野田容助・黒子正人編『長期時系列における貿易データと貿易指数の作成と応用』調査研究報告書, 開発研究センター2005-Ⅱ-04, アジア経済研究所, 2006 年

Chapter 9

Estimating China's Disaggregate Import Demand Functions[1]

Preliminary Report

FUKUMOTO Mayumi

要約

中国の輸入を要素集約度（Natural Resource Intensive, Unskilled Labor Intensive, Technology Intensive, Human Capital Intensive）で分類し、それぞれの分類ごとに輸入関数の推計を行った。まずは、中国の輸入とＧＤＰ，及び相対価格との間に長期的な関係が存在するかどうかを分析するために、Panel Dependence Test を行った上で単位根検定を行ったが、輸入及び相対価格については単位根であるという帰無仮説は棄却された。その後、パネル回帰を行ったがさらなる詳細な分析は来年度に行うこととする。

キーワード

China, Import Demand Functions

Introduction

There have been a few studies of estimating China's aggregate demand functions. For example, Moazzami and Wong (1988) estimated China's import demand function

with 17 annual observations (1970-86) by using a partial adjustment model. The OLS result showed that an income elasticity of imports is 0.87 and 3.78 in the short and long runs, respectively. The estimated short-and long-run price elasticities are -0.52 and -2.26 respectively.

Senhadji (1998) estimated structural import demand equations for 66 countries including China using available data from the World Bank database. Senhadji used GDP minus exports rather than GDP and he employed the Phillips and Hansen fully modified (FM) and OLS estimators. Estimated results (1960-93) for China's import demand based on a partial adjustment mechanism showed that long-run (FM estimator) price and income elasticities are -0.39 (insignificant at 10% significant level) and 2.12 respectively. The estimated short-run price and income elasticities are -0.04 and 0.24 respectively, but these estimates are insignificant at the 10% significance level. Also, the study found no cointegration for China's import demand equation.

Tang (2003) examined long-run relationship of China's aggregate import demand function for the period of 1970-1999. The long-run relationship of China's import demand function was estimated using the bounds testing approach. Several definitions are applied to represent domestic demand, i.e., GDP, GDP minus exports, national cash flow, and final expenditure components (consumption, investment, exports). The empirical result indicated a long-run equilibrium relationship between these measures of domestic demand and China's import demand. Overall, China's import demand function is found to be inelastic with respect to relative prices and income in the long run.

All the above studies are conducted in the aggregate level and there has been no attempt to investigate china's product specific import demand functions[2]. This main contribution of this study is to estimate China's product-specific import demand functions. Import products are disaggregated according to factor intensity, i.e., natural resource intensive, unskilled labor intensive, technology intensive and human capital intensive. The author calculated product and country specific price indices and used them in the pooled estimation for each product category. The method used here is panel regression (fixed effect model) and will be further modified since the dataset exhibits panel dependence. A complete version of this study will be reported next year.

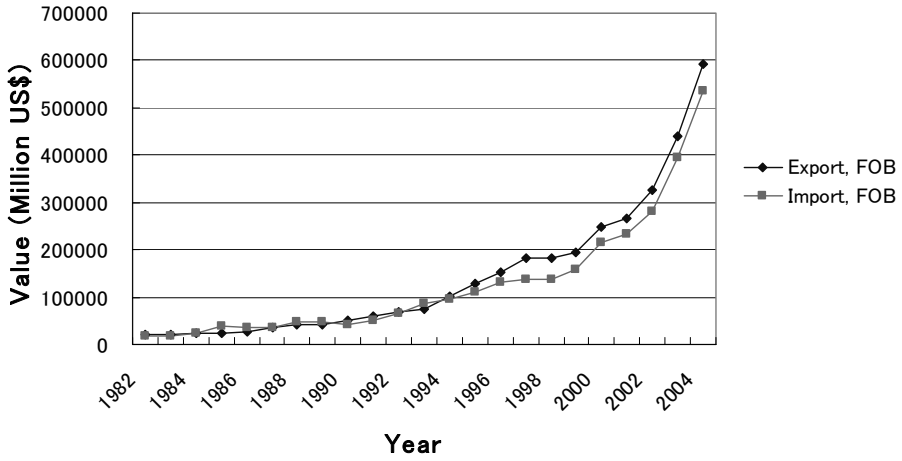
1. The Changing Patterns of China's Foreign Trade

Figure 1 shows export and import values of goods China from 1982 to 2004. Trade surplus increased remarkably around 1994 and still continues to expand. In 2004, the share of trade surplus to GDP (in real terms) marked 17.6% leading to a strong pressure of Yuen appreciation.

As Table 1 shows, Japan and NIEs are China's major trading partners accounting for around half of China's export and imports. However, exports to Japan had begun to drop after 1996 and export share of the US and EU15 has increased instead.

Table 2 shows China's exports and imports according to the product classification used in this study[3]. According to the table, imports of technology intensive have become major products and its share has been increasing rapidly. At the same time, exports of technology intensive products have been also expanding. It can be easily seen that China needs to import components to produce technology intensive products for exports. On the other hand, imports of unskilled labor intensive and human capital intensive had decreased significantly and their share dropped to the half compared to those in the mid-90s. Considering different changes of trade

Figure 1. China's Trade Value



Source: IMF (2006)

Table 1. China's Major Trade Partners

i) Imports (% share in total imports)

Year	JAPAN	US	ASEAN4[a]	NIES[b]	EU15	AUNZ[c]
1987	23.3	11.1	3.3	22.2	11.1	3.6
1988	20.0	12.0	3.7	26.0	9.5	2.7
1989	17.8	13.3	3.6	27.4	10.8	3.0
1990	14.2	12.3	3.9	33.6	11.4	2.8
1991	15.7	12.5	4.3	36.3	14.5	2.7
1992	17.0	11.0	3.7	37.5	13.5	2.4
1993	22.4	10.3	3.2	30.2	15.1	2.1
1994	22.8	12.0	3.8	28.8	16.1	2.4
1995	22.0	12.2	4.5	28.1	16.1	2.2
1996	21.0	11.6	4.9	28.9	14.3	2.8
1997	20.4	11.5	5.3	30.1	13.5	2.5
1998	20.3	12.0	5.8	30.4	14.8	2.2
1999	20.4	11.8	6.2	28.8	15.4	2.5
2000	18.4	9.9	7.1	28.1	13.7	2.5
2001	17.6	10.8	6.9	26.8	14.7	2.5
2002	18.1	9.2	7.7	28.6	13.1	2.3
2003	18.0	8.2	8.4	27.6	12.8	2.0

ii) Exports (% share in total exports)

Year	JAPAN	US	ASEAN4[a]	NIES[b]	EU15	AUNZ[c]
1987	16.2	7.7	2.5	38.3	7.3	0.9
1988	16.6	7.1	2.6	41.8	7.3	0.8
1989	16.0	8.4	2.5	46.0	6.7	0.9
1990	14.5	8.3	2.8	48.6	6.6	0.8
1991	14.2	8.6	2.8	51.4	9.8	0.9
1992	13.7	10.1	2.6	50.2	9.4	0.9
1993	17.2	18.5	2.6	31.2	13.4	1.3
1994	17.8	17.7	3.1	34.4	12.7	1.4
1995	19.1	16.6	3.7	33.1	12.9	1.2
1996	20.4	17.7	3.4	31.1	13.1	1.3
1997	17.4	17.9	3.6	33.2	13.1	1.3
1998	16.1	20.7	3.0	28.7	15.3	1.4
1999	16.6	21.5	3.2	27.3	15.5	1.6
2000	16.7	20.9	3.7	26.7	15.3	1.5
2001	16.9	20.4	3.8	26.3	15.4	1.5
2002	14.9	21.5	4.1	26.9	14.8	1.6
2003	13.6	21.1	4.0	26.1	16.5	1.6

Source: UN Comtrade Online(i, ii, iii)

Notes: [a] Malaysia,Thailand, Philippines, Indonesia, [b] Korea, Hong Kong, Singapore, [c] New Zealand, Australia

iii) Share of the above Areas to the Total

Year	Imports	Exports
1987	74.6	72.8
1988	73.9	76.3
1989	75.9	80.4
1990	78.2	81.6
1991	86.1	87.6
1992	85.1	87.0
1993	83.4	84.2
1994	85.9	87.2
1995	85.1	86.7
1996	83.5	87.0
1997	83.2	86.4
1998	85.5	85.3
1999	85.0	85.7
2000	79.8	85.0
2001	79.2	84.2
2002	78.9	83.8
2003	77.1	82.8

Table 2. Trade Share by 5 Product Groups

Year	Imports(% share in total imports)					Exports(% share in total exports)				
	0	1	2	3	4	0	1	2	3	4
1987	19.5	11.2	42.0	25.7	1.2	25.1	36.3	8.1	12.4	11.5
1988	21.1	10.6	43.7	22.7	1.4	26.0	36.4	10.3	14.3	8.2
1989	21.3	10.9	41.0	23.6	2.8	23.1	39.4	11.7	16.7	8.2
1990	20.0	13.7	42.2	21.3	2.4	20.7	38.1	12.4	18.6	8.3
1991	17.7	13.9	43.8	20.9	3.3	19.4	40.7	13.0	19.3	6.5
1992	17.8	12.7	47.0	17.3	4.5	17.8	47.1	14.3	14.8	5.5
1993	13.1	10.6	45.5	24.5	5.6	17.0	48.0	15.3	14.8	4.5
1994	15.3	11.7	48.5	20.2	3.5	17.0	47.8	16.4	15.2	3.4
1995	19.5	11.8	49.0	14.8	3.9	15.8	43.1	20.0	17.2	3.6
1996	18.3	11.6	49.7	14.9	5.0	14.8	42.7	22.1	16.4	3.9
1997	18.0	11.3	48.2	14.6	7.2	13.8	43.5	22.7	16.0	3.8
1998	16.7	10.6	53.2	14.7	4.9	12.4	42.6	25.5	16.7	2.8
1999	15.9	9.2	54.2	14.4	5.4	11.8	41.0	28.0	16.7	2.4
2000	16.5	8.0	52.5	13.1	9.2	11.0	38.4	29.9	17.4	3.1
2001	15.9	7.5	55.6	13.1	7.2	10.6	36.9	31.9	17.2	3.2
2002	14.3	6.6	58.4	13.6	6.5	9.9	35.3	34.3	17.7	2.6
2003	14.3	5.4	58.5	14.5	7.0	9.0	32.8	37.9	17.5	2.5

Source: UN Comtrade Online

Notes: 0: Natural Resource Intensive, 1: Unskilled Labor Intensive, 2: Technology Intensive, 3: Human Capital Intensive, 4: Fuels

Table 3. China's Trade by Products and Regions

i) ASEAN4

Year	Imports					Exports				
	0	1	2	3	4	0	1	2	3	4
1987	87.1	2.1	8.4	2.4	0.0	45.3	12.4	14.0	8.6	19.6
1988	80.4	3.2	8.1	6.9	1.4	47.7	10.3	14.7	11.7	15.6
1989	70.3	2.3	7.0	7.1	13.2	38.2	10.6	18.4	17.4	15.3
1990	68.4	2.0	7.0	10.8	11.8	34.2	8.9	21.5	27.6	7.8
1991	58.0	1.5	10.2	12.0	18.3	39.0	7.6	23.6	22.3	7.5
1992	60.8	1.7	6.4	3.2	27.8	35.4	13.6	25.6	18.5	5.4
1993	56.1	3.3	9.6	7.4	23.5	29.3	16.3	31.0	15.7	5.8
1994	60.5	4.7	10.2	5.6	18.9	33.3	19.8	26.9	15.8	2.8
1995	57.8	5.2	15.4	5.1	16.3	24.6	16.6	27.7	27.1	3.4
1996	47.3	7.1	20.4	6.6	18.5	23.4	14.5	32.8	23.0	6.2
1997	39.6	5.8	27.7	8.3	18.6	22.9	16.8	32.6	22.2	5.2
1998	37.1	5.0	38.0	11.2	8.6	28.4	18.0	36.0	14.5	3.1
1999	32.0	4.0	43.4	10.9	9.3	21.3	18.3	40.3	18.1	1.9
2000	26.9	3.2	50.5	7.5	11.7	16.5	15.9	40.4	21.5	5.7
2001	23.7	3.3	57.4	6.7	8.8	12.8	15.9	46.8	18.8	5.6
2002	19.6	2.9	62.6	6.3	8.5	14.3	15.5	48.0	17.8	4.4
2003	17.6	2.2	66.2	5.9	8.0	13.7	15.6	47.7	16.9	6.0

ii) NIEs

Year	Imports					Exports				
	0	1	2	3	4	0	1	2	3	4
1987	7.0	38.6	20.6	30.5	2.9	19.4	45.8	6.7	22.1	5.9
1988	7.9	30.7	30.0	28.1	3.0	19.4	42.9	9.8	23.7	4.2
1989	9.4	28.2	29.8	26.8	5.5	16.2	43.9	11.0	24.9	4.1
1990	7.7	30.9	28.9	29.2	3.1	14.9	41.6	12.4	27.0	4.1
1991	7.4	29.7	30.7	28.6	3.5	13.1	43.3	13.3	26.8	3.5
1992	10.7	24.8	41.6	17.3	4.0	12.4	50.4	14.6	19.3	3.2
1993	10.1	21.8	42.6	17.1	7.6	16.1	48.1	15.5	16.3	3.8
1994	11.0	23.3	43.4	16.9	4.9	17.3	47.2	16.8	15.5	3.1
1995	11.4	23.4	44.4	15.8	4.6	16.3	40.9	21.2	17.8	3.6
1996	10.9	22.0	46.1	16.0	4.7	15.4	40.1	22.9	17.5	4.0
1997	11.0	21.2	45.4	15.5	6.6	14.9	43.2	21.3	16.2	4.5
1998	10.1	19.5	49.2	16.3	5.0	13.1	41.4	25.2	16.6	3.6
1999	9.4	17.2	51.6	16.6	4.8	12.6	36.5	29.9	17.0	4.0
2000	9.0	14.5	56.2	15.2	4.9	12.4	31.5	34.3	17.2	4.5
2001	8.2	13.4	58.6	15.0	4.6	12.1	29.5	37.9	15.6	4.9
2002	6.6	10.8	65.7	13.6	3.2	11.7	28.4	41.4	14.6	3.8
2003	5.8	8.4	68.7	13.5	3.4	10.8	26.1	45.4	14.4	3.3

Source: UN Comtrade Online

Notes: 0: Natural Resource Intensive, 1: Unskilled Labor Intensive, 2: Technology Intensive, 3: Human Capital Intensive, 4: Fuels

iii) JAPAN

Year	Imports					Exports				
	0	1	2	3	4	0	1	2	3	4
1987	4.3	6.3	49.5	39.6	0.3	36.5	21.5	5.7	1.7	34.5
1988	4.6	6.5	51.1	37.7	0.2	40.9	24.2	6.9	2.6	25.4
1989	4.7	7.9	47.6	39.6	0.2	37.2	28.0	7.6	3.7	23.5
1990	5.7	11.5	48.3	33.6	0.9	33.3	25.2	7.7	4.7	29.0
1991	5.2	11.9	49.2	32.9	0.8	35.1	29.6	8.3	6.5	20.3
1992	5.0	11.6	53.3	29.2	1.0	32.1	36.7	8.6	4.5	18.1
1993	4.2	9.3	51.1	34.5	0.9	26.4	41.7	11.5	7.9	12.4
1994	4.6	11.2	52.0	31.7	0.5	28.1	43.6	11.7	8.7	7.8
1995	5.2	12.0	58.4	23.3	0.7	25.9	41.2	15.1	10.9	6.8
1996	5.3	12.8	60.2	20.8	0.9	23.5	41.4	17.6	10.1	7.4
1997	5.9	12.1	59.0	21.5	1.5	22.8	39.8	19.5	11.1	6.8
1998	6.2	11.1	61.0	20.8	0.9	21.7	40.2	21.4	11.9	4.7
1999	6.4	10.6	62.3	19.9	0.7	21.3	42.4	21.3	11.5	3.5
2000	5.5	10.7	64.7	18.5	0.6	19.4	41.9	23.0	10.9	4.7
2001	6.3	10.1	65.2	17.6	0.7	18.5	41.1	23.9	12.0	4.4
2002	5.1	8.0	66.6	19.5	0.7	17.5	37.4	27.8	13.2	4.0
2003	4.3	6.8	69.6	18.6	0.7	16.2	34.0	31.6	13.9	4.1

iv) EU

Year	Imports					Exports				
	0	1	2	3	4	0	1	2	3	4
1987	13.1	2.4	63.0	21.4	0.1	34.8	41.6	12.5	8.3	2.8
1988	15.5	3.0	64.8	16.6	0.1	34.5	41.2	12.3	9.4	2.6
1989	16.9	3.9	63.6	15.6	0.1	29.7	41.9	14.6	10.5	3.2
1990	17.0	3.5	68.7	10.6	0.3	28.2	41.9	15.4	11.6	2.8
1991	11.0	3.0	70.5	15.3	0.2	24.2	48.1	15.8	9.8	2.1
1992	9.8	2.7	68.2	19.0	0.2	21.6	49.5	16.6	10.1	2.0
1993	6.5	2.5	66.2	24.0	0.5	14.6	49.8	17.8	16.7	1.1
1994	6.6	4.3	72.7	15.7	0.4	14.5	47.3	20.3	16.9	1.1
1995	10.8	4.3	70.7	13.5	0.4	13.7	41.5	24.5	18.3	2.0
1996	9.1	3.1	73.9	13.0	0.3	12.9	40.8	27.1	17.8	1.4
1997	9.7	3.0	72.3	14.2	0.3	11.5	40.2	30.1	16.9	1.3
1998	9.4	2.9	73.6	13.9	0.2	10.8	38.2	32.1	17.4	1.5
1999	10.4	2.9	72.1	13.1	1.3	10.5	36.8	34.5	17.2	1.0
2000	12.1	3.1	69.1	14.4	1.2	9.7	34.6	36.4	18.3	1.0
2001	9.9	3.1	68.7	17.5	0.8	9.6	33.4	37.1	18.5	1.3
2002	9.4	3.6	66.0	19.9	1.0	7.8	34.0	37.1	20.2	1.0
2003	8.6	3.4	64.2	23.3	0.5	6.7	30.6	42.1	19.4	1.1

Source: UN Comtrade Online

Notes: 0: Natural Resource Intensive, 1: Unskilled Labor Intensive, 2: Technology Intensive, 3: Human Capital Intensive, 4: Fuels

v) US

Year	Imports					Exports				
	0	1	2	3	4	0	1	2	3	4
1987	21.0	2.0	68.3	8.1	0.6	14.1	51.8	8.0	9.7	16.3
1988	30.3	2.0	60.9	6.1	0.6	17.8	51.6	9.0	11.3	10.3
1989	33.4	2.2	54.5	9.2	0.7	14.2	49.2	10.5	12.3	13.8
1990	27.7	2.6	62.0	7.0	0.7	13.3	51.0	10.6	12.0	13.1
1991	24.0	1.8	64.6	8.2	1.4	10.9	55.7	10.4	12.5	10.5
1992	19.5	3.9	62.9	10.2	3.1	9.7	58.2	13.8	11.7	6.2
1993	13.5	3.9	65.9	12.9	3.3	5.6	61.1	14.3	16.7	2.1
1994	15.3	3.0	69.4	10.5	1.2	4.9	57.8	16.6	18.8	1.7
1995	29.1	3.5	57.6	8.6	0.7	5.3	53.9	19.2	19.7	1.8
1996	22.5	3.5	63.1	9.6	0.7	4.9	52.7	22.0	18.6	1.8
1997	22.3	2.9	62.9	9.8	1.4	5.0	51.7	24.0	17.8	1.4
1998	18.0	2.2	69.5	9.1	1.1	5.2	48.8	25.8	19.2	1.0
1999	16.6	1.9	70.5	9.2	1.0	5.0	47.0	27.8	19.7	0.5
2000	21.0	2.0	67.5	8.3	0.5	4.8	44.4	28.8	20.6	1.3
2001	19.0	1.8	70.3	7.8	0.4	5.0	43.3	29.4	21.6	0.7
2002	18.7	2.1	69.2	8.6	0.6	4.8	40.0	32.2	22.5	0.5
2003	24.3	2.2	62.3	10.0	0.7	4.6	35.4	37.3	22.1	0.6

vi) AUNS

Year	Imports					Exports				
	0	1	2	3	4	0	1	2	3	4
1987	10.5	68.0	11.7	5.3	4.5	86.7	0.7	6.7	5.2	0.8
1988	9.4	69.5	11.4	7.5	2.2	88.4	1.3	6.3	3.1	0.8
1989	10.5	68.1	10.3	8.5	2.5	81.4	1.4	9.6	6.3	1.3
1990	10.6	63.6	10.0	8.9	6.9	71.5	1.1	16.7	8.0	2.7
1991	9.7	68.4	10.4	9.6	1.9	76.6	1.2	14.7	6.7	0.7
1992	8.3	68.4	11.7	11.1	0.5	77.6	2.4	11.4	2.5	6.1
1993	6.1	64.6	11.2	17.9	0.2	72.8	3.0	15.0	4.3	4.7
1994	5.6	63.4	11.4	19.2	0.3	71.7	3.0	19.7	4.0	1.3
1995	6.4	59.9	13.2	20.0	0.5	72.2	1.8	18.5	4.6	2.2
1996	6.2	58.4	15.5	18.3	1.6	76.5	1.4	12.9	4.9	3.9
1997	6.4	56.3	16.6	18.7	2.0	75.2	2.0	12.1	5.5	5.1
1998	7.5	53.9	18.8	18.1	1.7	71.5	1.4	15.9	7.1	4.1
1999	6.1	55.8	19.1	17.7	1.2	58.7	0.9	15.6	5.9	6.4
2000	6.2	52.3	20.4	18.3	2.8	60.6	0.8	16.7	5.1	7.2
2001	6.6	49.4	22.8	19.3	1.9	62.7	0.8	15.2	5.8	4.9
2002	6.5	46.0	23.1	22.1	2.2	62.1	0.9	15.9	6.5	7.5
2003	6.5	42.3	27.2	21.0	3.0	63.4	0.9	18.4	6.3	9.6

Source: UN Comtrade Online

Notes: 0: Natural Resource Intensive, 1: Unskilled Labor Intensive, 2: Technology Intensive, 3: Human Capital Intensive, 4: Fuels

patterns in those product groups, particularly imports, each import demand would react to the environmental changes such as relative prices, domestic demand differently. Thus, it is important to estimate import demand functions for each product separately.

Table 3 explains trade patterns more clearly. For example, imports of technology intensive from all regions have increased. On the contrary, imports of human capital intensive from Japan and NIEs have decreased. Those from the US and EU15 seem to remain stable.

2. Estimation of China's Import Demand Functions

2.1 Model and Data Description

For each product group, estimated equation is as follows:

$$\ln M_{it} = \alpha_0 + \alpha_1 \ln GDP_t + \alpha_2 \ln EX_t + \alpha_3 \ln\{EXRA_t \; PM_{it} / PD_t\}$$
$$+ \alpha_4 \ln GL_{it} + \alpha_5 \ln M_{i,t-1} + \varepsilon_{it}$$

where i represents partner country, t is year, GDP is China's real GDP[4], EX is China's product specific real exports, EXRA is RMB yuan's exchange rate, PM is China's country specific import prices, PD is domestic price, and GL is Grubel-Lloyd index. Although GDP and exports are highly correlated, both variables still need to be included in order to capture the fact that some exports need more imports than others. GL is included to capture the effects of trade in differentiated final products on import demand.

Data of exports and imports come from UN Comtrade online and others come from China Statistical Yearbook. Sample year is from 1988 to 2003, and 17 countries[5] are included as trading partners. Imports are deflated by using country specific import prices, and real exports are deflated by product specific export prices. Product specific import price indices were calculated using the Laspeyres, Paasche and Fischer formulas both in chained and fixed. In the analysis, chained Paasche is used. Purchasing price index of raw material is used as corresponding domestic price in the equation of natural resource intensive, and the ex-factory price index of industrial products is introduced as domestic price index for the other products.

2.2 Cross Dependence and Unit Root Tests

Before proceeding to the estimation, it should be noted that we are not only interested in analyzing determinants of import demand, but also examine whether there exists a long-time relationship among imports and regressors. Thus, it is required to conduct panel unit root tests. However, some panel unit root tests suffer from size distortions when the dataset is cross-dependent[6]. Therefore, before proceeding further, it is essential to test whether the dataset is cross-dependent panels.

Among tests of cross section dependence, the author applied two tests. One is Breush and Pagan's test (BP test) and the other is a new test developed by Pesaran (2004). Table 4 reports the results of the test and it shows existence of cross dependence for all product groups.

Next step is to conduct panel unit root tests for cross dependent panels. There have been various kinds of methodology such as using common factors, SUR based tests, subsampling, etc[7]. The author conducted one simple test proposed by Choi (2001b). Choi (2001b) shows that cross-sectional demeaning can eliminate the cross-sectional correlation and apply the panel unit root tests developed for independent panels. Thus, after demeaning the data for each variable, tests based on p-values were applied[8]. There are two test statistics. One is called the inverse chi-square test (shown as P in table 5.1 and table 5.2), and the other is the inverse normal test (shown as Z in both

Table 4. Cross Dependence of China's Import Demand Functions

	Regressors	*Natural Resource Intensive*	*Unskilled Labor Intensive*	*Technology Intensive*	*Human Capital Intensive*
BP Test	RP, GDP	1286.2	255.7	744.6	442.7
	RP, GDP, $Import_{t-1}$	307.5	173.5	245.3	310.8
	RP, GDP, $Import_{t-1}$, Exports	334.5	146.8	264.7	315.7
	RP, GDP, $Import_{t-1}$, GL, Exports		151.4	219.7	298.9
Pesaran's Test	RP, GDP	35.2	3.9	24.3	9.3
	RP, GDP, $Import_{t-1}$	11.09	2.0	4.0	5.9
	RP, GDP, $Import_{t-1}$, Exports	11.06	1.9	3.9	4.5
	RP, GDP, $Import_{t-1}$, GL, Exports		3.1	6.0	4.8

Notes: Dependent variable is country-specific imports

Table 5.1. Panel Unit Root Tests for Cross Dependent Panels[a]

Null Hypothesis: Unit root

			Natural Resource			Unskilled Labor Intensive				Technology Intensive				Human Capital Intensive				GDP
			Import	RP[b]	Exports	Import	RP	GL	Exports	Import	RP	GL	Exports	Import	RP	GL	Exports	
P	No cross-sectional correlation	(1)	19.5	72.9		72.9	38.9	42.8		20.5	35.7	34.9		41.0	80.8	38.7		
		(2)	82.7	90.6		40.3	91.2	73.2		41.0	97.6	117.1		59.3	127.0	50.0		
		(3)	77.2	0.1		53.9	68.5	82.6		108.2	49.3	79.8		40.4	84.5	58.4		
	Cross-sectional correlation	(4)	117.8	109.7		57.1	113.6			76.6	98.3			133.1	72.7			
		(5)	170.8	157.5		113.4	166.5			121.3	162.6			174.0	163.2			
Z	No cross-sectional correlation	(1)	4.1	-2.9		-4.0	1.1	0.2		6.1	3.1	2.9		0.7	-2.9	2.0		
		(2)	-1.7	-3.5		-1.0	-2.0	-1.4		3.4	0.6	-4.4		2.1	-5.2	0.0		
		(3)	3.3	1.6		-0.3	-1.7	-4.8		-2.3	2.0	0.6		0.8	-3.0	-1.0		
	Cross-sectional correlation	(4)	-6.9	-6.4		-2.2	-6.9			-3.8	-5.1			-6.9	-3.7			
		(5)	-9.8	-9.4		-6.8	-9.9			-7.3	-9.5			-10.0	-9.0			
LLC Tests (No cross-sectional correlation)		(1)	-1.6	5.3	21.5	0.1	-4.3	2.4	6.3	10.2	2.2	0.6	29.8	2.3	-11.1	-5.2	11.1	9.0
		(2)	0.5	12.0	-29.5	42.6	-118.9	-66.0	15.7	-7.6	-3.6	0.2	-4.2	-4.5	-26.1	3.1	-36.3	116.8
		(3)	-14.5	6.6	-3.9	-2.5	-10.6	-3.5	16.0	2.7	6.1	-5.6	1.0	13.4	-4.7	-3.3	49.0	-283.7

(Notes)
* Sample is balanced panel with 16 time series (from 1988 to 2003) and 17 cross-sectional.
** Shaded areas' p-values are less than 0.10. See table 5.2 for detalied p-values

[a] The BIC lag selection was used for the tests with the maximum lag of five for the equation (3) and six for others.
[b] Relative price
(1): No deterministic terms
(2): Constant
(3): Constand and Trend
(4): Demeaning with constant
(5): Demeaning with constant and trend

Table 5.2. P-Values of Panel Unit Root Tests

Null Hypothesis: Unit root

			Natural Resource			Unskilled Labor Intensive				Technology Intensive				Human Capital Intensive				GDP
			Import	RP	Exports	Import	RP	GL	Exports	Import	RP	GL	Exports	Import	RP	GL	Exports	
P	No cross-sectional correlation	(1)	0.98	0.00		0.00	0.13	0.06		0.97	0.39	0.43		0.19	0.00	0.27		
		(2)	0.00	0.00		0.09	0.00	0.00		0.19	0.00	0.00		0.00	0.00	0.04		
		(3)	0.00	0.08		0.00	0.00	0.00		0.00	0.04	0.00		0.21	0.00	0.01		
	Cross-sectional correlation	(4)	0.00	0.00		0.00	0.00			0.00	0.00			0.00	0.00			
		(5)	0.00	0.00		0.00	0.00			0.00	0.00			0.00	0.00			
Z	No cross-sectional correlation	(1)	1.00	0.00		0.00	0.85	0.58		1.00	1.00	1.00		0.77	0.00	0.98		
		(2)	0.05	0.00		0.15	0.02	0.09		1.00	0.72	0.00		0.98	0.00	0.51		
		(3)	0.00	0.94		0.37	0.05	0.00		0.01	0.98	0.74		0.80	0.00	0.17		
	Cross-sectional correlation	(4)	0.00	0.00		0.01	0.00			0.00	0.00			0.00	0.00			
		(5)	0.00	0.00		0.00	0.00			0.00	0.00			0.00	0.00			
LLC Tests (No cross-sectional correlation)		(1)	0.06	0.00	1.00	0.54	0.00	0.01	1.00	1.00	0.99	0.74	1.00	0.99	0.00	0.00	1.00	1.00
		(2)	0.70	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	0.56	0.00	0.00	0.00	1.00	0.00	1.00
		(3)	0.00	1.00	0.00	0.01	0.00	0.00	1.00	1.00	1.00	0.00	0.84	1.00	0.00	0.00	1.00	0.00

Table 6. Panel Regression Results (Fixed Effects)

	Natural Resource Intensive	*Unskilled Labor Intensive*	*Technology Intensive*	*Human Capital Intensive*
Constant	*-2.27*	*-3.78*	*1.24*	*-4.29*
	-2.11	-2.32	0.98	-3.16
Relative Price	*-0.14*	*-0.74*	*0.03*	*-0.99*
	-1.08	-6.35	0.33	-7.38
GDP	*0.10*	*0.38*	*-0.20*	*0.72*
	0.74	2.15	-1.29	4.24
$Import_{t-1}$	*0.56*	*0.54*	*0.75*	*0.59*
	15.88	15.09	25.31	15.68
Export	*0.46*	*0.23*	*0.28*	*0.05*
	4.17	3.76	5.25	0.72
GL		*0.31*	*-0.12*	*0.05*
		3.76	-2.12	0.91
R-squared	*0.94*	*0.85*	*0.95*	*0.89*
F	*9.39*	*10.88*	*5.93*	*7.71*

Notes:

(1) Fixed effects model is applied for each product category.

(2) The upper cells are coefficients and the lower cells show their t-values.

tables). As for product specific exports and GDP, only evin, Lin, and Chu (LLC) test was applied.

According to the table 5.1 and 5.2 which reports the results of panel unit root tests and their p-values, after cross-sectional demeaning, there is almost no evidence of unit root for both imports and relative price. On the other hand, results for exports, GDP and GL are quite mixed.

2.3 Panel Regression

Considering the fact that the dataset is cross dependent, and also exports and GDP is unit root, a careful attention needs to be paid in selecting an estimation model. However, as the first step, panel regression (fixed effect model) was used for

estimation.

Table 6 shows the results of panel regression. Some interesting results should be noted. First of all, GDP for all product groups are not elastic, and coefficient of technology intensive becomes negative. This is mainly due to strong correlation between exports and GDP. Secondly, although it is not statistically significant, relative price of technology intensive is positive. This reflects the fact that exports of technology intensive need more imports than other products, and thus, imports are not affected by relative price. Furthermore, some of the components used in the production of technology intensive may not be available at all domestically. If that is the case, import prices should be used instead of relative price since there is no corresponding domestic price. Thirdly, past values of imports have stronger effects on current imports in technology intensive. This also confirms that technology intensive needs relatively more imports than others. Lastly, it is counter-intuitive for GL in technology intensive to be negative and it is significant.

Conclusion

This study aims to explain and investigate China's disaggregate import demand functions and provide deeper analysis of China's import behavior. However, methodologically speaking, the analytical model used was very simple and not well-suited for the nature of the dataset. Thus, taking the above results into consideration, further modifications to the model is necessary and it will be conducted and reported next year.

---

[1] The author would like to thank Mr. Kuroko for providing advice and support in calculating price indices which play the most important role in this study. Also, the author would like to thank Mr. Noda, who is an organizer of this project, for calculating Grubel-Lloyd (GL) index for this study. However, the author is solely responsible for the views expressed and any errors that remain.

[2] There is one study of estimating country-specific import demand functions by two product categories (agriculture and manufacturing). The study is organized by IDE and estimation

results are reported in "FTAs in East Asia – Trade Link Model (I)". However, compared to the IDE study which used common aggregate import prices to estimate country and product specific import demand functions, I calculated country and product specific import price indices and used them in estimating each equation.

[3] Classification method is described in Krause (1987).

[4] In 2005, the Chinese government announced that GDP series had been underestimated and currently under revision. In January 2006, the government released a new series of GDP from 1993 to 2004. Thus, in this study, GDP data has been replaced with a new series of data.

[5] ASEAN (Indonesia, Philippines, Thailand, Malaysia), NIEs (Korea, Singapore, Hong Kong, Taiwan), Japan, US, Canada, Mexico, New Zealand, Australia, France, Italy, UK

[6] O'Connell (1998) and Maddala and Wu (1999).

[7] For more details, see Choi (2004) 's survey for nonstationary panels.

[8] Test statistics combining p-values were developed by Choi (2001a).

References

[1] Choi, In (2001a), Unit Root Tests for Panel Data, *Journal of International Money and Finance* 20, 249-272

[2] Choi, In (2001b), Combination Unit Root Tests for Cross-Sectionally Correlated Panels, *Econometric Theory and Practice: Frontiers of Analysis and Applied Research: Essays in Honor of Peter C. B. Phillips*, Cambridge University Press

[3] Choi, In (2004), Nonstationary Panels, *Palgrave Handbooks of Econometrics*, Vol. 1

[4] Krause B, Lawrence (1987), The Structure of Trade in manufactured Goods in the East and Southeast Asian Region, *Trade and Structural Change in Pacific Asia* edited by Colin I. Bradford, Jr, and William H. Branson, NBER.

[5] Maddala, G.S., Wu, S. (1999), A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test, *Oxford Bulletin of Economics and Statistics*, 61, 631-652.

[6] Moazzami, B., & Wong, E. (1988), Income and Price Elasticities of China's Trade, *Asian Economic Review*, 30, 218-230.

[67 O'Connell, P.G.J. (1998), The Overvaluation of Purchasing Power Parity, *Journal of International Economics*, 44. 1-19.

[8] Pesaran M, H (2004), General Diagnostic Tests for Cross Section Dependence in Panels, Working paper.

[9] Senhadji, A. (1998), Time-Series Estimation of Structural Import Demand Equations: A Cross Country Analysis, *IMF Stuff Papers*, 42, 290-312.

[10] Tang, Tuck Cheong (2003), An Empirical Analysis of China's Aggregate Import Demand Function, *China Economic Review*, 14, 142-163.

調査研究報告書
開発研究センター 2005-Ⅱ-04
貿易指数の作成と応用

2006年３月31日発行

発行所　日本貿易振興機構
アジア経済研究所
〒261-8545　千葉県千葉市美浜区若葉3-2-2
電話　043-299-9500

　印刷　(株)理想社

調査研究報告書
開発研究センター **2005-Ⅱ-04**
貿易指数の作成と応用（Ⅲ）研究会