to conduct international trade: the coastal versus the interior" (Démurger, *et al.*, 2002a: 153). Because China does not have a substantial part of its territory within the tropical zone, the temperate-tropical dichotomy is not the major factor to explain the significant variation in regional export performance in China (Démurger, *et al.*, 2002a; b).

From the locational viewpoint, the coast-interior dichotomy highlights "the importance of transport costs in determining a region's participation in international trade" (Démurger, *et al.*, 2002a: 153). This is why the "low cost of water transport makes the coastal areas along navigable rivers that flow to the sea better suited to be platforms for producing manufactured exports" (Démurger, *et al.*, 2002a: 166-167).

4.4.2.2 Coastal advantages in China

As far as China is concerned, the advantages of geographical location possessed by China's coastal region over those of the interior areas are shaped by two factors.

Firstly, from the point of view of topography, China is a "three-step staircase running down from west to east" (Démurger, *et al.*, 2002a: 154). The arid plateaus of north-western China are different from the grain-growing plains of central China, and the warm, wet south-western provinces. Because the natural conditions in the west are poor and the climate is harsh, those regions are sparsely populated and, historically speaking, they were the poorest (Démurger, *et al.*, 2002a; b).

Traditionally, the coastal regions were much more developed in comparison to the inland regions before the reform policies of the central government enhanced their takeoff. These regions are close to coastlines and seaports and they are important bases for agriculture, industry, and commerce all the time. Major economic centres, transport facilities, and universities are located here. That means the coastal provinces can provide superior social and economic infrastructures, communications, better service facilities, and human resources (Sun, 2001; Démurger, *et al.*, 2002a; b).

Secondly, as discussed in chapter 2.2.2, since 1979 the open policy and economic reforms in China have been pursued with a particular spatial dimension, with priority being given to the coastal region (Sun, 2001). The strategic direction of economic liberalisation is to target the mobilisation of FDI first starting in special economic zones (SEZs) and then other coastal cities or provinces and, later, inland cities or provinces (see table 2.1; Ng and Tuan, 2001). Table 2.1 provided information concerning the special favourable policies in taxation and land use implemented by the various types of economic zones (mainly in coastal areas) to attract foreign investors. With the help of foreign funds, the export capacities of the coastal provinces could be strengthened. In addition, the Chinese government committed a huge amount of capital in the coastal regions to improve the infrastructure and investment environment (Sun, 2001). Empirical evidence has been found that the coastal areas benefit from these coast-biased regional policies that allow these coastal provinces to operate in an economic environment closer to those of their East Asian neighbours (Sun, 2001; Démurger, *et al.*, 2002a; b).

In conclusion, according to the industrial location theory (Krugman, 1991a; b), easy access to sea transport, advanced physical and social facilities and a liberalised market can help a region become an export centre. Thus, the above discussion leads to the formation of another argument in the empirical work of this study. Since the coastal areas are relatively open to international trade and have well-established trade channels, they are most advantageously located to engage in exports. This hypothesis will be tested by applying a coastal dummy variable equal to 1 for all coastal areas and 0 for other regions. A positive coefficient on the dummy is expected.

4.4.3 Innovation in manufacturing

4.4.3.1 Theory and empirics

Innovation is at the heart of the new trade theory and endogenous growth theory. The role of innovation in explaining the evolution of trade flows and export focuses on developing new products and generating technological competitiveness in an industry (Grossman and Helpman, 1995; Liu and Shu, 2001). As a result, the technological characteristics of a sector are the key factors influencing export performance. It is clear that innovation determines technological competitiveness; and hence export performance. Higher spending on innovation, such as R&D expenditure, enables firms to produce sophisticated goods and improve the quality of products (Grossman and Helpman, 1995; Liu and Shu, 2001).

The empirical evidence on the impact of innovation on exports is clear. For example, Greenhalgh, *et al.*, (1994) found evidence of a significantly positive effect of R&D expenditure on the UK's trade performance. Leon-ledesma (2000) also showed that innovation plays a critical role in OECD trade performance.

4.4.3.2 Innovation in manufacturing in China

In the empirical studies, innovation can get proxied by many measures, such as R&D expenditure, R&D manpower, and so on. In this study, the innovation investment in manufacturing will be used as an indicator of innovation because the sectoral distribution of China's exports concentrates on the manufacturing sector (see chapter 2.3.2).

Through the research period of this study (1994-2003), the share of manufacturing products in total exports increased from over 80% in 1994 to over 90% in 2003 (see table 2.7). This fact turns the question "whether regional export performance in China is affected by regional technological competitiveness" into the question "whether regional export performance is affected by regional technological competitiveness in the manufacturing sector". It is expected that the effect of innovation in manufacturing on regional exports will be positive.

4.4.4 Human capital

4.4.4.1 Theory and empirics

If investment in innovation enables enterprises to improve the quality of products (see section 4.4.3), human capital accumulation will increase the quality (embodied and disembodied) of labour (Narayan and Smyth, 2004). In the endogenous growth theory, investment in human capital is regarded as being "at least as important as investment in physical capital for a country's long-run economic success" (Mankiw, 2001). It is commonplace to know that well-trained human resources tend to enhance the productivity of the workforce and stimulate further exports and economic growth. Therefore, it is not surprising that empirical studies for a range of different countries and periods find that human capital can contribute to exports (Gould and Ruffin, 1995; Hanson and Harrison, 1995; Stokey, 1996; Narayan and Smyth, 2004).

4.4.4.2 Human capital in China

Shortly after the founding of the People's Republic of China in 1949, the Chinese government took education[14] as a matter of primary importance, and made the enhancement of the cultural quality of the people as the basis of the construction of the whole nation (http://www.asianinfo.org/asianinfo/china/pro-education.htm). By 1996, the estimated enrolment ratio in primary and secondary schools had reached 100% and 70%, respectively (Narayan and Smyth, 2004). However, at the tertiary level, progress is not as impressive as is the case at the lower levels (Narayan and Smyth, 2004).

Especially after the Chinese government opened up coastal cities, the local governments and enterprises in those open areas implemented special policies to attract higher-educated people from other regions. College graduates from other regions flocked to those coastal cities, which greatly boosted the export performance and economic growth in the host regions (Zhou, 2004). Therefore, it is suspected that the main difference in education among provinces and over time is the number of graduates in higher education. As a result, the ratio of graduates in higher education is used as a proxy in this study. This variable is calculated as the number of provincial graduates from universities and colleges relative to provincial total population. It is expected that education has a positive effect on regional exports.

[14] The extent of human capital is often measured through education.

4.5 Estimation of the determinants of provincial export performance

4.5.1 Variables

The purpose of this study is to examine the relationships between regional export performance and regional characteristics such as provincial FDI, geographical factor (coastal dummy), innovation in manufacturing, and human capital during the period 1994 to 2003. Each of these variables was discussed in section 4.4. Table 4.4 contains a summary of these variables.

Table 4.4: Description of variables

Variables	Measurement
Export	The provincial annual export value in China (unit: US$). Sample period: 1994-2003.
FDI	The provincial annual inflow of foreign direct investment in China (unit: US$). Sample period: 1994-2003.
Innovation	Provincial annual investment of innovation in manufacturing, deflated by the GDP deflators based on the year of 1978. Sample period: 1994-2003.
Ratio of H.E.	The ratio of higher-educated graduates, defined as the number of provincial graduates from universities and colleges relative to provincial total population. Sample period: 1994-2003.
Coastal dummy	A coastal dummy variable equal to 1 for the following provinces and 0 for other regions: Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi, and Hainan.

4.5.2 Data

This analysis is based on a panel of data for 28 of 32 of China's provinces, autonomous regions, and municipalities (provincial level cities) over the period 1994 to 2003. Two provinces, Tibet and Qinghai, are omitted because of lack of reliable data. Chongqing and Sichuan Province were only separated in 1997 and have therefore been included as one combined province to make the

number of observations consistent before and after 1997. Also, for political as well as economic reasons, Taiwan Province is excluded for this group of observations.

The primary data source for this study is from China Statistical Yearbook complied annually by the State Statistical Bureau (SSB) of China. The values of provincial exports and FDI are provided in US dollars in the official statistics. According to Yao (2006: 342), "Since they are measured in US dollars, most economic analysts do not bother to deflate the values in current prices into values in constant prices (Liu, *et al.*, 1997; Liu, 2000)". However, the innovation investment in manufacturing is measured by Yuan (Chinese currency). Therefore, the values in current prices of the innovation investment in manufacturing are deflated by the GDP deflator based in the year of 1978. It should be noted that, according to Yao (2006: 342), it is "not important to convert the values in Yuan into values in US$ because all the values will be logged".

4.5.3 Empirical model and methodology

In this study, the methodology is driven by a desire to address traditional econometric problems in cross-country regressions such as unobserved country effects and endogeneity. The use of panel data can increase the number of degrees of freedom, improves the efficiency of estimation, and is an appropriate method for this kind of research (Wei, *et al.*, 1999). The details of the panel data approach were discussed in chapter 1.4.2.1 of this study.

As suggested by Ng and Leung (2002: 1014), "applying both the fixed-effects and random-effects models is a way to check the robustness of the results". However, it should be noted here that a shortcoming of the fixed-effects approach is that time-constant factors, such as geographical factors and initial period variables, cannot be included in x_{it} – otherwise there would be no way to distinguish the effects of these variables from the effects of the unobservable c_i (see equation 1.2 in section 1.4.2.1; Naudé, 2004: 840).

In the following section, two of the methods/approaches discussed in chapter 1.4.2.1 (random effects and fixed effects) will be used (with STATA 9.0) and compared to estimate the determinants of spatial export performance in China.

4.5.4 Empirical results

According to the explanations for provincial export performance in China, four specifications will be estimated using various estimators. The first specification contains only provincial FDI as regressor. Whilst the second specification concerns technological variables, the third specification contains only the geographical effect. The final specification combines the statistically significant variables from the above three specifications.

It should be mentioned that a log-linear functional form will be adopted to transform a likely non-linear relationship between the regional export performance and the explanatory variables into a linear one. In addition, the logarithmic transformation is the means of directly obtaining export elasticities with respect to various explanatory variables.

The results of the GLS random-effects regression for model specifications 1-4 and fixed-effect OLS estimator for model specifications 1-2 are contained in table 4.5 below.

The results of the models are quite satisfactory, and are similar to results found elsewhere in the literature. All of the variables take the signs as expected and are statistically significant at the 1% level in both estimators and all the specifications. Therefore, it can be stated that FDI, innovation in manufacturing, higher-education, and coastal locations are found to have a significantly positive association with provincial export performance in China.

Based on the overall R^2 ("goodness of fit"), the FDI specification (1) in table 4.5 and the combined model specification perform best. In terms of coefficient size, the results of technology specification with random-effects (2a) in table 4.5 are roughly the same as the results of fixed-effects (2b) (in table 4.5), suggesting that these two technological variables are fairly robust as to the estimation method. Technological elements embedded in exports are relatively high, which implies that the process of transition in China's export, which moves from exporting labour-intensive manufactured goods to technology-intensive exports, goes very quickly.

Table 4.5: Random and fixed effects panel data regression results

Variable	1a FDI with random-effects	1b FDI with fixed-effects	2a Technology with random-effects	2b Technology with fixed-effects	3 Geography with random-effects	4 Combined
Constant	7.5549 (14.53)***	10.1219 (16.22)***	11.1476 (50.25)***	11.2049 (107.48)***	11.5189 (49.92)***	9.1827 (23.24)***
ln (FDI)	0.4492 (9.64)***	0.2130 (3.71)***				0.1297 (3.28)***
ln (innovation)			0.3047 (5.84)***	0.2728 (5.14)***		0.3368 (6.55)***
Ratio of H.E.			6.3948 (12.37)***	6.5169 (12.45)***		5.4748 (10.83)***
Coastal dummy					2.1437 (6.08)***	1.3431 (6.10)***
Number of obs.	280	280	280	280	280	280
Overall R^2	0.7711	0.7711	0.4002	0.3840	0.5535	0.7722

Note:

1. The z-values are shown in brackets.
2. *** Significance at the 1%, ** at the 5%, and * at the 10%.

4.5.5 Conclusion and policy implications

Some policy implications can be drawn from these results:

Firstly, the results support the idea that foreign direct investment significantly accounts for differences in export performance among China's provinces. Coastal areas' export experience has been driven by FDI. Therefore, finding ways to help inland regions receive more inward FDI is a crucial task facing the Chinese government.

Secondly, technological factors play a more and more important role in determining export performance. Both the central and provincial governments should place more emphasis on encouraging innovation, improving R&D infrastructure, and investing in higher education in the Chinese hinterland, which is vital to upgrade export structure and promote regional exports.

Thirdly, it is essential for the Chinese authorities to understand the provincial characteristics that influence export performance in order for them to adopt appropriate investment policies. Investments in physical infrastructure, transport, and communication can change the comparative advantages of a region (Démurger, *et al.*, 2002a; b).Therefore, it is also important for inland areas to exploit their advantages and enhance other regional characteristics such as infrastructure and service facilities.

4.6 Summary

This chapter firstly overviewed China's provincial export performance. After providing the theoretical foundations of the determinants of exports, this study made use of the more recent data between 1994 and 2003 to draw its own conclusion on estimating the factors that explain the divergence of regional export performance in China, particularly the effects of FDI inflows, technological factors, and geographical effects on exports.

As was expected, it was found that inward FDI has a significantly positive influence on exports. This is because FDI helps the host country to enhance global market access for exports through FIEs and to acquire advanced management and technology through spillover effects. It was also found that investment in production innovation can produce more sophisticated goods and human capital can improve the quality of labour, both of which can make exporting products

become more competitive. The empirical results of this chapter also suggested that the geographic location plays an important role, which indicates that the coastal areas are far more export-oriented than the inland regions, even after all the other factors are controlled.

From these empirical results, it can be seen that some of the determinants of regional export performance are inimitable, for instance, favourable geographic factors (such as geographic location, topography, favourable climate, and the amount of arable land). However, others can be developed through investment and favourable policies, for example, physical infrastructure, transport, communication, and human resources. Therefore, attracting FDI, encouraging innovation, improving the quality of labour, and investing in social, economic, and scientific infrastructure are vital for the Chinese authorities to promote export performance of the inner regions.

Chapter 5: The causal relationship between foreign direct investment and exports in China

5.1 Introduction

Chapter 4 identified the determinants of China's export performance at a provincial level during the period 1994 to 2003. The regression analyses dealt with the dependence of exports on other variables, such as FDI inflows, technological, and geographical factors. However, it does not imply causal relationship (cause and effect relationship) between exports and the others. That is, it does not provide the information whether there is a lead-lag relationship between the dependent and independent variables. Among all of the variables affecting export performance, the direction of causality between FDI and exports is considered the central issue in designing a country's development policies and strategies (Zhang and Felmingham, 2001). Therefore, the purpose of this chapter is to evaluate the causal link between inward FDI and exports from China after China's WTO accession in December, 2001.

This chapter is structured as follows: Section 5.2 provides an overview of the conceptual arguments about the causal relationship between inward FDI/exports and reviews the existing empirical evidence. Section 5.3 discusses the key trends and determinants of FDI in China, especially under WTO-related market opening. The methodology and results are set out and discussed in sections 5.4 and 5.5. The chapter concludes with a summary in section 5.6.

5.2 Literature review

Chapter 4 of this study posed the question whether FDI is a substitute for, or a complement to, exports. Because China's inward FDI stocks have been much bigger than outward stocks since the beginning of reforms, this fact turned the research effort towards inward FDI and the recipient country's exports relationship (see chapter 4.4.1.1). The theoretical analysis and empirical work support the complementary relationship between inward FDI and exports from the host country (see chapter 4.4.1.1).

However, the nature of the relationship between these two important economic indicators is "inextricably associated with questions about precedence and time" (Zhang and Felmingham, 2001: 83). That is: does inward FDI lead exports, or the other way around? Zhang and

Felmingham (2001) summarised this issue as the comparison between outward and inward oriented development policies. Thus, understanding the cause and effect relationship between the two variables is essential for developing and transitional economies to pursue appropriate development strategies. In the case of China, this causal link is also necessary for the evaluation of past policies by the Chinese government and the provision of information for future reforms. In this section, the issue concerning the direction of causality between inward FDI and the host country's exports will be discussed based on the theoretical research and empirical studies in all the countries.

5.2.1 Theoretical considerations

In the terms of causality, four relationships between inward FDI and the host country's exports are conceivable: i) Exports cause FDI (EXPORT=>FDI); ii) FDI causes exports (FDI=>EXPORT); iii) FDI causes exports, and vice versa (FDI<=>EXPORT); and iv) FDI does not cause exports, and vice versa (FDI<≠>EXPORT).

The first possibility is a unidirectional causality from export expansion to FDI, which is suggested by the theories of international economics and business with the following rationale:

- The pressures of international competition force export-oriented firms to invest in innovation and reduce managerial inefficiencies, which may attract more foreign investors (Hein, 1992; Lucas, 1993).

- Through providing greater economies of scale, export expansion can promote productivity, which will lower the costs of capital utilisation (Helpman and Krugman, 1985; Porter, 1990). For foreign investors, it means that they can get a higher rate of return because of lower costs (Zhang and Felmingham, 2001).

- Export expansion can also bring about higher-quality and differentiated products to adapt to international consumption patterns, which can command higher prices in world markets (Krueger, 1985; Porter, 1990).

- Frequent export activities enable the business partners to know more about economic, cultural, political, and social situations in each other's countries, which facilitates quick flows of information on investment opportunities (Wei, *et al.*, 1998).

The second possibility is in the opposite direction: the causality from FDI to exports. There are two theoretical explanations for this causative process: one is from the industrial organisation theory and the other is from endogenous growth theory. The industrial organisation theory states that foreign investment plays an important role in technology transfer, market structure, and competition through multinational enterprises (Caves, 1996; Dunning, 1993). Endogenous growth theory emphasises that inward FDI is a vital source of human capital augmentation, technology change, and spillover effects. So, inward FDI can create "greater export potential and may alter a host country's export product mix over time" (Zhang and Felmingham, 2001: 85). In this way, inward FDI will be the prerequisite for exports.

The third possibility is a two-way causal link that combines the first and second ones. It means that inward FDI and exports from the host country can be mutually reinforcing in the process of development. The rigorous theoretical arguments offered by the first and second hypotheses support this bidirectional link. Zhang and Felmingham (2001) gave an example to explain this phenomenon. If an export-led development policy attracts FDI on a large scale, foreign subsidiaries may eventually begin to export.

Finally, the fourth possibility is that there is no causal relationship between inward FDI and exports. That is, FDI and exports are both the results of the process of economic development and structural change. A country should then look for alternative policies to encourage FDI or to promote exports (Zhang and Felmingham, 2001).

5.2.2 Empirical evidence

Chapter 3.4 provided an overview of empirical studies about causality in the relationship between inward FDI and exports in the case of China. The mixed empirical results on this issue are provided not only in China as discussed in chapter 3.4 but also in other countries.

For example, Lucas (1993) analyses the development of the South East Asian countries and finds that inward FDI is more sensitive to the demand for exports than it is to domestic aggregate demand, which implies that exports precede inward FDI. However, Johnson (2006) investigates the inward FDI and exports in eight high performing East Asian economies for the period 1980 to 2003 and Granger causality tests indicate that FDI inflows cause exports from the host countries. Jun and Singh's (1996) empirical evidence is even more mixed. They find that from 1969 to 1993, there is no causal link between inward FDI and exports in some countries such as

Colombia, Egypt, and Mexico. However, during the same period, in the case of Thailand and Ecuador, inward FDI tends to Granger-cause exports.

As mentioned in chapter 3.4, although economists consider China as an interesting example in terms of inward FDI/exports causal relationship (Liu, *et al.*, 2001), there is still a lack of empirical efforts on this issue, especially for the period after China joined the World Trade Organisation (WTO) in December, 2001. This study aims to fill this gap, using the latest monthly time-series data for the period of January, 2002 to June, 2006 in China. Because reliable provincial data on inward FDI and exports are only available on an annual basis from the Chinese Statistical Yearbook, the yearly data set is not sufficient for provincial time series analysis and would make it easy to lead to the spurious regression problem. Therefore, this study will focus on evaluating the causal links between inward FDI and Chinese exports at the national (aggregate) level.

From the point of view of policy implication, as China is the largest developing and transitional country, an investigation of the more recent national experience in FDI and export growth would provide a more complete picture in the development strategies of openness and trade liberalisation for other developing and transition economies.

5.3 FDI in China

In section 5.2, theoretical considerations provided the economic rationale that causation between inward FDI and exports can occur in either of two single directions, a bidirectional link, or no causal link at all and the existing empirical studies of this relationship also present mixed results.

In the case of China, from 1979 at the beginning of reforms and opening up of the economy to the four and a half years' membership in the WTO in June, 2006, exports have always grown rapidly along with the rise of inward FDI flows. Table 2.7 demonstrated the stylised fact of exports and FDI during this period. At the same time, empirical work in chapter 4 of this study based on panel data of provincial FDI and exports during the period 1994 to 2003 also showed a remarkable statistical relationship between inward FDI and China's exports. All of these indicate that the relationship between exports/FDI should not be independent in China.

Therefore, which direction of causality between FDI and exports may be the case under the WTO-related market openings? To answer this question, it is necessary to do some preliminary analysis on the recent trends and patterns of China's FDI and export performance.

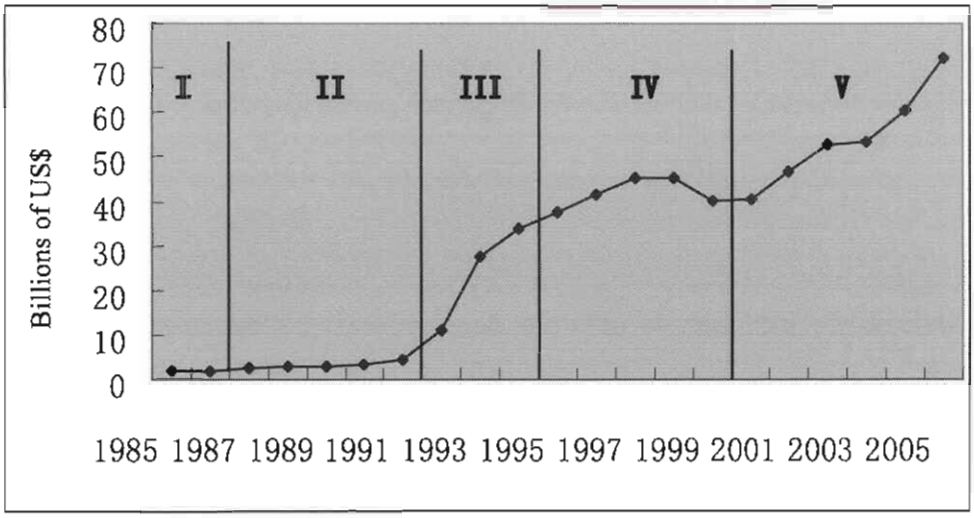
As for China's exports, chapter 2 of this study examined the historical evolution of China's foreign trade regime and discussed the recent trends and patterns of China's exports, including the increasing role of FIEs in the expansion of China's exports (see table 2.7), a growing share of more technically sophisticated export products (see chapter 2.3.2), the major export industries (see chapter 2.3.2), and the latest top export destinations (see chapter 2.3.5). Chapter 4 provided the geographic distribution of China's exports and identified the determinants of regional export performance.

However, for inward FDI, it should be realised that, in the previous sections of this study, FDI was only mentioned and tested as a dominant force in regional export growth in chapter 4. In fact, FDI can not only have a significant impact on export sector, but also can be the fundamental factor for economic development. This has already been widely documented in the literature (Work Bank, 1993; Fukao, *et al.* 2003; Zebregs, 2003). As the largest host for FDI in developing countries since 1993 (Lai, 2002), it can be said that, without the contribution of FDI, China's export and economic performance would look very different. Therefore, before examining the causality between inward FDI and exports, this section will firstly identify the characteristics of China's FDI and explain the Chinese factors to attract so much FDI, especially during the research period of this chapter since the end of 2001.

5.3.1 The key trends of FDI in China

FDI in China began in 1979. Since then it has experienced an initial period, a steady growth period, a rapid growth period, a mature period and the fifth period in responding to the WTO accession as shown in figure 5.1 (see chapter 3.3; Ng and Tuan, 2001). Table 2.7 provided the FDI inflows in every year from 1980 to 2004. Because the first four phases have already been discussed by giving an overview of the literature in chapter 3.3, the focus of this section is to discuss the trends and patterns of inward FDI after China's WTO accession. There are several basic findings:

Figure 5.1: FDI inflows in China, 1985-2005



Source: China Statistical Yearbook, various years.

- FDI inflows: The total amount of inward FDI has increased continuously. In 2002 and 2003, China gained its place as the top global recipient of FDI (China Statistical Yearbook, 2004).

- Modes of FDI[15]: The share of wholly foreign-invested enterprises increases significantly, while the shares of equity joint ventures and co-operative joint ventures are gradually decreasing (China Statistical Yearbook, 2005). Wholly foreign-invested enterprises are regarded as the most dynamic and productive firms in China's economy, which appear to benefit domestic firms more than the other two forms through positive spillovers (Zebregs, 2003).

- Source countries: By the end of 2003, Hong Kong SAR, as the most important source of FDI in China, had contributed 44.38% of the total cumulative actual investment. Other important sources of FDI include the US, Japan, Taiwan Province, EU, Singapore, and South Korea (China Statistical Yearbook, 2004). The investment shares of Hong Kong SAR continue decreasing, while the shares of the US and the EU keep on increasing in recent years (China Statistical Yearbook, 2005).

[15] In China, foreign-invested enterprises include wholly foreign-owned enterprises, equity joint ventures and co-operative joint ventures (Yao, 2006; see chapter 2.2.2.4).

- Sector distribution: The largest share of FDI is still destined for manufacturing. However, more and more foreign investment is flowing from the traditional manufacturing ventures into the equipment manufacturing, electronic machinery, high-technology, entertainment, retail, and financial service sectors (USCBC, 2005).

- Regional distribution: The disparity between the east (coastal) region and the inland areas is basically unchanged as discussed in chapter 4 (China Statistical Yearbook, 2005).

- FIEs: FIEs play a more and more important role in China's total exports (see table 2.7). They are the principal exporters of high-technology manufactured products. FIEs' main export destinations are the US, the EU, Japan, and Hong Kong SAR (China Statistical Yearbook, 2005).

When comparing the recent patterns of China's exports as discussed in chapter 2, it can be found that the key developments of FDI after the accession to WTO have similar trends. Especially the roles of FIEs in the export expansion and contents provide prima facie evidence for causality flowing from FDI to exports or bi-directionally.

5.3.2 The determinants of China's FDI

It is widely accepted that China has been the most attractive site for FDI in the world (Zhang, 2002). By the end of 2004, the number of total cumulative registered FDI projects is 508,941, the total cumulative contracted value of FDI is US$1,096.6 billion, and the total cumulative realised FDI in China reached US$562.1 billion (China Statistical Yearbook, 2005). The question can be asked: why is China so attractive for FDI? This section will answer this question from two perspectives: the traditional determinants and new advantages after WTO's accession.

In China, the traditional attraction of FDI is as follows:

- Market size: It is generally accepted that the larger market size can offer greater opportunities for realising economies of scale more effectively (Zhang, 2000; 2005). The huge size of the market helps China become a highly desirable location for foreign investment (Zhang, 2002).

- Abundant supply of cheap labour: The combination of low wage costs and the largest population in China provides the particularly strong attraction to export-oriented multinational enterprises. In order to take this advantage, the large amount of FDI flows into labour-intensive manufacturing production (Zhang, 2002; 2005).

- China's export-promotion FDI strategy: Since its economic opening in 1979, China has launched its open policies to attract FDI, which have an important and special position in China's economic development (Jian, *et al.*, 1996; Chen and Fleisher, 1996; Zhang, 2001a; b; see chapter 2.2.2.4). These policies in terms of "preferential" measures are designed to attract export-oriented manufacturing firms and advanced technology joint ventures (Ng and Tuan, 2001; see chapter 2.2.2.4; table 2.2). What the "preferential policies" really do is to remove some of "these regulations against the marketisation and internationalisation of economic activities" (Démurger, *et al.*, 2002: 6). Therefore, they are also described as building a "business-friendly investment environment" for foreign investors (Ng and Tuan, 2001: 1053).

  It should be noted that China's coastal areas (especially Guangdong Province, see chapter 4.4.1.2) are the pioneering regions designed to open up for FDI promotion by Chinese authorities and thus have enjoyed their time lead (Ng and Tuan, 2001). In this way, the selective export-promotion FDI strategy is largely to blame for the growing gap between coastal and inland provinces (Wang and Hu, 1999; Tseng and Zebregs, 2003; see chapter 4.4.1.2).

- The Chinese connections: The "Chinese connections" reflect the ethnic factors. It means that the investors from Asian economies have a unique link with China, consisting of "same language, culture, geographic proximity, relatives/friends, and former business ties with China" (Zhang, 2005: 303). The most significant examples are the pairs of Hong Kong SAR-Guangdong Province and Taiwan Province-Fujian Province (Zhang, 2002). Such geographical and cultural proximity can encourage FDI from two sides. One is from the recipient side. By the end of 2003, in terms of the total cumulative utilised FDI, Guangdong and Fujian attract the first and third largest shares of FDI in China, respectively (China Statistical Yearbook, 2004; see chapter 4.4.1.2). The other is from the source side. In 2003, the one-year FDI flows from the Asian ten countries (Hong Kong SAR, Macao SAR, Taiwan Province, Japan, Philippines, Thailand, Malaysia, Singapore, Indonesia and South

Korea) contribute over 60% of both total contractual and actual investment (China Statistical Yearbook, 2004).

With the accession to the WTO, China's economy became more open than before. Apart from the above traditional attraction still being present, there are other new factors in attracting FDI.

- More attractive investment climate: Following the agreements reached during WTO accession negotiations, China has set up a more friendly investment environment for FDI promotion, including the "hard" and "soft" components. In developing its "hard" environment, the Chinese government has invested substantially in fixed investment in physical infrastructure such as transport and telecommunication (Ng and Tuan, 2001). In particular, considerable efforts have been put into developing the Great Western and Northeast regions of China (USCBC, 2005). In developing its "soft" side, China eliminates various requirements on FDI, including foreign exchange and trade balance, technology transfer, local content, and export performance. Foreign enterprises are allowed to own up to 50% of FIEs in the telecom and insurance sectors. China is also obliged to adhere to the WTO rules on intellectual property rights, which is the top concern for companies investing and operating in China (Huang, *et al.*, 2004; USCBC, 2005).

- Agglomeration effect: Manufacturing production can become more efficient due to agglomeration economies, which result from existing manufacturing activities locating in close proximity (Zhang, 2002). That is because "concentration of production and urbanisation facilitate quick spillovers of knowledge and the use of joint networks of suppliers and distribution" (Wei, *et al.*, 1999: 859). After nearly three decades of efforts in encouraging FDI, China, especially coastal China, already has a critical mass of inward FDI and substantial clustering of industrial activities. The agglomeration effect gives China (especially coastal China) an important advantage over other countries/regions with a dispersed manufacturing sector (Tseng and Zebregs, 2003).

It is important to emphasise that the discussion of all the above determinants in this section does not imply that they are the only FDI factors in China. Other determinants, such as infrastructure, R&D manpower, and international trade, have been also recognised and tested in the existing empirical studies (Wei, *et al.*, 1998; Zhang, 2002; Tseng and Zebregs, 2003). It is interesting to see that many determinants to attract FDI can also explain China's export patterns (Liu and Shu,

2001; Adams, *et al.*, 2006). This firms up the causal observation at the beginning of this section: there is a complementary causal link between FDI and exports in China.

5.4 Methodology

The test for causality between two economic variables is proposed by Granger (1969). The test implies determining whether a variable can help to forecast another variable (Liu, *et al.*, 1997). However, this test procedure requires that the time series should be stationary. Otherwise, it can result in spurious causality. That is, before any causality analysis, the integration orders of the time series should be tested. The augmented Dickey-Fuller (ADF) test (with Eviews 3.0) is used for this purpose.

5.4.1 ADF test

The ADF test of stationarity for a variable y is based on the following equations:

$$\Delta y_t = \mu + \beta y_{t-1} + \sum_{j=1}^{m} \delta_j \Delta y_{t-j} + u_t \quad \text{(excluding time trend)} \tag{5.1}$$

$$\Delta y_t = \mu + \lambda t + \beta y_{t-1} + \sum_{j=1}^{m} \delta_j \Delta y_{t-j} + u_t \quad \text{(including time trend)} \tag{5.2}$$

Where m is the lag length of the dependent variable and should be long enough to permit a white-noise error term. If the OLS estimate of β is significantly different from zero, based on the calculated t-statistic, the series y is non-stationary or y has at least one unit root. The same procedure is then repeated for the first differenced (growth) series Δy_t and, if necessary, for higher-order differenced series until a stationary series is obtained. Since the t-distribution of equations (5.1) and (5.2) is not standard, the critical values for t are given by Fuller (1976) and Mackinnon (1990) (Liu, *et al.*, 1997).

It should be noted that the ADF test is not only to examine the properties of each time series for the presence of unit root(s), but also to determine whether the time series are co-integrated (Kwan, *et al.*, 1999).

In order to determine the optimum lag length of Δy_t, this study uses Akaike's information criterion (AIC) and Schwarz criterion (SC) for serial correlation. Therefore, the selected lag length should minimise AIC and SC on the condition that the residuals are not autocorrelated. In fact, SC is an alternative to the AIC with basically the same interpretation (Liu, *et al.*, 1997).

5.4.2 The Granger test

The Granger causality test[16] assumes that the information relevant to the prediction of the respective variables, x and y, is contained solely in the time series data on these variables. The test involves estimating the following regressions:

$$y_t = \sum_{i=1}^{n} \alpha_i x_{t-i} + \sum_{j=1}^{n} \beta_j y_{t-j} + u_{1t} \tag{5.3}$$

$$x_t = \sum_{i=1}^{m} \lambda_i x_{t-i} + \sum_{j=1}^{m} \delta_j y_{t-j} + u_{2t} \tag{5.4}$$

Where it is assumed that the disturbances u_{1t} and u_{2t} are uncorrelated (Gujarati, 1995: 620).

Equation (5.3) postulates that current y is related to past values of y itself as well as of x, and equation (5.4) postulates a similar behaviour for x_t. Note that these regressions can be cast in growth forms, $\dot{y}$ and $\dot{x}$, where a dot over a variable indicates its growth rate. The four cases are as follows:

- Unidirectional causality from x to y is indicated if the estimated coefficients on the lagged x in equation (5.3) are statistically different from zero as a group (i.e., $\sum \alpha_i \neq 0$) and the set of estimated coefficients on the lagged y in equation (5.4) is not statistically different from zero (i.e., $\sum \delta_j = 0$).

- Conversely, unidirectional causality from y to x exists if the set of lagged x coefficients in equation (5.3) is not statistically different from zero (i.e., $\sum \alpha_i = 0$) and the set of the lagged y coefficients in equation (5.4) is statistically different from zero (i.e., $\sum \delta_j \neq 0$).

[16] The Granger causality test is well and clearly stated by Gujarati (1995). This study here quotes his work from page 620 to 621.

- Feedback, or bilateral causality, is suggested when the sets of x and y coefficients are statistically significantly different from zero in both regressions.
- Finally, independence is suggested when the sets of x and y coefficients are not statistically significant in both the regressions (Gujarati, 1995: 620-621).

More generally, since the future can not predict the past, if variable x (Granger) causes variable y, then changes in x should precede changes in y. Therefore, in a regression of y on other variables (including its own past values) if past or lagged values of x are included and it significantly improves the prediction of y, then it can be said that x (Granger) causes y. A similar definition applies if y (Granger) causes x (Gujarati, 1995: 621).

Given in equation (5.3), the steps involved in implementing the Granger causality test are illustrated as follows:

- Regress current y on all lagged y terms and other variables, if any, but do not include the lagged x variables in this regression. From this regression obtain the restricted residual sum of squares, RSS_R.

- Now run the regression including the lagged x terms. From the regression obtain the unrestricted residual sum of squares, RSS_{UR}

- The null hypothesis is $H_0 : \sum \alpha_i = 0$, that is, lagged x terms do not belong in the regression.

- To test this hypothesis, the F test is applied,

$$F = \frac{(RSS_R - RSS_{UR})/m}{RSS_{UR}/(n-k)} \tag{5.5}$$

  which follows the F distribution with m and (n-k) degree of freedom. m is equal to the number of lagged x terms and k is the number of parameters estimated in the unrestricted regression.

- If the computed F value exceeds the critical F value at the chosen level of significance, the null hypothesis is rejected (Gujarati, 1995: 621).

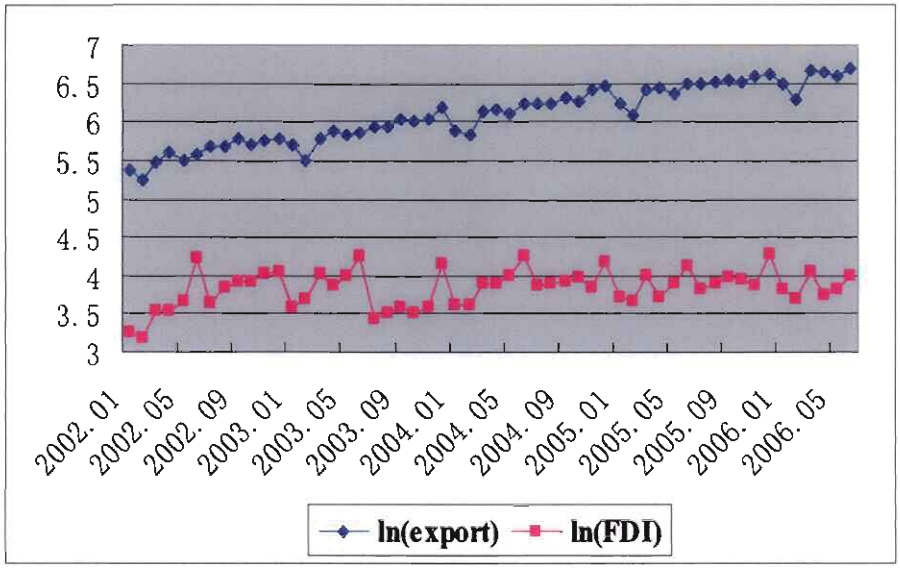
The empirical analysis has been done using Eviews version 3.0.

5.5 Empirical results

5.5.1 Data

Monthly data on national FDI and exports from Jan, 2002 to Jun, 2006 were obtained from the website of the State Statistical Bureau of China. Both FDI inflows and export sales are measured in US dollars. According to Liu, *et al.*, (1997), Liu (2000) and Yao (2006), it is not important to deflate the values in current prices into values in constant prices if they are provided in US dollars. Figure 5.2 shows the plots of logarithms of the two time series, which also implies that this section works throughout with the logarithms of the variables.

Figure 5.2: The plots of logarithms of FDI inflows and exports, Jan 2002-June 2006



5.5.2 Results of the ADF test

As discussed in section 5.4.1, the ADF test involves two tests, namely the test including constant but no trend (see equation 5.1) and the test including constant and trend (see equation 5.2). As is apparent from figure 5.2, there is a rising trend in ln(export) over time. That is, ln(export) is the linear function of time. Therefore, the ADF test for ln(export) should only concern the one including constant and trend. The number of the lags included was determined using Akaike Information Criteria (AIC) in this study (not reported here).

The results of the unit root tests are presented in table 5.1 and they suggest that the monthly FDI and exports time series (in logarithmic form) are both stationary at the level of 5%. Therefore, the two variables do not have to be transformed into differenced forms.

Table 5.1: ADF unit root test

Variables	ADF test 1	ADF test 2	5% Critical values	Order of integration
ln(FDI)	-3.84 (7)		-3.51	I (0)
		-3.18 (7)	-2.93	
ln(export)	-3.77 (3)		-3.50	I (0)

Note:

1. ADF test 1 includes constant and time trend and ADF test 2 includes constant but no time trend.
2. The numbers in parentheses for the ADF tests represent the number of lags included in the test regression determined by AIC.

5.5.3 Results of Granger causality test

After ADF test, the Granger causality test is carried out. It is well-known that the direction of causality suggested by the Granger causality test is sensitive to the number of lags that are used (Shan and Tian, 1998). That is why Davidson and Mackinnon (1993) suggest using more, rather than fewer, lags. Pindyck and Rubinfeld (1991: 217) also point out that "it is best to run the test for a few different lag structures and make sure that the results are not sensitive to the choice of lag length". Therefore, this study performs Granger causality tests from one to eight lags. The results set out in table 5.2 are robust to different lag structures.

As indicated in table 5.2, from two lags onwards (this may suggest that one lag is not an appropriate lag length), there is one-way causality running from FDI to exports in China after WTO accession. But no Granger causality is found from exports to FDI. It is also interesting to find in table 5.2 that inward FDI has stronger causal connection with further exports. The causality from FDI to exports is at the 5% significance level when the number of lags is from two to six, while it is achieved at the 1% significance level when the lag length becomes longer. This implies that it needs a rather long gestation period for inward FDI to turn "export potential" into "export performance" (Zhang and Felmingham, 2001: 91).

The fact that causality runs from inward FDI to exports suggests that it is the rapid inflows of FDI that precede the changes in export growth. There appears to be evidence that FDI is the engine of exports in the case of China. The major outcome also provides some testimony to the effectiveness of China's more open investment policies under the WTO accession terms leading to greater interaction between China and the rest of the world. In particular, the Chinese government is still actively encouraging foreign investment through providing a more attractive investment climate.

In Zhang and Felmingham's (2001: 97) study, the process of staged development is subdivided into two stages: "In the first stage, the degree of openness attracts FDI, which, in time, creates trade in the form of increased exports. If causality is assessed at an early stage of this process, then exports or potential exports could appear to be leading FDI, however, the direction could be reversed at a later stage when the FDI has turned export potential into real export growth". The empirical results of this study may simply reflect that China has already gone through the early stage of the export development process and has been in the second stage.

Table 5.2: Results of Granger causality test

Direction of causality	Lag(s)	F-statistic	Probability	Decision
EXPORT=>FDI	1	1.82936	0.18229	Rejection
FDI=>EXPORT		1.15729	0.28719	Rejection
EXPORT=>FDI	2	1.51023	0.23138	Rejection
FDI=>EXPORT		4.79131**	0.01277	No rejection
EXPORT=>FDI	3	0.41462	0.74334	Rejection
FDI=>EXPORT		4.01094**	0.01313	No rejection
EXPORT=>FDI	4	1.22102	0.31674	Rejection
FDI=>EXPORT		3.81511**	0.01000	No rejection
EXPORT=>FDI	5	1.75909	0.14484	Rejection
FDI=>EXPORT		3.00496**	0.02211	No rejection
EXPORT=>FDI	6	0.56349	0.75628	Rejection
FDI=>EXPORT		2.46054**	0.04323	No rejection
EXPORT=>FDI	7	0.40796	0.89023	Rejection
FDI=>EXPORT		3.43849***	0.00743	No rejection
EXPORT=>FDI	8	0.92513	0.51066	Rejection
FDI=>EXPORT		4.70549***	0.00090	No rejection

Note: ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

5.6 Summary

The purpose of this chapter was to assess the causation between inward FDI stock and exports in China over the recent period Jan, 2002 to Jun, 2006. It means the analysis focuses on the "precedence and timing" of the relationship between the two important economic indicators.

This chapter firstly presented the key trends and determinants of the FDI boom in China. Then the augmented Dickey-Fuller (ADF) tests were carried out to test stationarity for the two variables involved. Finally, standard Granger causality tests were conducted based on the monthly time series data at the national level.

The empirical results indicate that there exists a one-way complementary causal link from FDI inflows to China's export flows, which is consistent with the findings of Liu, *et al.*, (2001). Such results have important implications. Since FDI inflows cause host country exports, inflows of FDI should be encouraged. This provides the motivation for more FDI promotion policy designs and implementations. In light of the significant business opportunities created by China's WTO accession, the attraction of further FDI will stimulate the further development of exports, and eventually increase the standard of living. This aspect will be subsequently discussed in the next chapter.

Chapter 6: Economic disparities across Chinese Provinces

6.1. Introduction

Chapter 4 discussed the widening of the export disparity among China's provinces during the period 1994 to 2003. Meanwhile, although the Chinese economy has been growing rapidly since 1978, it seems that the economic growth has not been shared equally across China during the period 1994 to 2003. In the existing literature, almost all of the convergence analyses across China's provinces used data for a period before the end of the 1990s. The conclusion is that there was no convergence before 1978, but an increasing divergence in the 1980s and 1990s (Jian, *et al.*, 1996; Chen and Fleisher, 1996; Li, *et al.*, 1998). Therefore, what, exactly, is the trend of the provincial economic performance in China during the more recent period? Particularly, what is the role of exports in China's provincial economic growth? The purpose of this chapter is to carry out the convergence analysis with three different methods, beta-convergence, sigma-convergence and Markov Chain analysis, for the period 1994 to 2003 and to identify the determinants of provincial economic growth in China, especially the impact of export performance on the growth rate, with two different estimators (standard OLS cross section and random-effects GLS panel data approaches). The period from 1994 to 2003 is chosen not only because it reflects the latest trend, but also because it is the most open period in Chinese history and thus can reflect the most intensive effect of exports.

The chapter is structured as follows. In section 6.2, it will show that economic performance has varied widely across China's regions. In section 6.3, beta-convergence (including both unconditional and conditional convergence) is applied to check if the real per capita GDP across different regions in China converges and to estimate the determinants of provincial growth rates. Section 6.4 tests sigma-convergence and section 6.5 uses Markov Chain analysis. Section 6.6 concludes the chapter.

6.2 Overview of provincial development in China

China's economic reform was initiated in 1978. Since then, China's economy has grown rapidly. However, although the whole country has experienced significant economic growth, disparity in regional economic development is also well-recognised (Li and Zhao, 1999; Fujita and Hu, 2001).

Table 6.1 shows the Chinese provincial economic performance between 1994 and 2003. The output data used in table 6.1 are provincial per capita GDP in constant prices based on per capita GDP deflators (1978 year). It can be seen that the disparity between coastal provinces and interior areas has become more and more obvious.

In order to make this point clearer, table 6.2 ranks the provinces according to the real provincial per capita GDP which are provided in table 6.1. It shows that both initially rich and initially poor provinces have increased in living standards. However, the extent of improvement has differed substantially.

In terms of average annual growth rate of real per capita GDP, as shown in table 6.1, during the period from 1994 to 2003, the best performers, except Tibet in western region, are all in coastal China: Tianjin, Beijing, Zhejiang and Shanghai (in descending order). However, Tibet is still one of the poorest provinces in China. Other top provinces all had high initial output levels in 1994 (see table 6.2) and they still manage to record the highest average annual growth rates among China's provinces. However, during the same period, most of the provinces in the inland areas, especially in West China, have experienced the slowest average growth in their real per capita GDP. The provincial average growth rates of real per capita GDP are below 3% in five out of the nine west provinces. This implies that the coastal region goes up to its high steady state and the inner areas, especial west provinces fail to catch up and go down to their low equilibriums.

Table 6.1: Provincial average growth rates of real per capita GDP in China, 1994-2003

Province	Per capita GDP 1994 (Yuan)	Per capita GDP 2003 (Yuan)	94-03 (%)
Eastern (coastal) zone			
Beijing	2674	4594	6.20
Tianjin	2152	3802	6.53
Hebei	950	1506	5.25
Liaoning	1680	2043	2.20
Shanghai	4035	6694	5.79
Jiangsu	1603	2409	4.62
Zhejiang	1723	2887	5.90
Fujian	1469	2146	4.30
Shandong	1239	1957	5.21
Guangdong	1759	2466	3.83
Guangxi	767	855	1.22
Hainan	1292	1192	-0.89
Central zone			
Shanxi	778	1065	3.55
InnerMongolia	837	1286	4.88
Jilin	1010	1338	3.18
Heilongjiang	1223	1664	3.48
Anhui	694	925	2.59
Jiangxi	655	957	4.30
Henan	684	1085	5.26
Hubei	911	1291	3.95
Hunan	740	1082	4.32
Western zone			
Sichuan	687	933	3.46
Guizhou	418	516	2.37
Yunnan	686	811	1.88
Tibet	539	979	6.86
Shannxi	651	928	4.03

Gansu	527	720	3.52
Qinghai	809	1047	2.90
Ningxia	738	959	2.96
Xinjiang	1145	1390	2.17

Source: Author's own calculations using raw data from the China Statistical Yearbooks (1994-2003) published by China's State Statistics Bureau.

Note:

1. The data for Taiwan Province are not included.

2. In 1997, Chongqing, which used to be part of Sichuan Province, was granted the status of municipalit (provincial level city). In order to make the number of observations consistent before and after 1997, the information of Sichuan includes that of Chongqing during the whole research period.

Table 6.2: The rank of the best and worst performers in real per capita GDP, 1994 and 2003

Rank	Best (1994)		Worst (1994)		Best (2003)		Worst (2003)	
1	Shanghai	(c)	Guizhou	(i)	Shanghai	(c)	Guizhou	(i)
2	Beijing	(c)	Gansu	(i)	Beijing	(c)	Gansu	(i)
3	Tianjin	(c)	Tibet	(i)	Tianjin	(c)	Yunnan	(i)
4	Guangdong	(c)	Shannxi	(i)	Zhejiang	(c)	Guangxi	(c)
5	Zhejiang	(c)	Jiangxi	(i)	Guangdong	(c)	Anhui	(i)
Gap	3617 (Yuan)				6178 (Yuan)			

Note:

1. (c) means the province belongs to coastal areas and (i) means it is a inland province.

2. Gap is real per capita GDP gap between the best performer and its counterpart in 1994 and 2003, respectively.

In the extensive empirical growth literature, regional disparity has been classified as the study of convergence[17], which focuses on convergence or divergence of income levels among countries or provinces within a particular country (Aziz and Duenwald, 2003; Zhang, *et al.*, 2001). Chapter

[17] Convergence is defined here as the phenomenon of income levels in poorer regions catching up in relative terms with those in the rich regions (Aziz and Duenwald, 2003).

3.5 of this study reviewed the existing literature on this issue in the case of China. The main conclusion was that, until the end of 1990s Chinese regions had converged into three clubs of growth: Coastal, Central and West. Have the poorer provinces in China caught up with the richer ones during the more recent period? This chapter will provide insights into the convergence process from 1994 to 2003 in China, through three different methodologies. The most common approach, beta-convergence will be introduced firstly in the next section.

6.3 Beta convergence

One of the key predictions of the neoclassical growth model is absolute or unconditional convergence, which is observed across a group of countries or regions sharing with identical rates of savings and population growth, and unlimited access to the same technology. For economies with different rates of savings or population growth, conditional convergence is predicted (Rogers, 2003). The objectives of this section are not only to carry out the convergence analysis, but also to identify the determinants of China's provincial economic growth, especially testing whether exports still have a vital impact on provincial growth during the most export-intensive period.

6.3.1 Economic growth theory and empirical modelling

The basic framework for determining growth is the augmented Solow model provided by Mankiw, *et al.*, (1992). The microeconomic foundations are provided by the constant returns to scale Cobb-Douglas production function:

$$Y = K^{\alpha} H^{\beta} (AL)^{1-\alpha-\beta} \tag{6.1}$$

where Y = output

K = physical capital

H = human capital

L = labour supply

A = index of technical efficiency.

It is assumed that investment rates in physical and human capital are constant at s_k and s_h respectively, and that they depreciate at rate δ. It is also assumed that technical efficiency

improves at an exogenous rate g across countries and regions and that the labour force growth rate is n. The initial level of efficiency is $A(0)$ and is assumed to vary randomly across countries and regions (Naudé, 2004: 829).

In this model, growth is given by

$$\ln\frac{\mathrm{Y(t)}}{\mathrm{L(t)}} - \ln\frac{Y(0)}{L(0)} = \theta \ln A(0) + gt + \theta\frac{\alpha}{1-\alpha-\beta}\ln s_k + \theta\frac{\beta}{1-\alpha-\beta}\ln s_h$$

$$-\theta\frac{\alpha+\beta}{1-\alpha-\beta}\ln(n+g+\delta) - \theta\ln\frac{Y(0)}{L(0)} + \varepsilon \qquad (6.2)$$

where $\theta = 1-e^{\lambda t}$ and λ is the rate of convergence to a country's steady state (Temple, 1999).

In this equation, the initial income $Y(0)/L(0)$ affects growth negatively, because poorer countries and regions will grow more quickly over a transitory period since they have lower stocks of human and physical capital so that the marginal product of extra capital is higher. This phenomenon is known as the convergence property of the augmented Solow model (Barro, 1997; Naudé, 2004: 829).

Convergence can be tested by regressing average annual growth rates of GDP per capita (y_i) on the log of initial GDP per capita (y_{i0}). In other words by estimating:

$$y_i = \alpha + \beta y_{i0} \qquad (6.3)$$

If β <0, it suggests that there is 'β-convergence' (absolute or unconditional convergence) and that poorer countries and regions will subsequently grow faster (Barro, 1997).

In practice, equation (6.2) is implemented in an ad hoc fashion following the approach of Barro (1991), namely to estimate a conditional convergence equation, consisting of (6.3) extended by a number of variables, most notably investment (s_k), human capital (s_h), population growth (n), and a number of other conditioning variables.

The resulting equation to be estimated can be expressed as follows:

$$\ln y_{i(t2)} - \ln y_{i(t1)} = -(1 - e^{-\beta T}) \ln y_{i(t1)} + \alpha_i X_i + \varepsilon_i \quad (6.4)$$

where y = per capita GDP of country i

X_i = a vector of determinants of economic growth rates

ε_i = an error term with the usually assumed properties, including E (X_i ε_i) = 0.

The parameter β can be interpreted as the rate of convergence to the steady state (Barro, 1997; Naudé, 2004: 830).

6.3.2 Estimators

The single point, period-averaged, cross-section regression analysis consists of estimating equation (6.4) using OLS, which is the most common estimation methodology in the empirical growth studies. The advantage of this approach is that it can examine long-run trends of economic growth (Chen and Feng, 1999).

However, this method has some shortcomings[18]. It can lead to an omitted variable problem[19] of unobserved fixed effects (Islam, 1995; Yao and Weeks, 2000; Naudé, 2004). According to Islam (1995), the bias generated by the correlation of omitted country- (region-) specific technology effects and the technological growth rate in the steady state can bias the convergence speed parameter downwards. Furthermore, Yao and Weeks (2000), point out that "there may be additional problems due to endogeneity of control variables" in cross-country/section regressions.

In the estimation methods, the panel data approach has potential advantages in overcoming these two problems (Yao and Weeks, 2000), which was discussed in detail in chapter 1.4.2.1.

Because the shortcoming of the fixed-effects estimator is that time-constant factors, such as initial period variables, can not be included in the explanatory variables that can vary over time and regions (Naudé, 2004), in this chapter, a random-effects panel data approach will be used to

[18] Despite the shortcomings of cross-country regressions, "there will continue to be a place for cross-country work" (Temple, 1999: 149).

[19] This is that the other parameter estimates will be biased if they are correlated with the level of technical efficiency (Temple, 1999).

carry out the conditional convergence analysis (which must include the initial per capita GDP variable). For comparative purposes, the standard OLS cross-section estimator will be also used with STATA 9.0.

6.3.3 The determinants of provincial economic growth

Following the economic growth theories and the various explanations of economic growth offered in the existing literature, several of the economic factors will be used in the growth regressions to identify the determinants in explaining provincial economic growth in China between 1994 and 2003. These are as follows:

6.3.3.1 Initial provincial GDP per capita

At first, real provincial GDP per capita in 1994 will be used as an indicator of the initial level of economic development for the period of 1994 to 2003. If the notion of convergence is correct, initial levels of income should have a negative effect on subsequent growth rates. Barro (1997) pointed out that the initial level of per capita GDP reflects endowments of physical capital and natural resources, and the unobservable level of technology. Therefore, it is expected that the initial real provincial income per capita (GDP) to be negatively related to growth.

6.3.3.2 Export performance

In both theoretical analyses and empirical evidence, the impact of export performance on economic growth has often been summed up as the issue of openness and growth relations. Most economists agree that a domestic economy that is more open to world trade should grow faster than a closed economy (Chen and Feng, 1999; Wei, *et al.*, 2001; Lewer and Vandenberg, 2003). Wacziarg (2001) concluded that openness can affect economic growth through six potential channels: macroeconomic policy quality, price distortions, investment share of GDP, government size, FDI, and technology improvement. In particular, the last two channels are most often emphasised in the literature, which have the technological transfer and spillover effects on economic growth as inferred from the new theory of endogenous growth (Fujita and Hu, 2001; Yao, 2006).

From the theoretical point of view, exports are considered as external demand and capital input (Fujita and Hu, 2001). The neo-classical economic growth theory explains the direct effect of

exports on economic growth through factor input increases and efficiency improvements (Lin, 2001; Campenhout, 2002). Exports are thought to encourage international factor mobility, especially in the form of financial and physical capital, and are regarded as a factor that can affect technological progress which is related to economic efficiency (Lin, 2001; Campenhout, 2002). The endogenous new growth theory considers exports as an important source of human capital augmentation, technological diffusion, and spillover, and thus exports can accelerate economic growth (Grossman and Helpman, 1995; Lin, 2001).

Many empirical studies provide evidence that export performance is an important instrument for growth (Fujita and Hu, 2001; Wei, *et al.*, 2001; Yao, 2006). For example, Clerides, *et al.*, (1998) showed clearly that exports can be an important source of productivity gains. Frankel and Romer (1999) also found export (trade) to positively influence growth through investment channel (factor accumulation). Barro (1991) suggested that increasing the openness of an economy can have a favourable impact on economic growth by improving technology. Feder (1982), who divided the economy into two sectors: the export sector and the domestic sector, found that the export sector is more efficient than the domestic sector and can positively affect growth in the non-export sector. Lewer and Vandenberg (2003) even re-examined the empirical literature on trade and growth and quantified the size of the relationship between export and growth: a 1% increase in the growth of exports is associated with a 0.2% increase in economic growth.

Despite the already voluminous empirical efforts in this field, increasing attention is still paid to the link between openness and economic growth. This is the reflection that development and globalisation have become the two most important topics in the world. As the biggest developing and transitional economy, some of the development lessons can be learned from China's successful experience in exports and growth.

From the point view of national experience, the co-movement between exports and growth at the aggregate level in China since 1978 has been widely recognised (Lin, 2001; Lardy, 2003; Lai, 2006). Exports (openness) in many studies are considered as the basic driving force in China's macroeconomic performance (Lai, 2006). This demonstrates the idea that "it is the increasing openness of a national economy that has been of central importance in economic growth" (Jin, 2002: 1572).

As far as China's provincial economies are concerned, although many studies have investigated regional economic growth using provincial data (Chen and Fleisher, 1996; Jian, *et al.*, 1996; Yao

and Zhang, 2001a; b), the majority of the empirical work uses data for the period before the end of the 1990s and few have been focused on the policy implications of the export-growth relationship at the provincial level. This study aims to fill these gaps through identifying the determinants of provincial economic growth, and especially to test the impact of exports on provincial economic performance in a more recent and open period in China.

The prima facie evidence for a positive relation between provincial exports and the performance of the region's economy in the case of China is provided by the stylised facts of regional exports (see chapter 4.2) and economic growth (see section 6.2). Comparing the overview of provincial export performance discussed in chapter 4.2 with regional economic disparity shown in section 6.2, it seems that the provinces which do well in their export performance also do well in their economic growth, for example, Shanghai, Guangdong and so on (see tables 4.2 and 6.2). Therefore, it is expected that exports will show a positive influence on growth during the research period of this chapter.

6.3.3.3 Other determinants

Other determinants that can affect regional economic growth are:

- Population growth: It is generally accepted that population growth may influence economic growth in a negative way (Campenhout, 2002; Zhou, 2004). A portion of the economy's investment has to provide the increased population with capital, rather than raise capital per worker (Campenhout, 2002; Zhou, 2004). Thus, population growth reduces the long-term steady state level of GDP per capita. In addition, childcare can also draw away time that cannot be used for production (Brendan, 2002; Campenhout, 2002). In the existing empirical studies, the negative relationship between population growth and economic growth has been well documented (Malthus, 1798; Barro, 1997 and Becker, *et al.*, 1999). Therefore, it is also expected in this study that the effect of this variable on regional growth will be negative.

- Human capital: In endogenous new growth models, knowledge-driven growth can lead to a constant, or even increasing, rate of return. Human capital plays a critical role in the knowledge-driven growth (Chen and Feng, 1999). Therefore, it is generally accepted that "countries and regions with larger initial human capital stock are more likely to have new products and grow faster than other countries and regions" (Chen and Feng, 1999: 8). In many empirical studies, human capital has been shown to have a positive impact on

economic growth (Chen and Feng, 1999; Wang and Yao, 2001). From a number of alternative measures or instruments of human capital, such as education, health care, and training, the ratio of graduates in higher education is chosen as a proxy in this study. Because, in the case of China, it is suspected that the main difference in education among provinces and over time is the number of graduates in higher education (Narayan and Smyth, 2004; see chapter 4.4.4.2). The sign on education is expected to be positive.

It should be noted here that, among the various explanations given for the Chinese regional economic performance, foreign direct investment (FDI) and the coastal dummy have been often emphasised as preferential-policy effects and geographic effects on regional growth in many empirical studies (Chen and Fleisher, 1996; Jian, *et al.*, 1996; Démurger, *et al.*, 2002).

In this study, chapter 4 tested the determinants of China's regional export performance and found that both FDI and coastal dummy had significantly positive influences on provincial exports during the period 1994 to 2003. The statistical significance between both explanation variables and exports is at the 1% level, which implies that FDI, the coastal dummy, and exports are closely correlated. When the correlation coefficients for exports, FDI, and the coastal dummy are analysed using cross-sectional data in this study, the correlation coefficients for exports and FDI, exports and coastal dummy are 0.9096 and 0.8036, respectively. This shows that during the research period, a serious multicollinearity problem exists if the model includes exports, FDI, and coastal dummy as the independent variables at the same time. The existence of multicollinearity can lead to the estimated coefficient being inconsistent with economic theory[20] and influencing the impacts of independent variables on the dependent variable (Huang, *et al.*, 2004). Because the purpose of this section is to test whether the export-growth relationship is valid for provincial economies in China and most of the characteristics and trends of FDI and coastal dummy have already been included in export variable (see chapters 4.4.1 and 4.4.2), the levels of provincial exports are used in this chapter instead of FDI and coastal dummy.

[20] The coefficients of FDI and coastal dummy are estimated to be negative through cross-section and panel data approaches, which are inconsistent with economic theory. The source of this inconsistency is the multicollinearity problem.

6.3.4 Empirical results

6.3.4.1 Data and variables

The primary data source for this chapter is from the China Statistical Yearbook complied annually by the State Statistical Bureau (SSB) of China. Two provinces, Tibet and Qinghai, are omitted because of lack of reliable data. Chongqing and Sichuan Province were only separated in 1997 and have therefore been included as one combined province, in order to make the number of observations consistent before and after 1997. For political and economic reasons, Taiwan Province is excluded for this group of observations.

All of the provincial GDP per capita are in real values measured by 1978 constant prices. The initial level of real per capita GDP is that of 1994 in both cross-section and panel data regressions. In the cross-sectional approach, like GDP, the initial year of 1994 is adopted for education. That is, the initial ratio of higher education is defined as the number of provincial graduates from universities and colleges in 1994 relative to provincial total population of the year of 1994. Other variables, such as the levels of provincial exports and population growth rates are averaged over the period 1994 to 2003.

In the panel data approach, the data set is a panel of 28 regions covering the research period. The first-order lag structure of provincial exports is used to capture the relatively longer period, which may be required for the impacts of exports to be felt on economic growth. Because technological diffusion, spillover effect and efficiency improvement, or other changes need a rather long time to take effect, it is not possible that the influence of exports on economic growth can be felt immediately. The reason to choose a first-order lag structure is that a simple lag approach is more appropriate for the relatively short research period of this study. Ratios of higher education and population growth rates are provincial annual variables from 1995 to 2003. It should be noted that the initial provincial per capita GDP and exports are adopted in the logarithmic forms in both approaches.

6.3.4.2 Empirical results for unconditional and conditional convergence

Two growth specifications are estimated in this section. The first specification is a test for absolute convergence in growth rates amongst China's regions, which contains only initial GDP per capita as regressor. The second one makes convergence conditional on the variables that were discussed in section 6.3.3. A standard cross-section OLS estimator and a random-effects GLS estimator estimate these two growth-specifications. The empirical results will be reported in this section.

- **Results for unconditional convergence**

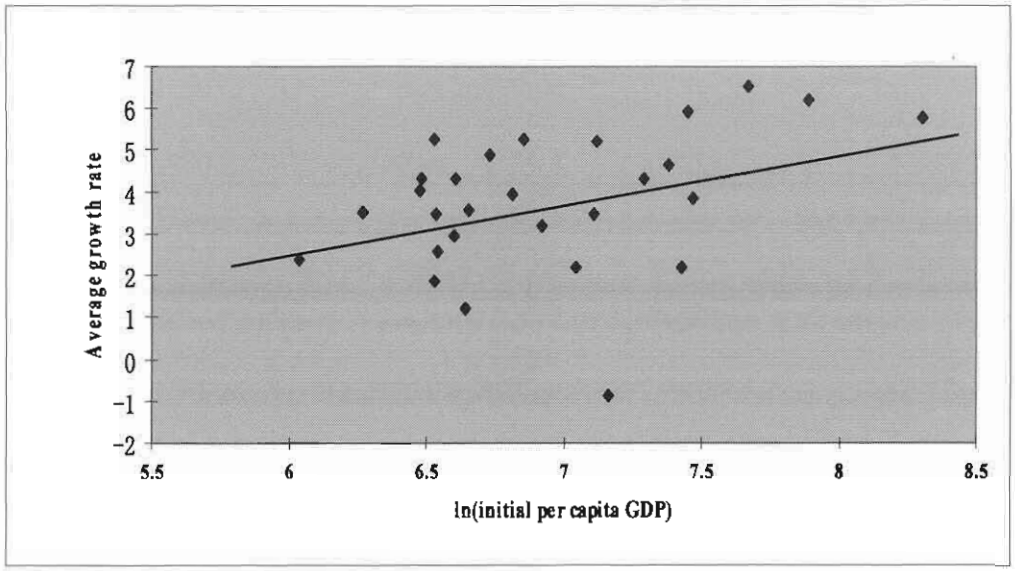
Table 6.3 reports the regression results for the first specification. As discussed above, absolute convergence is tested by regressing average annual growth rates of GDP per capita (y_i) (1994-2003) on the log of initial GDP per capita (y_{i0}) in the year 1994. The first specification rejects absolute convergence according to the significant positive coefficient of initial per capita GDP. Figure 6.1 gives the same result as table 6.3. It is clear that, during the period 1994 to 2003, the regions in China have mainly shown a strong tendency of divergence.

Table 6.3: Test for absolute convergence: dependent variable real GDP growth rate per capita, annual average 1994-2003

Variables	Coefficient	Standard error	t-value
Constant	-0.05087	0.039386	-1.29171
ln(initial per capita GDP)	0.012776	0.005653	2.260075**
Adjusted R-squared = 0.1320 Number of observations = 28			

Note: *** Significance at the 1%, ** at the 5% level and * at the 10% level.

Figure 6.1: Plot of the log of initial per capita GDP with average real GDP growth rate per capita, annual average 1994-2003



- **The standard OLS cross-section results for conditional convergence**

Table 6.4 reports the single year/point OLS regression results for the second growth specification, with STATA 9.0. One common problem facing the cross-section regression is that heteroskedasticity is generally encountered, which can make the OLS estimators inefficient (Liu and Shu, 2001). Therefore, the estimation procedure of robust standard errors is adopted to deal with this problem and make the empirical results more efficient.

Table 6.4: OLS cross-section regression results, dependent variable real GDP growth rate per capita

Variable	Coefficient	Robust Standard error	t-value
Constant	0.0443524	0.0526429	0.84
ln(initial GDP per capita)	-0.014121	0.0129865	-1.09
Initial ratio of higher education	0.1984381	0.067154	2.95***
ln(average export)	0.0069336	0.003307	2.10**
Average population growth rate	-0.8430437	0.4932079	-1.71*
Number of observations = 28			

Note:

1. *** Significance at the 1%, ** at the 5% level and * at the 10% level.

2. The robust standard error means that the standard error of the OLS regression has been adjusted by the White (1980) procedure. Therefore, the t-values are the heteroskedasticity-robust t-values.

As shown in table 6.4, firstly, the negative coefficient of initial per capita GDP implies conditional convergence and the speed of conditional convergence is 1.41%. Secondly, the value of the coefficient of ln(average export) is positive and significant at the 5%, which is of particular interest for this chapter. This suggests that export performance clearly has an important positive effect on regional economic growth in China. Thirdly, the other two variables also take the right signs. As expected, education is positively related with the average growth rate of per capita GDP and population growth affects the annual growth rate negatively. In terms of coefficient size, education and population growth are statistically significant at the 1% and 10% levels, respectively.

- **The random-effects GLS panel data regression results for conditional convergence**

The results of the GLS random-effects panel data regression for conditional convergence are contained in table 6.5. Like the cross-sectional regression results, the results tend to support conditional convergence. The coefficient of the first-order lag structure of exports indicates export performance in the previous year has a significant positive impact on regional economic growth rate in the next year. Education and population growth both have the correct signs and are statistically significant, as in the results of the above cross-sectional regression. In comparison, the coefficient of population growth becomes more significant from the 10% level to the 1% level and the coefficient of education is less significant and down to the 10% significance level in the panel data approach.

Table 6.5: The random-effects GLS panel data regression results, dependent variable real GDP growth rate per capita

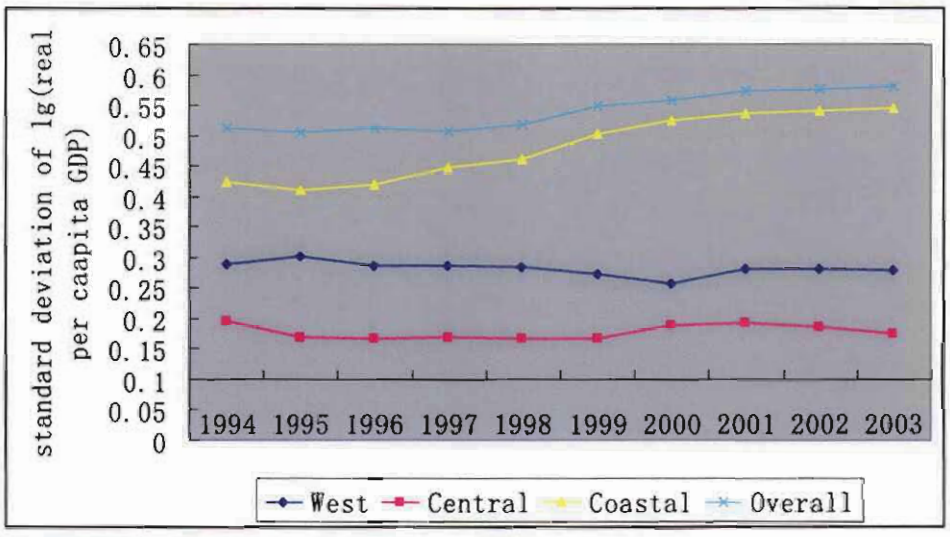
Variable	Coefficient	Standard error	z-value
Constant	0.0238753	0.0708241	0.34
ln(initial GDP per capita)	-0.0158958	0.0134263	-1.18
ratio of High Education	0.1140585	0.0636241	1.79*
ln(export) (lag = 1)	0.0097219	0.0039102	2.49**
population growth rate	-0.5148883	0.1787116	-2.88***
Number of observations = 252			

Note: *** Significance at the 1%, ** at the 5% level and * at the 10% level.

6.4 Sigma convergence

In the literature of economic growth across countries and regions, another common approach to measure convergence or divergence is sigma convergence. It can be said that beta convergence discussed in section 6.3 is the focus of macroeconomists and "sigma convergence has attracted more attention in regional science and economic geography literature" (Naudé and Krugell, 2006: 4). Sigma convergence applies if the variance of per capita GDP among economies tends to decline over time. The variance or dispersion can be measured by the standard deviation across countries or regions of the logarithm of real GDP per capita (Jian, *et al.*, 1996; Aziz and Duenwald, 2003). Figure 6.2 shows there is clear sigma divergence across 28 provinces in China during the period from 1994 to 2003, because the dispersion of real per capita GDP tends to rise substantially.

Figure 6.2: The dispersion of real per capita GDP in China, 1994-2003



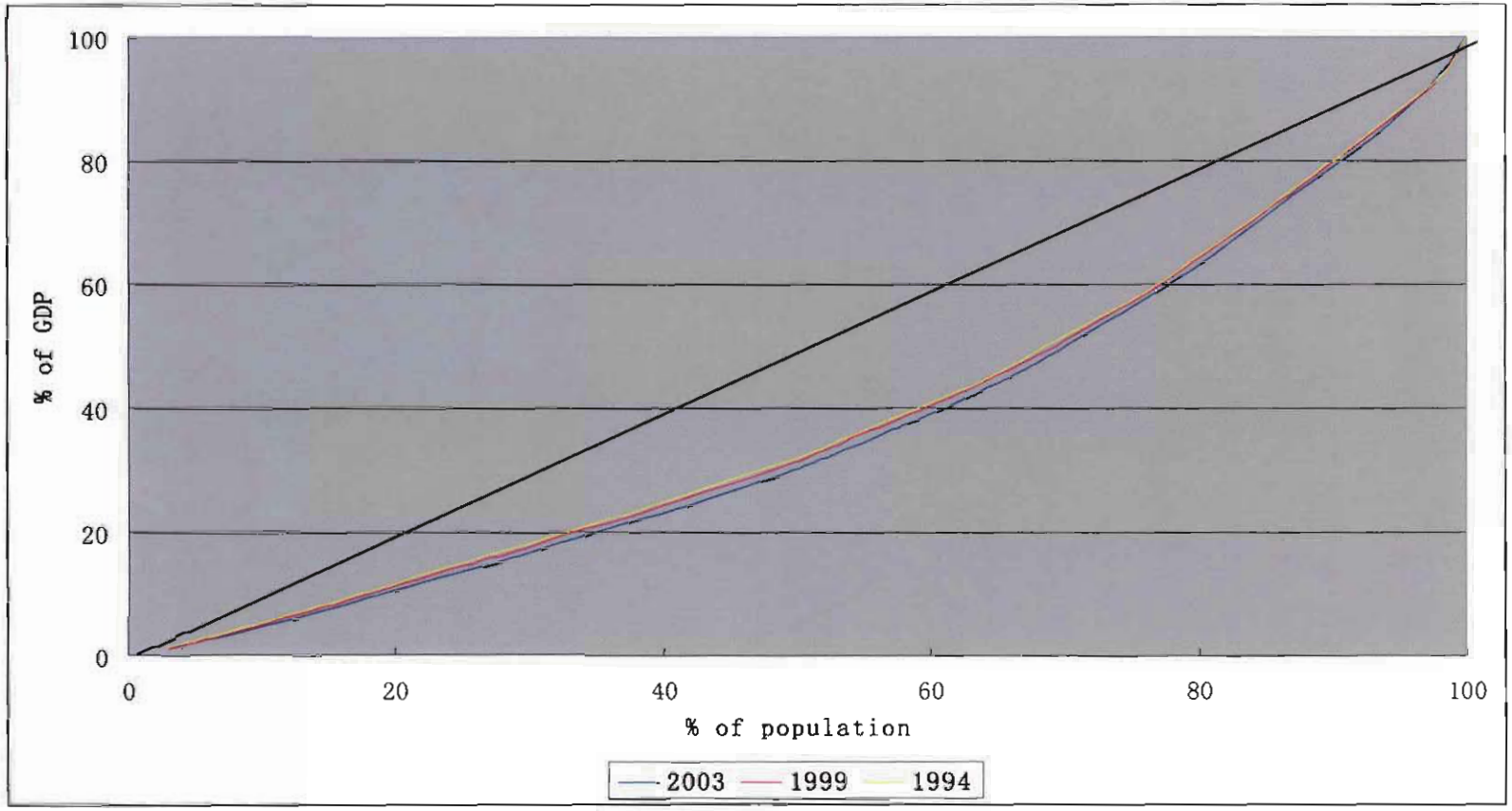
It is also obvious from figure 6.2 that GDP dispersion in coastal China is much wider than that in central and western China during the same period. The standard deviation of log of real per capita GDP across coastal areas increases from 0.4236 in 1994 to 0.5449 in 2003, while the extent of dispersion in 1994 in central and western regions are both higher than those in 2003. From the trends as suggested in figure 6.2, it can be concluded that in coastal China, the

tendency is δ-divergence during the period 1994 to 2003 and it is a mixed process of convergence and divergence in central and western China.

Where inequality refers to the dispersion of the GDP distribution across regions, Lorenz curves can access this inequality visually (Lambert, 1993: 54). In the case of this study, the Lorenz curve is applied to display the way that cumulative shares of national GDP are earned by cumulatively increasing fractions of the population, arranged from the lowest provincial GDP per capita to the highest.

The three Lorenz curves in figure 6.3 show the degree of Chinese regional inequality in 1994 (the yellow line), 1999 (the pink line) and 2003 (the blue line), respectively. It can be seen that there is significant regional disparity in China from 1994 to 2003, because the further the Lorenz curve is from the 45-degree diagonal, the greater the extent of inequality (Ray, 1998). Between 1994 and 1999, the Lorenz curve shifted outward slightly, which means there was a slight increase in inequality during this period. Between 1999 and 2003, the degree of inequality became much greater than the degree during the period 1994 to 1999.

Figure 6.3: Lorenz curves for regional inequality in China, 1994, 1999 and 2003



6.5 Markov Chain analysis

As mentioned in chapter 3.5, either beta convergence or sigma convergence can only provide "a partial view of the convergence process" (Aziz and Duenwald, 2003: 31). Neither method is able to say anything about the evolutionary process of regional income distribution differences over time (Naudé and Krugell, 2006). This led to the development of Markov Chain analysis, which suggested by Quah (1993; 1996a; b).

The essence of Markov Chain analysis is to "quantify the dynamics of the regional income distribution as a whole in terms of the intra-distributional dynamics of the individual regions making up this distribution" (Naudé and Krugell, 2006: 6-7). Following Quah (1993), the Markov Chain matrix is employed in this section.

Firstly, letting Y_t denote the distribution of per capita GDP across provinces at time t and making the assumption that the distribution follows a homogenous, stationary, first-order Markov Chain process, the evolution of this discrete[21] distribution can be written as follows:

$$Y_{t+1} = M Y_t \tag{6.5}$$

Where M maps one distribution into another, and tracks where in Y_{t+1} points in Y_t end up. Thus, M is the so-called transition probability matrix and encodes information on intra-distribution dynamics, which contains more information than just aggregate statistics such as means (in the case of unconditional and conditional beta-convergence) or standard deviations (in the case of sigma-convergence) (Bhalla, *et al.*, 2003: 33).

Assuming that the transition probability matrix remains the same over time, the distribution after N periods can be obtained by iterating equation (6.5) N number of times:

$$Y_{t+N} = M^N Y_t \tag{6.6}$$

[21] The discrete process here is "to discretize the space of income values" in order to "simply count the observed transitions out of and into distinct discrete cells" and "normalize those counts by the total number of observations". "Using discrete cells that span the space of all possible realizations", we can then construct a transition probability matrix (Quah, 1997: 9). The remainder of this section will discuss in detail the process of discretization (dividing the Chinese provinces into four groups or states: each state represents an income internal) and transition probability matrix in the case of China.

As $N \to \infty$, the distribution converges to the ergodic distribution or the steady state distribution, $\overline{Y}$, which can be characterised as:

$$Y_{t+N} = M^N Y_t \xrightarrow{N \to \infty} \overline{Y} \tag{6.7}$$

The ergodic distribution[22] depicts the eventual long-run income distribution (Sakamoto and Islam, 2005: 9-10). The ergodic distribution is constant, allowing us to write:

$$\overline{Y} = M\overline{Y} \tag{6.8}$$

If $\overline{Y}$ shows a tendency to a point mass, it would suggest convergence in per capita incomes. On the other hand, if it displays a tendency towards a bimodal (two-point) or multimodal measure, it would be evidence of income polarization or stratification (Magrini, 2003: 33).

It should be mentioned here that if the states are ergodic and the set of all states is not closed then the Markov Chain is ergodic. For an ergodic Markov chain there is always a stationary, ergodic distribution, independent of time, which is the limiting distribution of the chain and can be computed from the eigen values of the transition matrix (Pellegrini, 2002).

Then, real per capita GDP of each province relative to the Chinese average is calculated. According to their values, relative per capita GDP is divided into four[23] groups (states): low-income, lower-income, higher-income and high-income. Operator M is described by a 4 by 4 Markov Chain transition matrix. In the Markov chain transition matrix, its elements (i, j) are the probabilities that an economy in group (state) i transits to group (state) j.

Table 6.6 reports the transition matrix, estimated by averaging the annual transitions for China's provinces every year. In table 6.6, group 1 comprises provinces that have the lowest level of per capita GDP in China. That is, per capita GDP is no greater than 64.6% of the national average. Group 4 comprises the richest provinces with per capita GDP over 140% of the national average, and group 2 and 3 comprise provinces whose levels of per capita GDP are between the group 1

[22] For the transition matrix to result in an ergodic distribution one of its eigenvalues needs to equal 1 with the remaining eigenvalues below 1 in absolute value (Sakamoto and Islam, 2005: 9-10).

[23] Here relative per capita GDP can also be divided into three states: low-income, middle-income and high-income, which will not change the result. However, the figures in the result of four income states can display that Chinese provinces converge into "stratification" better than the ones in the result of three income states. Therefore, this study only reports the result of four income states.

and group 4. The dividing line between group 2 and 3 is 87% of the national average. It should be mentioned here that the dividing lines are chosen because they divide provinces into roughly equal sized groups during 1994 to 2003, following the suggestion by Quah (1993).

The panel in table 6.6 contains the yearly transition matrix from 1994-95 to 2002-03. The total numbers of transitions with starting points in group *i* are given in the first column. Columns 2 to 5 are the yearly transition probabilities.

A noticeable feature of the results is the high persistence in these four income groups (the diagonal entries exceed 80%), especially in the low-income (group 1) and high-income groups (group 4), which means that if a province is in group *i* in year *t*, the possibility of it being in the same group in year $t+1$ is over 80% and the transition possibilities between different income groups are small. For instance, 97% of the high-income observations remain in the same group in the next year.

As the complement of the persistence (Aroca, *et al.*, 2006), high mobility is found in the two middle groups in table 6.6. Both in group 2 and 3, the possibility of a higher income province falling into the lower income province is larger than that of its moving into the higher income province. For instance, the province in group 2 (or 3) is more likely to fall into group 1 (or 2) than to move into group 3 (or 4).

The entrance and exit probabilities for the rich group (group 4) are only 3.2% and 3%, respectively, which shows that there is a strong trend that the rich stays rich. As far as the low-income group (group 1) is concerned, the entrance probability of group 1 (14.8%) is much larger than the exit probability (7.9%), which means that there is a tendency that the poor still keeps poor but the low-income group tends to expand in the research period.

It can be concluded from the above results that China's provinces tend to form different income clubs. This finding is consistent with the ergodic distribution reported in the bottom of table 6.6. Note for instance that the ergodic distribution has the largest value in group 1 (0.419), which implies that, based on the trend for the period 1994 to 2003, the low-income group will have the largest number of members in the long run. It also shows that Chinese provinces converge into different levels of relative to the country GDP per capita in the future. Quah (1996a; 1997) labelled this as "stratification".

Table 6.6: Markov Chain transition matrix for provincial per capita GDP (relative to China average), first-order, time-stationary, states: 4

Period (1994-2003) (Number)	Group 1 (0, 0.646]	Group 2 (0.646, 0.870]	Group 3 (0.870, 1.400]	Group 4 (1.400, ∞)
63	**0.921**	0.079	0	0
61	0.148	**0.803**	0.049	0
62	0	0.065	**0.903**	0.032
66	0	0	0.030	**0.970**
Ergodic distribution	**0.419**	**0.226**	**0.172**	**0.183**

6.6 Summary

The objectives of this chapter were to discuss the provincial convergence among China's provinces and to identify the determinants of regional economic growth, and specifically the impact of export performance on growth rate during the period 1994 to 2003, which updates the convergence analyses to include the most recent period that has so far been generally neglected in convergence studies.

The evidence of this chapter indicates that the convergence hypothesis does not hold in China between 1994 and 2003, which suggests that the Chinese provinces are in a process of grouping into different economic clubs as the coastal region becomes richer and the inner provinces become poorer. This chapter used multiple methods of convergence, beta-convergence, sigma-convergence and Markov Chain analysis, which is necessary to avoid the problem that results may be contingent upon specific measures used for each (Hansen, 1995). Among these three methods, Markov Chain analysis has the advantage over the other two, which found that there is a tendency that poorer provinces remains poor but tends to increase in membership size over the period 1994 to 2003.

Two different econometric estimation methods including OLS cross-section and random-effects GLS panel data estimators were adopted to identify the determinants of regional economic

growth (conditional convergence) in China. The results showed a sign of conditional convergence, conditioning the explanatory variables such as exports, human capital, and population growth. The value of the coefficient on provincial exports is of particular interest for this study. It is positive and significant. Higher education and population growth also had the expected significant coefficients.

Some policy implications arise from these results.

Firstly, promoting exports is an important channel to spur economic development. It can be regarded as a basic means of narrowing the differences in economic performance between the coastal region and the inner regions in China. This result is consistent with the study of Chen and Feng (1999), which suggested that "the inner provinces may capture the external benefits of foreign trade by trading with coastal provinces, which trade with other countries at relatively low costs. Like foreign trade, inter-provincial trade is conducive to factor equalisation and shared economic growth" (Chen and Feng, 1999: 13).

Secondly, the efforts towards investing in education, especially higher education in inland provinces should be emphasised by the local and central government, which can have great potential contribution to the growth of total factor productivity in poor areas. As Wang and Yao (2001: 47) pointed out, "China needs to address its insufficient and uneven distribution of educational investment urgently, if China is to sustain its growth and welfare improvement in the next decade". During the period of improving the quality of labour, curtailing population growth should also be realised as a good way to increase the GDP per capita. That is, the one-child policy still needs to be emphasised in China for a rather long time.

Finally, it should be noted that the Chinese authorities have already realised that unequal growth between the coastal provinces and the inland provinces can cause serious social and political problems. Great efforts focused on encouraging foreign direct investment and trade and investing infrastructure, "technological upgrading, and training and education" have been made under the "Develop the West" plan by the Chinese government to help the inner regions to develop their economies (Aziz and Duenwald, 2003: 50). Today, it becomes the top of the policy agenda for Chinese authorities to narrow the income gaps of provinces.

Chapter 7: Summary and conclusion

7.1 Introduction

Napoleon once said that China was a giant lion in deep sleep and the whole world would be amazed once it woke up. It happened. Since China started reforms and opened its economy in 1978, the Chinese economy has grown fast, making it another "miracle economy" after the four "Asian tigers" (Hong Kong, Singapore, South Korea and Taiwan Province). It is widely accepted that increasing of openness of its economy has been the driving force behind China's exceptional growth performance, particularly in terms of increasing exports. Therefore it is necessary to study China's exports to provide some useful lessons for other developing and transitional countries.

The general objectives of this research were to study the determinants of China's exports, the direction of causality between FDI and exports, and the impacts of regional export performance on China's provincial economic growth. In detail, the specific research objectives were to:

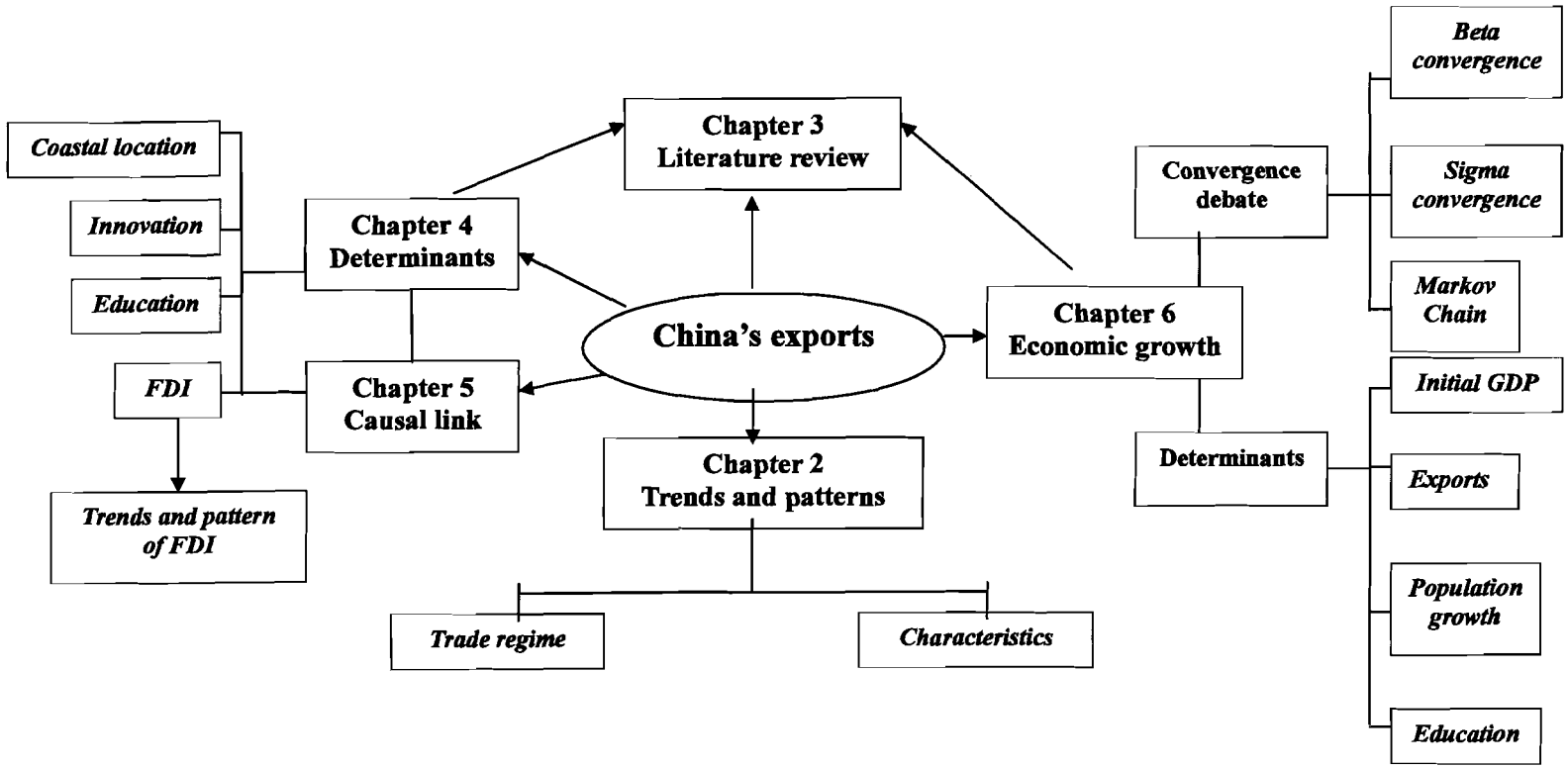
1) Describe the development of China's trade regime, especially export-promoting development strategy.
2) Describe the trends and characteristics of China's export performance since 1979.
3) Provide the literature reviews, including recent extensions and views, on China's export performance, inward FDI, the relationship between FDI and China's exports and convergence debate in the case of China.
4) Identify the determinants of China's provincial exports using panel data during the period of 1994 to 2003, especially the FDI-export linkage.
5) Describe the recent trends and determinants of FDI in China after China's WTO accession.
6) Study the Granger causality between exports and FDI using monthly data during the period January, 2002 to June, 2006.
7) Carry out convergence analysis with multiple measures (beta-convergence, sigma-convergence and Markov Chain analysis) and identify the determinants of provincial economic growth in China for the period 1994 to 2003, especially the impact of exports on growth rates, using cross-section and panel data.

8) Describe China's national success and provincial experience in economic growth, export performance, and FDI.

Chapter 2 achieved the first and second objectives of this study. Chapter 3 achieved the third objective and Chapter 4 achieved the fourth one. The fifth and sixth objectives were achieved in chapter 5. The seventh objective was achieved in chapter 6. As to the eighth objective, chapters 4, 5 and 6 provided China's national and provincial experience of export performance, FDI and economic growth, respectively.

Chart 7.1 shows the structural layout of all of the chapters in this study.

Chart 7.1: Structural layout of this study



7.2 Summary

In chapter 1, general information about China and its remarkable economic and export performance since 1978 were introduced.

China is the largest developing economy in the world with a territory of 9.6 million square kilometres, and with climate ranging from temperate to subtropical. The Chinese authorities specify the 31 regions (excluding Taiwan Province) into three geo-economic zones: east (coastal), central and west.

The introduction of the historical background in this chapter noted that China's economic reforms and the opening up of its economy experienced a tough road. During the pre-reform period, the Chinese government placed emphasis on the strategy of self-sufficiency and legitimised the political isolation of the country. The reform period was from 1978 onward under the leadership of Deng Xiaoping. From then on, China embarked on a bold programme of reforms and opening its economy to the world, which sparked an unprecedented economic and export boom.

However, the disparities of both China's economic and export performance among the regions have become increasingly serious in recent years, which may bring social and economic problems in the future. Therefore, it is necessary to explore the determinants of regional economic growth and exports, particularly in the more recent and open period.

The objective of chapter 2 was to discuss history, key trends, and characteristics of China's export performance. For this purpose, the structure of this chapter was focused on two aspects.

The first aspect was the evolutionary process of China's foreign trade regime. The strategies and policies before 1978 were compared with those after 1978. The second aspect focused on the key trends and characteristics of China's exports since 1978. The apparent linkages between export-promotion policies and the basic export patterns can be easily observed.

Some important policy implications can be drawn: firstly, China's experience proves that the export promotion development strategy is a good way to spur an economy. Since the beginning of the reforms and opening-up of the economy, the results of the efforts of the Chinese

government in formulating this strategy have been quite substantial in terms of policy coverage and determination for change.

Secondly, labour-intensive manufacturing goods exports have played a leading role in sustained high export growth in China. With a relatively cheap, literate, and adaptable workforce, China will remain an attractive destination for FDI from labour-intensive industries in other countries. However, in the long run, it cannot continue to support sustained high export growth when the per capita income level and/or market share reaches a high level and the country loses comparative advantage to countries that are less developed. Therefore, there is a development tendency for China's exports to move up the technological ladder into more technologically-intensive products, which must rely on new reforms in the future.

Thirdly, the establishment of OEZs, which reflects the incremental nature of the reform process in China, provides a new angle for studying the dynamics of and interrelationship between reform and development. By focusing on specific regions (coastal area), it also highlights some problems, especially the rising of development disparities.

Fourthly, from an international perspective, China has emerged as a major source of US imports, leading to a rapidly growing bilateral trade surplus with the US, which has resulted in new barriers to China's exports to the US and pressures from the US to allow the appreciation of the Yuan in recent years. Such barriers and restrictions may also affect the flow of Chinese exports towards other potential markets, causing other importing countries to impose their own trade barriers on the same types of products.

Lastly, it can be realised that inward FDI is closely associated with exports during the whole reform period in the case of China.

Chapter 3 reviewed the existing literature about four topics: China's export performance, inward FDI, the relationship between FDI and China's exports, and convergence among Chinese regions. The literature survey provided the background of China's FDI, economic, and export performance and also generated a number of hypotheses to be tested in the following three chapters.

It should be noted that there is extensive literature on the performance of China's FDI and exports. However, the systematic empirical investigations on the relationship between inward FDI and exports have been limited. Moreover, the existing work has not incorporated the influence of new policy regime changes, such as the transitional development strategy from labour-intensive goods export expansion to high-technology exports, into their models, and information for the more recent and open period after China's WTO accession has not yet been included.

As far as the issue of convergence or divergence among Chinese regions is concerned, the methods in the existing studies are limited and cannot provide information about the dynamics of the entire cross-sectional distribution. Therefore, to extend the extant literature by filling these gaps is an objective of this study.

Chapter 4 firstly overviewed China's provincial export performance. After providing the theoretical foundations of the determinants of exports, this study made use of the more recent data between 1994 and 2003 to draw its own conclusion on estimating the factors that explain the divergence of regional export performance in China, particularly the impacts of FDI inflows, technological factors, and geographical effects.

As was expected, it was found that inward FDI has a significantly positive influence on exports. This is because FDI helps the host country to enhance global market access for exports through FIEs and to acquire advanced management and technology through spillover effects. It was also found that investment in production innovation can produce more sophisticated goods and human capital can improve the quality of labour, both of which can make exporting products become more competitive. The empirical results of this chapter also suggested that the geographic location plays an important role, which indicates that the coastal areas are far more export-oriented than the inland regions, even after all the other factors are controlled.

From these empirical results, it can be seen that some of the determinants of regional export performance are inimitable, for instance, favourable geographic factors (such as geographic location, topography, favourable climate, amount of arable land). However, others can be developed through investment and favourable policies, for example, physical infrastructure, transport, communication, human resources, and so on. Therefore, attracting FDI, encouraging innovation, improving the quality of labour, and investing in social, economic and scientific

infrastructure are vital for Chinese authorities to promote export performance of the inner regions.

The purpose of chapter 5 was to assess the causation between inward FDI stock and exports in China over the period Jan, 2002 to Jun, 2006. It means the analysis focused on the "precedence and timing" of the relationship between the two important economic indicators.

This chapter firstly presented the key trends and determinants of the FDI boom in China. Then the augmented Dickey-Fuller (ADF) tests were carried out to test stationarity for the two variables involved. Finally, standard Granger causality tests were conducted based on the monthly time series data at the national level.

The empirical results indicate that there is a one-way complementary causal link from FDI inflows to China's export flows. Such a result has important implications. Since FDI inflows cause host country exports, inflows of FDI should be encouraged. This provides the motivation for further FDI promotion policy designs and implementations. In the light of the significant business opportunities created by China's WTO accession, the attraction of further FDI will stimulate further development of exports, and eventually increase the standard of living.

Chapter 6 covered the regional convergence debate among China's regions and identified the determinants of regional economic growth, especially the impact of export performance on the growth rate during the period 1994 to 2003. This chapter updated the convergence analyses to include the most recent period that has so far been generally neglected in convergence studies

The evidence of this chapter indicates that the convergence hypothesis does not hold in China between 1994 and 2003, which suggests that the Chinese provinces are in a process of grouping into different economic clubs as the coastal region becomes richer and the inner provinces become poorer. This chapter used multiple methods of convergence, beta-convergence, sigma-convergence and Markov Chain analysis, which is necessary to avoid the problem that results may be contingent upon specific measures used for each (Hansen, 1995). Among these three methods, Markov Chain analysis has the advantage over the other two, which found that there is a tendency that poorer provinces remains poor but tends to increase in membership size over the period 1994 to 2003.

Two different econometric estimation methods including OLS cross-section and random-effects GLS panel data estimators were adopted to identify the determinants of regional economic growth (conditional convergence) in China. The results showed a sign of conditional convergence, conditioning the explanatory variables such as exports, human capital, and population growth. The value of the coefficient on provincial exports is of particular interest for this study. It is positive and significant. Higher education and population growth also had the expected significant coefficients.

Some policy implications arise from these results.

Firstly, promoting exports is an important channel to spur economic development. It can be regarded as a basic means to narrow the differences in economic performance between the coastal region and the inner regions in China.

Secondly, the efforts towards investing in education, especially higher education, in inland provinces should be emphasised by the local and central government. This can make a great potential contribution to the growth of total factor productivity in poor areas. During the period of improving the quality of labour, curtailing population growth should also be realised as a good way to increase the GDP per capita. That is, the one-child policy still needs to be emphasised in China for a rather long time.

Finally, it should be noted that the Chinese authorities have already realised that unequal growth between the coastal provinces and the inland provinces may cause serious social and political problems. Great efforts focused on encouraging foreign direct investment and trade and investing in infrastructure, technological upgrading, and training and education, have been made under the "Develop the West" plan by the Chinese government to help the inner regions to develop their economies. Today, it becomes the top of the policy agenda for Chinese authorities to narrow the income gaps of provinces.

7.3 Conclusion

The general objectives of this research were to study the determinants of China's exports and regional economic growth, to test the direction of causality between FDI and exports, and to carry out convergence analysis among Chinese provinces. This study contributes by making use of recent national (January, 2002 to June, 2006) and provincial (1994 to 2003) data and

incorporating the influence of new policy regime changes into the models. The information for the most open period in Chinese history after China's WTO accession and about the dynamics of the entire cross-sectional distribution is also included.

Some conclusions and implications can be drawn:

Firstly, China's significant export expansion represents one of the most successful fields in China's reform and opening its economy to the outside world. It means that China has completed a successful transition from a closed economy to a global exporter affecting the world trade structure.

Secondly, China's amazing transition experience during the last quarter century shows that the export promotion development strategy has played a critical role in the process of catching up with the developed countries.

Thirdly, in the process of transition, China's gradual approach, especially the selective export promotion policies, highlights the rising of income and export disparities by focusing on coastal regions.

Fourthly, China's WTO accession provides huge business opportunities. China enters a new era with nation-wide full-fledged liberalisation and opening up.

Fifthly, the particular macro-level issue, FDI-export causal linkage, suggests that in the long term, the appropriate development strategy for Chinese government is to provide motivation for further FDI designs and implementations which, in time, lead to export growth.

Sixthly, technological factors play a more and more important role in promoting export growth. China is in the transitional stage that moves from exporting labour-intensive manufactured goods to technology-intensive exports.

Seventhly, investments in physical infrastructure and human capital can change the comparative advantage of a region and enhance economic development which, in turn, can serve as a means of narrowing the gap in economic and export performance between coastal regions and inland areas.

Lastly, given the new opportunities following the WTO accession, the Chinese government must introduce further reforms in order to sustain high economic and export performance. Earlier reforms have "run their course". The next phase of reforms might be more painful and costly, which is the topic in the future research.

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