

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

An investigation into China's export-share policy for foreign-invested firms

**A thesis submitted in partial fulfilment of the requirements
for the degree of Master of Arts at Massey University**

**Andrew Victor Shelley
December 1994**

382630951

She

Dezo.

Abstract

This thesis analyses China's export-share policy; a policy that requires foreign-invested firms to export a certain minimum share of their production. The initial discussion focuses on the development of China's foreign investment and foreign exchange control policies since the commencement of the Open Door policy. Data on foreign-invested firms is analysed to determine whether (i) the export-share requirements affect investor behaviour, and (ii) the pattern of requirements imposed has changed over time. The effect of export-share requirements on domestic welfare, foreign investment, and the level of foreign reserves are then examined within a partial equilibrium framework, and, more extensively, within a general equilibrium model that allows for urban unemployment and various forms of trade protection. Finally, the results of the theoretical analysis are applied to the earlier discussion on China's foreign investment and foreign exchange control policies. It is found that the various policy goals pursued by China have conflicting optimal export-share requirements and, even though many of the theoretical results are ambiguous, the export-share policy implemented by China is probably non-optimal.

Acknowledgements

I would like to thank Professor Rolf Cremer, my supervisor, for his inspiration and enthusiasm for this topic. I would also like to thank him for asking difficult questions during the preparation of a conference paper that forced me to obtain a clear idea of some aspects of this thesis that otherwise might remain vague.

Thanks also go to my father, and to Leanne Smith, for help with proof reading parts of this thesis.

Contents

Abbreviations	iii
Tables	iv
1. INTRODUCTION	1
2. EXPORT-PERFORMANCE REQUIREMENTS AS PART OF CHINA'S FOREIGN EXCHANGE CONSERVATION POLICY	3
Introduction	4
The 'Open Door' Policy	4
Foreign Trade and Foreign Exchange Policy	5
Foreign Investment	6
1985-1986 Reforms	9
Other Bases for Export-share Requirements	12
Summary	12
3. STATISTICAL EVIDENCE	14
Introduction	15
Do the export-performance requirements matter?	15
Was there a change in the pattern of requirements imposed after 1986?	17
Summary	20
4. PARTIAL EQUILIBRIUM ANALYSES	21
Introduction	22
Herander and Thomas (1986)	22
Export-share Requirements in an Oligopolistic industry	28
Summary	28
5. GENERAL EQUILIBRIUM ANALYSIS: A GENERAL MODEL	29
Introduction	30
The Model	30
6. GENERAL EQUILIBRIUM ANALYSIS: VALIDITY OF ASSUMPTIONS	36
Introduction	37
China as a "Small" Economy	37
Location of Foreign Investment in China	40
Labour Unemployment	41
Summary	42

7. GENERAL EQUILIBRIUM ANALYSIS: COMPARATIVE STATICS	43
Introduction	44
General Equations	44
Full Employment	48
Harris-Todaro Unemployment	54
8. GENERAL EQUILIBRIUM ANALYSIS: RESULTS	60
Introduction	61
Policy Goals	61
Quota Protection of the Importable Sector	63
Tariff Protection of the Importable Sector	66
Summary	76
9. CONCLUSION	77
APPENDIX A: DATA TABLES	81
APPENDIX B	95
BIBLIOGRAPHY	97

Abbreviations

The following abbreviations are used in this thesis:

CEMI	China-Europe Management Institute
cif	(imports valued at) cost, insurance and freight
CJV	Contractual or Co-operative Joint Venture
df	degrees of freedom
EJV	Equity Joint Venture
EPZ	Export processing zone
ESR	Export-share requirement
FEAC	Foreign exchange Adjustment Centre
FIE	Foreign-invested enterprise
Forex	Foreign exchange
FTC	Foreign Trade Corporation
LDC	Less Developed Country
MNC	Multi-National Corporation
MOFERT	Ministry of Foreign Economic Relations and Trade
PRC	People's Republic of China
RMB	Renminbi
SAEC	State Administration of Exchange Control
SEZ	Special Economic Zone
SFLPRC	<u>Selected Foreign-Related Laws and Regulations of the PRC</u> , Vol. 2, Hong Kong: Institute of Chinese Law (Publishers) and East Asia Open Institute
SGAEC	State General Administration of Exchange Control
SOE	Small open economy
USCBC	US-China Business Council
WFOE	Wholly Foreign-Owned Enterprise

Tables

Table 2-1	Joint venture investment by sector, to the end of 1984, in \$US millions and per cent	8
Table 3-1	Requirement imposed on responding firms	15
Table 3-2	Range of export-share requirements imposed	16
Table 3-3	Range of requirements imposed, by period, on the 60 firms that could have a requirement imposed	17
Table 3-4	Calculation of the Pearson χ^2 statistic for testing whether the pattern of requirements imposed changed after 1986	18
Table 3-5	Calculation of the Pearson χ^2 statistic for testing whether the pattern of requirements imposed changed after 1986	19
Table 3-6	Calculation of the Pearson χ^2 statistic for testing whether there has been any change in the proportion of requirements imposed that are greater than 50%	19
Table 6-1	The Value of China's Exports and Imports as a percentage of World, United States, and G-5 Exports and Imports	38
Table 6-2	Location of enterprises surveyed by CEMI	40
Table 6-3	Estimates of Rural-to-Urban Migration in China	42
Table A-1	Summary of requirements imposed on firms surveyed by CEMI	81
Table A-2	Export-performance requirements imposed on each firm surveyed by CEMI	81
Table A-3	Calculation of the probability that $\chi^2 \geq 9.0945$ for 27 observations with 3 categories and an expected distribution of (7.94, 14.29, 4.77)	86
Table A-4	Calculation of the probability that $\chi^2 \geq 0.0245$ for 20 observations with 2 categories and an expected distribution of (13.33, 6.67)	94

CHAPTER 1

INTRODUCTION

As part of the Open Door policy, China has sought to attract foreign investment to assist with technology¹ transfer. At the same time, however, China has imposed the requirement to export on foreign-invested firms². Known generally as export-performance requirements, the most common forms employed in China are foreign exchange balancing which requires a firm to balance its foreign exchange revenue and expenses, and export-share requirements (ESR) which specify a certain minimum share of production must be exported.

Chapter 2 discusses the reasons for China's export-performance policies, and describes the general framework of foreign investment and foreign exchange control policies in which the requirements operate. It is clear that the policy goals of most importance are the minimization of foreign exchange outflows, attracting foreign investment, and improving national welfare. Chapter 3 uses some statistical data to determine (i) whether imposing export-share requirements affects enterprise and investor behaviour; and (ii) whether the pattern of requirements imposed on foreign-invested firms has changed over time.

A major part of this thesis is a theoretical analysis of export-share requirements. Chapter 4 examines partial equilibrium analyses by Herander and Thomas (1986) and Rodrik (1987), extending those analyses where appropriate. Chapters 5, 6, 7, and 8 present a general equilibrium analysis of export-share requirements under the separate assumptions of full employment, and a particular model of unemployment that is relevant to developing countries. Chapter 5 provides the framework for the model, with chapter 6 providing evidence to support three of the major assumptions of the model. Chapter 7 consists of a comparative static analysis, and chapter 8 discusses the results of the model under the separate assumptions of quota protection for the importable sector and tariff protection for the importable sector. The use of various assumptions regarding employment and trade protection enable the model to be used to illustrate the analyses of Rodrik (1987) and Chao and Yu (1991, 1992, 1994) as well as scenarios not covered in the literature.

It is found that the effects of an export-share requirements under quotas are ambiguous, but under tariffs an export share requirement will decrease the level of foreign investment, may improve domestic welfare, and may cause a deterioration in the level of foreign reserves. If China is to continue with its export-share policy, it should convert existing quantitative restrictions to tariffs so that the domestic welfare gains are certain. This will, however, result in a reduction in foreign investment, and may result in a decline in the level of foreign reserves.

1. The word technology is used here in its broadest economic sense of being a pool of knowledge regarding the industrial and agricultural arts (Mansfield, 1991:507), so that it includes not just physical machinery, but also knowledge about advanced management and marketing methods.

2. The term "foreign invested firms" is used to denote any firms in which foreigners have invested, whether the firms be Wholly Foreign-Owned Enterprises (WFOE), Equity Joint Ventures (EJV), or Contractual Joint Ventures (CJV).

CHAPTER 2

EXPORT-PERFORMANCE REQUIREMENTS AS PART OF CHINA'S FOREIGN EXCHANGE CONSERVATION POLICY

Introduction

This chapter briefly discusses the changing attitude of the Chinese towards foreign trade and foreign investment, focusing mainly on the reforms that commenced in 1979 with the 'Open Door' policy. It is clear the Chinese have been guided by a desire to control foreign exchange reserves and not to repeat the foreign-exchange related problems that often plague less developed countries such as Brazil and Chile³. At the same time, the Chinese have also sought to attract foreign investment as a means for both increasing exports and obtaining access to advanced foreign technology. In an attempt to ensure that foreign investment does not simply result in the extraction of profits from China by the investors, China has imposed foreign exchange balancing requirements and export-share requirements on foreign investors.

The 'Open Door' Policy

After attaining power in 1949 the Chinese Communists initially intended "to do business and establish diplomatic relations with all foreign countries on the basis of equality, mutual benefit and mutual respect for territorial integrity and sovereignty" (Guillermaz, 1968:437). However, the problem of the Guomindang in Taiwan, the Korean War in 1950, and the general freezing of the Cold War meant that relations with the West were severed. China's relationship with the Soviet Union grew increasingly fractious, resulting in a severing of ties in 1960. In addition, 1962 saw the Sino-Indian war. China found itself in a position of isolation and could not expect any help from more prosperous developed nations.

Under the reformist influence of premier Zhou Enlai total trade grew from \$US 4.59 billion in 1970 to around \$US 14 billion in the years 1974-1976 (Riskin, 1991:317). As a percentage of aggregate production, however, trade was still at relatively low levels.

During 1976-1978 the present leader of China, Deng Xiaoping, rose to power. China had experienced very low rates of growth in productivity and living standards for many years: neither the extremist policies of the Maoist period nor the more moderate policies of Hua Guofeng had been successful. Political survival required a shift to a paradigm focused on what might seem to be a central tenet of marxism - improving the living standards of the impoverished population. To fail to do so could result in the Chinese Communist Party loosing the "mandate of heaven" and being overthrown by popular revolt. It was from this new paradigm that Deng could declare:

"Both planning and market regulation are means of controlling economic activity. ... Whether the emphasis is on planning or on market regulation is not the essential distinction between socialism and capitalism."

Huang, 1993:175

Whatever would raise productivity, raise production levels, and raise living standards could now be considered valid. It was obvious that China lacked the capacity to develop advanced

3. For a short discussion of the causes and extent of these problems see Todaro (1989:413-419).

industry, and required access to foreign technology and expertise if it was to have any chance of catching up to the advanced capitalist economies.

The only ways to obtain the needed technology and expertise was to either buy it, or to encourage technology transfer from foreign companies. Deng's regime began trying to increase exports more rapidly in order to obtain the foreign exchange necessary to pay for imports (Bucknall, 1989:77), a policy that has been explicitly set out in China's Sixth Five Year Plan (1981-85) and Seventh Five Year Plan (1986-90) (Hsu, 1989:129). Foreign investment was now viewed as desirable because it would provide additional investment for economic growth and boosting exports; enable China to learn advanced production, marketing, and management techniques; and introduce advanced technology to China.

1978 marked the start of the 'Open Door' policy: in February China and Japan signed a long-term trade agreement, and in December the Coca Cola Company reached an agreement with China to open a bottling plant in Shanghai (Mackerras and Yorke, 1991:33). This was followed in 1979 by Deng Xiaoping's visit to the United States, and Hua Guofeng's visit to France, West Germany, Britain and Italy (Mackerras and Yorke, 1991:34-35). In July of 1979 the *Law of the People's Republic of China on Joint Ventures using Chinese and Foreign Investment* was enacted.

Foreign Trade and Foreign Exchange Policy

As one of the first steps to increase export earnings, authority to conduct foreign trade was decentralised from Ministry of Foreign Trade controlled Foreign Trade Corporations (FTC) to FTCs owned and operated by provinces and towns (Panagariya, 1993:54). Incentives to export were provided by allowing FTCs to retain a portion of foreign exchange earned. However, two other policies often made it profitable for FTCs to reduce exports and increase imports. First, China maintained an overvalued exchange rate (ref), which inherently makes imports cheaper and effectively taxes exports. The use of an overvalued exchange rate is a common policy amongst countries trying to industrialise: a given quantity of exports can purchase more foreign technology and machinery⁴. Second, the irrational price structure often meant that FTCs could make large RMB profits from imports, but make RMB losses from exports. The price structure even led to an increase in the exports of products, such as petroleum products, that were in short supply in China (Lardy, 1992:94). With the loss of central control import volume rose by an estimated 51 percent in 1978 and 21 percent in 1979 (Riskin, 1991:319). As a result China's foreign exchange reserves fell from \$US 2.65 billion at the end of the first quarter of 1978 to \$US 1.69 billion at the end of the third quarter of 1979 (IMF, 1982:114).

China reacted to this precipitous fall in foreign exchange reserves by suspending and/or cancelling billions of dollars of contracts with foreign firms. In March 1979 the State General Administration of Exchange Control (SGAEC) was established to regulate the sources and uses of foreign exchange. The SGAEC was directly under the State Council in order to give the central government a high level of control over access to foreign exchange.

4. Note, however, that this argument ignores the detrimental effect that this policy has on the level of exports.

In March 1982 control was rationalised and centralised further by amalgamating the Ministry of Foreign Trade, the Ministry of Economic Relations with Foreign Countries, the Import Export Commission, and the Foreign Investment Control Commission to form the Ministry of Foreign Economic Relations and Trade (MOFERT). SGAEC was renamed the State Administration of Exchange Control (SAEC) and became part of the People's Bank of China.

Continued growth in exports coupled with the tighter control on imports caused China's foreign exchange reserves to grow to \$US 16.67 billion by September 1984 (IMF, 1988:160). At this point a new round of reforms was launched. More FTCs were approved and even large production enterprises could be allowed to handle foreign trade themselves (Panagariya, 1993:54). The Bank of China began issuing large amounts of credit, enabling enterprises to borrow to finance imports. In the six months from September 1984 to March 1985 foreign exchange reserves fell from \$US 16.67 billion to \$US 13.66 billion (IMF, 1988:160). In the same period imports (cif) rose from Y 15.55 billion to Y 23.65 billion (*ibid.*) Central controls on the use of foreign exchange were reimposed, imports of consumer durables suspended, and new taxes imposed. However, imports continued to grow and it was not until September 1987 that foreign exchange reserves again exceeded \$US 13.66 billion⁵.

Foreign Investment

Legal Basis of Export-share Requirements

The only form of foreign direct investment to have any legal basis in China in the early 1980s was the Equity Joint Venture (EJV). EJVs are governed by the first law establishing the right of foreign investors to invest in China: the *Law of the People's Republic of China on Joint Ventures using Chinese and Foreign Investment*⁶, promulgated on 8 July 1979. An EJV is established as a Chinese corporation with limited liability, and the shares of profit (loss) are governed by each party's share of equity.

Any foreign investor will want to repatriate profits, which represents a foreign exchange outflow for China. Thus there is an inherent conflict between the policies of encouraging foreign investment and maintaining control over the uses of foreign exchange: increased foreign investment will result in increased foreign exchange outflows. The Chinese attempted to eliminate this problem by requiring joint ventures to export their production and to balance their foreign exchange requirements. In that way the net foreign exchange earnings of the joint venture, after the remittance of any profits to the foreign partner, would be at least zero.

Article 9 of the *EJV Law* states that "[a] joint venture is encouraged to market its products outside China. It may distribute its export products on foreign markets through direct channels or its associated agencies or China's foreign trade establishments. Its products may

5. The actual level of foreign reserves for September 1987 was \$US 13.98 billion; foreign reserves during 1986 were about \$US 10.5 billion (IMF, 1988:160-161).

6. SFLPRC (1989:71-77). This law will be referred to as the *EJV Law*.

also be distributed on the Chinese market". While this wording does not mention that export-share requirements are obligatory, so that there does not appear to be a firm legal basis for such requirements, it does suggest that export is normal and expected, while distribution on the Chinese market *may* be allowed (Cremer, 1992:4).

Special Economic Zones

Many Developing Countries have implemented Export Processing Zones (EPZs)⁷. As the name implies, there is an expectation on the part of the host country that a substantial share of production from EPZs is to be exported (Basile and Germidis, 1984:26). China has introduced what are known as Special Economic Zones (SEZs) which are a variant of the EPZ concept (Osborne, 1986:75; Grummitt, 1986:28; Bucknall, 1989:143).

The *Regulations on Special Economic Zones in Guangdong Province*⁸, approved by the Standing Committee of the National People's Congress on 26 August 1980, established the Shenzhen, Zhuhai, and Shantou SEZs. These SEZs were intended to "develop external economic cooperation and technical exchanges and promote the socialist development programme" (Article 1).

The regulations provide for preferential treatment - in the form of tax concessions and preferential prices for China-sourced machinery, raw materials, and other goods - for those enterprises that are high technology-based or have a large capital commitment. It might be thought that these concessions would compensate for the harsh export requirements imposed. However, firms operating in the SEZs encountered a number of problems, which the concessions might only just offset. For example, the zones were established in new, unindustrialised areas. There was no tradition of industry, no dynamism, and no particular pride in quality. In addition, there was a lack of external economies such as a skilled and experienced labour supply, and education appropriate for modern industrial workers (Bucknall, 1989:156). Other problems included a bureaucracy that could be inefficient and difficult to deal with, and Chinese managers that lacked experience of simple cost accounting, clear ideas of profit and loss, and even running a firm as a unit independent of the state (*op cit*: 157).

Article 9 of the *Regulations on Special Economic Zones in Guangdong Province* states that "products of the enterprises in the special zones are to be sold on the international market". If an enterprise is to sell its products on the domestic market, it must have approval and will have to pay customs duties. These regulations make the obligation to export very clear, and imply that an enterprise in a SEZ would normally be subject to an ESR of 100 percent.

7. For example, there are EPZs in Indonesia, Malaysia, the Philippines, Taiwan (Osborne, 1986:77), and South Korea (Basile and Germidis, 1984:26).

8. SFLPRC (1989:119-123)

Sectoral Destination of Foreign Investment

Article 4 of the *Regulations for the Implementation of the Law of the People's Republic of China on Joint Ventures using Chinese and Foreign Investment*⁹, promulgated on 20 September 1983, states that:

Applicants to establish joint ventures ... shall comply with one or several of the following requirements:

- (1) They shall adopt advanced technical equipment and scientific management which help increase the variety, improve the quality and raise the output of products and save energy and materials;
- (2) They shall provide benefits in terms of technical renovation of enterprises and result in less investment, quicker returns, and bigger profits;
- (3) They shall help expand exports and thereby increase income in foreign currency;
- (4) They shall help the training of technical and management personnel.

In the face of the harsh levels of ESR implied by the *EJV Law*, foreign investors exploited these *Regulations* to invest in areas where there would be quick returns and high profits, and also in areas where they could not be forced to export.

It is evident in table 2-1 that a large proportion of foreign investment in the period from 1979 to 1984 was not directed at the manufacturing, high technology, and export oriented sectors envisaged by the Chinese. Tourism, the largest category, may have been able to generate

Table 2-1 Joint venture investment by sector, to the end of 1984, in \$US millions and per cent.

	Investment		Number of projects	% of number
	\$m	% of \$m		
Tourism	507.25	36.7	73	7.8
Machinery	174.58	12.6	82	8.8
Building materials	97.16	7.2	92	9.9
Light industry	62.78	4.5	152	16.3
Electricity	76.74	5.6	110	11.8
Commerce	69.04	5.0	113	16.3
Total	987.55	71.6	622	70.9

Source: Bucknall (1989:130). Percent columns do not sum to 100% because insufficient data was provided in the source.

9. SFLPRC (1989:255-278)

foreign exchange income by charging foreign tourists in a currency such as the \$US, but has no high technology or manufacturing base. Building materials, and electricity jointly contributed 12.8% of foreign investment, and although they may be in areas where there are shortages in the Chinese economy, they are clearly in areas where foreign exchange would not be earned. Light industry and commerce, contributing 9.5% of foreign investment, are areas which the Chinese themselves would be able to develop. In addition to these figures, in excess of 28% of foreign investment was directed at real estate in the period from 1979 to 1988 (Dong, 1992:149). It is clear from the above figures that much foreign investment could not earn foreign exchange. In the light of those statistics it is not surprising that in 1985 foreign exchange disbursements by FIEs were 2.7 times greater than their export earnings (*op cit*:160).

1985-1986 Reforms

As was discussed above, China was experiencing balance of payments problems at this time, and the fact that FIEs were not balancing their foreign exchange requirements was evidently of great concern to the State Council. In 1985 the first Foreign Exchange Adjustment Centre (FEAC) was opened in the Shenzhen SEZ to provide FIEs the opportunity to trade RMB for foreign currency. And, 1986 saw the introduction of three new regulations concerning foreign exchange balancing, the legal form of foreign investment, and the provision of new concessions to foreign investors.

Foreign Exchange Adjustment Centres

Foreign exchange Adjustment Centres (FEACs), or 'swap centres', were created under SAEC to facilitate the sale and purchase of retained foreign exchange by FIEs and thus alleviate one of the constraints that was suppressing investment in the desired sectors. The first FEAC was created in the Shenzhen SEZ in 1985, and was followed by a second FEAC in Shanghai in November 1986 (Lardy, 1992:58). The late 1980s saw substantial growth in both the number of FEACs and the volume of foreign exchange transacted: in 1988 there were 39 FEACs, and the annual transaction volume was \$6.264 billion (Lardy, 1992:61); by August 1989 there were 90 FEACs in operation (Panagariya, 1993:55), and trading volume was \$8.566 billion (Lardy, 1992:61); and by 1990 trading volume had reached \$13.2 billion (Lardy, 1992:61).

A survey conducted by the US-China business council in 1991 found that 77% of FIEs used swap centres as a method of balancing foreign exchange (Frisbie, 1992:15). Despite this statistic, and despite the fact that FEACs were initially established for the benefit of FIEs, the majority of total turnover is now generated by domestic firms rather than FIEs. In 1988 FIEs sold \$662 million and purchased \$220 million, and in 1989 their combined total of buy and sell trades was \$2.32 billion (Lardy, 1992:61).

By September 1988, Shanghai was the first FEAC where the price of foreign exchange was determined mainly by supply and demand (Lardy, 1992:63). The market uses a Walrasian auction to establish the market clearing price before any transactions are allowed. Market participants register the amount of foreign exchange that they wish to buy or sell at the previous day's price. If demand and supply do not balance, then the price of foreign

exchange rises or falls by one one hundredth of a yuan every two minutes, and market participants are then free to alter the quantity of foreign exchange that they wish to trade. When balance occurs all orders are filled and the market is closed until the next trading day.

There is obviously potential for any system of physically separate markets to result in different prices for the same good. The Chinese Finance and Banking Society has published data that demonstrates significant inter-market price differentials existed in 1988. In the first quarter the Shanghai swap rate was significantly overvalued at under 2 yuan, while the average rate in the Tianjin swap market was more than 3.5 times the Shanghai rate (Lardy, 1992:64). For the remainder of 1988 the inter-market differential averaged 7 percent. Perhaps as a result of these significant differences in swap rates, in 1988 the establishment of a national foreign exchange swap centre in Beijing was announced. The function of the national centre is to conduct arbitrage transactions to reduce the inter-market differentials in swap rates.

In the early 1980s the swap centre rate was directly pegged by the authorities, so the system employed by the Shanghai market and the national centre to arbitrage the differences in rates is an obvious improvement in terms of economic efficiency. However, even the most transparent supply and demand based system does not preclude government manipulation of the swap centre rate.

The swap centre rate is kept artificially high by restricting entry to the markets. Individuals are allowed to purchase foreign exchange for only very limited purposes. Domestic enterprises generally require pre-approval of the intended use of the foreign exchange, to the extent of requiring an import license to purchase the specified commodity before being able to register with SAEC as a buyer (Lardy, 1992:61). FIEs are also faced with restrictive entry conditions: in some markets FIEs have not been allowed to buy foreign exchange unless they could produce documentation demonstrating that their RMB funds are derived from the sale of products registered as "import substitutes" (Lardy, 1992:62).

In addition, there is nothing to stop SAEC from buying or selling foreign exchange to influence the swap centre rate in much the same way as the central bank of any developed country may intervene in the currency markets to stabilise the domestic currency. One major difference is, however, that the transactions on the swap market cannot be used to establish an open position in foreign exchange holdings: all foreign exchange must be used within a specified period which is about six months to one year.

China has maintained an official exchange rate that is significantly overvalued when compared to the swap centre rate which, as we have seen, is set partially by market forces. Nevertheless, a series of devaluations have seen the official rate rise from 1.53 RMB per \$US in December 1980 (IMF, 1988:160) to 5.8 RMB per \$US in December 1993. It was announced on 29 December 1993 that there would, in the future, be a single exchange rate for the yuan (Morrison *et al*, 1994:18), and that:

"The renminbi will not become totally convertible. But ... in current account projects mainly in foreign trade you will be able to freely use renminbi to get foreign exchange from banks at the rate determined by the market"

Zhu Rongji (cited in House, 1993:28)

However, the following statement by Zhu Rongji make it clear that there will be continued intervention in the swap markets to attempt to maintain an overvalued RMB:

"... the exchange rate with the U.S. dollar [will] continue at the old rate - 5.8 to \$1 ... people thought that the exchange rate would shift to [the swap centre rate of] 8.7"

Morrison *et al*, 1994:18

Foreign Exchange Balancing Regulations

On 15 January 1986 the *State Council's Provisions on Balance between Foreign Exchange Income and Expenses for Joint Ventures using Chinese and Foreign Investment*¹⁰ were promulgated, stating that "Chinese-foreign joint ventures shall try their best to increase export of their products and earn more foreign exchange in the hope of maintaining a balance between their foreign exchange income and expenses" (Article 2).

Foreign Enterprise Law

The *Law on Enterprises operated exclusively with Foreign Capital*¹¹ was adopted by the People's Congress on 12 April 1986. This had the potential to be of major benefit for some foreign investors, as it could free them from some of the problems associated with Chinese joint venture partners: consensus decision making that cause even simple decisions to take weeks, lack of expertise, etc.

The *Foreign Enterprise Law* appears more stringent than the *EJV Law*, possibly because the use of a WFOE precludes technology transfer to any Chinese parties and all of the profits of the enterprise will accrue to foreign interests. Article 3 of the *Foreign Enterprise Law* states that "[a WFOE] shall use advanced technology and equipment or market all or most of its products outside China". Note that this implies an ESR of at least 50 percent for WFOEs not using advanced technology and equipment. Other factors looked on favourably are the development of new products, conservation of energy and raw materials, upgrading or renovation of products, or import substitution (Dong *et al*, 1992:169). The US-China Business Council (USCBC) reports the case of a proposed import-substituting WFOE that was approved in December 1989 by the local authorities in Guangdong, only to have approval refused by MOFERT unless an explicit export commitment was written into the business licence (USCBC, 1990:64). Thus it would appear that the express requirements of Article 3 are held by the central authorities to be more important than any other requirement.

10. SFLPRC (1989:433-436)

11. SFLPRC (1989:439-442). This law will be referred to as the *Foreign Enterprise Law*.

New Concessions

In an attempt to redirect foreign investment towards sectors considered a priority by the Chinese, the *Provisions of the State Council for the Encouragement of Foreign Investment*¹², were promulgated on 11 October 1986. These regulations grant special preferences to enterprises producing products for exports and to "technologically advanced" enterprises. A technologically advanced enterprise is a "production enterprise possessing advanced technology supplied by foreigners which engage[s] in the development of new products, and the upgrading and replacing of existing products with a view to raising export earning or substituting [for] imports" (Article 2).

Other Bases for Export-share Requirements

Many of the Chinese parties in joint ventures are inexperienced in doing business with foreign business partners, so the Ministry of Foreign Economic Relations and Trade (MOFERT) has drafted a sample contract and a sample set of articles of association for utilization by EJVs¹³. Article 20 of the sample contract specifies that "the products of [the] joint venture company will be sold both on the Chinese market and on the overseas market" (Dong *et al*, 1992:225), and provides for the actual percentage of production that is to be exported to be written into the contract. It is also noted in that Article that "in normal conditions, the amount for export shall at least meet the needs of foreign exchange expenses of the joint venture company" (*op cit*). In addition, Article 6 of the sample articles of association contains a schedule of the percentage of production to be exported in successive years.

Co-operative or Contractual Joint Ventures (CJVs) were given legal recognition with the *Law of the PRC on Chinese-Foreign Cooperative Enterprises*¹⁴, which was not promulgated until 13 April 1988. A CJV does not have to be incorporated, and the shares of profit (loss) are governed by contract. Article 4 of the *CJV Law* states that "the State shall encourage the establishment of enterprises of the type that exports its products or is advanced-technology oriented" (SFLPRC:601), and Article 20 states that "Cooperative enterprises are responsible for their own balance of foreign currency payments and receipts" (SFLPRC:602). As with the *WFOE Law*, the *CJV Law* would appear to stipulate an export-share requirement of at least 50 percent for enterprises not using advanced technology.

Summary

This chapter has shown that the Chinese have had a desire to attempt to balance their foreign exchange requirements, and to obtain foreign technology to upgrade China's productive capacity. These two desires have led the Chinese to try to attract foreign investment as a vehicle for increasing exports and providing technology transfer to China.

12. SFLPRC (1989:445-449)

13. These sample documents are reproduced in Dong *et al* (1992:217-257).

14. SFLPRC (1989:601-605). This law will be referred to as the *CJV Law*.

In an attempt to maintain the levels of their foreign exchange reserves, China has subject foreign investment to restrictions such as foreign exchange balancing and ESR. These requirements resulted in foreign investment being targeted at sectors that were either (i) sectors that would produce a quick return to the investor, or (ii) sectors where foreign exchange could not normally be earned. The Chinese responded to this by establishing swap centres from 1985 onwards to facilitate the trading of foreign exchange by FIEs, and by passing regulations in 1986 that granted concessions to advanced technology and export-oriented firms. The Chinese authorities continue to tax FIEs by maintaining an over-valued swap centre rate and limiting access to the swap markets. However, this is still a vast improvement when compared to the pre-1985 position in which a FIE might not have any guaranteed access to foreign exchange. With the relaxation of some constraints on foreign investors, it would, therefore, be expected that the level of foreign investment would increase after 1985.

Regulations implemented after 1985 would appear to be at least as stringent as their predecessors in specifying that FIEs should export, and therefore seems reasonable to hypothesise that there would have been no weakening of requirements after the 1985-1986 shift in policy. This hypothesis is tested in the following chapter.

CHAPTER 3

STATISTICAL EVIDENCE

Introduction

This chapter uses survey data gathered by the US-China Business Council to address the question of whether export-performance requirements actually matter. Tests are then conducted on the hypothesis that there has been no weakening of the export-performance requirements imposed. These tests use data on export-performance requirements that was obtained as part of a survey of FIEs in China by the China Europe Management Institute (CEMI) in Beijing.

Do the export-performance requirements matter?

Table 3-1 shows the requirements that were imposed on the sample of 85 joint ventures surveyed by CEMI. Seven of the replies were not usable, and for six of the replies the requirement was ambiguous¹⁵. Of the remaining 72 replies, twelve firms were in service industries and so no requirement was applicable, leaving a total of 60 replies that could have a requirement imposed. Of those 60 replies, 65% (39) were subject to an export-share requirement, 11.7% (7) had to balance their foreign-exchange needs, and 23.3% (14) had no requirement imposed.

The range of export-share requirements imposed on the 39 firms subject to such requirements is shown in Table 3-2. 52.6% (20.5) were subject to a requirement of 30% or less, 25.6% (9.5) were subject to a requirement of between 31% and 70%, and the remaining 24.4% (9) were subject to a requirement greater than 70%¹⁶.

The data in tables 3-1 and 3-2 demonstrate that a large number of enterprises are subject to either export-share or foreign exchange balancing requirements, and that the level of export-share requirements imposed vary considerably across firms. One possible explanation for this variation is that the requirements are the maximum requirement that the foreign investor considers will not constrain the operation of the enterprise. If this is true, then the requirements have no effect on investor behaviour. Before going any further, it is therefore important to address the question of whether the export-share requirements and foreign exchange balancing requirements actually do matter.

Table 3-1 Requirement imposed on responding firms.

Requirement Imposed	Number
Specified Export-Share Target	39
No Export-Share Target	14
Balance foreign exchange	7
Services Industry or otherwise not applicable	12
Requirement is ambiguous	7
No reply / Not usable	7
Total	85

15. An unusable reply was one in which there was no usable data. An ambiguous reply either had an ambiguous export-share target or did not specify what the export target was, but the remainder of the reply did contain information that could be useful.

16. Note that one enterprise was subject to an ESR of 25% on one product line, and 50% on a second product line. That enterprise was recorded as 0.5 in the 21% - 30% category, and 0.5 in the 41% - 50% category.

If a FIE is established to take advantage of low-cost production so that products will be highly price-competitive in the world market, then an export-share requirement will not affect the behaviour of the enterprise, and therefore it will have no economic effect. However, in a survey of 125 FIEs with investment from the United States¹⁷, penetration of the Chinese market was identified as a strategic objective for 89% (111) of the enterprises. Only 11% (14) of the enterprises were intended to establish a low cost production base to access external markets.

In an earlier survey, conducted during April and May 1989¹⁸, respondents ranked their main problems, in order of importance, as balancing foreign exchange, local sourcing, management, bureaucratic interference, inflation, financing, and access to the domestic market. In the 1990 survey, the ranking had changed to obtaining financing,

cash flow, bureaucratic interference, balancing foreign exchange, sales volume, management, local sourcing, inflation, and access to the domestic market. In both surveys, investors identified foreign exchange balancing as a significant problem. In the 1990 survey, foreign exchange balancing had slipped from first place to fourth place because (i) the austerity programme that had been in place since late 1988 was adversely affecting the viability of some FIEs¹⁹, and (ii) in the wake of the suppression of Tiananmen Square pro-democracy demonstrations there has been increased bureaucratic interference. In spite of this fall in relative importance, there is some evidence to suggest that China's investment approval authorities became stricter in their application of the foreign exchange balancing requirement. In several cases authorities have tried to add export requirements after investment contracts had been approved, and enterprises previously receiving foreign exchange from a state organ were told that this would cease (USCBC, 1990:64-65).

Given the clear intention on the part of investors to sell their products on the Chinese market, and high ranking that foreign exchange balancing receives as being a problem area, it can be

Table 3-2 Range of export-share requirements imposed.

Range	Number	Percent
1 % - 10 %	3	7.7 %
11 % - 20 %	6	15.4 %
21 % - 30 %	11.5	29.5 %
31 % - 40 %	0	0.0 %
41 % - 50 %	4.5	11.5 %
51 % - 60 %	2	5.1 %
61 % - 70 %	3	7.7 %
71 % - 80 %	1	2.6 %
81 % - 90 %	1	2.6 %
91 % - 100 %	7	17.9 %
Total	39	100.0 %

17. This survey was conducted by the US-China Business Council from March through May 1990. For details see USCBC (1990:82-86).

18. For details see USCBC (1990:76-81).

19. A key aspect of the austerity programme was controls on bank lending, hence the most important problem in 1990 being obtaining financing. The Chinese government subsequently moved to relax controls on lending to FIEs (USCBC, 1990:48). The austerity programme also inevitably reduced demand for goods on the Chinese domestic market, leading to the cash flow problems identified as the second most major problem (*ibid*:47).

concluded that the ESR policy must change investor and enterprise behaviour. The ESR policy does, therefore, matter.

Was there a change in the pattern of requirements imposed after 1986?

It was hypothesised at the end of the previous chapter that there was no weakening of requirements imposed on foreign investors after the shift in Chinese policy that occurred at around 1985-1986. It is, therefore, of interest to compare the pattern of requirements that were imposed in the periods 1980-1986 and 1987-1990. Table 3-3 takes the 60 firms that could have a requirement imposed, and shows the range of requirement imposed in the two periods of interest. It would appear from the percentages presented in table 3-3 that there are substantial differences in the pattern of requirements imposed. A χ^2 test can be conducted to determine whether this apparent difference is statistically significant. The null hypothesis for the test, H_0 , is that the pattern of requirements imposed on firms in the post-1986 period is the same as the pattern of requirements imposed in the pre-1987 period. The alternative hypothesis is, therefore, that the pattern has changed.

To conduct a χ^2 test it is necessary to have a set of expected values and a set of actual observations. If the pre-1987 values are used as the actual observations, then the post-1986 percentages should be used to calculate the expected number of observations in each category. Conversely, if the post-1986 values are used as the actual observations, then the pre-1987 percentages should be used to calculate the expected number of observations. The pre-1987 sample set has a sample size of 34 and the post-1986 sample set has a sample size of only 24, so the pre-1987 sample set is more likely to display large sample characteristics than the post-1986 sample set. This means that the percentage of requirements falling in to each category in the pre-1987 sample set is more likely to be representative of the percentages

Table 3-3 Range of requirements imposed, by period, on the 60 firms that could have a requirement imposed.

	1980-86		1987-90		unknown year	Total
	No.	%	No.	%		
No export-share target	10	29.4	4	16.7		14
1 % - 20 %	5	14.7	4	16.7		9
21 % - 40 %	5	14.7	5.5	22.9	1	12
41 % - 60 %	3	8.8	3.5	14.6		7
61 % - 80 %	1	2.9	3	12.5		4
81 % - 100 %	4	11.8	3	12.5	1	8
Balance Forex	6	17.7	1	4.2		7
	34	100.0	24	100.0	2	60

displayed by the entire pre-1987 population than is the case for the post-1986 sample. To reduce the likelihood of rejecting H_0 when it is true the pre-1987 sample set should be used to calculate the expected post-1986 distribution, and the post-1986 observations should be used as the actual data set.

Table 3-4 shows the calculation of the Pearson χ^2 statistic for testing whether the pattern of requirements imposed did change after 1986. If H_0 is true, the probability of χ^2 exceeding the calculated value of 13.2600 with 6 degrees of freedom is 0.039088, and therefore H_0 is rejected at the 5% significance level, but cannot be rejected at the 1% significance level. However, for the Pearson χ^2 statistic to be a sufficiently close approximation of the χ^2 distribution, each expected value must be not less than five when there are more than two categories (Van Matre and Gilbreath, 1980:314), and hence the probability value given may not be valid. This doubt about the validity of the test necessitates the evaluation of the actual probabilities of χ^2 being equal to or exceeding the calculated value of 13.2600 (Rao, 1973:397). With 24 observations and 7 categories there are a total of $(24+6)!/(24!6!) = 593,775$ probabilities to evaluate, which is a little impractical. This problem can be circumvented by amalgamating categories until the expected value in each category is not less than five (Van Matre and Gilbreath, 1980:314), or until there are sufficiently few categories that there are not an excessive number of probabilities to evaluate.

The number of categories can be reduced to three by having a single category for all the FIEs that had an export-share requirement imposed. Utilising one such category also enables the inclusion of enterprises 26, 30, and 71 from the "ambiguous" category²⁰. The null

Table 3-4 Calculation of the Pearson χ^2 statistic for testing whether the pattern of requirements imposed changed after 1986.

	1980-86		1987-90		(Actual - Expected) ² / Expected
	No.	%	Expected	Actual	
No export-share target	10	29.41	7.06	4.0	1.3263
1 % - 20 %	5	14.71	3.53	4.0	0.0626
21 % - 40 %	5	14.71	3.53	5.5	1.0994
41 % - 60 %	3	8.82	2.12	3.5	0.8983
61 % - 80 %	1	2.94	0.71	3.0	7.3861
81 % - 100 %	4	11.76	2.82	3.0	0.0115
Balance Forex	6	17.65	4.24	1.0	2.4758
Total	34	100.00	24.01	24.0	$\chi^2 = 13.2600$

$$P(\chi^2 > 13.2600, 6 \text{ df}) = 0.039088$$

20. See list in Appendix A of enterprises with "ambiguous" requirements.

Table 3-5 Calculation of the Pearson χ^2 statistic for testing whether the pattern of requirements imposed changed after 1986.

	1980-86		1987-90		(Actual - Expected) ² / Expected
	No.	%	Expected	Actual	
No export-share target	10	29.41	7.94	4	1.9551
Export-share target imposed	18	52.94	14.29	22	4.1598
Balance Forex	6	17.65	4.77	1	2.9796
Total	34	100.00	27.00	27	$\chi^2 = 9.0945$

hypothesis for this test is that the distribution of requirements imposed in the post-1986 period is no different from the distribution of requirements imposed in the pre-1987 period. Table 3-5 shows the calculation of the Pearson χ^2 for this test. Again there is an expected value less than five, so it is necessary to evaluate the actual probability of χ^2 being not less than the calculated value of 9.0945 with 2 degrees of freedom. With 27 observations and 3 categories there are $(27+2)!/(27!2!) = 406$ probabilities to evaluate, which is easily accommodated on a spreadsheet. It is shown in Appendix A that the probability of $\chi^2 \geq 9.0945$ is 0.359604. Therefore, the null hypothesis cannot be rejected, and there is no evidence that the pattern of requirements imposed has changed.

The test just conducted does not provide any information on whether, for those enterprises that had an export-share requirement imposed, the export-share requirements imposed have become more or less stringent. The *Foreign Exchange Balancing Regulations*, the *Foreign Enterprise Law*, and the *CJV Law* all suggest that more enterprises in the post-1986 period would have an export-share requirement of more than 50% imposed than in the pre-1987 period. This test will have two categories: one category for requirements of 1%-50%, and one category for requirements of 51%-100%. Note that this allows us to include enterprise 30 from the "ambiguous" list. The null hypothesis is that the same proportion of enterprises in the post-1986 period have requirements greater than 50% imposed as did so before 1987.

Table 3-6 Calculation of the Pearson χ^2 statistic for testing whether there has been any change in the proportion of requirements imposed that are greater than 50%.

Export-share target imposed	1980-86		1987-90		(Actual - Expected) ² / Expected
	No.	%	Expected	Actual	
1-50%	12	66.67	13.33	13	0.0082
51-100%	6	33.33	6.67	7	0.0163
Total	18	100.00	20.00	20	$\chi^2 = 0.0245$

Table 3-6 shows the calculation of the Pearson χ^2 statistic for this test. With two categories, all expected values must be not less than ten for the Pearson χ^2 statistic to be a sufficiently close approximation to the χ^2 distribution (Van Matre and Gilbreath, 1980:314). The expected value for the 51%-100% requirement is less than 10, so it is necessary to evaluate the actual probability of χ^2 being not less than the calculated value of 0.0245. It is shown in Appendix A that this probability is 1. Therefore, the null hypothesis cannot be rejected, and again there is no evidence that the pattern of requirements has changed.

Both of the tests conducted have shown that there is no evidence to suggest that the pattern of requirements imposed in the post-1986 period is different to the pattern of requirements imposed in the pre-1987 period, subject to the assumption that the sample is a representative, random sample. This conclusion implies that the same restrictive requirements that deterred foreign investment in the early 1980s are still being imposed.

Summary

Survey data collected by USCBC indicates that export-performance requirements are of concern to foreigners investing in China, and that they probably do influence investor behaviour. Data was presented that indicates a wide range of export-share requirements have been imposed. χ^2 tests found no evidence to support the hypothesis that the pattern of requirements imposed on foreign investors had changed after 1986, implying that the same restrictive requirements that deterred foreign investment in the early 1980s are still being imposed.

CHAPTER 4

PARTIAL EQUILIBRIUM ANALYSES

Introduction

This chapter discusses the limited number of partial equilibrium analyses that are concerned with export-share requirements. Herander and Thomas (1986) examine the effect of export-share requirements on the trade balance; and Rodrik (1987) examines the oligopolistic interactions between the subsidiary of a multinational company and domestic firms. Herander and Thomas's analysis is extended to include the effect, under free trade and a non-prohibitive tariff, of export-share requirements on the current account balance and on aggregate national welfare.

Herander and Thomas (1986)

Herander and Thomas (1986) use a short-run partial equilibrium analysis based on the profit-maximising behaviour of perfectly competitive firms to evaluate whether ESR achieve the objective of trade balance improvement. ESR are imposed on all firms within a sector, forcing individual firms to reallocate output from the domestic to the foreign market. Both the free-trade and the prohibitive-tariff scenarios are investigated. In the free-trade case the export-share requirement has no effect on the trade balance because any increase in exports is offset by an increase in imports.

The Trade Balance effect of ESR under a totally-prohibitive tariff

When there is a totally prohibitive tariff, the reduction in domestic supply causes increased domestic prices. Herander and Thomas define a "composite price" which is the weighted average of the world price and the trade-barrier-induced high domestic price. It is clear that the composite price will be higher than the initial domestic price for low levels of ESR. Output then expands until marginal cost equals the higher composite price, resulting in an overall increase in the level of domestic production and exports, improving the trade balance. However, if the tariff-ridden price is lower than the new, higher domestic price then increased imports will at least partially offset some of the increased exports. Successively higher levels of export-share requirement will result in a composite price that is less than the initial domestic price, resulting in a reduction in the equilibrium level of output and exports, and a deterioration of the trade balance.

Extensions to the basic analysis

There are a number of extensions that can be easily appended to the analysis of Herander and Thomas: the case of a non-prohibitive tariff, the effect of the export-share policy on the current account under free trade and a non-prohibitive tariff, and the welfare effect of the export-share requirement under a non-prohibitive tariff.

It is first necessary to define several symbols that are used by Herander and Thomas:

Let	Q	= production by firms in the home country
	s	= share of production that is exported
	P_d	= domestic price
	P_x	= world price
	P_c	= "composite price" = $sP_x + (1-s)P_d$
	D	= domestic demand

In addition, the following symbols will be useful:

Let	B_T	= trade balance
	B_C	= current account balance
	M	= imports
	R	= revenue of firms in the home country
	γ	= share of a change in revenue that is paid to foreign factors

The Trade Balance effect of ESR under a non-prohibitive tariff

Domestic demand, D , is equal to imports plus that share of production that is not exported:

$$D = M + (1-s)Q \quad (4-1)$$

Differentiating, noting that under a non-prohibitive tariff $dP_d = 0$ and therefore $dD = 0$, and solving for M , we have:

$$dM = Qds - (1-s)dQ \quad (4-2)$$

The contribution of the good in question to the trade balance is:

$$B_T = P_x Qs - P_x M \quad (4-3)$$

Differentiating (4-3) we have:

$$dB_T = P_x(Qds + s dQ - dM) \quad (4-4)$$

Substituting (4-2) into (4-4), the change in the trade balance is obtained as:

$$dB_T = P_x[s dQ + (1-s)dQ] = P_x dQ \quad (4-5)$$

Defining the price elasticity of supply, e_s , as $(dQ/Q)/(dP_c/P_c)$, then $dQ = e_s(Q/P_c)dP_c$, and (4-5) can be rewritten as:

$$dB_T = P_x e_s \left(\frac{Q}{P_c} \right) dP_c \quad (4-6)$$

For a given level of output, under a non-prohibitive tariff, any increase in exports will be matched by an increase in imports, and thus there is no excess demand and no increase in the domestic price. An increase in the export-share requirement will, therefore, result in a reduction in the composite price, and a reduction in the trade balance. The explanation for this result has two parts: first, any increase in exports as a result of the increased export-share requirement is matched by an equal increase in imports, and thus there is no effect on the trade balance. Second, because the composite price drops from the protected domestic price towards the free-trade world price ($dP_c < 0$), there is a reduction in output until marginal cost equals the new, lower composite price. The fall in output causes a further reduction in domestic market sales, which must be compensated for by an increase in imports, resulting in the deterioration of the trade balance.

The Current Account effect of ESR under free trade and a non-prohibitive tariff

If the ESR is applied to domestic firms, then the trade balance effect is the current account effect. However, if the ESR is applied to firms owned by foreign investors, then there will also be a change in the level of profit repatriations to foreign-owned factors that will affect the current account balance.

The change in the current account balance is defined as the change in the trade balance less the change in repatriations to foreign-owned factors:

$$dB_C = dB_T - \gamma dR \quad (4-7)$$

It has already been established that there is no change in the trade balance under free trade, so the first term on the right hand side of (4-7) is zero. The world price and the domestic price are equal under free trade, so there is no change in revenue earned by the affected firms, and thus the second term on the right hand side of (4-7) is also zero. Therefore, we have the result that an export-share policy has no effect on the current account balance under free trade.

Let the revenue, R , of the firms subject to the ESR policy be defined as:

$$R = P_c Q \quad (4-8)$$

Differentiating, we obtain an expression for the change in revenue:

$$\begin{aligned}
 dR &= P_c dQ + Q dP_c \\
 &= P_c e_s \left(\frac{Q}{P_c} \right) dP_c + Q dP_c \\
 &= P_c (1 + e_s) \left(\frac{Q}{P_c} \right) dP_c
 \end{aligned} \tag{4-9}$$

Substituting equations (4-6) and (4-9) into (4-7), we have:

$$dB_c = [P_x e_s - \gamma P_c (1 + e_s)] \left(\frac{Q}{P_c} \right) dP_c \tag{4-10}$$

Having already established that $dP_c < 0$, a necessary condition to prevent the current account balance from deteriorating is:

$$P_x e_s \leq \gamma P_c (1 + e_s) \tag{4-11}$$

Substituting the definition of the composite price into (4-11), noting that $P_d = (1+t)P_x$, and solving for s yields the following necessary condition to avoid a deterioration of the trade balance:

$$\begin{aligned}
 P_x e_s &\leq \gamma (1 + e_s) [s(P_x - P_d) + P_d] \\
 \Rightarrow s &\leq \frac{(1+t)}{t} - \frac{e_s}{\gamma (1 + e_s) t}
 \end{aligned} \tag{4-12}$$

Note that $0 \leq s \leq 1$ because $s < 0$ would be an *import* requirement, and $s > 1$ is a requirement to export more than total production. Therefore, we have:

$$s_{\max} = \min \left[1, \frac{(1+t)}{t} - \frac{e_s}{\gamma (1 + e_s) t} \right] \tag{4-13}$$

where s_{\max} is the level of s that produces no change in the current account balance.

When the supply curve is perfectly inelastic, equation (4-13) reduces to:

$$s_{\max} = \min \left[1, \frac{(1+t)}{t} \right] = 1 \tag{4-14}$$

and, therefore, any level of tariff and any export-share requirement will improve the current account balance.

If, however, the supply curve is not perfectly inelastic, then for an export-share requirement to avoid a deterioration in the current account balance, the right hand side of (4-12) must not be less than zero:

$$\frac{(1+t)}{t} - \frac{e_s}{\gamma(1+e_s)t} \geq 0$$

$$\Rightarrow \gamma(1+e_s)(1+t) \geq e_s \quad (4-15)$$

Solving (4-15) for the tariff rate, we have:

$$t \geq \frac{e_s}{\gamma(1+e_s)} - 1 \quad (4-16)$$

When the supply curve is perfectly inelastic, the right hand side of (4-16) is negative, so any tariff rate (including $t = 0$), will have a non-negative s_{max} . When the supply curve is perfectly elastic, (4-16) reduces to:

$$\lim_{e_s \rightarrow \infty} t \geq \frac{1}{\gamma} - 1 \quad (4-17)$$

If all of the revenue loss is borne by foreign-owned factors of production, and the supply curve is perfectly elastic, then any tariff rate will have a positive s_{max} . If none of the revenue loss is borne by the foreign-owned factors then the tariff will have to be infinitely large to avoid a current account deterioration with the imposition of an ESR.

The Welfare effect of ESR under a non-prohibitive tariff

Let $E(\cdot)$ denote aggregate national expenditure as a function of goods prices and aggregate utility u . Assuming that expenditure equals income²¹, we have:

$$E(P_d, \dots, u) = (1-\gamma)P_cQ + (P_d - P_x)M + \dots \quad (4-18)$$

where $(1-\gamma)P_cQ$ is revenue earned by firms net of repatriations of earnings to foreign-owned factors, $(P_d - P_x)M = tP_xM$ is tariff revenue which is assumed to be redistributed to the private sector in a lump sum fashion, and "... " is used to denote influences on expenditure and income that are not relevant for this analysis²².

21. While expenditure may not equal income in the short run, it seems to be a reasonable long-run assumption, if we assume that all borrowings must be repaid and all savings are ultimately used for consumption.

22. This includes, but is not limited to, income from production of other goods, tariff revenue earned on other goods, etc. These are all classed as not relevant because they do not change under the partial equilibrium framework, i.e. their derivatives are equal to zero.

Differentiating (4-18), noting that $dP_d = 0$ under a non-prohibitive tariff, we obtain

$$E_u du = (1-\gamma)(P_c dQ + Q dP_c) + tP_x dM \quad (4-19)$$

where $E_u = \partial E / \partial u$, and $E_u du$ is the change in aggregate national welfare.

Substituting (4-2) into (4-19) gives:

$$E_u du = (1-\gamma)(P_c dQ + Q dP_c) + tP_x Q ds - tP_x(1-s)dQ \quad (4-20)$$

Noting that under a constant tariff with a constant world price, $dP_c = -tP_x ds$, (4-20) becomes:

$$E_u du = (1-\gamma)(P_c dQ + Q dP_c) - Q dP_c - tP_x(1-s)dQ \quad (4-21)$$

Noting further that from the earlier definition of the price elasticity of supply that $dQ = e_s(Q/P_c)dP_c$, (4-21) is rearranged to become:

$$\begin{aligned} E_u du &= [(1-\gamma)(P_c e_s + P_c) - P_c - tP_x(1-s)e_s] \left(\frac{Q}{P_c} \right) dP_c \\ &= [(1-\gamma)P_c(1+e_s) - P_c - tP_x(1-s)e_s] \left(\frac{Q}{P_c} \right) dP_c \\ &= [P_c e_s - tP_x(1-s)e_s - \gamma P_c(1+e_s)] \left(\frac{Q}{P_c} \right) dP_c \end{aligned}$$

Rearranging the algebraic definition of the composite price to give $P_c = P_d - tP_x$, we can substitute for P_c to obtain:

$$\begin{aligned} E_u du &= [P_d e_s - tP_x s e_s - tP_x(1-s)e_s - \gamma P_c(1+e_s)] \left(\frac{Q}{P_c} \right) dP_c \\ &= [(P_d - tP_x)e_s - \gamma P_c(1+e_s)] \left(\frac{Q}{P_c} \right) dP_c \\ \rightarrow E_u du &= [P_x e_s - \gamma P_c(1+e_s)] \left(\frac{Q}{P_c} \right) dP_c \quad (4-22) \end{aligned}$$

Reference to (4-10) shows that the right-hand side of (4-10) is identical to the right-hand side of (4-22), and therefore exactly the same conditions are required for an improvement in aggregate national welfare as are required for an improvement in the current account balance. This result is a direct consequence of the assumption that expenditure is equal to income.

Export-share Requirements in an Oligopolistic industry

Rodrik (1987) conducts a partial equilibrium analysis of the oligopolistic interactions between the subsidiary of a multinational corporation (MNC) and domestic firms. It is shown that the aggregate level of foreign sales of the MNC is independent of the level of any export-share requirement because any increase in exports from the subsidiary will be matched one-to-one by reduction in the output of the parent. Assuming the subsidiary has higher marginal costs than the parent, an export-share requirement will reduce the profit of the MNC. Therefore, the MNC would choose an export-share requirement of zero if it were allowed the choice²³. The necessity of substituting some of the more costly subsidiary's production for that of the parent raises the effective marginal cost of the subsidiary, leading to a reduction in domestic sales. The effect on the sales and output of the local firm will depend on the slope of the local firm's reaction function, but the local firm's profits will increase regardless of its output response. Uncertainty about the response of the local firm means that the welfare effect is ambiguous.

Summary

Imposing an export-share requirement under free trade will not alter the trade balance, current account balance, or the level of aggregate national welfare. Under a non-prohibitive tariff, an export-share requirement will cause a deterioration in the trade balance, but may cause an improvement in the current account balance and an increase in the level of aggregate national welfare. Under a totally-prohibitive tariff the effect of an export-share requirement on the trade balance is ambiguous. The effect of an export-share requirement on the current account balance and on aggregate national welfare was not examined under the totally-prohibitive tariff assumption. Rodrik concludes that imposing an export-share requirement imposed on the subsidiary of an MNC that interacts oligopolistically with domestic firms has an ambiguous effect on welfare.

23. Conversely, if the marginal costs of the parent were higher than the subsidiary, then the profit of the MNC would increase with an export-share requirement, and the MNC would choose to export all of the subsidiary's production.

CHAPTER 5

GENERAL EQUILIBRIUM ANALYSIS: A GENERAL MODEL

Introduction

Rodrik (1987) and Chao and Yu (1991, 1992, 1994) have conducted general equilibrium analyses of the effect of an export-share requirement on domestic welfare under differing assumptions about trade protection and labour unemployment. This chapter presents a general equilibrium model that can be used to illustrate those analyses. Chapter 6 then discusses the validity of three of the major assumptions of this model, *viz.* that China can be characterised as a small economy, that foreign investment is directed at the urban sector, and that the unemployment model used is relevant for China. Chapter 7 then conducts a comparative static analysis of the model, and chapter 8 discusses the effect of an export-share requirement, in the context of this model, on domestic welfare, foreign investment, and the level of foreign reserves.

The Model

Assume a small economy consisting of an urban manufacturing sector, X , and rural agriculture, Y . The manufacturing sector is comprised of a domestic sub-sector, D , and a foreign-owned sub-sector, F . The agricultural sector produces exportables, whereas the manufacturing sector is import-competing. Nothing impedes trade in the exportables, but quotas or tariffs are imposed on imports. Prices are normalised in terms of the exportable, so that the price of the exportable is 1 and the domestic price of the importable is p . The world price of the importable is p^* , with $p > p^*$ because of the quotas or tariffs. For a variety of reasons foreign firms directly invest in the manufacturing sector of the developing small economy. The developing country responds by imposing a requirement to export a certain share, α , of output produced in the manufacturing sector. This is done to protect local firms and to reduce or balance the outflow of funds from capital repatriation. For a given α the effective producer price of good F (p_e) is the weighted average of the world price and the domestic price:

$$p_e = \alpha p^* + (1 - \alpha)p \quad (5-1)$$

Production functions are assumed to be linearly homogenous and concave. Specifically, they are:

$$\begin{aligned} D &= D(L_D, K_D) \\ F &= F(L_F, K^*) \\ Y &= Y(L_Y, K_Y) \end{aligned} \quad (5-2)$$

where L_i and K_i denote the employment of labour and capital in the i th sector ($i = D, F, Y$), respectively, and K^* is foreign capital. Note that the specification of the production function for F assumes that the enterprises in the foreign-owned sector are wholly foreign-owned enterprises: there are no joint ventures. However, it will be seen that the results obtained by this model are identical to published models that have only one manufacturing sector that utilises both domestic and foreign capital.

Domestic Sectors

Following Chao and Yu (1992), the revenue function of domestic firms, R , is:

$$R(p, 1, L, K) = [pD(L_D, K_D) + Y(L_Y, K_Y) \mid K = K_D + K_Y, L = L_D + L_Y] \quad (5-3)$$

where K is the stock of domestic capital and L is the employment of labour by domestic firms. The partial derivative of R with respect to goods prices yields the respective output, i.e. $R_p = \partial R / \partial p = D$ and $R_2 = Y$.

The profit function of domestic firms, π , is:

$$\pi = R(p, 1, L, K) - w_D \bar{L}_D - w_Y L_Y - r_D K_D - r_Y K_Y \quad (5-4)$$

where w_i denotes the wage rate, and r_i denotes the return to capital, in the i th sector.

Firms are assumed to be profit-maximising, and so pay each factor its marginal revenue product:

$$w_D = \frac{\partial R}{\partial L_D} = p \frac{\partial D}{\partial L_D} = p D_L \quad (5-5)$$

$$w_Y = \frac{\partial R}{\partial L_Y} = \frac{\partial Y}{\partial L_Y} = Y_L \quad (5-6)$$

$$r_D = \frac{\partial R}{\partial K_D} = p \frac{\partial D}{\partial K_D} = p D_K \quad (5-7)$$

$$r_Y = \frac{\partial R}{\partial K_Y} = \frac{\partial Y}{\partial K_Y} = Y_K \quad (5-8)$$

where D_j and Y_j are the marginal physical products of factor j ($j = L, K$) in sectors D and Y respectively. Factors are assumed to exhibit positive, but declining, marginal physical products, i.e. $D_j > 0$, $D_{jj} < 0$, $Y_j > 0$, and $Y_{jj} < 0$.

Assuming a constant supply of domestic capital, we have:

$$\bar{K} = K_D + K_Y \quad (5-9)$$

Foreign-Owned Manufacturing

The revenue function of foreign-owned firms, R^* , is:

$$R^*(p_e, L_F, K^*) = p_e F(L_F, K^*) \quad (5-10)$$

The partial derivative of R^* with respect to p_e yields the output of the foreign-owned manufacturing sector, i.e. $R_p^* = \partial R^* / \partial p_e = F$.

The profit function of foreign-owned firms, π^* , is:

$$\pi^* = R^*(p_e, L_F, K^*) - w_F L_F - r_F K^* \quad (5-11)$$

where w_F denotes the wage rate, and r_F denotes the return to capital, in the foreign-owned sector.

Firms are again assumed to be profit-maximising and employ pay each factor its marginal physical product:

$$w_F = \frac{\partial R}{\partial L_F} = p_e \frac{\partial F}{\partial L_F} = p_e F_L \quad (5-12)$$

$$r_F = \frac{\partial R}{\partial K^*} = p_e \frac{\partial F}{\partial K^*} = p_e F_K \quad (5-13)$$

where F_L and F_K are the marginal physical products of labour and capital, respectively, in the foreign-owned manufacturing sector. Marginal physical products are again assumed to be positive but diminishing.

Following Rodrik (1987) it is assumed that the level of foreign capital is fixed and the rate of return endogenous in the short-run. However, in the long-run the level of foreign capital is endogenous and the rate of return to foreign capital equals the fixed world rate of return r^* , so that:

$$r_F = r^* \quad (5-14)$$

Equilibrium Conditions

Following Dei (1985) and Chao and Yu (1992), total demand is represented by an expenditure function $E(p, I, u)$ where u is the aggregate utility of the home country. Assuming that expenditure equals net national revenue, the budget constraint is:

$$E(p, 1, u) = R(p, 1, L, K) + R^*(p_e, L_F, K^*) - r_F K^* + (p - p^*)M \quad (5-15)$$

where M is the home country imports of good X . R , as defined above, is the revenue of

domestic firms. $R^* - r_F K^*$ is the revenue of foreign-owned firms net of the returns to foreign capital; $(p-p^*)M$ represents the revenue that the home government obtains from trade protection, and is assumed to be redistributed to the private sector in a lump sum fashion. If tariffs are imposed then $(p-p^*)M$ is total tariff revenue; if quotas are imposed then $(p^*-p)M$ is the revenue that the home government gains from auctioning quota tickets.

The partial derivative of E with respect to goods prices yields respective consumption, thus equilibrium in the goods markets requires that:

$$E_p = R_p + (1 - \alpha)R_p^* + M \quad (5-16)$$

which acts as the defining equation for M .

Equation (16) can also be written as:

$$E_p = D + (1 - \alpha)F + M \quad (5-16a)$$

which will be useful when solving the model.

If we assume competitive equilibrium, then price equals unit cost. Thus the zero-profit condition for domestic manufacturing is:

$$r_D \frac{K_D}{D} + w_X \frac{L_D}{D} = p \quad (5-17)$$

$$\Rightarrow r_D K_D + w_X L_D = pD$$

Similarly, the zero-profit condition for foreign-owned manufacturing is:

$$r_F K^* + w_F L_F = p^* F \quad (5-18)$$

Labour Market

There are only two equilibrium conditions that remain to be specified, and those are both for the labour market. The first condition is that free mobility of labour within the manufacturing sector equates the wages in the domestic and foreign-owned manufacturing sector so that:

$$w_D = w_F = w_X \quad (5-19)$$

where w_X is the manufacturing sector wage.

The second condition concerns the relationship between the rural wage and the urban, manufacturing wage in equilibrium. There are two different assumptions that are allowed for in this model: first, that Harris-Todaro unemployment exists in equilibrium; and second, that there is full employment in equilibrium. These two assumptions, and the equilibrium conditions that result, are discussed below.

Harris-Todaro Unemployment

Rodrik (1987) and Chao and Yu (1992) assume full employment in all the factor markets. Conversely, Chao and Yu (1991, and 1994) assume that labour unemployment exists. More precisely, they utilise the model of rural-urban migration developed by Harris and Todaro (1970).

The central feature of the Harris-Todaro model is (Harris and Todaro, 1970:126) "that migration proceeds in response to urban-rural differences in expected earnings with the urban unemployment rate acting as an equilibrating force". The expected urban sector wage is defined as "the minimum urban sector wage times the proportion of the urban labour force actually employed" (Harris and Todaro, 1970:128). Translating this definition directly into symbols, we have:

$$w_X^e = w_X \frac{L_X}{L_X + U} \quad (5-20)$$

where w_X^e is the expected urban sector wage, $L_X = L_D + L_F$ is total urban employment, and U is urban unemployment. $L_X + U$ is the total urban labour force.

For analytical convenience, $\lambda = U/L_X$ is substituted into (5-20) to obtain:

$$w_X^e = w_X \frac{1}{1 + \lambda} \quad (5-21)$$

Equilibrium in the labour market occurs when:

$$w_Y = w_X^e \quad (5-22)$$

When the rural wage (w_Y) is less than the expected urban wage (w_X^e), labour moves from the rural to the urban areas to seek employment. This raises the rural wage and, by increasing the level of urban unemployment, lowers the expected urban wage. Rural-urban migration continues until the rural wage equals the expected urban wage, as specified by the equilibrium condition (5-22). Unemployment will continue to exist at equilibrium if the rural wage (w_Y) is less than the urban wage (w_X).

Labour must be either employed in the rural sector, employed in the urban sector, or unemployed in the urban sector. Denoting the total endowment of labour by \bar{L} , we therefore have:

$$(1 + \lambda)(L_D + L_F) + L_Y = \bar{L} \quad (5-23)$$

In keeping with the analysis of Harris and Todaro, it is assumed that the urban-sector wage is set by non-market forces at a level significantly above the rural wage, and thus urban unemployment continues to exist at equilibrium. Examples of non-market wage setting include union-set wages, foreign-owned firms paying local workers the same wage as that paid to expatriate staff members, and government-regulated wages.

Full Employment

If the model is to be analysed for the special case of full employment, all that is necessary is to set $\lambda = 0$ and $d\lambda = 0$. With these restrictions in place, the labour market equilibrium condition (5-22) reduces to:

$$w_Y = w_X \quad (5-22a)$$

and, labour is allocated so that:

$$L_D + L_F + L_Y = \bar{L} \quad (5-23a)$$

Which completes the specification of the model.

CHAPTER 6

GENERAL EQUILIBRIUM ANALYSIS: VALIDITY OF ASSUMPTIONS

Introduction

There are three major assumptions of the model presented in chapter 5 that need to be examined to determine whether this model is applicable to China. First is that China can be categorised as small; second is that foreign-owned firms are urban-based and do not participate in the rural agricultural sector; and third is whether full employment or Harris-Todaro unemployment is appropriate for analysing China.

China as a "Small" Economy

Recalling that this model is to be used to draw policy conclusions that are relevant to China, perhaps the most unrealistic assumption to many readers is that of a small economy. However, the term "small" is used not in terms of population, geography, or even in terms of national income. The term "small" is used in a purely technical sense in relation to international trade. Prachowny (1984:17-18) provides the following succinct definition of a small open economy (SOE):

An SOE produces commodities, is endowed with factors of production, and holds assets. All of these are bought and sold in organised markets. The distinguishing feature of an SOE is that if any of the commodities, factors, or assets is traded in international markets, the smallness of its participation means that it is a price taker in these markets.

Thus by assuming that China is small, the assumption is made that it is a price taker in international markets.

Table 6-1 shows the value of China's exports and imports as a percentage of world, United States, and G-5 exports and imports over the period from 1979 to 1991. Although China's exports continued to grow throughout the 1980s, by 1991 they only comprised 2% of the value of world exports, 16.7% of the exports of the world's largest trading nation - the United States - and 22.9% of the average value of exports for the G-5 nations. As discussed in chapter 1, China's imports have been subject to varying levels of administrative control during the 1980s, and so show a somewhat erratic path. The highest level of imports, as a percentage of world imports, occurred in 1985 when China's imports comprised only 2.3% of world trade. In the same year China's imports were 12.1% of value of United States imports, and 24.8% of the average value of imports for the G-5 nations. It is clear from these statistics that, in terms of aggregate exports and aggregate imports, China is far from being a large economy.

Of course, the fact that China only plays a small part in total world trade does not necessarily mean that it is a price taker in all markets. For example, China is a major supplier to the world market of minerals such as tungsten, antimony, and tin, and pursues an active commercial policy through the use of export licences (Lardy, 1992:46). Nevertheless, the purpose of this general equilibrium model is to assess the effect of an export-share requirement independently of changes in other policy variables such as the tariff rate. Therefore, the key question is whether, by altering its export-share policy, China could significantly alter world prices. This question must be answered by making some assumptions

Table 6-1 The Value of China's Exports and Imports as a percentage of World, United States, and G-5 Exports and Imports.

	Exports as a percentage of			Imports as a percentage of		
	World	United States	Average G-5	World	United States	Average G-5
1979	0.9	7.5	10.6	1.0	7.0	11.2
1980	1.0	8.2	11.7	1.0	7.8	11.9
1981	1.2	9.2	13.9	1.1	7.9	13.5
1982	1.3	10.3	15.2	1.1	7.4	12.5
1983	1.3	10.8	15.6	1.2	7.9	14.1
1984	1.4	11.1	16.4	1.4	7.5	15.4
1985	1.5	12.5	17.5	2.3	12.1	24.8
1986	1.6	13.7	17.0	2.1	11.3	22.6
1987	1.7	15.6	18.7	1.8	10.2	19.4
1988	1.8	14.7	19.4	2.0	12.0	21.8
1989	1.8	14.3	19.8	1.9	11.9	21.4
1990	1.8	15.6	20.5	1.5	10.2	16.9
1991	2.0	16.7	22.9	1.8	12.3	19.8
Average	1.5	12.3	16.9	1.6	9.7	17.3

Source: Calculated from *IMF International Financial Statistics*

Note: G-5 is comprised of the United States, Japan, France, Germany, and the United Kingdom.

that will help to obtain an estimate of the absolute maximum effect that China's export-performance policies would have on world prices. First, I will estimate the maximum effect that the complete removal of export performance policies could have on world prices. And second, I will estimate the maximum effect that a mandatory 100 percent export-share policy could have on world prices.

To estimate the maximum effect that removing all export-performance requirements could have on world prices, it is first necessary to obtain an estimate of the maximum percentage of China's exports that are sourced from FIEs. Lardy (1992:127) reports that of the total exports of Guangdong province in 1990, exports of FIEs comprised 35 percent of the total by value when measured in \$US. This was the highest level that FIE exports had reached since the reform process had started. 61 percent by value of investment in China originates from Hong Kong (USCBC, 1990:17), much of which is targeted at Guangdong and Fujian provinces (*op cit*:20), and much of which is labour-intensive export-oriented activities (*ibid*). Therefore, it seems reasonable to assume that exports of FIEs would comprise less than 35 percent of China's total exports. The U.S.-China Business Council (1990:9) reports that

"more than ten percent of China's exports were, at the end of the [1980s], being produced in factories that had received foreign investment", which suggests that the true figure lies somewhere between 10 percent and 20 percent. Taking 20 percent as the upper estimate of the proportion of China's exports sourced from FIEs, the upper limit on the quantity of FIE exports as a percentage of world trade is 0.4 percent²⁴. If China removed all export-share requirements, so that FIEs could sell all of their produce within China, then world exports would decrease by less than 0.4 percent, allowing for the fact that some FIEs are intended for export processing. Taking a lower estimate of the price elasticity of world import demand as 0.42²⁵, and assuming that the world export supply is price inelastic, then a reduction in world exports of 0.4% would cause an increase in aggregate world prices of 0.95 percent. However, even with no export-performance requirements some FIEs, particularly those with investment from Hong Kong, would continue to export from China. In addition, the price elasticity of world import demand may be higher than 0.42, and the world export supply curve is almost certainly not price-inelastic. Taking all of these factors together could easily result in an increase in aggregate world prices that is very small indeed.

To estimate the maximum effect that a mandatory 100 percent export-share policy would have on world prices, it is first necessary to obtain an upper estimate of the value of total FIE production. In 1992 the sales revenue of "Other Ownership" enterprises²⁶ was 234.252 billion yuan (State Statistical Bureau, 1992:374). Converting this at the implicit, over-valued exchange rate that has been used by the State Statistical Bureau to convert between total trade in yuan and total trade in \$US for 1992²⁷, gives the total production by "Other Ownership" enterprises as \$US 42.522 billion. Assuming that the total production of "Other Ownership" enterprises can be attributed to FIEs, and assuming that only 10 percent of China's 1992 exports of \$US 85 billion were sourced from FIEs, then a mandatory 100 percent export-share policy would increase exports by \$US 34 billion. China's exports would, therefore, increase by 40 percent, which implies an increase in world exports of 0.8 percent. Using the same elasticity assumptions as before, this would result in a maximum reduction in world prices of 1.9 percent. However, with a mandatory 100 percent export-share requirement, exports are unlikely to increase by the full \$US 34 billion because (i) this figure includes some production by non-FIEs, (ii) some FIEs would cease to operate, and (iii) some FIEs produce products that are officially in demand by China, and so would still be able to sell products to the Chinese domestic market. Coupled with more realistic elasticity assumptions, the actual aggregate world price decrease from a 100 percent export-share policy is likely to be significantly less than 1.9 percent.

24. China's exports comprised 2 percent of world exports in 1991, so 20 percent of that 2 percent is 0.4 percent.

25. Stern *et al* (1976:13) report a range of price elasticities of total import demand across industrial countries of from 0.42 to 1.37. The lower the price elasticity, the less that quantity will change in response to a given change in price, and the greater that price will change in response to a given change in quantity, so the lowest estimate is used to maximise the effect that the export-share policy could have on world prices.

26. "Other Ownership" is defined as foreign-owned enterprises and joint-owned enterprises. The latter comprises enterprises owned by: (a) the State and collectives, (b) the State and individuals, (c) Collectives and individuals, and (d) Chinese and foreign investors (State Statistical Bureau, 1992:4). Statistics for these forms of ownership are generally aggregated under the heading of "Other Ownership", and are not further broken down.

27. Calculated from State Statistical Bureau (1992:370), Table T10.4

Thus, we have seen that: (i) China's imports and exports comprise only a small proportion of world trade, (ii) China's exports are only 16.7 percent of the value of the exports of the United States, and (iii) China's imports are no more than 12.1 percent of the imports of the United States. In addition, even if China faces price-inelastic world import demand and the world export supply is price-inelastic, China's export-share policy has little influence over aggregate world prices. Therefore, China can be considered to be a price-taker for the purpose of this analysis, and is, consequently, a small economy.

Location of Foreign Investment in China

Table 6-2 shows the location of FIEs surveyed by CEMI, as was discussed in chapter 2. Two-thirds (52) of the 78 enterprises were situated in the cities of Tianjin, Beijing, Shanghai, and Guangzhou. The remainder of the enterprises surveyed were all situated in industrialised, urban areas. Further, none of the enterprises surveyed by CEMI participated in the agricultural sector.

In a survey conducted by the USCBC of 517 United States-owned FIEs in China, 37% of enterprises were located in metropolitan areas²⁸, both as a percentage of the total number and as a percentage of the total value of investment. A further 47% of the number, or 45% of investment value, were located in the coastal provinces of Guangdong, Jiangsu, Liaoning, Fujian, Zhejiang, Shandong, Hebei, and Hainan (USCBC, 1990:35).

Further, the USCBC (1990:27) reports that of 2491 FIEs represented in its Foreign Investment Database, 3.5% were in the agricultural sector, 6.1 % in the food sector, 2.9% in property development, 3.6 % in the service sector, and 4.9% in transportation. The remaining 79% of FIEs were in sectors that could be broadly described as industrial. On a geographical basis, 18% of those enterprises were situated in metropolitan areas and 63% in coastal areas (USCBC, 1990:24).

It is clear from all three data sources that foreign investment in China is overwhelmingly directed at urban, industrialised areas, and is consequently non-agricultural. Therefore, it appears that it is reasonable to assume that in China foreign-owned firms are urban-based and do not participate in the agricultural sector.

Table 6-2 Location of enterprises surveyed by CEMI.

Location	Number	Percent
Tianjin	15	19.2 %
Beijing	11	14.1 %
Shanghai	26	33.3 %
Guangzhou	16	20.5 %
Shenzhen	8	10.3 %
Jiangsu	1	1.3 %
Fujian	1	1.3 %
Total	78	100.0 %

28. The term "metropolitan areas" covers Beijing, Shanghai and Tianjin.

Labour Unemployment

Official statistics placed China's level of urban unemployment at between 2% and 3% for most of the 1980s (Asian Development Bank, 1992:114-115; State Statistical Bureau, 1993:97), and thus the full employment model may seem to be appropriate. However, this figure excludes many in the urban labour force. For example, Li (1993:84) writes of 70 million young peasants who "are roaming major cities looking for employment", and whose lack of official urban residency prevents them from obtaining permanent employment, and is used as a reason for not including them in the unemployment statistics.

Official urban residents have access to subsidised food, housing, education, medical care, and fuel. Goods available privately via the market can be substantially more expensive. Some authors (e.g. Anderson (1990) and Zhang (1991)) contend that because the state subsidies are only available to official urban residents, new migrants would find it prohibitively expensive to live in the cities, and thus rural-to-urban migration will be stifled. However, instead of viewing this situation as a difference in living costs, it is also possible to view it as a difference in real income. Researchers from the Chinese Academy of Social Sciences estimate that the real difference between urban and rural incomes may be as much as 4:1 once the state subsidies provided to urbanites and fees levied on farmers are taken into account (Kaye, 1993). In the context of the Harris-Todaro model, rather than stifling rural-urban migration, such a difference in real income actually provides the incentive for migration to occur.

Wu (1991) constructs a set of urban population statistics that are independent of the shifting official Chinese definitions of urban place and urban population. Using information on vital statistics, Wu then estimates the natural increase in population, and, as a residual, the net rural-to-urban migration that occurred each year. Table 6-3 summarises some of Wu's results. According to those results, the population of urban areas grew by 30% from 1977-1983 and 37% from 1983-1989, and in both periods rural-urban migration accounted for about 80% of the growth in urban population. This corresponds to a total estimated net rural-to-urban migration of 31.58 million people in 1977-1983 and 52.80 million people in 1983-1989. Data for the 20 largest cities show that growth in the population of those cities was lower in both periods (26% and 19% respectively) and, although rural-to-urban migration accounted for a lower proportion of the total growth (73% and 64% respectively), it was still significant.

Thus with large urban-rural real wage differentials, potentially 100 million Chinese peasants redundant in the rural sector, large-scale migration towards the industrialised coastal areas of China (Economist, 1993:27; 1994:29), and evidence of significant rural-to-urban migration during the 1980's, the Harris-Todaro framework does appear to be appropriate for analysing China.

Table 6-3 Estimates of Rural-to-Urban Migration in China.

	Urban Areas		20 Largest Cities	
1983 Population	177.73		50.24	
1977 Population (base year)	136.83		39.96	
Population Growth	40.90	29.9 %*	10.28	25.7 %*
Estimated Natural Increase	9.32	22.8 %†	2.74	26.7 %†
Estimated Net Rural-to-Urban migration	<u>31.58</u>	77.2 %†	<u>7.54</u>	73.4 %†
1989 Population	243.59		59.52	
1983 Population (base year)	177.73		50.24	
Population Growth	65.86	37.1 %*	9.28	18.5 %*
Estimated Natural Increase	13.06	19.8 %†	3.37	36.3 %†
Estimated Net Rural-to-Urban migration	<u>52.80</u>	80.2 %†	<u>5.91</u>	63.7 %†

Notes:

* Percent of base year population

† Percent of population growth

Source: Wu (1991), Table 5 (p. 23) and Table 9 (p. 35)

Summary

This chapter has examined three important assumptions of the model presented in chapter 5, and found that: (i) China can, for the purpose of this analysis, reasonably assumed to be a small economy; (ii) most foreign investment is urban-based and targeted at non-rural and non-agricultural industries; and (iii) the Harris-Todaro model is applicable to China.

CHAPTER 7

GENERAL EQUILIBRIUM ANALYSIS: COMPARATIVE STATICS

Introduction

This chapter presents the comparative static analysis of the general equilibrium model presented in chapter 5. First the equations presented in chapter 5 are differentiated, and an equation for the price effect under quotas is developed. Then the model is analysed (i) with the assumption of full employment, and (ii) with the assumption of Harris-Todaro unemployment.

To avoid solving the same equations twice, once under tariffs and once under quotas, use will be made of the fact that for any variable Z :

$$dZ/d\alpha = (\partial Z/\partial\alpha) + (\partial Z/\partial p)(dp/d\alpha)$$

When analysing the model under a constant tariff $dp = dt = 0$, so $dZ/d\alpha = \partial Z/\partial\alpha$. When analysing the model under a constant import quota, $dZ/d\alpha$ is determined once we know $\partial Z/\partial\alpha$, $\partial Z/\partial p$, and $dp/d\alpha$.

Therefore, for each employment assumption both sets of partial differentials are solved and described, and the sign of the price effect under quotas is determined. Where the price effect is unambiguous, the sign of the total derivative under quotas is also presented. Both the short run and the long run are analysed for each employment assumption.

General Equations

Differentials of Structural Equations

Differentiating the rate of return to capital employed in domestic manufacturing (5-7):

$$dr_D - pD_{KK}dK_D - pD_{KL}dL_D = D_K dp \quad (7-1)$$

Differentiating the rate of return to capital employed in foreign-owned manufacturing (5-13):

$$dr_F - p_e F_{KK}dK^* - p_e F_{KL}dL_F = -(p - p^*)F_K d\alpha + (1 - \alpha)F_K dp \quad (7-2a)$$

In the short run the level of foreign capital is fixed, and it is the rate of return to foreign capital that adjusts. Therefore, (7-2a) becomes:

$$dr_F = -(p - p^*)F_K d\alpha + (1 - \alpha)F_K dp + p_e F_{KL}dL_F \quad (7-2b)$$

In the long run the rate of return to foreign capital is fixed at the world rate of return ($r_F = r^*$), and it is the level of foreign capital that adjusts. Therefore, (7-2a) becomes:

$$dK^* = \left(\frac{1}{p_e F_{KK}} \right) [(p - p^*)F_K d\alpha - (1 - \alpha)F_K dp - p_e F_{KL}dL_F] \quad (7-2c)$$

Differentiating (5-23) and noting that $d\bar{L} = 0$:

$$(L_D + L_F)d\lambda + (1 + \lambda)dL_D + (1 + \lambda)dL_F + dL_Y = 0 \quad (7-3)$$

Differentiating (5-5) and (5-19):

$$dw_X - pD_{LL}dL_D - pD_{LK}dK_D = D_L dp \quad (7-4)$$

Differentiating (5-12) and (5-19):

$$dw_X - p_e F_{LL}dL_F - p_e F_{LK}dK^* = -(p - p^*)F_L d\alpha + (1 - \alpha)F_L dp \quad (7-5)$$

Differentiating (5-6), (5-21), and (5-22), and making use of (5-26):

$$dw_X - (1 + \lambda)Y_{LL}dL_Y + (1 + \lambda)Y_{LK}dK_D - Y_L d\lambda = 0 \quad (7-6)$$

Differentiating the zero-profit equation for domestic manufacturing (5-17):

$$K_D dr_D + L_D dw_X = D dp \quad (7-7)$$

Differentiating the zero-profit equation for foreign-owned manufacturing (5-18):

$$K^* dr_F + L_F dw_X = -(p - p^*)F d\alpha + (1 - \alpha)F dp \quad (7-8)$$

Price Effect under Quotas

By differentiating the budget constraint (5-15) and the goods market equilibrium condition (5-16a) it is possible to produce two equations in du , dp , and $d\alpha$. These two equations can be solved simultaneously to provide an equation for $dp/d\alpha$.

Budget Constraint

Differentiating the budget constraint (5-15) totally, and noting that because we are assuming a small economy $dp^* = 0$, we have:

$$\begin{aligned} E_p dp + E_u du &= R_p dp + r_D dK_D + r_Y dK_Y + w_x dL_D + w_y dL_Y \\ &\quad + (p^* - p)R_p^* d\alpha + (1 - \alpha)R_p^* dp + r_F dK^* \\ &\quad + w_x dL_F - K^* dr_F - r_F dK^* + M dp + (p - p^*)dM \end{aligned}$$

where $E_p = \partial E / \partial p$, $E_u = \partial E / \partial u$, and $R_p = \partial R / \partial p$.

Making use of equation (5-16), and eliminating terms that cancel out from the above equation:

$$E_u du = r_D dK_D + r_Y dK_Y + w_X dL_D + w_Y dL_Y + w_X dL_F + (p^* - p)R_1^* d\alpha - K^* dr_F + (p - p^*)dM \quad (7-9)$$

where $E_u du$ is the change in net national welfare.

Differentiating (5-23) and noting that $d\bar{L} = 0$ gives:

$$(1 + \lambda)dL_D + (1 + \lambda)dL_F + dL_Y = -(L_D + L_F)d\lambda$$

Multiplying through by Y_L , and making use of equations (5-6), (5-21) and (5-22):

$$w_X dL_D + w_X dL_F + w_Y dL_Y = -Y_L(L_D + L_F)d\lambda \quad (7-10)$$

Differentiating (5-9), and noting that $d\bar{K} = 0$, gives:

$$dK_Y = -dK_D \quad (7-11)$$

Substituting (7-10) and (7-11) into (7-9), noting that $(r_D - r_Y)dK_D = 0$ because in the short-run $dK_D = 0$ and in the long-run $r_D = r_Y$, we obtain the following expression:

$$E_u du = -Y_L(L_D + L_F)d\lambda - R_p^*(p - p^*)d\alpha - K^* dr_F + (p - p^*)dM \quad (7-12)$$

But $\lambda = \lambda(\alpha, p)$ and $r_F = r_F(\alpha, p)$, and under quotas $dM = 0$, so:

$$\begin{aligned} E_u du + \left[Y_L(L_D + L_F)(\partial\lambda/\partial p) + K^*(\partial r_F/\partial p) \right] dp \\ = - \left[Y_L(L_D + L_F)(\partial\lambda/\partial\alpha) + R_p^*(p - p^*) + K^*(\partial r_F/\partial\alpha) \right] d\alpha \end{aligned} \quad (7-13)$$

which is the first equation that will be used for determining the price effect.

Goods Market Equilibrium

Differentiating the goods market equilibrium condition (5-16a) and noting that $dM = 0$:

$$E_{pu} du + E_{pp} dp = dD + (1 - \alpha)dF - Fd\alpha \quad (7-14)$$

However, both D and F can be expressed as a function of α , and therefore $dD = (\partial D/\partial\alpha)d\alpha + (\partial D/\partial p)dp$ and $dF = (\partial F/\partial\alpha)d\alpha + (\partial F/\partial p)dp$. Substituting these expressions into (7-14) and rearranging, we thus have:

$$\begin{aligned}
 E_{pu} du &= \left[-E_{pp} + \frac{\partial D}{\partial p} + (1-\alpha)\frac{\partial F}{\partial p} \right] dp + \left[\frac{\partial D}{\partial \alpha} + (1-\alpha)\frac{\partial F}{\partial \alpha} - F \right] d\alpha \\
 \Rightarrow E_{pu} du &= \left[-\frac{p}{M} \frac{\partial E_p}{\partial p} + \frac{p}{M} \frac{\partial (D + (1-\alpha)F)}{\partial p} \right] \left(\frac{M}{p} \right) dp + \left[\frac{\partial D}{\partial \alpha} + (1-\alpha)\frac{\partial F}{\partial \alpha} - F \right] d\alpha \\
 \Rightarrow E_{1u} du - (c+s) \left(\frac{M}{p} \right) dp &= \left[\frac{\partial D}{\partial \alpha} - F + (1-\alpha)\frac{\partial F}{\partial \alpha} \right] d\alpha \quad (7-15)
 \end{aligned}$$

where $c = -(p/M)(\partial E_p/\partial p)$ is the demand substitution elasticity, and $s = (p/M)\partial(D + (1-\alpha)F)/\partial p$ is the supply substitution elasticity. Equation (7-15) is the second equation that will be used for determining the price effect.

Solution of $dp/d\alpha$

Solving (7-16) and (7-15) simultaneously for $dp/d\alpha$ gives:

$$\frac{dp}{d\alpha} = \frac{E_u \left[\frac{\partial D}{\partial \alpha} + (1-\alpha)\frac{\partial F}{\partial \alpha} - F \right] + E_{pu} \left[Y_L(L_D + L_F)\frac{\partial \lambda}{\partial \alpha} + R_p^*(p-p^*) + K^*\frac{\partial r_F}{\partial \alpha} \right]}{-E_u(c+s)\frac{M}{p} - E_{pu} \left[Y_L(L_D + L_F)\frac{\partial \lambda}{\partial p} + K^*\frac{\partial r_F}{\partial p} \right]}$$

Multiplying through by P/E_u , and rearranging yields:

$$dp/d\alpha = - \left(p \left[\frac{\partial D}{\partial \alpha} + (1-\alpha)\frac{\partial F}{\partial \alpha} - F \right] + m \left[Y_L(L_D + L_F)\frac{\partial \lambda}{\partial \alpha} + R_p^*(p-p^*) + K^*\frac{\partial r_F}{\partial \alpha} \right] \right) / \Delta \quad (7-16)$$

where $m = pE_{pu}/E_u$ is the marginal propensity to import, and $\Delta = M(c+s) + mY_L(L_D + L_F)(\partial \lambda/\partial p) + mK^*(\partial r_F/\partial p)$.

Expressing r_F and w_X as functions of α and p , (7-8) becomes:

$$K^* \frac{\partial r_F}{\partial \alpha} d\alpha + K^* \frac{\partial r_F}{\partial p} dp + L_F \frac{\partial w_X}{\partial \alpha} d\alpha + L_F \frac{\partial w_X}{\partial p} dp = -(p-p^*)F d\alpha + (1-\alpha)F dp$$

Thus:

$$R_p^*(p-p^*) + K^*(\partial r_F/\partial \alpha) = -L_F(\partial w_X/\partial \alpha) \quad (7-17)$$

Therefore, $dp/d\alpha$ can also be expressed as:

$$dp/d\alpha = -\left(p \left[\frac{\partial D}{\partial \alpha} + (1-\alpha) \frac{\partial F}{\partial \alpha} - F \right] + m \left[Y_L(L_D + L_F) \frac{\partial \lambda}{\partial \alpha} - L_F \frac{\partial w_X}{\partial \alpha} \right] \right) / \Delta \quad (7-18)$$

The partial differentials contained within both the numerator and the denominator of (7-16) and (7-18) mean that it is not possible to determine the price effect independently of each of the analyses that follow.

Full Employment

The full employment assumption requires that $\lambda = 0$ and $d\lambda = 0$, and that the wage rate is equal across sectors, i.e. $w = w_X = w_Y$.

Short Run

In the short run capital is sector-specific so that $dK_D = 0$ and $dK^* = 0$.

Equations (7-1)-(7-6) can be represented in matrix form as:

$$\begin{bmatrix} -pD_{KL} & 0 & 0 & 1 & 0 & 0 \\ 0 & -p_e F_{KL} & 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 & 0 & 0 \\ -pD_{LL} & 0 & 0 & 0 & 1 & 0 \\ 0 & -p_e F_{LL} & 0 & 0 & 1 & 0 \\ 0 & 0 & -Y_{LL} & 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} dL_D \\ dL_F \\ dL_Y \\ dr_D \\ dw_X \\ dr_F \end{bmatrix} = - \begin{bmatrix} 0 \\ (p-p^*)F_K \\ 0 \\ 0 \\ (p-p^*)F_L \\ 0 \end{bmatrix} d\alpha + \begin{bmatrix} D_K \\ (1-\alpha)F_K \\ 0 \\ D_L \\ (1-\alpha)F_L \\ 0 \end{bmatrix} dp \quad (7-19)$$

Solving (7-19) produces a set of partial differentials with respect to α and a set of partial differentials with respect to p .

The set of partial differentials with respect to α are:

$$\begin{aligned}
 \partial L_D / \partial \alpha &= -(p - p^*) F_L Y_{LL} / \Delta &> 0 \\
 \partial L_F / \partial \alpha &= (p - p^*) F_L (Y_{LL} + p D_{LL}) / \Delta &< 0 \\
 \partial L_Y / \partial \alpha &= -(p - p^*) F_L p D_{LL} / \Delta &> 0 \\
 \partial r_D / \partial \alpha &= -(p - p^*) F_L Y_{LL} p D_{KL} / \Delta &> 0 \\
 \partial w_X / \partial \alpha &= -(p - p^*) F_L Y_{LL} p D_{LL} / \Delta &< 0 \\
 \partial r_F / \partial \alpha &= (p - p^*) [p_e F_{KL} F_L (Y_{LL} + p D_{LL}) - F_K \Delta] / \Delta &< 0 \\
 \Delta &= Y_{LL} (p_e F_{LL} + p D_{LL}) + p D_{LL} p_e F_{LL} &> 0
 \end{aligned}$$

An increase in the export-share requirement reduces the effective producer price faced by foreign-owned firms and consequently reduces in the rate of return to foreign capital ($\partial r_F / \partial \alpha < 0$). Foreign-owned firms respond by cutting back production ($\partial F / \partial \alpha < 0$) until marginal cost equals price, which requires a reduction in their employment of labour ($\partial L_F / \partial \alpha < 0$).

The labour released from foreign-owned firms increases the domestic supply of labour, and consequently causes the wage rate to fall ($\partial w_X / \partial \alpha < 0$). The labour is absorbed both by the domestic manufacturing sector ($\partial L_D / \partial \alpha > 0$) and by the rural sector ($\partial L_Y / \partial \alpha > 0$), causing output to rise in both sectors ($\partial D / \partial \alpha > 0$ and $\partial Y / \partial \alpha > 0$ respectively). The effect of the export-share requirement on the domestic sectors is predicted by the specific factors model: an increase in the supply of the mobile factor (labour) causes output of both goods to increase, which is exactly what has been shown.

Solving (7-19) for the partial differentials with respect to p gives:

$$\begin{aligned}
 \partial L_D / \partial p &= -[Y_{LL}(D_L - (1-\alpha)F_L) + p_e D_L F_{LL}] / \Delta &> 0 \\
 \partial L_F / \partial p &= [Y_{LL}(D_L - (1-\alpha)F_L) - (1-\alpha)p D_{LL} F_L] / \Delta &\geq 0 \\
 \partial L_Y / \partial p &= [p_e D_L F_{LL} + (1-\alpha)p D_{LL} F_L] / \Delta &< 0 \\
 \partial r_D / \partial p &= [D_K \Delta - p D_{KL} Y_{LL}(D_L - (1-\alpha)F_L) - p D_{KL} p_e F_{LL} D_L] / \Delta &> 0 \\
 \partial r_F / \partial p &= [(1-\alpha)F_K \Delta - (1-\alpha)p_e F_{KL} F_L (Y_{LL} + p D_{LL}) - p_e F_{KL} D_L Y_{LL}] / \Delta &> 0 \\
 \partial w_X / \partial p &= Y_{LL} [p_e D_L F_{LL} + (1-\alpha)p D_{LL} F_L] / \Delta &> 0 \\
 \Delta &= Y_{LL} (p_e F_{LL} + p D_{LL}) + p D_{LL} p_e F_{LL} &> 0
 \end{aligned}$$

An increase in p causes domestic manufacturers to expand production. With fixed capital stocks, the only way that production can be increased is by employing more labour ($\partial L_D / \partial p > 0$). Each unit of capital in the domestic manufacturing sector now has more labour working with it, so its marginal physical product rises. Coupled with the increase in price that raises

capital's marginal revenue product still further, capital rents in the manufacturing sector must rise ($\partial r/\partial p > 0$).

An increase in p affects the foreign-owned manufacturers indirectly, through the effective producer price p_e . If the export-share requirement is low, then foreign-owned manufacturers will face most of an increase in p , and will increase production accordingly. As with the domestic sector, production can only be increased by employing more labour, so L_F will increase (L will decrease). However, if the export-share requirement is high, very little of an increase in p will be felt by the foreign-owned manufacturers, and their demand for extra labour will be relatively weak. Therefore, it is possible that, under a high export-share requirement, the increased demand for labour by D as a result of an increase in p will draw labour from both Y and F . Hence the sign of both $\partial L_F/\partial p$ and $\partial L/\partial p$ is ambiguous. However, any increase in p that is passed on to the foreign-owned manufacturing sector via p_e will raise the marginal revenue product of capital employed in that sector, and hence capital rents in the foreign-owned manufacturing sector must rise ($\partial r_F/\partial p > 0$).

Price Effect under Quotas

We are now in a position to determine the sign of $dp/d\alpha$. $\partial r_F/\partial p > 0$, so the denominator of $dp/d\alpha$ is positive. $\partial w_X/\partial \alpha < 0$, so the second term in the numerator of (7-18) is positive.

Labour employed by rural agriculture increases in response to an export-share requirement ($\partial L_Y/\partial \alpha > 0$), so the total labour employed in manufacturing must decrease. Given fixed supplies of capital, this implies that total production of manufactures also decreases, and thus the decrease in production by F is greater in absolute value than the increase in production by D . When α is low, this will result in an absolute decrease in the amount of manufactures supplied to the domestic market. But when α is high, only a small portion of F 's production is sold domestically, so the decrease in production by F will have only small effect on the domestic market, and the increased production of D will ensure that the supply of manufactures on the domestic market increases. Therefore, the term $[(\partial D/\partial \alpha) + (1-\alpha)(\partial F/\partial \alpha) - F]$ is negative for low values of α but ambiguous for high values.

With the term $[(\partial D/\partial \alpha) + (1-\alpha)(\partial F/\partial \alpha) - F]$ in the numerator of (7-16) and (7-18) being ambiguous, the sign of $dp/d\alpha$ is also ambiguous. Even at low values of α when $[(\partial D/\partial \alpha) + (1-\alpha)(\partial F/\partial \alpha) - F]$ is negative, the second term of (7-18) is positive, and therefore the sign of $dp/d\alpha$ is ambiguous. At high values of α there is an increase in the domestic market supply of manufactures, but the sign of $[(\partial D/\partial \alpha) + (1-\alpha)(\partial F/\partial \alpha) - F]$ is ambiguous, and therefore the sign of $dp/d\alpha$ is still ambiguous.

This result contrasts with that of Chao and Yu (1992). By employing a more traditional comparative static analysis utilising unit cost functions, Chao and Yu are able to show that factor prices depend solely on goods prices, and thus the wage rate is independent of the size of the labour supply. Therefore, factor prices do not change when labour is released by foreign-owned manufacturers following an increase in the export-share requirement. Coupled with the Heckscher-Ohlin assumption that domestic capital is fully mobile between sectors even in the short run, the term $[(\partial D/\partial \alpha) + (1-\alpha)(\partial F/\partial \alpha) - F]$ is unambiguously negative

because the Rybczynski effect ensures that output of the capital-intensive manufactured good falls. With $\partial w_X / \partial \alpha = 0$, this means that the numerator of (7-18) is positive, and thus $dp/d\alpha$ is also positive.

Long Run

In the long run the rate of return to foreign capital is equal to the fixed world rate of return ($r_F = r^*$) so that $dr_F = dr^* = 0$. In long run equilibrium capital rents in the domestic sectors are equal at r . Thus we have:

$$r = R_K(p, 1, K, L)$$

Differentiating r and noting that $dK = 0$ gives:

$$dr = R_{Kp} dp + R_{KL} dL = D_K dp + R_{KL} dL \quad (7-20)$$

Similarly, the change in the wage rate is given by:

$$dw = R_{Lp} dp + R_{LL} dL = D_L dp + R_{LL} dL \quad (7-21)$$

And, noting that $D = R_p$, the change in the domestic production of manufactures is:

$$dD = R_{pL} dL + R_{pp} dp = D_L dL + R_{pp} dp \quad (7-22)$$

Noting that $dL_F = -dL$, and utilising equations (7-2a), (7-5), (7-20), (7-21), and (7-22), we have the following matrix equation:

$$\begin{bmatrix} -R_{KL} & 0 & 1 & 0 & 0 \\ -R_{LL} & 0 & 0 & 1 & 0 \\ p_e F_{KL} & -p_e F_{KK} & 0 & 0 & 0 \\ p_e F_{LL} & -p_e F_{LK} & 0 & 1 & 0 \\ -D_L & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} dL \\ dK^* \\ dr \\ dw \\ dD \end{bmatrix} = -(p - p^*) \begin{bmatrix} 0 \\ 0 \\ F_K \\ F_L \\ 0 \end{bmatrix} d\alpha + \begin{bmatrix} D_K \\ D_L \\ (1-\alpha)F_K \\ (1-\alpha)F_L \\ R_{pp} \end{bmatrix} dp \quad (7-23)$$

Solving (7-23) produces a set of partial differentials with respect to α and a set of partial differentials with respect to p .

The set of partial differentials with respect to α are:

$$\begin{aligned}
 \partial L / \partial \alpha &= (p - p^*) \delta / \Delta &> 0 \\
 \partial K^* / \partial \alpha &= (p - p^*) [F_K(p_e F_{LL} + R_{LL}) - p_e F_{KL} F_L] / \Delta &< 0 \\
 \partial r / \partial \alpha &= (p - p^*) R_{LK} \delta / \Delta &> 0 \\
 \partial w / \partial \alpha &= (p - p^*) R_{LL} \delta / \Delta &< 0 \\
 \partial D / \partial \alpha &= (p - p^*) D_L \delta / \Delta &> 0 \\
 \Delta &= p_e^2 (F_{KK} F_{LL} - F_{LK}^2) + p_e F_{KK} R_{LL} = p_e F_{KK} R_{LL} > 0 \\
 \delta &= p_e (F_{LK} F_K - F_{KK} F_L) > 0 \\
 \\
 \partial L_F / \partial \alpha &= -\partial L / \partial \alpha &< 0 \\
 \partial F / \partial \alpha &= F_L (\partial L_F / \partial \alpha) + F_K (\partial K^* / \partial \alpha) &< 0
 \end{aligned}$$

Note that in the analyses of Batra and Ramachandran (1980) and Chao and Yu (1991, 1994) the coefficient of the coefficient matrix is a multiple of $F_{KK} F_{LL} - F_{LK}^2$. To ensure that this term is positive rather than zero, those authors use a third factor S in the production function of the manufactured good²⁹. However, because of the formulation used here, the determinant of the coefficient matrix in (7-23) is positive without needing to include such an additional factor.

The short run decline in the rate of return to foreign capital causes a long run reduction in the level of foreign investment ($\partial K^* / \partial \alpha < 0$), a reduction in employment by foreign-owned firms ($\partial L_F / \partial \alpha < 0$), and consequently a decrease in production by foreign-owned firms ($\partial F / \partial \alpha < 0$). The reduction in employment by foreign-owned firms increases the domestic supply of labour, causing the wage rate to fall ($\partial w / \partial \alpha < 0$). Each unit of domestic capital now has more labour to work with, so the rental rate of domestic capital rises ($\partial r / \partial \alpha > 0$).

The set of partial differentials with respect to p are:

$$\begin{aligned}
 \partial L / \partial p &= -p_e [F_{KK} D_L + (1 - \alpha) \delta] / \Delta &\geq 0 \\
 \partial K^* / \partial p &= -[p_e D_L F_{LK} - (1 - \alpha) (p_e F_{KL} F_L - p_e F_{LL} F_K - R_{LL} F_K)] / \Delta &\geq 0 \\
 \partial r / \partial p &= [p_e F_{KK} (D_K R_{LL} - R_{LK} D_L) - (1 - \alpha) R_{LK} \delta] / \Delta &\geq 0 \\
 \partial w / \partial p &= [(1 - \alpha) R_{LL} \delta] / \Delta &> 0 \\
 \partial D / \partial p &= [p_e F_{KK} (D_L^2 - R_{LL} R_{pp}) - (1 - \alpha) D_L \delta] / \Delta &> 0 \\
 \Delta &= p_e^2 (F_{KK} F_{LL} - F_{LK}^2) + p_e F_{KK} R_{LL} = p_e F_{KK} R_{LL} > 0 \\
 \delta &= F_{LK} F_K - F_{KK} F_L > 0
 \end{aligned}$$

29. See Batra and Ramachandran (1980:280) for a detailed description of the factor S .

If α is high then an increase in p has very little effect on p_e , and there is only a small increase in demand for labour by foreign-owned manufacturers. However, at the same time the domestic manufacturers face the full increase in p and, relative to foreign-owned manufacturers, have large increase in their demand for labour. The overall effect is that the domestic manufacturing sector draws labour from both the rural sector and from the foreign-owned firms, and hence $\partial L/\partial p$ would be positive. However, if α is very low, then both domestic and foreign-owned manufacturers will increase their demand for labour, and hence $\partial L/\partial p$ would be negative. Thus, the overall sign of $\partial L/\partial p$ is ambiguous. Foreign investment moves in the same direction as employment of labour by foreign-owned firms, so that too has an ambiguous sign.

Price Effect under Quotas

In the long run $dr_F = 0$, so the denominator of (7-16) and (7-18) is positive. The wage rate in the manufacturing sector declines with an increase in the export-share requirement ($\partial w/\partial \alpha < 0$), so the second term in the numerator of (7-18) is positive. The sign of $\partial D/\partial \alpha$ is positive, and hence the term $[(\partial D/\partial \alpha) + (1-\alpha)(\partial F/\partial \alpha) - F]$ is ambiguous. Therefore, the sign of the numerator of (7-18) is ambiguous, and the sign of $dp/d\alpha$ is also ambiguous.

As with the short run result, this result contrasts with that of Chao and Yu (1992) who found that $dp/d\alpha > 0$ in an identical framework. The reasons for the difference between the two results was discussed under the short run. In summary, the use of a more traditional comparative static analysis utilising unit cost functions means that factor prices do not change when labour is released by foreign-owned manufacturers following an increase in the export-share requirement. Therefore, $[(\partial D/\partial \alpha) + (1-\alpha)(\partial F/\partial \alpha) - F]$ is negative because of the Rybczynski effect, and $\partial w_x/\partial \alpha = 0$, so that $dp/d\alpha$ is positive.

Harris-Todaro Unemployment

With the Harris-Todaro structure the urban wage is set by non-market forces so that $dw_x = 0$.

Short Run

In the short run capital is sector-specific so that $dK_D = 0$ and $dK^* = 0$.

Equations (7-1) and (7-4) can be written as:

$$\begin{bmatrix} 1 & -pD_{KL} \\ 0 & -pD_{LL} \end{bmatrix} \begin{bmatrix} dr_D \\ dL_D \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix} d\alpha + \begin{bmatrix} D_K \\ D_L \end{bmatrix} dp \quad (7-24)$$

Solving (7-24) yields:

$$\begin{aligned} \partial r_D / \partial \alpha &= 0 \\ \partial L_D / \partial \alpha &= 0 \\ \partial r_D / \partial p &= (D_{LL}D_K - D_{KL}D_L) / D_{LL} > 0 \\ \partial L_D / \partial p &= -D_L / pD_{LL} > 0 \end{aligned}$$

Similarly, equations (7-2a) and (7-5) can be written as:

$$\begin{bmatrix} 1 & -p_e F_{KL} \\ 0 & -p_e F_{LL} \end{bmatrix} \begin{bmatrix} dr_F \\ dL_F \end{bmatrix} = -(p-p^*) \begin{bmatrix} F_K \\ F_L \end{bmatrix} d\alpha + (1-\alpha) \begin{bmatrix} F_K \\ F_L \end{bmatrix} dp_e \quad (7-25)$$

Solving (7-25) yields:

$$\begin{aligned} \partial r_F / \partial \alpha &= (p-p^*)(F_{KL}F_L - F_{LL}F_K) / F_{LL} < 0 \\ \partial L_F / \partial \alpha &= (p-p^*)F_L / (p_e F_{LL}) < 0 \\ \partial r_F / \partial p &= (1-\alpha)(F_{LL}F_K - F_{KL}F_L) / F_{LL} > 0 \\ \partial L_F / \partial p &= -(1-\alpha)F_L / (p_e F_{LL}) > 0 \end{aligned}$$

Substituting $dw_x = dK_D = 0$ into (7-6) and rearranging yields:

$$dL_Y = \frac{-Y_L}{(1+\lambda)Y_{LL}} d\lambda \quad (7-26)$$

$Y_{LL} < 0$, so dL_Y is the same sign as $d\lambda$.

Substituting (7-26) into (7-3) and rearranging gives:

$$d\lambda = \frac{(1+\lambda)^2 Y_{LL}}{Y_L - (1+\lambda)(L_D + L_F) Y_{LL}} [dL_D + dL_F] \quad (7-27)$$

(7-27) is solved for $(\partial\lambda/\partial\alpha)$ and $(\partial\lambda/\partial p)$ by substituting in the expressions for the appropriate partial differentials of L_D and L_F :

$$(\partial\lambda/\partial\alpha) = \frac{(1+\lambda)^2 Y_{LL}}{Y_L - (1+\lambda)(L_D + L_F) Y_{LL}} \left[\frac{(p-p^*)F_L}{p_e F_{LL}} \right] > 0$$

$$(\partial\lambda/\partial p) = \frac{-(1+\lambda)^2 Y_{LL}}{Y_L - (1+\lambda)(L_D + L_F) Y_{LL}} \left[\frac{D_L}{p D_{LL}} + \frac{(1-\alpha)F_L}{p_e F_{LL}} \right] < 0$$

From the above partial differentials, the change in production in each sector is:

$$\frac{\partial D}{\partial \alpha} = D_K \frac{\partial K_D}{\partial \alpha} + D_L \frac{\partial L_D}{\partial \alpha} \Rightarrow \frac{\partial D}{\partial \alpha} = 0$$

$$\frac{\partial F}{\partial \alpha} = F_K \frac{\partial K^*}{\partial \alpha} + F_L \frac{\partial L_F}{\partial \alpha} \Rightarrow \frac{\partial F}{\partial \alpha} < 0$$

$$\frac{\partial Y}{\partial \alpha} = Y_K \frac{\partial K_Y}{\partial \alpha} + Y_L \frac{\partial L_Y}{\partial \alpha} \Rightarrow \frac{\partial Y}{\partial \alpha} > 0$$

$$\frac{\partial D}{\partial p} = D_K \frac{\partial K_D}{\partial p} + D_L \frac{\partial L_D}{\partial p} \Rightarrow \frac{\partial D}{\partial p} > 0$$

$$\frac{\partial F}{\partial p} = F_K \frac{\partial K^*}{\partial p} + F_L \frac{\partial L_F}{\partial p} \Rightarrow \frac{\partial F}{\partial p} > 0$$

$$\frac{\partial Y}{\partial p} = Y_K \frac{\partial K_Y}{\partial p} + Y_L \frac{\partial L_Y}{\partial p} \Rightarrow \frac{\partial Y}{\partial p} < 0$$

In the short run, an increase in the export-share requirement causes a reduction the effective producer price faced by foreign-owned firms and a consequent reduction in the rate of return to foreign capital ($\partial r_f/\partial\alpha < 0$). Foreign-owned firms respond by cutting back production ($\partial F/\partial\alpha < 0$) until marginal cost equals price, which requires a reduction in their employment of labour ($\partial L_f/\partial\alpha < 0$).

The assumption of Harris-Todaro unemployment means that there is no change in the manufacturing sector wage rate ($\partial w_x/\partial\alpha = 0$). With capital fixed and an unchanged wage rate, domestic manufacturers only respond to price signals. The domestic price of the importable is fixed because of the constant world price and the constant tariff, so there is no

change in production by domestic manufacturers ($\partial D/\partial\alpha = 0$) and, therefore, no change in their employment of labour ($\partial L_D/\partial\alpha = 0$).

Some of the labour released from foreign-owned firms is absorbed by the rural sector ($\partial L_r/\partial\alpha > 0$), causing an increase in production by the rural sector ($\partial Y/\partial\alpha > 0$). However, not enough labour is absorbed to prevent an increase in the urban unemployment ratio ($\partial\lambda/\partial\alpha > 0$).

When p increases, both domestic and foreign-owned manufacturers increase their production ($\partial D/\partial p > 0$ and $\partial F/\partial p > 0$ respectively). With constant capital stocks, production can only be increased by employing more labour, so there is an increase in labour employed by both domestic and foreign-owned manufacturers ($\partial L_D/\partial p > 0$ and $\partial L_F/\partial p > 0$ respectively). The effect of this is to draw labour from both the ranks of the unemployed ($\partial\lambda/\partial p < 0$) and from the rural labour force ($\partial L_r/\partial p < 0$), reducing the amount of agricultural production ($\partial Y/\partial p < 0$).

Price Effect under Quotas

$\partial D/\partial\alpha = 0$ and $\partial F/\partial\alpha < 0$, so the term $[(\partial D/\partial\alpha) + (1-\alpha)(\partial F/\partial\alpha) - F]$ in the numerator of (7-16) and (7-18) is negative. $\partial\lambda/\partial\alpha < 0$ and $dw_x = 0$, so the second term in the numerator of (7-18) is also negative. With both terms negative, the overall sign of the numerator of (7-18) is unambiguously positive. However, $\partial\lambda/\partial p < 0$ and $\partial r_f/\partial p > 0$, so the denominator of (7-18) is ambiguous and the price effect is also ambiguous. This result was also obtained by Chao and Yu (1991), who examined the welfare effects of export-share requirements in a similar framework with sector-specific domestic capital.

Long Run

The Harris-Todaro structure severs the link between employment in foreign-owned manufacturing and employment in domestic manufacturing. Production by domestic manufacturers responds solely to price signals. Thus we have:

$$\begin{aligned} \partial D/\partial\alpha &= (\partial R_p/\partial\alpha) &&= 0 \\ \partial F/\partial\alpha &= (\partial R_p^*/\partial p_e)(dp_e/d\alpha) &&= -(p-p^*)R_{pp}^* < 0 \\ \partial D/\partial p &= (\partial R_p/\partial p) &&= R_{pp} > 0 \\ \partial F/\partial p &= (\partial R_p^*/\partial p_e)(dp_e/dp) &&= (1-\alpha)R_{pp}^* > 0 \end{aligned}$$

The foreign-owned manufacturing sector faces constant factor prices ($dr_F = dr^* = 0$ and $dw_X = 0$), so there is no change in the factor-output ratios. Therefore:

$$\begin{aligned}\partial L_F / \partial \alpha &= a_{LF}(\partial F / \partial \alpha) = -a_{LF}(p - p^*)R_{pp}^* < 0 \\ \partial K^* / \partial \alpha &= a_{KF}(\partial F / \partial \alpha) = -a_{KF}(p - p^*)R_{pp}^* < 0 \\ \partial L_F / \partial p &= a_{LF}(\partial F / \partial p) = a_{LF}(1 - \alpha)R_{pp}^* > 0 \\ \partial K^* / \partial p &= a_{KF}(\partial F / \partial p) = a_{KF}(1 - \alpha)R_{pp}^* > 0\end{aligned}$$

where a_{iF} is the per-unit requirement for factor i in the production of F .

Normally an increase in p would increase the rental rate of domestic capital, and consequently the domestic manufacturing sector would substitute labour for capital. Therefore, it is not possible to produce simple equations for dL_D and dK_D as was done for dL_F and dK^* . However, differentiating $D = D(L_D, K_D)$ gives:

$$dD = D_K dK_D + D_L dL_D \quad (7-28)$$

(7-1), (7-4), and (7-28) can be re-written as:

$$\begin{bmatrix} 1 & -pD_{KK} & -pD_{LK} \\ 0 & -pD_{LK} & -pD_{LL} \\ 0 & D_K & D_L \end{bmatrix} \begin{bmatrix} dr_D \\ dK_D \\ dL_D \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} d\alpha + \begin{bmatrix} D_K \\ D_L \\ \partial D / \partial p \end{bmatrix} dp \quad (7-29)$$

Solving (7-29) gives:

$$\begin{aligned}\partial r_D / \partial \alpha &= 0 \\ \partial K_D / \partial \alpha &= 0 \\ \partial L_D / \partial \alpha &= 0 \\ \partial r_D / \partial p &= p(D_K^2 D_{LL} - 2D_K D_L D_{LK} + D_L^2 D_{KK}) / \Delta > 0 \\ \partial K_D / \partial p &= (D_L^2 + pD_{LL} R_{pp}) / \Delta \quad \begin{matrix} > 0 \\ < 0 \end{matrix} \\ \partial L_D / \partial p &= -(pD_{LK} R_{pp} + D_K D_L) / \Delta > 0 \\ \Delta &= p(D_K D_{LL} - D_L D_{LK}) < 0\end{aligned}$$

The sign of $\partial K_D / \partial p$ is ambiguous because there is a positive effect on K_D from the increase in production but a negative effect from the substitution of labour for capital.

Making dL_Y the subject of (7-6):

$$dL_Y = \frac{Y_{LK}}{Y_{LL}} dK_D - \frac{Y_L}{(1+\lambda)Y_{LL}} d\lambda \quad (7-30)$$

Substituting (7-30) into (7-3) and rearranging:

$$\begin{aligned} [(1+\lambda)(L_D + L_F)Y_{LL} - Y_L]d\lambda + (1+\lambda)Y_{LK}dK_D &= -(1+\lambda)^2 Y_{LL}(dL_D + dL_F) \\ \Rightarrow d\lambda &= -(1+\lambda) \frac{(1+\lambda)Y_{LL}(dL_D + dL_F) + Y_{LK}dK_D}{(1+\lambda)(L_D + L_F)Y_{LL} - Y_L} \end{aligned} \quad (7-31)$$

$\partial L_D/\partial\alpha = \partial K_D/\partial\alpha = 0$ and $\partial L_F/\partial\alpha < 0$, so $\partial\lambda/\partial\alpha > 0$. However, the sign of $\partial\lambda/\partial p$ is ambiguous because $\partial K_D/\partial p$ is not unambiguously negative. If $\partial K_D/\partial p$ was unambiguously negative then $\partial\lambda/\partial p < 0$.

An export-share requirement does not directly affect the price faced by domestic manufacturers, neither production, labour employment, or the level of capital changes in the domestic manufacturing sector ($\partial D/\partial\alpha = 0$, $\partial L_F/\partial\alpha = 0$, and $\partial K_D/\partial\alpha = 0$ respectively).

The short-run decrease in the rate of return to foreign capital causes foreign investors to reduce their level of investment ($\partial K^*/\partial\alpha < 0$) until they are once again receiving the fixed world rate of return. Facing a reduced effective price, foreign-owned manufacturers reduce production ($\partial F/\partial\alpha < 0$) until marginal cost is again equal to price. The reduction in production occurs as foreign investment is withdrawn and labour employment ($\partial L_F/\partial\alpha < 0$) is reduced. Some of the labour released from foreign-owned manufacturing is reabsorbed by the rural sector ($\partial L_Y/\partial\alpha > 0$), but not enough to prevent the urban unemployment ratio from rising ($\partial\lambda/\partial\alpha > 0$).

When p increases, both domestic and foreign-owned manufacturers increase their production ($\partial D/\partial p > 0$ and $\partial F/\partial p > 0$ respectively). The foreign-owned manufacturing sector faces constant factor prices, so the increase in production is achieved by increasing the employment of labour ($\partial L_F/\partial p > 0$) and by increased foreign investment ($\partial K^*/\partial p > 0$). The domestic manufacturing sector faces a constant labour wages, but capital rents rise in response to the increase in p ($\partial r_D/\partial p > 0$), and thus production becomes more labour intensive. Therefore, when production by the domestic manufacturing sector increases, labour employment increases ($\partial L_D/\partial p > 0$), but the exact effect on the level of capital employed in the domestic manufacturing sector is ambiguous. Because the effect of an increase in p on capital employment in the domestic manufacturing sector is ambiguous, the effect on capital employment in the rural sector is also ambiguous, and the change in the employment of labour in the rural sector is also ambiguous. Thus, it is not possible to determine whether the urban unemployment ratio improves or deteriorates in response to an increase in p .

Price Effect under Quotas

$\partial D/\partial\alpha = 0$ and $\partial F/\partial\alpha < 0$, so the term $[(\partial D/\partial\alpha) + (1-\alpha)(\partial F/\partial\alpha) - F]$ in the numerator of (7-16) and (7-18) is negative. $\partial\lambda/\partial\alpha < 0$ and $dw_x = 0$, so the second term in the numerator of (7-18) is also negative. With both terms negative, the overall sign of the numerator of (7-18) is unambiguously positive. $\partial\lambda/\partial p < 0$ and $\partial r_F/\partial p = 0$, so the denominator of (7-18) is unambiguously positive and the price effect is also positive.

Therefore, in the long run with Harris-Todaro unemployment and quota protection for the importable sector, the total differentials of production in each sector, and the urban unemployment ratio, with respect to α are:

$$\begin{aligned}\frac{dD}{d\alpha} &= \frac{\partial D}{\partial\alpha} + \frac{\partial D}{\partial p} \left(\frac{dp}{d\alpha} \right) \Rightarrow \frac{dD}{d\alpha} > 0 \\ \frac{dF}{d\alpha} &= \frac{\partial F}{\partial\alpha} + \frac{\partial F}{\partial p} \left(\frac{dp}{d\alpha} \right) \Rightarrow \frac{dF}{d\alpha} < 0 \\ \frac{dY}{d\alpha} &= \frac{\partial Y}{\partial\alpha} + \frac{\partial Y}{\partial p} \left(\frac{dp}{d\alpha} \right) \Rightarrow \frac{dY}{d\alpha} < 0 \\ \frac{d\lambda}{d\alpha} &= \frac{\partial\lambda}{\partial\alpha} + \frac{\partial\lambda}{\partial p} \left(\frac{dp}{d\alpha} \right) \Rightarrow \frac{d\lambda}{d\alpha} < 0\end{aligned}$$

The total differentials of factor employment in each sector, and the rate of return to domestic capital, with respect to α are:

$$\begin{aligned}\frac{dL_D}{d\alpha} &= \frac{\partial L_D}{\partial\alpha} + \frac{\partial L_D}{\partial p} \left(\frac{dp}{d\alpha} \right) \Rightarrow \frac{dL_D}{d\alpha} > 0 \\ \frac{dL_F}{d\alpha} &= \frac{\partial L_F}{\partial\alpha} + \frac{\partial L_F}{\partial p} \left(\frac{dp}{d\alpha} \right) \Rightarrow \frac{dL_F}{d\alpha} < 0 \\ \frac{dL_Y}{d\alpha} &= \frac{\partial L_Y}{\partial\alpha} + \frac{\partial L_Y}{\partial p} \left(\frac{dp}{d\alpha} \right) \Rightarrow \frac{dL_Y}{d\alpha} < 0 \\ \frac{dK_D}{d\alpha} &= \frac{\partial K_D}{\partial\alpha} + \frac{\partial K_D}{\partial p} \left(\frac{dp}{d\alpha} \right) \Rightarrow \frac{dK_D}{d\alpha} > 0 \\ \frac{dK^*}{d\alpha} &= \frac{\partial K^*}{\partial\alpha} + \frac{\partial K^*}{\partial p} \left(\frac{dp}{d\alpha} \right) \Rightarrow \frac{dK^*}{d\alpha} < 0 \\ \frac{dr_D}{d\alpha} &= \frac{\partial r_D}{\partial\alpha} + \frac{\partial r_D}{\partial p} \left(\frac{dp}{d\alpha} \right) \Rightarrow \frac{dr_D}{d\alpha} > 0\end{aligned}$$

CHAPTER 8

GENERAL EQUILIBRIUM ANALYSIS: RESULTS

Introduction

This chapter the model presented in chapter 5 is solved for the three policy goals of interest: domestic welfare, the level of foreign investment, and the level of foreign reserves. First general equations for the policy goals are developed. Then, the differentials obtained in chapter 7 are used to determine the specific effects of an export-share requirement (i) when the importable sector is quota-protected; and (ii) when the importable sector is tariff-protected. The solutions obtained are compared with those obtained in the literature.

Policy Goals

This section develops general equations for the three policy goals of interest: domestic welfare, the level of foreign investment, and the level of foreign reserves. These equations are "general" in the sense that they are independent of the form of trade protection used and the are independent of the employment assumption.

Domestic Welfare

In chapter 7 the budget constraint (5-15) was differentiated to produce equation (7-12). Dividing (7-12) through by $d\alpha$ gives the change in welfare due to an increase in the export-share requirement:

$$E_u \frac{du}{d\alpha} = -Y_L(L_D + L_F) \frac{d\lambda}{d\alpha} - R_p^*(p - p^*) - K^* \frac{dr_F}{d\alpha} + (p - p^*) \frac{dM}{d\alpha} \quad (8-1)$$

The term on the left hand side of (8-1) is the change in net national welfare due to a change in the export-share requirement. The four terms on the right hand side of (8-1) depict the various effects on welfare as α changes. The first term, $-Y_L(L_D + L_F)d\lambda/d\alpha$, is the welfare loss from an increase in urban unemployment, and is equal to the agricultural production that the unemployed could produce if relocated to the rural sector. The second term, $-R_p^*(p - p^*)$, is the welfare loss from the decrease in revenue earned by foreign-owned firms caused by an increase in the export-share requirement. The third term, $-K^*dr_F/d\alpha$, is the welfare gain as repatriation of earnings to foreign capital are reduced following a decrease in the rate of return to foreign capital. And, the final term, $(p - p^*)dM/d\alpha$ is the welfare gain from an increase in the trade-protection revenue arising from an increase in imports.

Foreign Investment

The effect of a change in the export-share requirement on foreign investment is simply given by the derivative of foreign capital, K^* , with respect to α :

$$\frac{dK^*}{d\alpha} \quad (8-2)$$

Foreign Reserves

Under a fixed exchange rate regime, the change in the level of foreign reserves is equal to the sum of the current account and capital account balances:

$$d\Omega = B_C + B_K \quad (8-3)$$

where $d\Omega$ is the change in the level of foreign reserves, B_C is the current account balance, and $B_K = dK^*$ is the capital account balance.

The current account balance, B_C , can be defined as:

$$B_C = p^* \alpha F - r_F K^* + (p - p^*)M - pM + X \quad (8-4)$$

where $p^* \alpha F - r_F K^*$ is export earnings by foreign-owned firms net of the returns to foreign capital; $(p - p^*)M - pM = -p^*M$ is trade-protection revenue net of the price paid for imports; and X is export earnings from the rural sector.

It is not possible within the framework provided by this model to determine the exact value of the current account balance. However, it is possible to determine whether a particular policy will cause the current account balance to improve or to deteriorate. Differentiating (8-4) totally, and assuming that there is no change in export earnings from the rural sector (i.e. $dX = 0$), we have:

$$dB_C = \alpha p^* dF + p^* F d\alpha - K^* dr_F - r_F dK^* - p^* dM \quad (8-5)$$

The terms on the right hand side of (8-5) depict the various effects on the current account under a fixed exchange rate regime. The first term, $\alpha p^* dF$, is the increase in the current account balance caused by an increase in production by foreign-owned manufacturers. The second term, $p^* F d\alpha$, is the increase in the current account balance from increased exports by foreign-owned firms caused by an increase in the export-share requirement. The third term, $-K^* dr_F$, is the decrease in the current account balance caused by an increase in repatriations of profits to foreign capital due to an increase in the rate of return to foreign investment. The fourth term, $-r_F dK^*$, is the decrease in the current account balance caused by an increase in repatriation of profits to foreign capital due to an increase in the amount of foreign investment. And the final term, $-p^* dM$, is the decrease in the current account balance resulting from an increase in imports.

If the current account balance improves ($dB_C > 0$) and the capital account is positive ($dK^* > 0$), then the level of foreign reserves will either be increasing, or at the very least they will decrease at a slower rate. On the other hand, if the current account deteriorates ($dB_C < 0$) and the capital account is negative, then the foreign reserves will be decreasing. Any other combination of the current and capital account and the effect on the level of foreign reserves will be ambiguous.

Quota Protection of the Importable Sector

This section presents the results of the model for when the importable sector is protected by an import quota. The first task is to develop the general policy equations further so that they are relevant for the specific case of quota protection. Then, the results for the full employment case and the case of Harris-Todaro unemployment are presented. For each employment assumption the first result discussed is the effect of the export-share requirement on the domestic price of the manufactured good (importable), because that determines whether or not most of the variables in the policy equations are ambiguous. Having determined the price effect, each of the policy goals is then discussed.

Policy Goals

Under quotas $dM = 0$, so the domestic welfare equation reduces to:

$$E_u \frac{du}{d\alpha} = -Y_L(L_D + L_F) \frac{d\lambda}{d\alpha} - R_p^*(p - p^*) - K^* \frac{dr_F}{d\alpha} \quad (8-6)$$

Substituting $dM = 0$ into (8-5), and dividing through by $d\alpha$ provides the change in the current account balance that occurs with a change in the export-share requirement:

$$\frac{dB_C}{d\alpha} = \alpha p^* \frac{dF}{d\alpha} + p^* F - K^* \frac{dr_F}{d\alpha} - r_F \frac{dK^*}{d\alpha} \quad (8-7)$$

Full Employment

Price Effect

The effect of the export-share requirement on the domestic price of the importable is ambiguous both in the short run and in the long run under full employment. This result is different from that of Chao and Yu (1992) who examined the welfare effects of export-share requirements in a similar framework, and found that the price effect of an export-share requirement is unambiguously positive. The reasons for the difference between the two results was discussed in chapter 7. To summarise that discussion, Chao and Yu used a more traditional comparative static analysis utilising unit cost functions that means that factor prices do not change when labour is released by foreign-owned manufacturers following an increase in the export-share requirement. In addition, they employ the Heckscher-Ohlin assumption of free capital mobility between domestic sectors even in the short run. While the analysis of Chao and Yu is mathematically correct, and a useful and interesting contribution to pure international trade theory, it is my suggestion that there are two good reasons why my result is more useful for studying applied problems: first, the use of the specific factors model is undoubtedly more realistic when studying short run effects; and second, in a model that assumes there are no market imperfections it seems unreasonable to assume that increasing the supply of a factor does not reduce its price.

Welfare

The assumption of full employment means that the first term on the right hand side of equation (8-6) is zero. Because the price effect is ambiguous, the sign of $dr_F/d\alpha$ is also ambiguous in the short run, and the short run change in welfare is ambiguous. In the long run, $dr_F = 0$, so the third term on the right hand side of (8-6) is zero, and we are left with the second term, which is the revenue loss of foreign-owned firms. Thus in the long run there is an unambiguous welfare loss equal to the revenue loss of foreign-owned firms. This long run result is identical to that obtained by Chao and Yu (1992). Because Chao and Yu (1992) have a non-ambiguous price effect, and because in their analysis factor prices do not change in response to a change in the export-share requirement, Chao and Yu are also able to obtain the result that there is an unambiguous short run welfare loss.

Foreign Investment

The change in foreign investment due to a change in the export-share requirement is ambiguous. This follows both from the ambiguous price effect and from the result that the response of foreign investment to a change in the domestic price of the importable is also ambiguous.

Foreign Reserves

Because the price effect is ambiguous, the sign of the total differentials in (8-7) are ambiguous, and the change in the current account balance is also ambiguous. Even if the price effect is positive, as obtained by Chao and Yu (1992), the partial differentials with respect to α and the partial differentials with respect to p are of opposite signs for the foreign-owned manufacturing sector, and thus the total differentials in (8-7) remain ambiguous. With both the change in foreign investment and the change in the current account balance being ambiguous, the change in the level of foreign reserves is also ambiguous.

Harris-Todaro Unemployment

Price Effect

Under Harris-Todaro unemployment the effect of the export-share requirement on the domestic price of the importable is ambiguous in the short run, but positive in the long run. The short run result agrees with that obtained by Chao and Yu (1991) who examined the welfare effect of export-share requirements in a similar framework, and also found that the price effect of an export-share requirement is ambiguous. In retaining the sector-specificity of domestic capital, the "long run" analysis of Chao and Yu fits in between the short run and the long run analyses presented in chapter 7. Chao and Yu obtain a sufficient condition for their system to be stable and show that if the condition holds, the price effect is unambiguously positive. However, as the condition is not a *necessary* condition, it is possible for the system to be stable but for the stability condition *not* to hold, and therefore the price

effect remains ambiguous. In fact, it is quite probable that Chao and Yu's condition does not hold as the export-share requirement becomes large³⁰, and, therefore, the price effect is ambiguous for large α . The long run positive price effect that I have obtained does not depend on any stability conditions, and is independent of the level of export-share requirement imposed.

Welfare

Because the sign of the short run price effect is ambiguous, the signs of each of the differentials in (8-6) are also ambiguous. However, even if the price effect is unambiguously positive, then the welfare effect remains ambiguous because the partial differentials of λ and r_F with respect to α are opposite in sign to the partial differentials with respect to p . This result is identical to that obtained by Chao and Yu (1991).

In the long run, the rate of return to foreign capital is fixed at the world rate of return, so the third term is eliminated from the right hand side of equation (8-6). The second term on the right hand side, the revenue loss of foreign-owned firms is negative. The first term, however, remains ambiguous because $\partial\lambda/\partial p$ is ambiguous, and therefore the long run effect of an export-share requirement on domestic welfare is ambiguous.

Foreign Investment

The change in foreign investment due to a change in the export-share requirement is ambiguous. This is because the export-share requirement lowers the effective producer price, causing a long run decline in the level of foreign investment, but the positive price effect raises the producer price, causing an increase in the level of foreign investment.

Foreign Reserves

As with the full employment case, the effect of an export-share requirement on the level of foreign reserves is ambiguous. Because the short run price effect is ambiguous, the sign of the total differentials in (8-7) are ambiguous, and the change in the current account balance is also ambiguous. In the long run when the price effect is positive the partial differentials with respect to α and the partial differentials with respect to p are of opposite signs for the foreign-owned manufacturing sector, and thus the total differentials in (8-7) remain ambiguous. With both the change in foreign investment and the change in the current account balance being ambiguous, the change in the level of foreign reserves is also ambiguous.

30. The condition obtained by Chao and Yu (1991) is that $1 - \alpha - mb > 0$, where α is the export share requirement, m is the marginal propensity to import, b is an "unemployment distortion parameter" defined as $-(L_X Y_I / p)(\partial\lambda/\partial X)$ which is ≥ 0 , $L_X = (L_D + L_F)$ and $X = D + F$. It is clear that as α approaches 1, Chao and Yu's condition could easily become negative.

Tariff Protection of the Importable Sector

This section presents the results of the model for when the importable sector is protected by an import tariff. The first task is to develop the general policy equations further so that the change in imports is removed from each equation. Then, the results for the full employment case and the case of Harris-Todaro unemployment are presented. When the importable sector was quota-protected and a result was ambiguous, it was not possible to determine the optimal export-share requirement because the change in each variable was generally ambiguous. However, with tariff protection, the sign of each change is generally unambiguous. Therefore, when the overall effect of an export-share requirement on a particular policy goal is ambiguous, an attempt is made, where possible, to determine the optimal export-share requirement for that policy goal.

Policy Goals

Domestic Welfare

Differentiating (5-16a), and solving for dM , we have:

$$dM = E_{pp} dp + E_{pu} du - dD - (1 - \alpha)dF + Fd\alpha \quad (8-8)$$

Substituting (8-8) into (7-12), and noting that $(p-p^*) = tp^*$, and $dp = 0$:

$$E_u du = -Y_L(L_D + L_F)d\lambda - R_p^* tp^* d\alpha - K^* dr_F \\ + tp^* [E_{pu} du - dD - (1 - \alpha)dF + Fd\alpha]$$

Rearranging, and noting that $R_p^* = F$:

$$(E_u - tp^* E_{pu}) du = -Y_L(L_D + L_F)d\lambda - K^* dr_F - tp^* [dD + (1 - \alpha)dF]$$

Dividing through by $d\alpha$ gives the change in domestic welfare due to a change in the export-share requirement when the importable sector is tariff-protected:

$$(E_u - tp^* E_{pu}) \frac{du}{d\alpha} = -Y_L(L_D + L_F) \frac{d\lambda}{d\alpha} - K^* \frac{dr_F}{d\alpha} - tp^* \frac{dD}{d\alpha} - tp^*(1 - \alpha) \frac{dF}{d\alpha} \quad (8-9)$$

The term on the left hand side of (8-9) is the change in net national welfare as a result of a change in the export-share requirement. For a given level of production, imposing a tariff raises the nominal value of that production but leaves the real value unchanged. Thus to obtain the real value of GDP it is necessary to subtract from nominal GDP all expenditure that occurs solely because of trade protection. In this analysis, the expenditure function E represents nominal GDP, E_p is expenditure on manufactured goods, tp^* is the amount that the domestic price of manufactured goods is higher than the world price because of the tariff, and thus $tp^* E_p$ is the additional expenditure on manufactured goods that occurs because of the tariff. Hence real GDP is given by the term $E - tp^* E_p$. Therefore, the term in brackets

multiplying du is the partial differential of real GDP with respect to aggregate utility u , and is positive for normal goods³¹.

The right-hand side of (8-9) depicts the various effects on domestic welfare as α changes. The first term on the right hand side is a welfare reducing increase in urban unemployment, which is equal to the value of agricultural production that could be produced by the urban unemployed. The second term is a welfare improving reduction in profits repatriated by foreign firms. The third term is the welfare reducing effect of a tariff-protected increase in output by domestic manufacturers. And fourth, there is a welfare improving reduction in domestically marketed output of foreign-owned manufacturers that occurs as production by foreign-owned firms is reduced. This last effect is positive because the tariff causes manufactures to be over-produced, and therefore the decrease in production represents a reduction in the misallocation of resources.

Current Account Balance

Substituting (8-8) into (8-5) and noting that $dp = 0$ gives:

$$dB_C = p^* dD + p^* dF - K^* dr_F - r_F dK^* - p^* E_{pu} du$$

Multiplying through by $(E_u - tp^* E_{pu})/d\alpha$, and substituting (8-10) for $(E_u - tp^* E_{pu})(du/d\alpha)$:

$$\begin{aligned} (E_u - tp^* E_{pu}) \frac{dB_C}{d\alpha} &= (E_u - tp^* E_{pu}) \left[p^* \frac{dD}{d\alpha} + p^* \frac{dF}{d\alpha} - K^* \frac{dr_F}{d\alpha} - r_F \frac{dK^*}{d\alpha} \right] \\ &\quad - p^* E_{pu} \left[-Y_L(L_D + L_F) \frac{d\lambda}{d\alpha} - K^* \frac{dr_F}{d\alpha} - tp^* \frac{dD}{d\alpha} - tp^*(1-\alpha) \frac{dF}{d\alpha} \right] \end{aligned}$$

Grouping terms and noting that $(E_u - tp^* E_{pu} - p^* E_{pu}) = (E_{lu} + p^* E_{pu} - p^* E_{pu}) = E_{lu}$:

$$\begin{aligned} (E_u - tp^* E_{pu}) \frac{dB_C}{d\alpha} &= p^* E_u \frac{dD}{d\alpha} + p^* (E_u - \alpha tp^* E_{pu}) \frac{dF}{d\alpha} - K^* E_{lu} \frac{dr_F}{d\alpha} \\ &\quad - r_F (E_u - tp^* E_{pu}) \frac{dK^*}{d\alpha} + p^* E_{pu} Y_L (L_D + L_F) \frac{d\lambda}{d\alpha} \end{aligned} \quad (8-11)$$

The terms on the right hand side of (8-11) are the various effects on the current account balance as α changes. The first term on the right hand side is the improvement in the current account balance as increased domestic production of importables reduces imports. The second term is the deterioration in the current account balance as production by foreign-owned firms decreases, and therefore imports rise and exports fall. The third term is the improvement in

31. This is shown by Rodrik (1987:639). If we assume E_u to be linearly homogenous in goods prices, then $E_u = (1+t)p^* E_{pu} + E_{lu}$, which can be rearranged to $E_u - tp^* E_{pu} = p^* E_{pu} + E_{lu}$. If both goods are normal, the latter expression is positive.

the current account balance as repatriations of profits to foreign capital fall following a short-run reduction in the rate of return to foreign capital. The fourth term is the improvement in the current account balance arising decreased repatriations of profits to foreign capital following a long-run decline in the level of foreign investment. And, the final term is the improvement in the current account balance that occurs as urban unemployment increases. This last term improves the current account balance because with an increase in urban unemployment there is a reduction in the demand for manufactures, and therefore a reduction in imports.

Full Employment

Welfare

The assumption of full employment means that the first term on the right hand side of (8-9) is zero, and (8-9) becomes the welfare equation obtained by Rodrik (1987).

In the short run there is a welfare improving reduction in the rate of return to foreign capital ($dr_f/d\alpha$), a welfare reducing increase in domestic production of manufactures ($dD/d\alpha > 0$), and a welfare improving reduction in production by foreign-owned manufacturers ($dF/d\alpha < 0$). Therefore, the short run welfare effect is ambiguous. However, noting that capital is sector-specific in the short-run, and utilising (7-2b) for dr_f , the welfare equation can be re-written as:

$$(E_u - tp^* E_{pu}) \frac{du}{d\alpha} = K^* \left(tp^* F_K - p_e F_{KL} \frac{dL_F}{d\alpha} \right) - tp^* (1-\alpha) F_L \frac{dL_F}{d\alpha} - tp^* D_L \frac{dL_D}{d\alpha} \quad (8-12)$$

When $\alpha = 0$, (8-12) reduces to:

$$(E_u - tp^* E_{pu}) \frac{du}{d\alpha} = tp^* K^* F_K - p_e K^* F_{KL} \frac{dL_F}{d\alpha} - tp^* \left(F_L \frac{dL_F}{d\alpha} + D_L \frac{dL_D}{d\alpha} \right) \quad (8-13)$$

From the comparative statics in chapter 7:

$$F_L \frac{dL_F}{d\alpha} + D_L \frac{dL_D}{d\alpha} = \frac{tp^* F_L}{\Delta} [Y_{LL}(F_L - D_L) + F_L p D_{LL}] < 0$$

where $\Delta = Y_{LL}(p_e F_{LL} + p D_{LL}) + p D_{LL} p_e F_{LL} > 0$.

In the short run the reduction in production by foreign-owned manufacturers can only be achieved by reducing employment of labour, so $dL_F/d\alpha$ is negative. Therefore, all terms in (8-13) are positive, and imposing an export-share requirement improves domestic welfare.

When $\alpha = 1$, (8-12) reduces to:

$$(E_u - tp^*E_{pu})\frac{du}{d\alpha} = K^*\left(tp^*F_K - p_eF_{KL}\frac{dL_F}{d\alpha}\right) - tp^*D_L\frac{dL_D}{d\alpha} \quad (8-14)$$

Utilising the comparative statics in chapter 7, (8-14) can be rewritten as:

$$(E_u - tp^*E_{pu})\frac{du}{d\alpha} = \frac{tp^*}{\Delta} \left\langle K^*F_K\Delta - F_L[p_eK^*F_{LK}(Y_{LL} + pD_{LL}) - tp^*D_LY_{LL}] \right\rangle$$

where Δ is as defined above. When t is small, the term $tp^*D_LY_{LL}$ is small, the term in square brackets is negative, and the welfare effect of an export-share requirement is, therefore, positive. However, when t is large, the term in square brackets becomes positive, and for a sufficiently large t , the term inside the angular brackets becomes negative and the welfare effect of an export-share requirement becomes negative.

In the long run there is no change in the rate of return to foreign capital, so just the production effects remain. These effects move in opposite directions, so the long run welfare effect of the export-share requirement is ambiguous. However, it is possible to determine the welfare-optimising export-share requirement.

From (7-23) we have $dD = D_LdL + R_{pp}dp = -dL_F$. Coupled with the long run assumption of $dr_F = dr^* = 0$, the welfare equation reduces to:

$$(E_u - tp^*E_{pu})\frac{du}{d\alpha} = tp^* \left[D_L\frac{dL_F}{d\alpha} - (1-\alpha) \left(F_L\frac{dL_F}{d\alpha} + F_K\frac{dK^*}{d\alpha} \right) \right] \quad (8-15)$$

$w = pD_L = p_eF_L$, and $p \geq p_e$, so $D_L \leq F_L$. Hence when setting $\alpha = 0$ the term in square brackets is opposite in sign to $dL_F/d\alpha$ and $dK^*/d\alpha$, which are both negative, and imposing an export-share requirement will, therefore, improve welfare. Conversely, setting $\alpha = 1$ leaves the unambiguously negative expression $tp^*D_L(dL_F/d\alpha)$ on the right hand side, and the export-share requirement is, therefore, welfare reducing.

Setting $du/d\alpha = 0$ to obtain the turning point in the welfare function, the long run welfare-optimising export-share requirement α^0 is:

$$\alpha^0 = 1 - \frac{D_L(dL_F/d\alpha)}{F_L(dL_F/d\alpha) + F_K(dK^*/d\alpha)} \quad (8-16)$$

which lies in the region $[0,1]$. It can be seen from the welfare equation (8-15) that α must be less than the welfare-optimising value for the export-share requirement to be welfare-improving: when α is greater than its optimal value, the welfare loss from the increase in domestic production outweighs the welfare gain from the decrease in production by foreign-owned firms.

Thus the result is obtained that, in the short run, a low level of export-share requirement will be welfare-improving. For a low level of tariff an export-share requirement of 100 percent may also be welfare improving, which implies that the welfare-optimising export-share requirement is 100 percent. As the tariff rate becomes higher, the positive welfare effect at high levels of requirement will be mitigated, so that the welfare effect at high levels of requirement may eventually become negative, and the welfare-optimising export-share requirement will be less than 100 percent. In the long run, the welfare-optimising export-share requirement lies between zero and 100 percent, so a low level of requirement is welfare-improving, but a high level of requirement may be welfare-reducing. These results agree with those of Rodrik (1987) who, utilising a similar full-employment framework, found that a low level of export-share requirement is welfare improving, but a high level of requirement may be welfare reducing.

Foreign Investment

Increasing the export-share requirement reduces the effective producer price received by foreign-owned manufacturers, and therefore reduces the marginal revenue product of foreign capital. Foreign capital is paid its marginal revenue product, so foreign investors earn a reduced rate of return. Consequently, foreign investors withdraw capital from the economy, raising the marginal revenue product of the capital that remains. This continues until any foreign capital that remains invested in the economy is earning the fixed world rate of return. Hence, increasing the export-share requirement causes an unambiguous long run decline in the level of foreign investment ($dK^*/d\alpha < 0$). The foreign-investment maximising export-share requirement is, therefore, zero.

Foreign Reserves

The assumption of full employment means that the last term on the right hand side of (8-11) is zero.

In the short run there is no change in the level of foreign investment, so (8-11) becomes:

$$(E_u - t p^* E_{p_u}) \frac{dB_C}{d\alpha} = p^* E_u \frac{dD}{d\alpha} + p^* (E_u - \alpha t p^* E_{p_u}) \frac{dF}{d\alpha} - K^* E_{1u} \frac{dr_F}{d\alpha} \quad (8-17)$$

The short run change in the current account balance is ambiguous: there is a positive effect on the current account balance from the increase in domestic production, a negative effect from the decrease in production by foreign-owned firms, and a positive effect from the reduction in repatriation of profits to foreign capital that occurs because of the fall in the rate of return to foreign capital.

Setting $dB_c/d\alpha = 0$ for the turning point in the current account balance function, the export-share requirement at the turning point is:

$$\alpha = \frac{p^* E_u [(dD/d\alpha) + (dF/d\alpha)] - K^* E_{1u} (dr_F/d\alpha)}{p^* t p^* E_{pu} (dF/d\alpha)} \quad (8-18)$$

which cannot be definitely signed, even when the results of chapter 7 are substituted for each of the differentials.

In the long run the rate of return to foreign capital is fixed at the world rate of return, so (8-11) becomes:

$$(E_u - t p^* E_{pu}) \frac{dB_c}{d\alpha} = p^* E_u \frac{dD}{d\alpha} + p^* (E_u - \alpha t p^* E_{pu}) \frac{dF}{d\alpha} - r_F (E_u - t p^* E_{pu}) \frac{dK^*}{d\alpha} \quad (8-19)$$

The long run change in the current account balance is ambiguous: there is a positive effect on the current account balance from the increase in domestic production, a negative effect from the decrease in production by foreign-owned firms, and a positive effect from the reduction in repatriation of profits to foreign capital that occurs because of the reduction in the level of foreign investment. As in the short run case, the turning point in the current account function (8-19) cannot be definitely signed.

The negative effect on the current account balance of the decrease in production by foreign-owned firms is reduced at high levels of requirement by virtue of the term $-\alpha t p^* E_{pu}$ in (8-11), (8-17), and (8-19), which suggests that a requirement of 100 percent would maximise the current account balance. While this is true if the turning point in the current account function is (i) at a level of requirement less than zero and is, therefore, a minimum; or (ii) at a level of requirement that is greater than 100 percent and is, therefore, a maximum; it may not be true if the turning point lies at a level of requirement between zero and 100 percent. For example, if the turning point is at an export-share requirement of 80 percent, then the deterioration in the current account that occurs as the requirement is increased from zero to 80 percent may be larger than the improvement in the current account that occurs as the requirement is further increased from 80 to 100 percent. If such a situation existed, the current account balance would be lower at an export-share requirement of 100 percent than when no requirement was imposed.

Hence, in both the short run and the long run, the effect of an export-share requirement on the current account balance is ambiguous, and the current account-maximising level of export-share requirement cannot be determined. Therefore, even though the decline in foreign investment causes a decline in the level of foreign reserves, the overall effect of an export-share requirement on the level of foreign reserves is ambiguous.

Harris-Todaro Unemployment

Welfare

The full employment framework imposes an artificial constraint on the domestic sectors that they must absorb any labour released by foreign-owned firms, and thus production by domestic manufacturers increases when the export-share requirement is increased. However, with Harris-Todaro unemployment, that constraint is removed, and domestic producers respond solely to price signals. With constant tariffs the domestic price of manufactures is constant, and therefore there is no change in production by domestic producers. The welfare equation (8-9) thus becomes:

$$(E_u - tp^* E_{p_u}) \frac{du}{d\alpha} = -Y_L(L_D + L_F) \frac{d\lambda}{d\alpha} - K^* \frac{dr_F}{d\alpha} - tp^*(1-\alpha) \frac{dF}{d\alpha} \quad (8-20)$$

It is convenient to start the analysis of the effect of an export-share requirement on domestic welfare by examining the long run case. In the long run the rate of return to foreign capital is set at the constant world rate of return, so the second term in equation (8-20) is zero. The decrease in the effective producer price that results from the increase in the export-share requirement leads to a long-run welfare improving decline in the level of foreign production ($dF/d\alpha < 0$). With the foreign-owned manufacturers facing constant factor price there must, therefore, be a decline in both the level of foreign investment ($dK^*/d\alpha < 0$), and in the employment of labour by the foreign-owned manufacturers ($dL_F/d\alpha < 0$). Some labour is reabsorbed by the agricultural sector, but not enough to prevent a welfare reducing rise in the urban unemployment ratio ($d\lambda/d\alpha > 0$). Thus, in the long run, there are only two effects on welfare: the first term in equation (8-20) that signifies a welfare reducing increase in the urban unemployment ratio, and the third term in equation (8-20) that signifies a welfare improving decline in production by foreign-owned firms. The overall welfare effect of a change in the export-share requirement is, therefore, ambiguous.

It is possible, however, to examine the welfare-optimising export-share requirement. Following Chao and Yu (1994), an unemployment distortion parameter, given by equation (8-21), is defined:

$$b = \frac{-Y_L(L_D + L_F)}{p_e} \left(\frac{d\lambda/d\alpha}{dF/d\alpha} \right) \quad (8-21)$$

It is shown in Appendix B that b lies between 0 and 1.

Setting $du/d\alpha = 0$ for the turning point in the welfare function, equation (8-20), the welfare-optimising export-share requirement α^0 is:

$$\alpha^0 = 1 - \frac{p_e}{tp^*} b \quad (8-22)$$

Noting that the effective producer price p_e is equal to $(1+t)p^* - \alpha p^*$, equation (8-22) can be rewritten as³²:

$$\alpha^0 = 1 - \frac{b}{t(1-b)} \quad (8-23)$$

It can be seen from the welfare equation (8-20) that α must be less than the welfare-optimising value for the export-share requirement to be welfare-improving; when α is greater than its optimal value, the welfare loss from the increase in the urban unemployment ratio outweighs the welfare gain from the decrease in production by foreign-owned firms.

Equation (8-23) indicates that the two key determinants of α^0 are the tariff rate t and the unemployment distortion parameter b . The tariff, by raising the domestic price of manufactures, causes manufactures to be over-produced. If we set $b = 0$, so that we have full employment, then the welfare-optimising value of α is 1: in the long run under full employment the export-share ratio should be set at 100 percent to minimize the distortionary effect of the tariff. On the other hand, if there is urban unemployment, the over-production of manufactures increases the demand for urban labour and thus reduces the welfare loss from unemployment caused by the institutional (non-market) wage setting. The tariff is a second-best policy in the face of the labour market rigidities, so to minimize the effects of the tariff would reduce welfare. Thus, if b is greater than zero, so that there is urban unemployment, the optimal export-share requirement drops towards zero so that the positive effects of the tariff are not eliminated. If there is a large tariff in place, then the welfare-optimising tariff will lie between zero and 100 percent. However, as the tariff rate approaches zero, then the welfare-optimising value of α becomes negative, and the export-share ratio should, therefore, be set at zero.

In the short run, the reduction in the effective producer price caused by an increase in the export-share requirement causes a welfare-improving decline in the rate of return to foreign capital ($dr_f/d\alpha < 0$) and a welfare-improving decline in production by foreign-owned manufacturers ($dF/d\alpha < 0$). In the short run capital is sector-specific, so the reduction in production by foreign-owned manufacturers can only be achieved by reducing employment of labour ($dL_f/d\alpha < 0$). Some labour is reabsorbed by the agricultural sector, but not enough to prevent a welfare-reducing rise in the urban unemployment ratio ($d\lambda/d\alpha > 0$). Thus the overall effect on welfare is ambiguous.

Setting $du/d\alpha = 0$ for the turning point in the welfare function (8-20), the welfare-optimising export-share requirement is:

$$\alpha^0 = 1 - \frac{p_e}{tp^*} b + \frac{K^*}{tp^*} \left(\frac{dr_f/d\alpha}{dF/d\alpha} \right) \quad (8-24)$$

which is equation (8-22) plus the third term on the right hand side that captures the effect of the reduction in the rate of return to foreign capital.

32. In equation (4-1) p_e was defined as $\alpha p^* + (1-\alpha)p$, which with a little rearrangement provides $p_e = p - \alpha(p - p^*)$. Noting that $p = (1+t)p^*$, it is then easy to obtain $p_e = (1+t)p^* - \alpha p^*$.

From the comparative statics in chapter 7:

$$\left(\frac{dr_F/d\alpha}{dF/d\alpha} \right) = p_e \frac{(F_{LK}F_L - F_{LL}F_K)}{F_L^2} > 0 \quad (8-25)$$

Substituting (8-25) into (8-24), utilising $p_e = (1+t)p^* - \alpha p^*$, and rearranging provides:

$$\alpha^0 = \frac{tF_L^2(1-b) - F_L^2b + (1+t)K^*(F_{LK}F_L - F_{LL}F_K)}{tF_L^2(1-b) + tK^*(F_{LK}F_L - F_{LL}F_K)} \quad (8-26)$$

Setting $b = 0$, so that we have full employment, then the welfare-optimising value of α is greater than 1: in the short run if urban unemployment does not respond to a change in the level of production by foreign-owned manufacturers then the export-share requirement should be set at 100 percent to maximise domestic welfare. However, if $b = 1$ then the optimal export-share requirement depends on the relative magnitude of the variables in equation (8-26). If $F_L^2 \leq K^*(F_{LK}F_L - F_{LL}F_K)$ then the optimal export-share requirement when $b = 1$ will still be 100 percent, and it follows that the welfare-optimising export-share requirement will always be 100 percent regardless of the value of b or the tariff rate t . If $F_L^2 \geq K^*(F_{LK}F_L - F_{LL}F_K)(1+t)$ then the welfare-optimising export-share requirement will be zero when $b = 1$. As the tariff rate approaches zero, if $F_L^2 \geq K^*(F_{LK}F_L - F_{LL}F_K)(1+t)$ then α^0 becomes negative, and the export-share ratio should be set at zero; but if $F_L^2 < K^*(F_{LK}F_L - F_{LL}F_K)(1+t)$ then α^0 becomes very large, and the export-share ratio should be set at 100 percent. Therefore, the optimal export-share requirement lies between zero and 100 percent, and may, under special circumstances, equal either zero or 100 percent.

Chao and Yu (1994) conduct an analysis of export-share requirements and welfare in the presence of Harris-Todaro unemployment. The main difference between Chao and Yu's model and the model presented in this thesis is that in Chao and Yu's model the domestic urban sector produces non-tradeables whose price is determined entirely endogenously. The urban non-tradeable can be considered to be services if they are a complementary good to manufactures, or as locally produced manufactures if they are imperfect substitutes for imported manufactures. Chao and Yu consider a short run case in which all capital is sector-specific, an intermediate run case in which capital is mobile between the urban sectors, and a long run case in which all capital is mobile. Chao and Yu (1994:45) find that:

If the host country adopts a second-best tariff rate, then an increase in the export-share will always reduce welfare when the goods produced in urban regions are complements or independent, implying a zero optimal export-share. However, welfare effects of ESRs are ambiguous when goods are substitutes, signifying a positive optimal export-share.

For the long run ... the [ESR] policy ... always improves welfare as a result of better resource allocation. It follows that the optimal [export-share is] 100 percent.

For the model presented in this thesis, the domestic and foreign-owned manufacturing sectors are substitutes, so the results obtained are consistent with the short run and intermediate run results of Chao and Yu.

Foreign Investment

Foreign investment responds to an export-share requirement exactly the same under Harris-Todaro unemployment as it does under full employment. Increasing the export-share requirement reduces the effective producer price received by foreign-owned manufacturers, and therefore reduces the marginal revenue product of foreign capital. Foreign capital is paid its marginal revenue product, so foreign investors earn a reduced rate of return. Consequently, foreign investors withdraw capital from the economy, raising the marginal revenue product of the capital that remains. This continues until any foreign capital that remains invested in the economy is earning the fixed world rate of return. Hence, increasing the export-share requirement causes an unambiguous long run decline in the level of foreign investment ($dK^*/d\alpha < 0$). The foreign-investment maximising export-share requirement is, therefore, zero.

Foreign Reserves

With a constant tariff the domestic price of importables is constant, and there is, therefore, no change in production by domestic manufacturers. Hence the first term in equation (8-11) is equal to zero. An increase in the export-share requirement causes a decrease in production by foreign-owned manufacturers ($dF/d\alpha < 0$), so the second term in equation (8-11) is negative. An increase in the export-share requirement causes a short run decrease in the rate of return to foreign capital ($dr_F/d\alpha < 0$), and a long run decrease in the level of foreign investment ($dK^*/d\alpha < 0$), so the third and fourth terms in (8-11) are positive. And, an increase in the export-share requirement causes an increase in the urban unemployment ratio ($d\lambda/d\alpha > 0$), so the fifth term in equation (8-11) is positive. Therefore, the overall effect of an export-share requirement on the current account balance is ambiguous. This situation is qualitatively identical to that under full employment: under full employment the first term in (8-11) is positive and the fifth term is zero, but under Harris-Todaro unemployment the first term is zero and the fifth term is positive; all other terms have the same sign. Therefore, as was the case with full employment, it is possible to derive an equation for the turning point in the current account function, but it is not possible to determine whether the turning point lies below zero, between zero and 100 percent, or above 100 percent. It is also not possible to determine the current account-maximising export-share requirement.

Hence, although the decline in foreign investment acts to reduce the level of foreign reserves, the change in the current account balance is ambiguous, so the overall change in the level of foreign reserves is also ambiguous.

Summary

Using the model presented in chapter 5, and the comparative statics of chapter 7, this chapter has discussed the effect of an export-share requirement on domestic welfare, foreign investment, and the level of foreign reserves.

When the importable sector is protected by an import quota most of the effects are ambiguous. However, this result is still useful for the problem at hand. China has implemented the export-share policy as part of a policy package intended to improve welfare, attract foreign investment, and protect China's foreign reserves. The full employment case indicates that an export-share policy results in an unambiguous decrease in domestic welfare on the long run. The other results are all ambiguous, indicating that an export-share policy may result in decreased welfare, a loss of foreign investment, and a loss of foreign reserves: results that are all contrary to those that China desires.

When the importable sector is protected by a constant tariff the effects of an export-share requirement are still often ambiguous, but it may be possible to determine the optimal export-share requirement for a particular policy goal. With both full employment and Harris-Todaro unemployment there is an unambiguous long run decline in the level of foreign investment, and the foreign investment-maximising export-share requirement is, therefore, zero. This decline in foreign investment acts to reduce the level of foreign reserves. However, the change in the current account balance is ambiguous under both employment assumptions, so the overall effect of an export-share requirement on the level of foreign reserves is ambiguous. The welfare effect of an export-share requirement was ambiguous for both employment assumptions, but it was possible to determine the welfare-optimising export-share requirement. With full employment, the short run welfare-optimising export-share requirement is greater than zero, and may be 100 percent for low levels of tariff. As the tariff rate becomes large, the short run welfare-optimising export-share requirement lies between zero and 100 percent. In the long run, the welfare-optimising export-share requirement always lies between zero and 100 percent. With Harris-Todaro unemployment, the long run the welfare-optimising export-share requirement depends on the tariff rate and an unemployment distortion parameter that measures the responsiveness of unemployment to changes in the level of production by foreign-owned firms. If the unemployment distortion parameter is very low, then the optimal export-share requirement will be at or near 100 percent. However, as the unemployment distortion parameter increases, the optimal export-share requirement drops towards zero. When the tariff rate is high, the welfare-optimising export-share requirement is also high, so that the distortionary effects of the tariff are minimised. When the tariff rate is low, then the welfare-optimising export-share requirement becomes zero.

CHAPTER 9

CONCLUSION

In the late 1970s China's leadership realised that there was an urgent need to improve the welfare of China's population. One step towards this was to obtain advanced foreign technology to upgrade China's productive capacity. China could not, however, simply purchase the needed technology: to do so would have led to massive foreign exchange outflows and a loss of foreign reserves. Consequently, China has attempted to attract foreign investment as a vehicle for increasing exports so that there would be more foreign exchange available for purchasing imports, and as a vehicle for international technology transfer.

In an attempt to maintain the levels of their foreign exchange reserves, China has subject foreign investment to export-performance requirements such as foreign exchange balancing and export-share requirements. Whether these requirements have any economic effect depends on investor intentions: if investors intend to export the majority of their production then any export-performance requirement will have little, if any, effect. However, the U.S.-China Business Council found that 89 percent of U.S. investors investing in China intended to penetrate the Chinese domestic market. It is, therefore, likely that China's export-performance requirements do influence investor behaviour. This is born out by the sectoral destination of foreign investment in the first half of the 1980s. Foreign investment was often targeted at sectors that would produce a quick return to the investor, or sectors where foreign exchange could not normally be earned.

China responded to the concerns of investors by establishing swap centres from 1985 onwards to facilitate the trading of foreign exchange by FIEs, and by passing regulations in 1986 that granted concessions to advanced technology and export-oriented firms. The Chinese authorities continue to tax FIEs by maintaining an over-valued swap centre rate and limiting access to the swap markets. This is still, however, a vast improvement when compared to the pre-1985 position in which a FIE might not have any guaranteed access to foreign exchange. Despite these concessions, regulations implemented after 1985 appear to be at least as stringent as their predecessors in specifying that FIEs should export. This interpretation is supported by statistical tests which found no evidence to suggest that the pattern of requirements imposed on foreign investors had changed after 1986, implying that the same restrictive requirements that deterred foreign investment in the early 1980s are still being imposed. In addition, the U.S.-China Business Council found that export-performance requirements remain a concern for foreigners investing in China.

Thus, China has imposed export-share requirements, and export-performance requirements more generally, as part of a policy-package intended to improve domestic welfare, attract foreign investment, and maintain or improve the level of foreign reserves. Because the export-performance requirements alter investor behaviour, they will have an influence on whether these policy goals are achieved. It is not possible, *a priori*, to determine whether that influence will be to help achieve a particular policy goal, or to make it more difficult to achieve that goal, so it is necessary to turn to theoretical analysis.

Partial equilibrium analysis suggests that an ESR imposed under a non-prohibitive tariff will cause a deterioration in the trade balance, but may cause an improvement in the current account balance and an increase in the level of aggregate national welfare. Under a totally-prohibitive tariff, which will have an effect similar to an import quota, the effect of an ESR on the trade balance is ambiguous. An ESR imposed on the subsidiary of a multinational corporation that interacts oligopolistically with domestic firms has an ambiguous effect on

welfare.

The general equilibrium analysis analysed the effect of an ESR on domestic welfare, foreign investment, and the level of foreign reserves. When the importable sector is quota-protected, and there is full employment, an export-share policy results in an unambiguous long run decrease in domestic welfare. When there is Harris-Todaro unemployment the effect of an export-share policy on domestic welfare is ambiguous. With both employment assumptions the effect of an export-share policy on foreign investment and foreign reserves is ambiguous.

When the importable sector is protected by a constant import tariff, there is an unambiguous long run decline in the level of foreign investment for employment assumptions. The foreign investment-maximising ESR is, therefore, zero. This decline in foreign investment acts to reduce the level of foreign reserves. However, the change in the current account balance is ambiguous under both employment assumptions, so the overall effect of an ESR on the level of foreign reserves is ambiguous.

The welfare effect of an ESR was ambiguous for both employment assumptions, but it was possible to determine the welfare-optimising ESR. With full employment, the short run welfare-optimising ESR is greater than zero, and may be 100 percent for low levels of tariff. As the tariff rate becomes large, the short run welfare-optimising ESR lies between zero and 100 percent. In the long run, the welfare-optimising ESR always lies between zero and 100 percent. With Harris-Todaro unemployment, the long run welfare-optimising ESR depends on the tariff rate and an unemployment distortion parameter that measures the responsiveness of unemployment to changes in the level of production by foreign-owned firms. If the unemployment distortion parameter is very low, then the optimal ESR will be at or near 100 percent. However, as the unemployment distortion parameter increases, the optimal ESR drops towards zero. When the tariff rate is high, the welfare-optimising ESR is also high, so that the distortionary effects of the tariff are minimised. When the tariff rate is low, then the welfare-optimising ESR becomes zero.

China's imports have been subject to varying levels of administrative control throughout the 1980s, so it is not possible to say whether the results for quota protection or for tariff protection are more relevant. If China continues to use quantitative import restrictions, then the general equilibrium analysis suggests that continued use of the export share policy may result in decreased welfare, a loss of foreign investment, and a loss of foreign reserves: results that are all contrary to those that China desires. In a framework of quantitative restrictions, the judicious policy choice would appear to be the elimination of the export-share policy, although empirical analysis is required to confirm this.

Conversely, if China focuses more on tariffs restrictions, both the partial equilibrium analysis and the general equilibrium analysis suggest that the export-share policy may result in an improvement in welfare. The general equilibrium analysis suggests, however, that will be a decrease in foreign investment, and that there may be a loss of foreign reserves. So, again it is found that the export-share policy produces results that are contrary to those that China desires: there is an unambiguous decrease in foreign investment, and there may be a loss of foreign reserves. Remembering that the reason for attracting foreign investment is to improve domestic welfare, it seems reasonable that the goal of maximising foreign investment is subservient to the goal of maximising domestic welfare, and hence there is most likely a

positive optimal export share requirement. While this result could be used by the Chinese to defend their export-share policy, it is clear that their current practice makes no attempt to establish an optimal ESR. Firms within the same industry are subject to different requirements, and requirements may vary from zero to 100 percent across firms.

Of course, in each case where the theoretical analysis indicates that the effect of the export share policy is ambiguous and no optimal ESR can be determined, it may be that the export-share policy causes an improvement in the particular policy goal. Any such improvement cannot be guaranteed, however, and will be due more to good luck than to any judicious choice of policy. If China is to continue with its export-share policy, it should convert existing quantitative restrictions to tariffs so that the domestic welfare gains are certain, and empirical analysis should be conducted to determine, even if only approximately, the welfare-optimising ESR. Even so, there is no guarantee that there will not be a decline in the level of foreign reserves.

APPENDIX A: DATA TABLES

Table A-1 Summary of requirements imposed on firms surveyed by CEMI.

	1980-86	1987-90	unknown year	Total
Specified ESR	18	19	2	39
Balance Foreign Exchange	6	1		7
No Export-share Target	10	4		14
Subtotal	34	24	2	60
Services, etc	7	5		12
Usable Replies	41	29	2	72
Ambiguous Replies	1	4	1	6
Unusable Replies				7
Total				85

Table A-2 Export-performance requirements imposed on each firm surveyed by CEMI.

Enterprise No.	Size (\$m)	Date	Export Target (%)	Product(s)	Location
Balance Foreign Exchange					
5	20	1984	balance forex	Tagament, Zentel, Ferbid, Ecotrin etc.	Tianjin
10	4.86	1986	balance forex	air-conditioning systems CFCU/AHU	Shanghai
32	N.A.	1983	balance forex	ice-cream, snack foods, soft drinks	Guangzhou
44	7	1985	balance forex	empty gelatin capsules	Jiangsu
50	2.5	1985	balance forex	N.A.	Guangzhou
60	10	1982	balance forex	process management & control instruments systems	Shanghai
64	12	1988	balance forex	beer	Shanghai

Enterprise No.	Size (\$m)	Date	Export Target (%)	Product(s)	Location
No Export-Share Target					
7	1.5	1985	0	OA equipment, calculators	Beijing
11	4	1985	0	computer equipment for railroad operations	Shanghai
18	20	1987	0	wide range of consumer household goods	Shanghai
22	4	1985	0	computer products, mini-computers, PCs	Shanghai
23	6.8	1984	0	fiber, cement, building materials	Guangzhou
28	28	1985	0	2 piece cans, plastic bottles, etc.	Guangzhou
29	7	1984	0	dry baby food	Guangzhou
33	0.1	1985	0	packaging, shipping	Guangzhou
54	7	1985	0	consumer electronics	Beijing
57	180	1984	0	Volkswagen SANTANAS	Shanghai
68	8	1988	0	large scale silicon integrated circuits for tele systems	Shanghai
69	11.3	1988	0	drive shafts for front wheel drive cars	Shanghai
70	201	1984	0	SANTANA passenger car engines (parts)	Shanghai
79	0.75	1986	0	French bakery products	Beijing
Service Industries or Export Target otherwise Not Applicable					
25	8	1988	N.A.	737/757 aircraft maintenance	Guangzhou
27	2.5	1985	N.A.	financing, equipment leasing	Guangzhou
31	52	1987	N.A.	Hotel	Guangzhou
39	0.6	1983	N.A.	services to oil companies	Shenzhen
40	0.4	1984	N.A.	special chemicals for oil industry	Shenzhen

Enterprise No.	Size (\$m)	Date	Export Target (%)	Product(s)	Location
41	2	1981	N.A.	electrical oil well logging, etc	Shenzhen
43	N.A.	1989	0	computer services, training	Beijing
46	3430	1983	N.A.	telecom services for foreign oil companies	Shenzhen
51	4900	1983	N.A.	telephones, PABX	Shenzhen
66	15	1987	N.A.	industrial gas	Shanghai
77	1.6	1983	0	survey & positioning servicing	Tianjin
85	88	1989	0	Aircraft maintenance	Beijing

Ambiguous Requirement or Response

26	N.A.	1990	specified increasing amounts each year by \$ value	beauty products, skin care, make up	Guangzhou
30	8	1988	< 50%	soft drink concentrates	Guangzhou
37	N.A.	1983	negotiable	oil explorations	Shenzhen
71	N.A.	1988	confidential	PABX	Shanghai
76	1.75	1989	N.A.	N.A.	Tianjin
83	N.A.	N.A.	N.A.	N.A.	Tianjin

Specified Export-Share Target

1	14	1984	20	elevators, escalators	Tianjin
2	0.96	1988	30	electronic music instruments, keyboards	Tianjin
3	0.3	1986	55	ready to wear clothes	Beijing
4	0.52	1987	30	grape wines (white, dry, rose, red)	Beijing
6	6.5	N.A.	25	alcohol based products, brandy, Seagram coolers	Shanghai
8	1	1987	70	men's suits, jackets, trousers	Tianjin

Enterprise No.	Size (\$m)	Date	Export Target (%)	Product(s)	Location
9	2.1	1986	25	dental products, multilayer artificial teeth	Shanghai
12	1.5	1989	9.5	fire engines, trucks, pumps, etc	Shanghai
13	3.3	1987	24.2	adhesive bandage	Shanghai
14	15	1986	20	elevators, escalator, maintenance	Shanghai
15	3.2	1987	20	air-compressors	Shanghai
16	1.8	1988	100	Dim Sum food products	Shanghai
17	1.2	1985	20	convention ovens, gravity ovens, digital monitors, etc	Shanghai
19	2.7	1987	30	air conditioning units	Shanghai
20	1.2	1987	53	panty hose, shorter stockings	Shanghai
21	3	1987	66	spices	Shanghai
24	1.4	1988	50	hot melt adhesives	Guangzhou
34	0.75	1989	100	leather goods, purses, wallets, folders	Guangzhou
35	>10	N.A.	95	technical athletic footwear	Guangzhou
36	N.A.	1986	66	vitreous China, sanitary products	Guangzhou
38	2.5	1986	100	packaging bags	Shenzhen
48	2	1987	21	yogurt, deserts	Guangzhou
52	450	1984	100	lube oil	Shenzhen
53	5	1985	25	heating wire for electric household appliances	Beijing
55	16	1983	3.5	Jeep, Cherokee, local BJ 212	Beijing
56	1.2	1987	10	circuit breakers	Tianjin
58	0.54	1986	95	brushes	Tianjin
59	N.A.	1980	50	elevators, escalators	Beijing
61	0.1	1981	50	body & hair care products	Tianjin
62	0.56	1980	20	Color TVs	Fujian

Enterprise No.	Size (\$m)	Date	Export Target (%)	Product(s)	Location
63	0.45	1985	95	cosmetics and paint brushes	Tianjin
65	63	1987	50% 51FS; 25% 41FS	41FS, 51FS, colour TV tubes	Shanghai
67	4.7	1986	30	soap	Shanghai
72	7.6	1988	50	integrated circuits	Shanghai
73	1.2	1980	30	wine, brandy, chinese medicine wine	Tianjin
74	1.65	1985	70	bicycle	Tianjin
75	0.88	1988	20	lighting fittings	Tianjin
78	3	1980	30	Intravenous infusions chemical reagents	Tianjin
82	12.1	1985	90	jewellery	Beijing

Unusable Responses

81	7.9	N.A.	N.A.	N.A.	N.A.
42	N.A.	N.A.	N.A.	N.A.	N.A.
45	N.A.	N.A.	N.A.	N.A.	N.A.
47	N.A.	N.A.	N.A.	N.A.	N.A.
49	N.A.	N.A.	N.A.	N.A.	N.A.
80	N.A.	N.A.	N.A.	N.A.	N.A.
84	N.A.	N.A.	N.A.	N.A.	N.A.

Note on classification for "Service Industries or Export Target otherwise Not Applicable":

Industries such as aircraft maintenance (25, 85), financing and equipment leasing (27), and computer services (43) are obvious service industries that would be difficult to earn export revenue from. Telephones and PABX (51), special chemicals for oil industry (40), and industrial gas (66) have been included in this category because they supply products that would assist Chinese industry, and they would normally be expected to be exempted from export targets, particularly if they were an early entrant into China.

Table A-3 Calculation of the probability that $\chi^2 \geq 9.0945$ for 27 observations with 3 categories and an expected distribution of (7.94, 14.29, 4.77)

NB: Only the 282 distributions with a $\chi^2 \geq 9.0945$ are shown.

Requirement Imposed			χ^2	Probability
No Export-share Target	Export-share Target Imposed	Balance Forex		
27	0	0	64.8136	1.31e-13
26	1	0	58.20852	3.54e-12
26	0	1	58.34818	3.54e-12
25	2	0	51.99528	4.60e-11
25	1	1	51.99499	9.21e-11
25	0	2	52.55394	4.60e-11
24	3	0	46.17389	3.84e-10
24	2	1	46.03364	1.15e-09
24	1	2	46.45263	1.15e-09
24	0	3	47.43087	3.84e-10
23	4	0	40.74435	2.30e-09
23	3	1	40.46414	9.21e-09
23	2	2	40.74318	1.38e-08
23	1	3	41.58146	9.21e-09
23	0	4	42.97898	2.30e-09
22	5	0	35.70665	1.06e-08
22	4	1	35.28649	5.29e-08
22	3	2	35.42556	1.06e-07
22	2	3	36.12389	1.06e-07
22	1	4	37.38146	5.29e-08
22	0	5	39.19827	1.06e-08
21	6	0	31.06081	3.88e-08
21	5	1	30.50068	2.33e-07
21	4	2	30.4998	5.82e-07
21	3	3	31.05817	7.76e-07
21	2	4	32.17578	5.82e-07
21	1	5	33.85263	2.33e-07
21	0	6	36.08873	3.88e-08
20	7	0	26.80681	1.16e-07
20	6	1	26.10672	8.15e-07
20	5	2	25.96588	0.000002
20	4	3	26.38429	0.000004
20	3	4	27.36194	0.000004
20	2	5	28.89884	0.000002
20	1	6	30.99498	8.15e-07
20	0	7	33.65037	1.16e-07

Requirement Imposed			χ^2	Probability
No Export-share Target	Export-share Target Imposed	Balance Forex		
19	8	0	22.94465	2.91e-07
19	7	1	22.10461	0.000002
19	6	2	21.82381	0.000008
19	5	3	22.10226	0.000016
19	4	4	22.93996	0.00002
19	3	5	24.3369	0.000016
19	2	6	26.29308	0.000008
19	1	7	28.80851	0.000002
19	0	8	31.88319	2.91e-07
18	9	0	19.47434	6.15e-07
18	8	1	18.49435	0.000006
18	7	2	18.07359	0.000022
18	6	3	18.21208	0.000052
18	5	4	18.90982	0.000077
18	4	5	20.1668	0.000077
18	3	6	21.98303	0.000052
18	2	7	24.3585	0.000022
18	1	8	27.29322	0.000006
18	0	9	30.78718	6.15e-07
17	10	0	16.39589	0.000001
17	9	1	15.27593	0.000011
17	8	2	14.71522	0.00005
17	7	3	14.71375	0.000133
17	6	4	15.27153	0.000232
17	5	5	16.38855	0.000279
17	4	6	18.06482	0.000232
17	3	7	20.30033	0.000133
17	2	8	23.09509	0.00005
17	1	9	26.4491	0.000011
17	0	10	30.36235	0.000001
16	11	0	13.70927	0.000002
16	10	1	12.44936	0.000019
16	9	2	11.74869	0.000094
16	8	3	11.60726	0.000282
16	7	4	12.02508	0.000564
16	6	5	13.00215	0.00079
16	5	6	14.53846	0.00079
16	4	7	16.63401	0.000564
16	3	8	19.28882	0.000282
16	2	9	22.50286	0.000094
16	1	10	26.27615	0.000019

Requirement Imposed			χ^2	Probability
No Export-share Target	Export-share Target Imposed	Balance Forex		
16	0	11	30.60869	0.000002
15	12	0	11.41451	0.000002
15	11	1	10.01463	0.000027
15	10	2	9.174007	0.00015
15	8	4	9.170486	0.001128
15	7	5	10.00759	0.001806
15	6	6	11.40395	0.002106
15	5	7	13.35954	0.001806
15	4	8	15.87439	0.001128
15	3	9	18.94847	0.000502
15	2	10	22.58181	0.00015
15	1	11	26.77439	0.000027
15	0	12	31.52621	0.000002
14	13	0	9.511591	0.000003
14	6	7	10.47692	0.004514
14	5	8	12.8518	0.003385
14	4	9	15.78593	0.001881
14	3	10	19.27931	0.000752
14	2	11	23.33193	0.000205
14	1	12	27.9438	0.000034
14	0	13	33.11491	0.000003
13	6	8	10.22107	0.007899
13	5	9	13.01524	0.005266
13	4	10	16.36866	0.002633
13	3	11	20.28132	0.000957
13	2	12	24.75323	0.000239
13	1	13	29.78438	0.000037
13	0	14	35.37478	0.000003
12	6	9	10.6364	0.01141
12	5	10	13.84986	0.006846
12	4	11	17.62256	0.003112
12	3	12	21.95451	0.001037
12	2	13	26.84571	0.000239
12	1	14	32.29615	0.000034
12	0	15	38.30583	0.000002
11	6	10	11.7229	0.013692
11	5	11	15.35565	0.007468
11	4	12	19.54764	0.003112
11	3	13	24.29888	0.000957
11	2	14	29.60936	0.000205
11	1	15	35.47909	0.000027

No Export-share Target	Requirement Imposed		χ^2	Probability
	Export-share Target Imposed	Balance Forex		
11	0	16	41.90806	0.000002
10	7	10	9.98779	0.021516
10	6	11	13.48058	0.013692
10	5	12	17.53261	0.006846
10	4	13	22.14389	0.002633
10	3	14	27.31442	0.000752
10	2	15	33.04419	0.00015
10	1	16	39.3332	0.000019
10	0	17	46.18146	0.000001
9	7	11	11.99736	0.01956
9	6	12	15.90943	0.01141
9	5	13	20.38076	0.005266
9	4	14	25.41132	0.001881
9	3	15	31.00113	0.000502
9	2	16	37.15019	0.000094
9	1	17	43.85849	0.000011
9	0	18	51.12604	6.15e-07
8	8	11	10.90599	0.022005
8	7	12	14.6781	0.01467
8	6	13	19.00947	0.007899
8	5	14	23.90008	0.003385
8	4	15	29.34993	0.001128
8	3	16	35.35903	0.000282
8	2	17	41.92737	0.00005
8	1	18	49.05496	0.000006
8	0	19	56.7418	2.91e-07
7	9	11	10.20646	0.01956
7	8	12	13.83862	0.01467
7	7	13	18.03003	0.009028
7	6	14	22.78068	0.004514
7	5	15	28.09057	0.001806
7	4	16	33.95971	0.000564
7	3	17	40.3881	0.000133
7	2	18	47.37573	0.000022
7	1	19	54.92261	0.000002
7	0	20	63.02873	1.16e-07
6	10	11	9.898782	0.013692
6	9	12	13.39098	0.01141
6	8	13	17.44243	0.007899
6	7	14	22.05312	0.004514
6	6	15	27.22306	0.002106

Requirement Imposed			χ^2	Probability
No Export-share Target	Export-share Target Imposed	Balance Forex		
6	5	16	32.95224	0.00079
6	4	17	39.24067	0.000232
6	3	18	46.08834	0.000052
6	2	19	53.49526	0.000008
6	1	20	61.46143	8.15e-07
6	0	21	69.98684	3.88e-08
5	22	0	10.01845	1.06e-08
5	11	11	9.982951	0.007468
5	10	12	13.33519	0.006846
5	9	13	17.24668	0.005266
5	8	14	21.71742	0.003385
5	7	15	26.7474	0.001806
5	6	16	32.33662	0.00079
5	5	17	38.48509	0.000279
5	4	18	45.19281	0.000077
5	3	19	52.45977	0.000016
5	2	20	60.28597	0.000002
5	1	21	68.67142	2.33e-07
5	0	22	77.61612	1.06e-08
4	23	0	12.03401	2.30e-09
4	22	1	9.094596	5.29e-08
4	12	11	10.45897	0.003112
4	11	12	13.67125	0.003112
4	10	13	17.44278	0.002633
4	9	14	21.77356	0.001881
4	8	15	26.66358	0.001128
4	7	16	32.11285	0.000564
4	6	17	38.12136	0.000232
4	5	18	44.68912	0.000077
4	4	19	51.81612	0.00002
4	3	20	59.50237	0.000004
4	2	21	67.74786	5.82e-07
4	1	22	76.5526	5.29e-08
4	0	23	85.91658	2.30e-09
3	24	0	14.44141	3.84e-10
3	23	1	11.36204	9.21e-09
3	13	11	11.32683	0.000957
3	12	12	14.39916	0.001037
3	11	13	18.03073	0.000957
3	10	14	22.22155	0.000752
3	9	15	26.97161	0.000502

Requirement Imposed			χ^2	Probability
No Export-share Target	Export-share Target Imposed	Balance Forex		
3	8	16	32.28092	0.000282
3	7	17	38.14947	0.000133
3	6	18	44.57727	0.000052
3	5	19	51.56432	0.000016
3	4	20	59.11061	0.000004
3	3	21	67.21614	7.76e-07
3	2	22	75.88092	1.06e-07
3	1	23	85.10495	9.21e-09
3	0	24	94.88822	3.84e-10
2	25	0	17.24066	4.60e-11
2	24	1	14.02133	1.15e-09
2	23	2	11.36125	1.38e-08
2	22	3	9.26041	1.06e-07
2	15	10	10.21342	0.00015
2	14	11	12.58654	0.000205
2	13	12	15.51891	0.000239
2	12	13	19.01052	0.000239
2	11	14	23.06138	0.000205
2	10	15	27.67149	0.00015
2	9	16	32.84084	0.000094
2	8	17	38.56944	0.00005
2	7	18	44.85728	0.000022
2	6	19	51.70436	0.000008
2	5	20	59.1107	0.000002
2	4	21	67.07627	5.82e-07
2	3	22	75.60109	1.06e-07
2	2	23	84.68516	1.38e-08
2	1	24	94.32847	1.15e-09
2	0	25	104.531	4.60e-11
1	26	0	20.43175	3.54e-12
1	25	1	17.07247	9.21e-11
1	24	2	14.27243	1.15e-09
1	23	3	12.03163	9.21e-09
1	22	4	10.35008	5.29e-08
1	21	5	9.227777	2.33e-07
1	18	8	9.216333	0.000006
1	17	9	10.33101	0.000011
1	16	10	12.00493	0.000019
1	15	11	14.2381	0.000027
1	14	12	17.03051	0.000034
1	13	13	20.38217	0.000037

Requirement Imposed			χ^2	Probability
No Export-share Target	Export-share Target Imposed	Balance Forex		
1	12	14	24.29307	0.000034
1	11	15	28.76322	0.000027
1	10	16	33.79261	0.000019
1	9	17	39.38125	0.000011
1	8	18	45.52913	0.000006
1	7	19	52.23626	0.000002
1	6	20	59.50263	8.15e-07
1	5	21	67.32825	2.33e-07
1	4	22	75.71311	5.29e-08
1	3	23	84.65722	9.21e-09
1	2	24	94.16058	1.15e-09
1	1	25	104.2232	9.21e-11
1	0	26	114.845	3.54e-12
0	27	0	24.0147	1.31e-13
0	26	1	20.51545	3.54e-12
0	25	2	17.57545	4.60e-11
0	24	3	15.1947	3.84e-10
0	23	4	13.37319	2.30e-09
0	22	5	12.11093	1.06e-08
0	21	6	11.40791	3.88e-08
0	20	7	11.26414	1.16e-07
0	19	8	11.67961	2.91e-07
0	18	9	12.65433	6.15e-07
0	17	10	14.18829	0.000001
0	16	11	16.2815	0.000002
0	15	12	18.93396	0.000002
0	14	13	22.14565	0.000003
0	13	14	25.9166	0.000003
0	12	15	30.24679	0.000002
0	11	16	35.13622	0.000002
0	10	17	40.5849	0.000001
0	9	18	46.59283	6.15e-07
0	8	19	53.16	2.91e-07
0	7	20	60.28641	1.16e-07
0	6	21	67.97207	3.88e-08
0	5	22	76.21698	1.06e-08
0	4	23	85.02113	2.30e-09
0	3	24	94.38453	3.84e-10
0	2	25	104.3072	4.60e-11
0	1	26	114.7891	3.54e-12
0	0	27	125.8302	1.31e-13

Requirement Imposed			χ^2	Probability
No Export-share Target	Export-share Target Imposed	Balance Forex		
				<u>0.0359604</u>

$$P(X \geq 9.0945) = 0.359604$$

Table A-4 Calculation of the probability that $\chi^2 \geq 0.0245$ for 20 observations with 2 categories and an expected distribution of (13.33, 6.67)

Export-share Requirement Imposed		χ^2	Probability
1% - 50%	51% - 100%		
20	0	10.00750	9.54e-07
19	1	7.23170	0.000019
18	2	4.90578	0.000181
17	3	3.02975	0.001087
16	4	1.60360	0.004621
15	5	0.62735	0.014786
14	6	0.10098	0.036964
13	7	0.02450	0.073929
12	8	0.39790	0.120134
11	9	1.22120	0.160179
10	10	2.49438	0.176197
9	11	4.21745	0.160179
8	12	6.39041	0.120134
7	13	9.01325	0.073929
6	14	12.08598	0.036964
5	15	15.60860	0.014786
4	16	19.58111	0.004621
3	17	24.00350	0.001087
2	18	28.87579	0.000181
1	19	34.19796	0.000019
0	20	39.97001	9.54e-07
			1.000000

$$P(\chi^2 \geq 0.0245) = 1.0000$$

APPENDIX B

Unemployment Distortion Parameter

The unemployment distortion parameter is defined in equation (8-21) as:

$$b = -\frac{Y_L(L_D + L_F)}{p_e} \left(\frac{d\lambda/d\alpha}{dF/d\alpha} \right)$$

From the comparative statics in chapter 7, we can substitute for $d\lambda/d\alpha$ and $dF/d\alpha$ in (8-21) to obtain the short run b as:

$$\begin{aligned} b &= -\frac{Y_L(L_D + L_F)}{p_e} \left(\frac{(1+\lambda)^2 Y_{LL}}{F_L[Y_L - (1+\lambda)(L_D + L_F)Y_{LL}]} \right) \\ &= -\frac{Y_L(1+\lambda)}{p_e} \left(\frac{1}{F_L} \right) \left(\frac{(1+\lambda)(L_D + L_F)Y_{LL}}{Y_L - (1+\lambda)(L_D + L_F)Y_{LL}} \right) \end{aligned}$$

But $w_x = w_y(1+\lambda)$, so from (5-6) and (5-12) we have:

$$(1+\lambda) = \frac{p_e F_L}{Y_L}$$

And hence:

$$b = -\left(\frac{(1+\lambda)(L_D + L_F)Y_{LL}}{Y_L - (1+\lambda)(L_D + L_F)Y_{LL}} \right)$$

For analytical convenience, let $\beta = Y_L - (1+\lambda)(L_D + L_F)Y_{LL}$, so that:

$$b = \frac{\beta - Y_L}{\beta} = 1 - \frac{Y_L}{\beta}$$

$Y_{LL} < 0$, so $\beta > Y_L$. Therefore, $(Y_L/\beta) < 1$, and b must lie between zero and 1.

From the comparative statics in chapter 7, we can substitute for $d\lambda/d\alpha$ and $dF/d\alpha$ in (8-21) to obtain the long run b as:

$$b = -\frac{Y_L(L_D + L_F)}{p_e} \left(\frac{a_{LF}(1+\lambda)^2 Y_{LL}}{Y_L - (1+\lambda)(L_D + L_F)Y_{LL}} \right)$$

which reduces to:

$$b = a_{LF} F_L \left(1 - \frac{Y_L}{\beta} \right)$$

Substituting (5-12) and (5-13) into the zero-profit condition (5-18) gives:

$$p_e F_K K^* + p_e F_L L_F = p_e F$$

And hence

$$F_K a_{KF} + F_L a_{LF} = 1$$

$F_K > 0$, $F_L > 0$, $a_{KF} > 0$, and $a_{LF} > 0$, so $0 < F_L a_{LF} < 1$, and therefore the long run value of b must also lie between zero and 1.

BIBLIOGRAPHY

- Anderson, K. (1990) "Urban Household Subsidies and Rural Out-Migration: The Case of China", Chinese Economy Research Unit Working Paper No. 90/3, The University of Adelaide, South Australia
- Asian Development Bank (1992) Key Indicators of Developing Asian and Pacific Countries, 23:114-125, Oxford University Press
- Basile, A. and Germidis, D. (1984) Investing in Free Export Processing Zones, OECD, Paris
- Batra, R.N. and Casas, F.R. (1976) "A Synthesis of the Heckscher-Ohlin and the Neoclassical Models of International Trade", Journal of International Economics, 6:21-38
- Batra, R.N. and Ramachandran, R. (1980) "Multinational Firms and the Theory of International Trade and Investment", American Economic Review, 70(3):278-290
- Bucknall, K. B. (1989) China and the Open Door Policy, Allen and Unwin
- Chao, C.C. and Yu, E.S.H. (1991) "Export-Share Requirements and Unemployment: The Case of Quota", Southern Economic Journal, 58(2):368-378
- _____ (1992) "Should Export-Share Requirements Be Implemented under Quota Protection?", Unpublished Manuscript
- _____ (1993) "Content Protection, Urban Unemployment and Welfare", Canadian Journal of Economics, XXVI(2):481-492
- _____ (1994) "Export-share requirements and welfare in less developed countries: a three-sector general equilibrium analysis", The Journal of International Trade and Economic Development, forthcoming
- Chow, G.C. (1993) "Capital Formation and Economic Growth in China", The Quarterly Journal of Economics, CVIII(3):809-842
- Cremer, R.D. (1992) On the Rationale of Export Share Requirements: A Project Briefing, China Economic Research Centre, University of East Asia, Macau
- Dei, F. (1985) "Voluntary Export Restraints and Foreign Investment", Journal of International Economics, 19(3/4):305-312
- Dong, S., Zhang, D. and Larson, M.R. (1992) Trade and Investment Opportunities in China: The Current Commercial and Legal Framework, Quorum Books, Westport

- Economist (1993) "When the Chinese go on strike", The Economist, 2 October:26
- _____ (1994) "China's Government in a jam", The Economist, 15 January:29
- Ethier, W.J. (1988) "A Survey of the Pure Theory of International Trade" in Ethier, W.J. (1988) Modern International Economics, 2nd edition, W.W. Norton and Company
- Frisbie, J. (1992) "Surveying the Foreign Exchange Climate", The China Business Review, March-April:15
- Goldstein, C. (1993) "Resisting the Centre", Far Eastern Economic Review, 2 September:42-44
- Grummitt, K.P. (1986) China Economic Handbook, Euromonitor Publications Ltd., London
- Guillermaz, J. (1968) A History of the Chinese Communist Party 1921 - 1949, translated by Anne Destenay, Methuen & Co Ltd, London
- Harris, J.R. and Todaro, M.P. (1970) "Migration, Unemployment and Development: A Two-Sector Analysis", American Economic Review, 60:126-142
- Herander, M.G. and Thomas, C.R. (1986) "Export-Performance and Export-Import Linkage Requirements", Quarterly Journal of Economics, 101(3):591-607
- Hsu, J.C. (1989) "The Role of Foreign Trade in China's Economic Reforms, 1979-85" in Y.C. Jao, Victor Mok, and Lok-sang Ho (eds) Economic Development in Chinese Societies: Models and Experiences, Hong Kong University Press, pp 129-139
- House, K.E. (1993) "Head for Heights: Vice-Premier Zhu says economic reforms will continue", Far Eastern Economic Review, 23 December:28
- Huang Hua (1993) "The Market Economy in China", Security Dialogue, 24(2):175-179
- IMF (1982) International Financial Statistics, 35(1)
- ___ (1985) International Financial Statistics, 38(1)
- ___ (1988) International Financial Statistics, 41(1)
- ___ (1989) International Financial Statistics, 42(1)
- ___ (1993) International Financial Statistics, 46(1)
- James, D.E. and Throsby, C.D. (1984) An introduction to Quantitative Methods in Economics, John Wiley and Sons
- Jones, R.W. (1965) "The Structure of Simple General Equilibrium Models", Journal of Political Economy, 73(6):557-572

- Kaye, L. (1993) "Haves and Have-Nots", Far Eastern Economic Review, 2 September:46
- Lardy, N.R. (1992) Foreign Trade and Economic Reform in China: 1978-1990, Cambridge University Press, Cambridge
- Li, Dong (1993) "One Country, Two Societies" in D. Bing, S. Lim, and M. Lin (eds) Asia 2000: Modern China in Transition, pp 83-91
- Mackerras, C., and Yorke, A. (1991) The Cambridge Handbook of Contemporary China, Cambridge University Press, Cambridge
- Mansfield, E. (1991) Microeconomics, 7th ed., W.W. Norton & Company, New York.
- Morrison, M., Barnathan, J., and Curry, L. (1994) "The Road to Market: A talk with Zhu Rongji", International Business Week, 31 January:18-19
- Osborne, M. (1986) China's Special Economic Zones, OECD, Paris
- Panagariya, A. (1993) "Unravelling the Mysteries of China's Foreign Trade Regime", The World Economy, 16(1):51-68
- Prachowny, M.F.J. (1984) Macroeconomic Analysis for Small Open Economies, Clarendon Press, Oxford
- Rao, C.R. (1973) Linear Statistical Inference and Its Applications, 2nd ed., John Wiley and Sons, New York
- Riskin, C. (1991) China's Political Economy: The Quest for Development since 1949, Oxford University Press
- Rodrik, D. (1987) "The Economics of Export-Performance Requirements", The Quarterly Journal of Economics, 102(3):633-650
- State Statistical Bureau (1993) China Statistical Yearbook 1993, China Statistical Information and Consultancy Service Center, Beijing; and International Center for the Advancement of Science and Technology Limited.
- Stern, R.M., Francis, J. and Schumacher, B. (1976) Price Elasticities in International Trade: An Annotated Bibliography, Macmillan Press Ltd, London.
- Todaro, M.P. (1989) Economic Development in the Third World, 4 ed, Longman, New York
- U.S.-China Business Council (1990) U.S. Investment in China, published by: U.S.-China Business Council, Beijing
- Van Matre, J.G. and Gilbreath, G.H. (1980) Statistics for Business and Economics, Business Publications Inc., Dallas

- Wu, H.X. (1991) "China's Urbanization and Rural-to-Urban Migration: Estimates and Analysis in a Perspective of Economic Development in Pre- and Post-Reform Periods", Chinese Economy Research Unit Working Paper No. 91/8, The University of Adelaide, South Australia
- Zhang Xiaohe (1991) "The Urban-Rural Isolation and its Impact on China's Production and Trade Pattern", Chinese Economy Research Unit Working Paper No. 91/4, The University of Adelaide, South Australia