

*The Impact of Free Trade
Agreement on Trade Flows;
An Application of the Gravity Model Approach*

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*Session 1 of Part II, RIETI Policy Symposium
“Assessing Quality and Impacts of Major Free Trade
Agreements” 23rd March, 2007.*

Objective of the Study and the Method of Analysis

- Objective of the Study: To examine the impacts of FTAs on trade flows, specifically to identify the presence or absence of trade creation and trade diversion effects

- Apply two methodologies
 - * Descriptive analysis by two indicators;
 - Relative share and Trade intensity index of regional trade pattern
 - * Econometric analysis by the Gravity equation.
 - Estimation of trade creation and trade diversion effects at aggregated and disaggregated level data.

Two indicators for examination of intra FTA trade dependency for selected FTAs

Relative share:
$$\frac{X_{ii}}{X_{iw}}$$

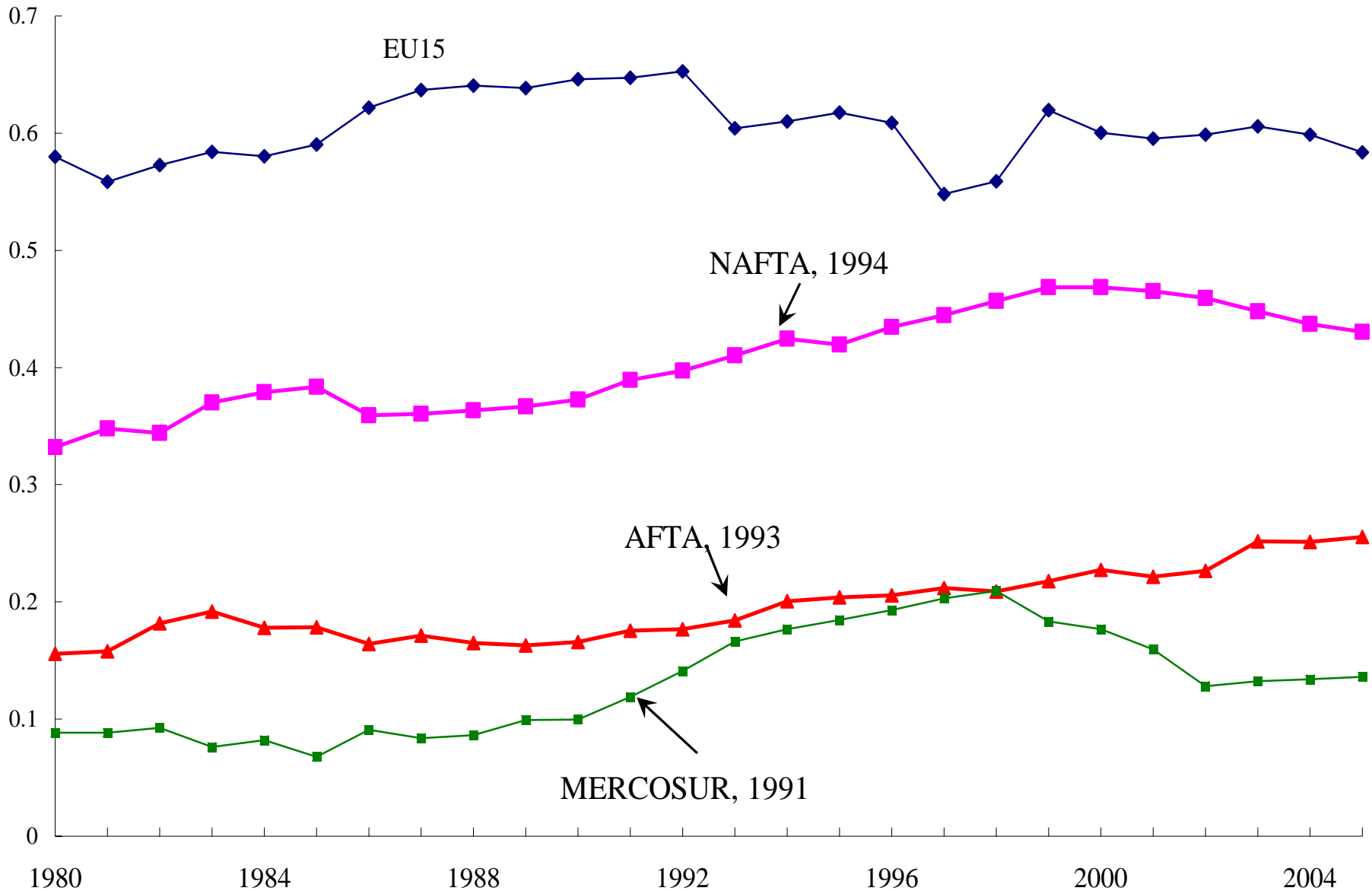
Trade intensity index:
$$\frac{X_{ii} / X_{iw}}{X_{iw} / X_{ww}}$$

Where, X_{ii} : intra-region (FTA) trade,

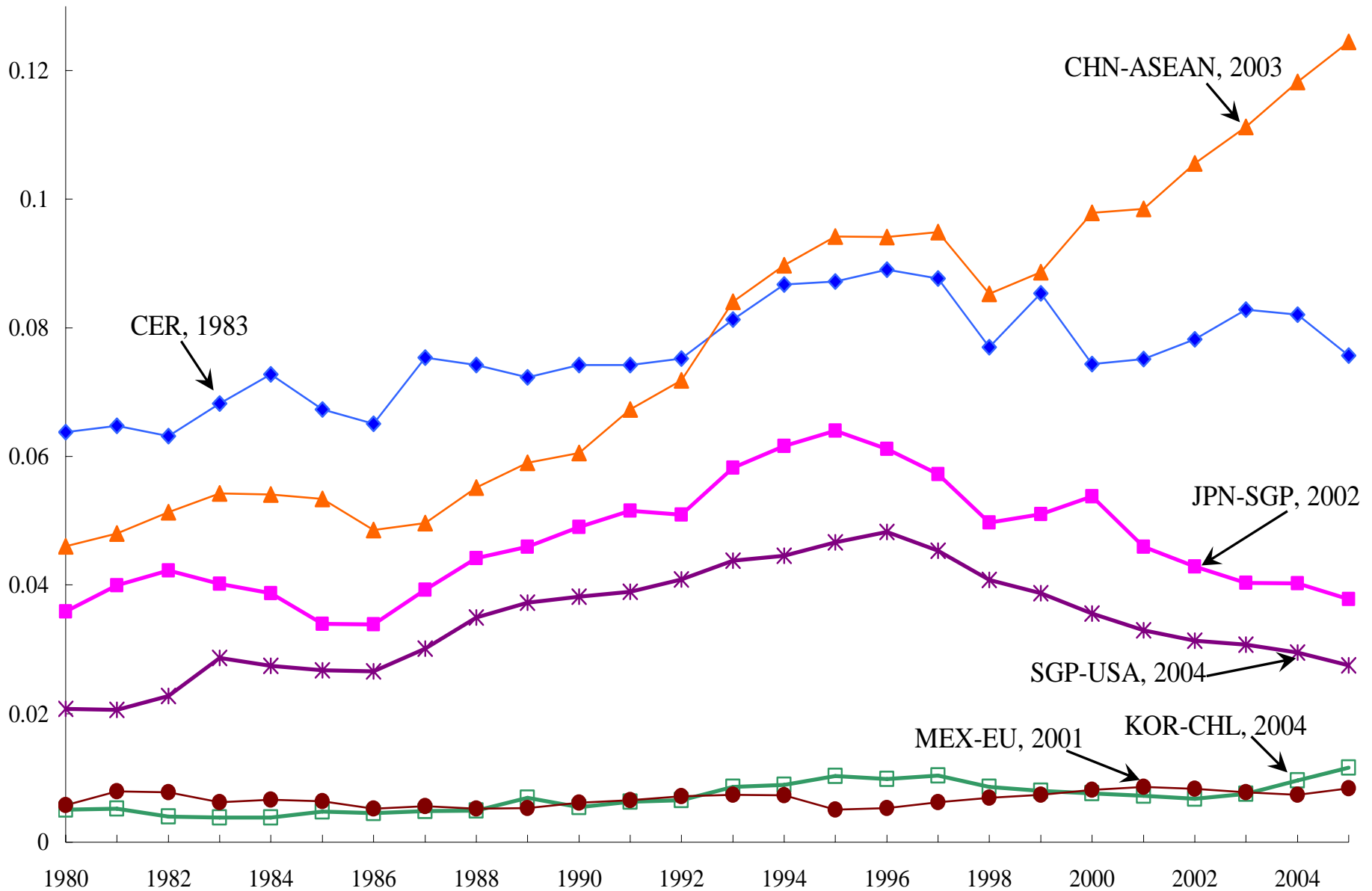
X_{iw} : region i's trade with the rest of the world,

X_{ww} : world trade.

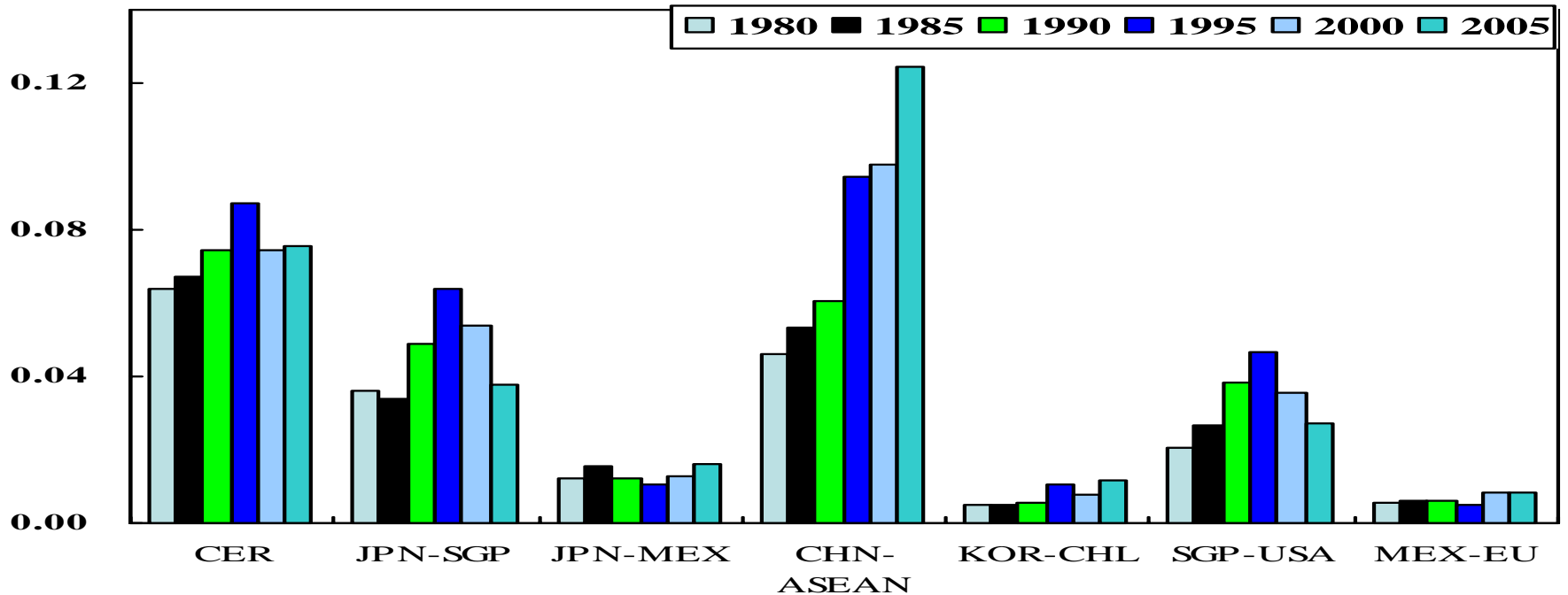
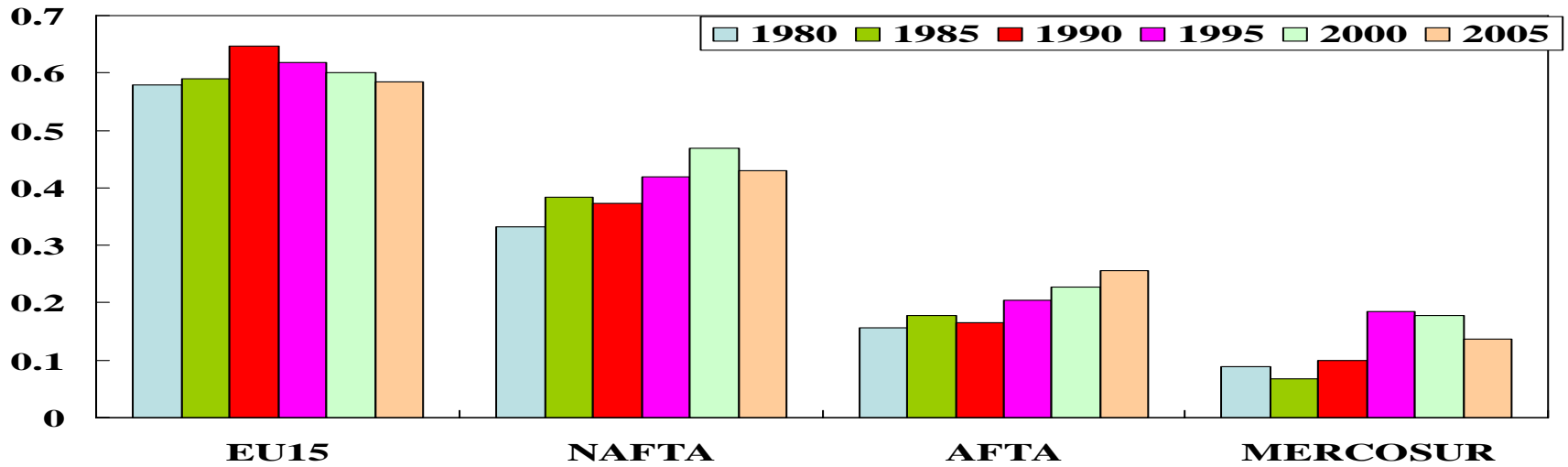
Relative share, 1980-2005



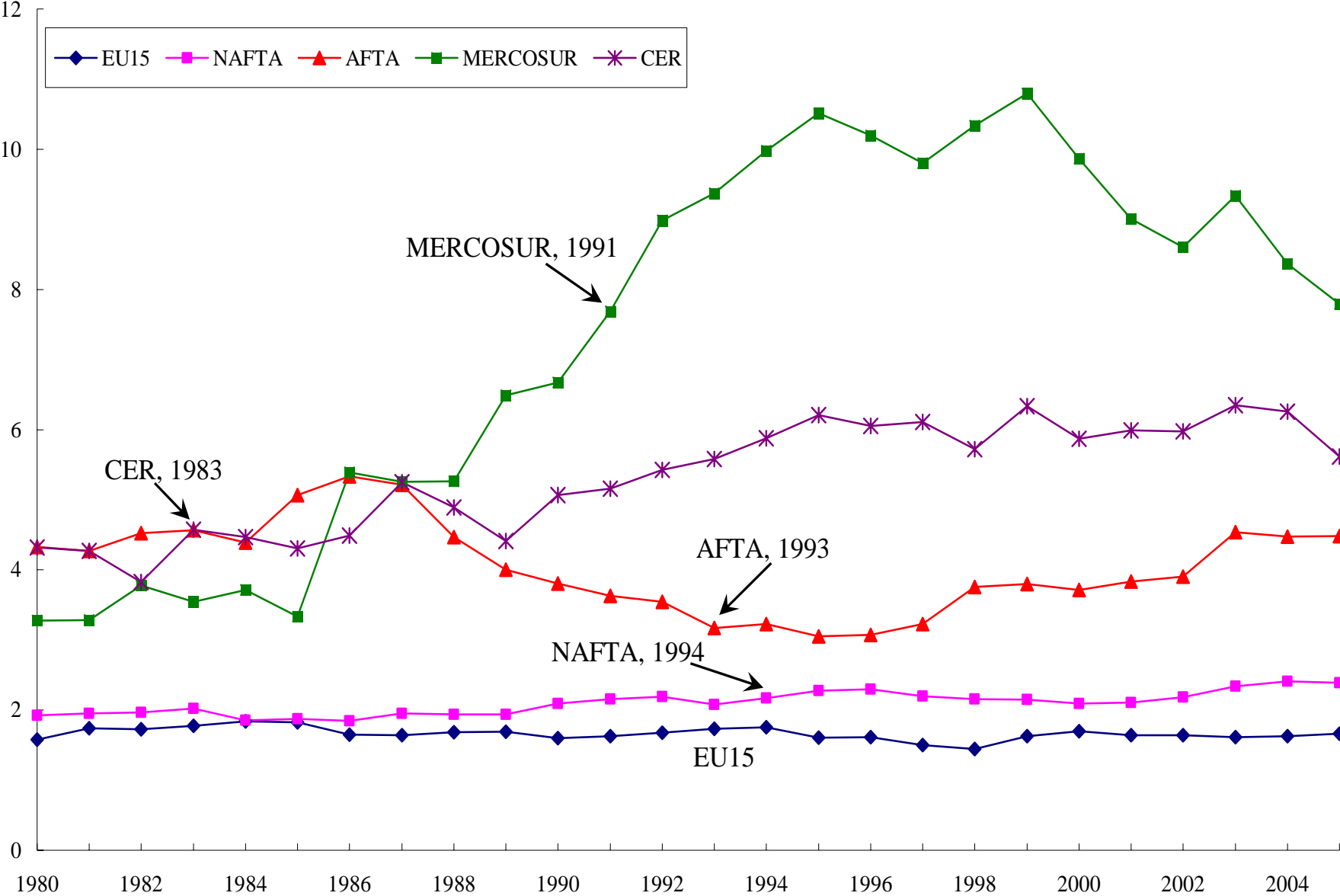
Relative share, 1980-2005



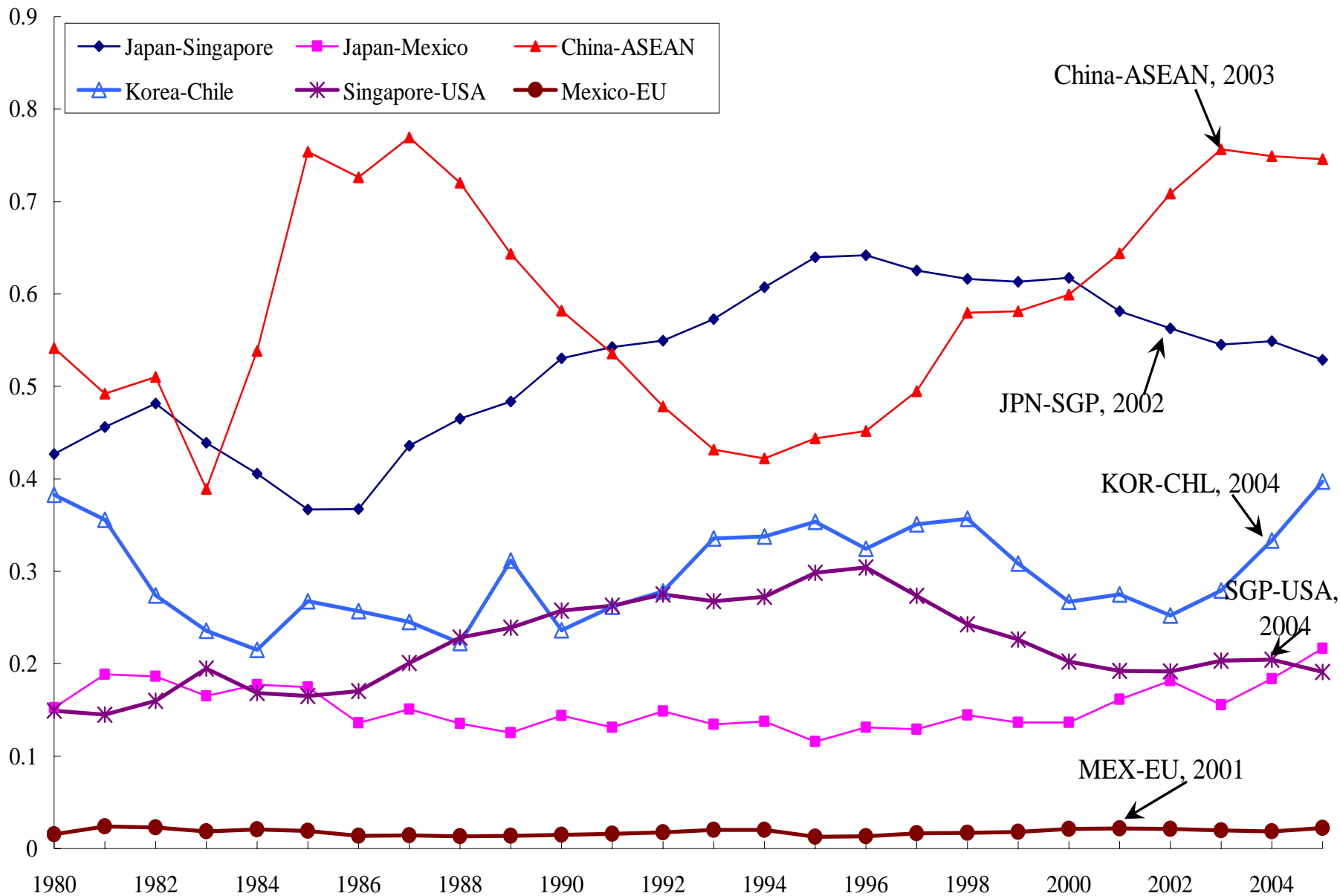
Relative share, 1980-2005



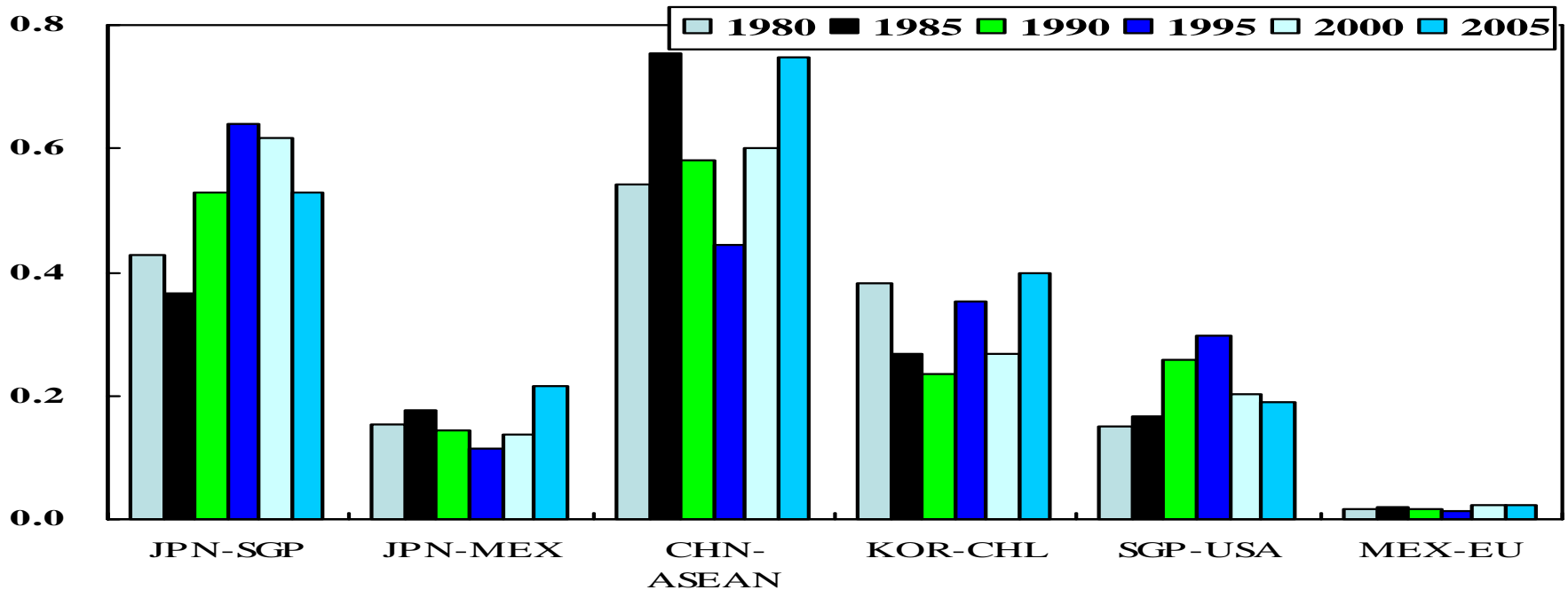
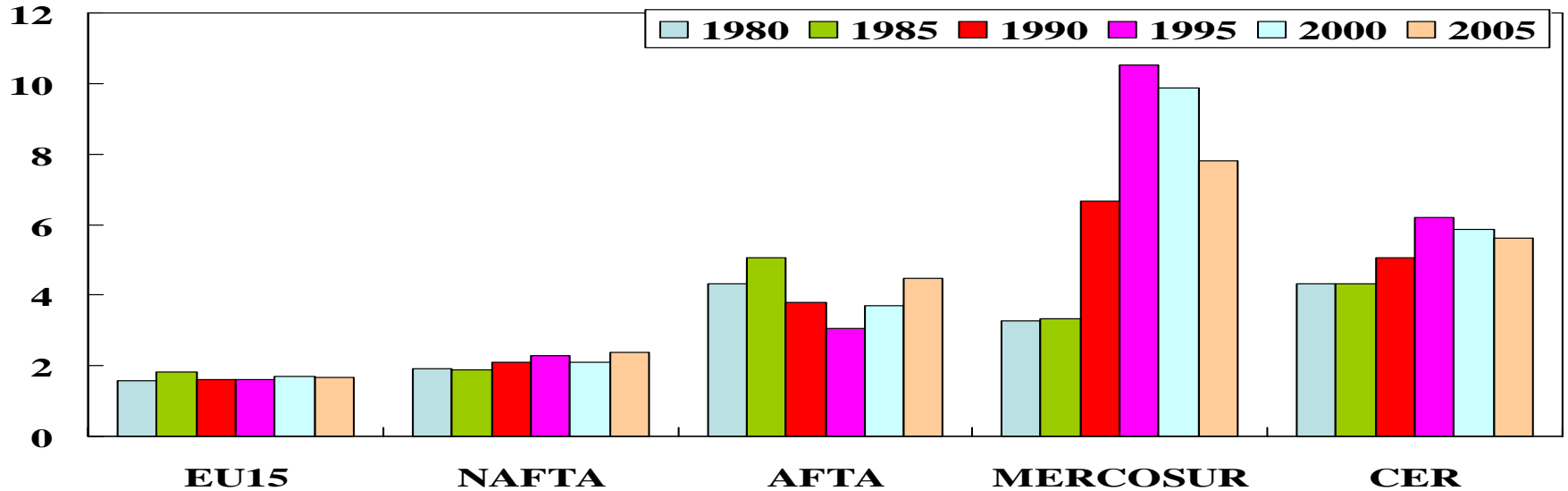
Trade Intensity Index, 1980-2005



Trade Intensity Index, 1980-2005



Trade Intensity Index, 1980-2005



Findings from the Descriptive Analysis

- Possible trade creation effects: NAFTA, AFTA, Mercosur and the CER
- Importance of intra-FTA trade in total trade: EU, NAFTA, AFTA, Mercosur and CER

The Impacts of FTAs on Bilateral Trade Flows:

An Application of a Gravity Model

■ A Brief Survey

- Tinbergen (1962) found positive effects on trade flows among members of the British Common Wealth. During the 1970s-1980s, Aitken (1973) and Brada and Mendez (1983), etc. have applied the gravity model to analyze major FTAs.
- On and after the 1990s, a large number of studies have attempted to capture effects of various FTAs. e.g.;
 - >Frankel, Stein & Wei (1995), Frankel (1997); MERCOSUR, AFTA, +++
 - >Solaga & Winters (2000); trade creation of LAFTA, trade diversion of EU & EFTA.
 - >Endoh (1999); trade creation and trade diversion of EEC, LAFTA & CMEA.
- Improvement of estimation method also have been made, e.g.;
 - >Baier & Bergstrand (2002); treated FTA dummies as endogenous variables.
- Analyses at disaggregated sector levels, e.g.;
 - >Gilbert, Scollay & Bora (2004); attempted to find out the effects of major FTAs and natural trading blocs in East Asia.
 - >Endoh (2005); effects of the GSTP, positive and significant.

The Analysis of Trade Creation Effect.

1) Estimation of General FTA effects

The estimated equation;

$$\ln(Trade_{ijt}) = \alpha + \beta_1 \ln(Y_{it} * Y_{jt}) + \beta_2 \ln(y_{it} * y_{jt}) + \beta_3 \ln(Distance_{ijt}) \\ + \beta_4 Adjacency_{ijt} + \beta_5 Language_{ijt} + \phi FTA_{ijt} + \sum_t \gamma_t TimeDum_t$$

Where,

Trade; total merchandise export among country i and j in US\$, deflated by US's CPI.

Y_{it} ; real GDP in US\$ of country i in year t,

y; GDP per capita,

Distance; Distance in km between the largest cities,

Adjacency; land adjacency dummy

Language; common language dummy.

FTA; “comprehensive FTA dummy”, which is one if country i belongs to the same FTA with country j, based on the RTAs notified to WTO up to September 2006.

Data description & estimation method;

- The sample; 178 countries over 1980-2005.
- Data source;
 - Total merchandise trade value; Direction of Trade Statistics, IMF
 - GDP and total population; World Development Indicators, UN.
 - Distance are calculated by latitude & longitude of the largest cities.
- Number of samples;

Although Total number of sample observations are 409,578, missing values are taken out.
- OLSQ for the pooled data of each three years periods.

The estimation results; Trade creation effect

	1980- 1982	1983- 1985	1986- 1988	1989- 1991	1992- 1994	1995- 1997	1998- 2000	2001- 2003	2004- 2005
Constant	-16.80	-17.27	-18.36	-18.78	-20.28	-20.40	-21.49	-21.26	-18.88
GDP	0.94	0.93	0.87	0.88	0.89	0.92	0.95	0.96	0.91
GDP per capita	-0.03	-0.02	0.15	0.16	0.13	0.10	0.08	0.07	0.05
Distance	-1.19	-1.17	-1.13	-1.18	-1.03	-1.15	-1.16	-1.21	-1.18
Adjacency			0.41	0.56	1.06	1.02	0.92	0.78	0.73
Common langu	0.53	0.44	0.54	0.58	0.72	0.67	0.71	0.73	0.71
FTA	0.35	0.40			0.26	0.34	0.31	0.27	0.28
Adjusted R ²	0.64	0.64	0.67	0.69	0.68	0.68	0.70	0.71	0.66
Observations	12596	13473	14624	16053	19406	23390	26214	26820	18158

Note; insignificant value, which are at more than 10% significance level are excluded.

The estimation results; Trade creation effects of FTAs.

	80-82	83-85	86-88	89-91	92-94	95-97	98-00	01-03	04-05
Constant	-15.2***	-15.9***	-17.0***	-17.6***	-18.7***	-19.0***	-20.0***	-19.8***	-17.3***
GDP	0.95***	0.94***	0.87***	0.88***	0.90***	0.93***	0.96***	0.96***	0.92***
GDP per capita	-0.03***	-0.02***	0.15***	0.17***	0.13***	0.10***	0.08***	0.07***	0.05***
Distance	-1.24***	-1.22***	-1.15***	-1.18***	-1.02***	-1.16***	-1.17***	-1.22***	-1.20***
Adjacency	0.54***	0.46***	0.56***	0.59***	0.74***	0.70***	0.74***	0.75***	0.73***
Language	-0.09	0.12	0.44***	0.55***	1.03***	1.00***	0.91***	0.77***	0.72***
EU	-0.16	0.05	0.40	0.17	0.32	0.35	0.03	-0.14	-0.01
NAFTA	-0.69	-0.62	-1.01	-0.99*	-0.64	-0.68	-0.65	-0.61	-0.10
AFTA	0.22	-0.73*	-0.57	-0.27	-0.01	0.17	0.15	-0.12	-0.21
MERCOSUR	-0.21	-0.41	-0.86	-0.38	-0.08	0.17	0.21	0.07	0.06
ASEAN-China	-1.59***	-1.31***	-1.41***	-1.28***	-1.70***	-1.57***	-1.56***	-1.60***	-1.60***
EU-Mexico	-0.46*	-0.52*	-0.71***	-0.47*	-0.20	-0.41	-0.20	-0.04	-0.01
CER	1.61	1.84*	1.59	1.74*	2.07**	2.14**	1.93*	1.82*	2.01
Japan-Singapore	2.32	2.34**	2.16**	2.16**	2.47**	2.41**	2.14**	1.97*	2.08
Japan-Mexico	-0.14	0.05	-0.15	-0.17	0.00	-0.17	-0.23	-0.44	0.07
Korea-Chile	2.77***	2.70**	2.83***	3.06***	3.07***	3.41***	3.04***	2.92***	3.39**
Singapore-USA	2.44*	2.84**	2.57**	2.62***	2.55**	2.64**	2.40**	2.22**	2.26
Adjusted R ²	12596	13473	14624	16053	19406	23390	26214	26820	18158
Observations	0.64	0.64	0.67	0.69	0.68	0.68	0.70	0.71	0.66

Note; *, ** and *** denote 10%, 5% and 1% at significance level respectively.

The Analysis of Trade Creation and Trade Diversion Effect.

The estimated equation;

$$\begin{aligned} \ln(Export_{ijt}) = & \alpha + \beta_1 \ln(Y_{it}) + \beta_2 \ln(Y_{jt}) + \beta_3 \ln(y_{it}) + \beta_4 \ln(y_{jt}) \\ & + \beta_5 \ln(Distance_{ijt}) + \beta_6 Adjacency_{ijt} + \beta_7 Language_{ijt} \\ & + \phi_{EU1} EU_{ijt}^1 + \phi_{EU2} EU_{ijt}^2 + \phi_{EU3} EU_{ijt}^3 \\ & + \phi_{NAFTA1} NAFTA_{ijt}^1 + \phi_{NAFTA2} NAFTA_{ijt}^2 + \phi_{NAFTA3} NAFTA_{ijt}^3 \\ & + \phi_{AFTA1} AFTA_{ijt}^1 + \phi_{AFTA2} AFTA_{ijt}^2 + \phi_{AFTA3} AFTA_{ijt}^3 \\ & + \phi_{MRCSR1} MRCSR_{ijt}^1 + \phi_{MRCSR2} MRCSR_{ijt}^2 + \phi_{MRCSR3} MRCSR_{ijt}^3 \\ & + \phi_{ASCH1} ASEANCHN_{ijt}^1 + \phi_{ASCH2} ASEANCHN_{ijt}^2 + \phi_{ASCH3} ASEANCHN_{ijt}^3 \\ & + \phi_{EUmex1} EUMX_{ijt}^1 + \phi_{EUmex2} EUMX_{ijt}^2 + \phi_{EUmex3} EUMX_{ijt}^3 \\ & + \phi_{CER} CER_{ijt} + \phi_{jpsg} JPSG_{ijt} + \phi_{jpmx} JPMX_{ijt} + \phi_{kochl} KRCHL_{ijt} + \phi_{sgusa} SGUSA_{ijt} \\ & + \sum_t \gamma_t Timedum_t \end{aligned}$$

Notes; EU denotes EU15, MRCSR, ASEANCHN, EUMX are MERCOSUR, ASEAN-CHINA, and EU-Mexico FTA respectively.

JPSG, JPMX, KRCHI and SGUSA denotes Japan-Singapore, Japan-Mexico, Korea-Chile and Singapore-USA FTA respectively.

Two Types of Trade Diversion

- Type 1: Decline in exports of FTA members to non-members (upper case letter 2)
- Type 2: Decline in exports of non-FTA members to FTA (upper case letter 3)

Data description & estimation method;

- The sample; 63 countries, in 1990, 1995, 2000 and 2005
 - * The same sample as previous studies.
- Disaggregated trade value are from UN's COMTRADE Statistics.
 - >Food and live animals, SITC code 0.
 - >Apparels, HS code 61.
 - >Iron and Steel, HS code 72.
 - >Electrical machinery, HS code 85.
 - >Motor vehicles for transport persons, HS code 8703.
- OLSQ for the pooled data.

The estimation results; Trade creation and Trade diversion effect

	Food	Apparels	Steel	Electrical machinery	Motor vehicles	Total Exports	
EU	0.95***	0.88***	0.64***	-0.15	1.24***	EU	-0.15
EU to non-EU	0.64***	-0.21**	0.28***	-0.09	0.10	EU - non	0.43***
non-EU to EU	-0.01	0.47***	-0.44***	-0.18**	-0.68***		
NAFTA	0.88*	-0.15	-0.16	-0.41	1.70***	NAFTA	-0.33
NAFTA to non members	0.58***	-1.74***	-1.35***	-1.60***	-1.87***	NAFTA - non	-0.39***
non members to NAFTA	-0.46***	1.13***	-0.01	-0.08	-0.92***		
AFTA	2.25***	0.24	1.35***	4.20***	1.24***	AFTA	1.71***
AFTA to non members	1.01***	1.21***	-0.39***	2.97***	0.10	AFTA - non	1.00***
non members to AFTA	0.76***	-0.08	1.21***	1.25***	0.06		
MERCOSUR	0.83***	-0.41	-0.33	-0.44	0.97**	MERCOSUR	0.29
MERCOSUR to non members	1.10***	-1.55***	1.12***	-1.97***	-0.99***	MERCOSUR - non	-0.25***
non members to MERCOSUR	-1.08***	-0.54***	-0.70***	0.00	-0.57***		
ASEAN-China	0.40	1.36***	0.35	1.06***	-0.01	ASEAN-China	-0.21
ASEAN-China to non member	-0.31***	1.87***	-0.37**	0.61***	-0.74***	ASEAN*China - non	0.37***
non members to ASEAN-China	-0.14	0.35*	0.47***	0.36***	-0.37*		
EU-Mexico	-0.07	0.11	0.26	0.32**	0.20	EU-Mexico	-0.18
EU-Mexico to non member	-0.51***	0.30**	-0.01	0.09	-0.13	EU*Mexico - non	-0.31***
non members to EU-Mexico	0.06	-0.33**	0.00	0.17	0.37**		
CER	3.06***	-0.37	3.03***	2.50**	2.07	CER	1.91**
Japan-Singapore	0.65	-1.11	1.44	0.54	1.35	Japan-Singapore	0.60
Japan-Mexico	-1.56	-2.05	0.44	0.20	0.78	Japan-Mexico	0.80
Korea-Chile	0.37	3.10*	1.75	0.75	3.74**	Korea-Chile	3.60***
Singapore-USA	0.24	-0.75	0.22	1.38	-1.60	Singapore-USA	1.10
Adjusted R2	0.46	0.45	0.46	0.64	0.52		0.70
Observations	115535	7801	7271	9350	5671		30700

Findings from the Econometric Analysis

- An analysis of the aggregated data indicated that FTAs bring about trade creation effect.
- However, the results were mixed when it comes to specific FTAs.

>Aggregated data;

Trade creation effect of the AFTA and the MERCOSUR were found, while EU and NAFTA were not.

>Disaggregated data;

Trade creation effect of the EU and the NAFTA were found for some sectors.

Trade diversion effect for many products in the case of the EU, the NAFTA and the MERCOSUR.

Conclusion:

- The EU and the NAFTA are relatively more closed or introverted than the AFTA, the CER or the MERCOSUR. Other FTAs appear to be too recent to show substantial impacts yet.
- Limitations: exclusion of the factors such as foreign direct investment that would affect trade
- Future research agenda: panel data analysis, country specific analysis



Thank you!