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Asian regionalism and its effects on trade in the 1980s and 1990s☆

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Abstract

This paper begins by outlining the major preferential trade agreements (PTAs) in Asia and other regions and reviewing trends in trade flows. The paper uses a gravity model augmented with several sets of dummy variables to estimate the effect of various PTAs on trade flows within and across membership groupings as well as the effect of PTAs on members' trade with Asian countries. On the basis of these estimates, we are able to categorize 11 major PTAs into those that increase intrabloc trade at the expense of their respective imports from the rest of the world; those that expand their respective trade among their members without reducing their trade with nonmembers; and those that reduce trade with nonmembers without significant changes in intrabloc trade. The authors also show that PTAs have augmented trade in Asia.

Keywords: Economic Integration; Trade Negotiations; Trade Forecasting and Simulation; Trade Policy; Asia including Middle East; Regional Development Policy; International Economic Order

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1. Introduction

Recent years have seen a sharp upturn in interest and activity in the formation of Preferential Trading Arrangements (PTAs) in the Asia and Pacific Region. Japan and Singapore recently signed an Economic Partnership Agreement in February 2002. Singapore also signed a bilateral trade agreement with New Zealand in 2001. Japanese policymakers have proposed a Japan–ASEAN Comprehensive Economic Partnership, and an ASEAN–China Free Trade Area was proposed by China and endorsed by ASEAN's 10 leaders in the organization's ministerial meeting in Brunei in October 2001. In February 2002, government representatives of 14 Pacific Island nations met and agreed to form a FTA. These recent events follow more than a decade of increasing numbers of PTAs in the Asian and Pacific Region (see Fig. 1) and a similar upsurge in the number of PTAs in the world as a whole in the late 1980s and early 1990s. At present, about 97% of total global trade involves countries that are members of at least one PTA. This compares with a 72% share in 1990.

The increased interest in preferential trade agreements raises the important question of whether these more limited, often regionally based, trading arrangements are beneficial to Asian economies. As PTAs become a more commonly considered policy option, it is increasingly important to evaluate how the economic effects of PTAs compare to the effects of broader multilateral trading arrangements as well as how the PTAs affect world trade flows in general.

This paper focuses on the latter question. The following section describes the debate over PTAs' effects on world trade flows and provides some background on the PTAs we include in the analysis. Sections 3 and 4 present empirical and analytical explorations of trade flows within and across preferential trade agreements. We first present a set of descriptive measures of trade flows and Section 5 presents the result of an augmented gravity model that estimates the effect that PTAs have on trade flows after controlling for non-policy determinants of trade. Following Soloaga and Winters (2001), we use a combination of dummy variables in the gravity model that allows us to separately identify the effects of PTA on intra-bloc trade as well as trade between members and the rest of the world. Our estimating equation also includes a set of dummy variables to identify the impact that PTAs have had on trade with Asian countries in particular. Another contribution is to estimate the model using data covering the years 1980–2000, a panel that allows us to consider how the Asian financial crisis influenced trade flows and the effects of PTAs on trade flows.

Our main finding is that the effect of PTAs on trade flows varies widely across PTAs. We estimated large positive ''intra-bloc trade'' effects for the Andean Pact, effects for the Andean Pact, European Cooperation Organization (ECO), European Free Trade Association (EFTA), Mercosur, South Asian Preferential Trade Arrangement (SAPTA), and South Pacific Regional Trade and Economic Cooperation Agreement (SPARTECA). These trade agreements appear to have had little effect on members' trade with countries outside the PTAs. Membership in Asia-Pacific Economic Cooperation forum (APEC) and the European Union (EU), in contrast, was estimated to expand significantly trade both between members of the PTA and between members and to the rest of the world. Our gravity model estimates indicate that CER had no incremental trade effect within or outside the bloc, and most of the estimation coefficients for this PTA were not statistically different from zero.

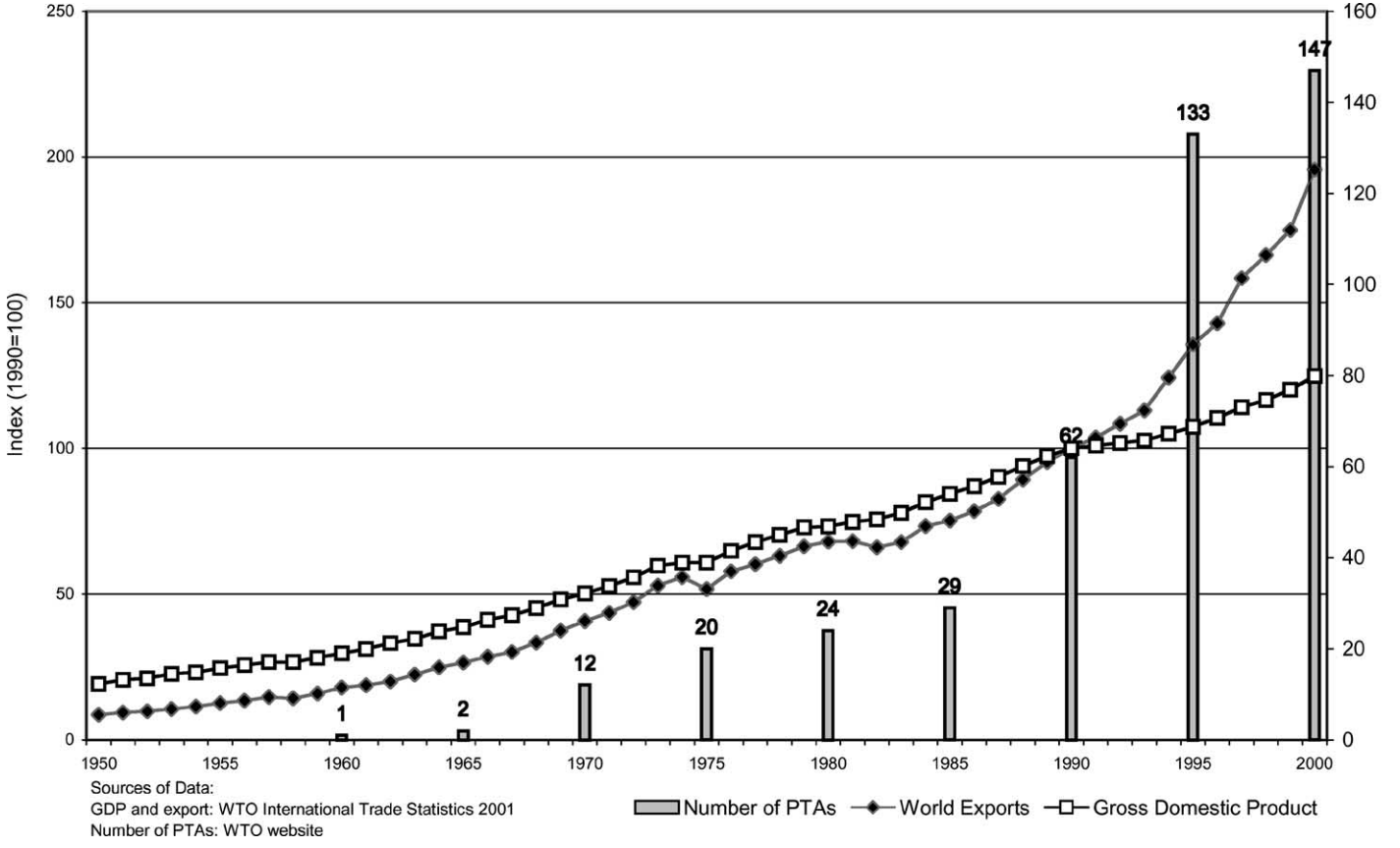

Fig. 1. World merchandise exports, gross domestic product and number of PTAs: 1950–2000.

Finally, we estimated ASEAN Free Trade Area (AFTA) and North American Free Trade Agreement (NAFTA) to have little effect in altering intra-bloc trade but they have reduced exports and imports between members and the rest of the world.

Acronym	Full name of PTA	Member countries
AFTA	ASEAN Free Trade Area	Brunei, Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam
Andean Pact	Andean Community	Bolivia, Colombia, Ecuador, Peru, Venezuela
ASEAN	Association of South East Asian Nations	Same membership as AFTA
CER	Closer Trade Relations Trade Agreement	Australia and New Zealand
ECO	Economic Cooperation Organization	Afghanistan, Azerbaijan, Iran, Kazakhstan, Kyrgyz, Republic, Pakistan, Tajikistan, Turkey, Turkmenistan, and Uzbekistan
EFTA	European Free Trade Association	Iceland, Liechtenstein, Norway, and Switzerland
EU	European Union	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, United Kingdom
Mercosur	Southern Common Market	Argentina, Brazil, Paraguay, and Uruguay
NAFTA	North American Free Trade Agreement	Canada, Mexico, and United States
SAPTA	South Asian Preferential Trade Arrangement	Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka
SPARTECA	South Pacific Regional Trade and Economic Cooperation Agreement	Australia, New Zealand, Cook Islands, Fiji, Kiribati, Marshall Islands, Micronesia, Nauru, Niue, Papua, New Guinea, Solomon Islands, Tonga, Tuvalu, Vanuatu, and Western Samoa

2. PTAs: trade creating or trade diverting?

It is an open question whether PTAs create more trade than they divert. The lowering of trade barriers among block members may expose member economies to greater competitive pressures and open up larger markets for producers in member countries. Like other forms of trade liberalization, PTAs can increase competition in domestic industries which can then spur productive efficiency gains among domestic producers and improve the quality/quantity of inputs and goods available in the economy (Dollar, 1992; Edwards, 1998; Sachs & Warner, 1995; Wacziarg, 2001). Producers can also benefit from the greater market size created through the PTA, which can expand opportunities for exporting products and lead to enterprise and employment growth. PTAs' small size can also ease trade-facilitating ''deep integration'' such as harmonizing standards or regulatory codes.

The main fear, however, is that PTAs may augment intra-bloc trade by diverting trade away from non-member economies (Bhagwati & Panagariya, 1996; de Melo, Panagariya & Rodick, 1992; Schiff, 1997). These policy-diverted trade flows may lead to non-optimal patterns of specialization if the distribution of resources across members is not representative of the distribution of resources in the world. A country that is the relatively capital-rich member of a PTA might be relatively labor-rich in relation to the rest of the world, for example. PTA-induced specialization would not be optimal under global free trade (Panagariya, 1994; Venables, 2000). Complex and overlapping international and regional trading arrangements can create a ''spaghetti bowl'' of complex overlapping regulations and commitments that are difficult to disentangle and make it difficult to proceed in broader trade liberalization (Bhagwati, Panagariya, et al., 1996; Krueger, 1997; Wonnacott, 1997).

In general, the greater the difference in the comparative advantages of member economies to a PTA and the closer the agreement approaches open trade across members, the greater the economic benefits of the agreement. However, in a world where trade interventions and market imperfections are commonplace, the effects of PTAs on trade flows are generally ambiguous analytically. This makes empirical examination of the effects of PTAs on trade flows essential to understanding these effects.

2.1. Overview of PTAs in Asia and the rest of the world

Before reviewing the gravity model, it is useful to provide some description of PTAs in Asia and the Pacific and to contrast these with PTAs in other region. We also look at trends in trade during the years over which data used in the gravity model estimates are drawn.

There have been 30 multilateral PTAs and 58 bilateral arrangements notified to the WTO worldwide over the past three decade. It is widely recognized that the actual number of new PTAs is larger, as only PTAs involving WTO member countries are obligated to report to the WTO. Most of these PTAs are between neighboring countries, and most fall short of being free-trade agreements (FTAs) although they aspire to evolve to this form of PTA rather than to become customs unions (CU). Table 1 identifies some of the most important PTAs notified to the WTO, and lists their memberships, date of formation, and type of PTA.

The degree of internal free trade varies greatly across PTAs, as does the breadth of the agreements beyond tariff reductions in terms of the sectors and goods covered and the extent of tariff reduction achieved. Agriculture is commonly excluded from the list of sectors where trade is liberalized. Most PTAs explicitly recognize the need for trade facilitation, harmonization of quality and other regulatory issues, infrastructure development, and streamlining customs procedures, but the extent of tangible activity in these areas tends to be limited for all but a few PTAs. Liberalization of trade in services is comparatively rare, although liberalization of within-bloc investment policies is more common.

As noted in Frankel and Wei (1998), formal regional trading arrangements are less common in Asia than in other regions. Also, PTAs in the Asian and Pacific Region tend to have modest—at best—achievements in liberalizing trade between members. PTAs in Asia have generally made few tangible achievements in lowering tariffs and tariff reductions cover only a fraction of the goods traded between members. ASEAN, likely the region's

Table 1
Selected regional trade agreements notified to the GATT/WTO, as of January 31, 2002

Acronym	Full name of PTA	Member countries	Date of entry into force	Date of notification to WTO	Related provisions	Type of agreement
AFTA	ASEAN Free Trade Area	Brunei, Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam	January 28, 1992	October 30, 1992	Enabling clause	Other
Andean Pact	Andean Community	Bolivia, Colombia, Ecuador, Peru, Venezuela	May 25, 1988	October 12, 1992	Enabling clause	Customs union
ASEAN	Association of South East Asian Nations	Brunei, Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam	August 31, 1977	1-November-77	Enabling clause	Other
CER	Closer Trade Relations Trade Agreement	Australia and New Zealand	January 1, 1989	November 22, 1995	GATS Art. V	Services agreement
			January 1, 1983	April 14, 1983	GATT Art. XXIV	Free Trade Agreement
ECO	Economic Cooperation Organization	Afghanistan, Azerbaijan, Iran, Kazakhstan, Kyrgyz, Republic, Pakistan, Tajikistan, Turkey, Turkmenistan, and Uzbekistan	Not available	July 22, 1992	Enabling clause	Other
EFTA	European Free Trade Association	Iceland, Liechtenstein, Norway, and Switzerland	May 3, 1960	November 14, 1959	GATT Art. XXIV	Free Trade Agreement
EU	European Union	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, United Kingdom	January 1, 1958	April 24, 1959	GATT Art. XXIV	Common Market and Currency Union
Mercosur	Southern Common Market	Argentina, Brazil, Paraguay, and Uruguay	November 29, 1991	March 5, 1992	Enabling clause	Customs union
NAFTA	North American Free Trade Agreement	Canada, Mexico, and United States	January 1, 1994	February 1, 1993	GATT Art. XXIV	Free Trade Agreement
			April 1, 1994	March 1, 1995	GATS Art. V	Services agreement
SAPTA	South Asian Preferential Trade Arrangement	Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka	December 7, 1995	September 22, 1993	Enabling clause	Other
SPARTECA	South Pacific Regional Trade and Economic Cooperation Agreement	Australia, New Zealand, Cook Islands, Fiji, Kiribati, Marshall Islands, Micronesia, Nauru, Niue, Papua, New Guinea, Solomon Islands, Tonga, Tuvalu, Vanuatu, and Western Samoa	January 1, 1981	February 20, 1981	Enabling clause	Other

Table 2
Characteristics of PTAs—interlinking trading arrangements

Name PTA	Average number of PTAs per member[a]	Percent of members belonging to other PTAs	Percent of members belonging to WTO[b]	Ave. pct. Export/ GDP of members[c]	Ave. pct. Trade within PTA[d]	Ave. pct. Trade external to PTA	Combined market size of the PTA[e]	Average GDP per capita of member economies[f]	Coefficient of variation in GDP/per capita of member economies
AFTA	4.33	100.00	100.00	52.31	24.54	75.46	3.33	4598	1.64
ANDEAN	4.40	80.00	89.47	22.13	10.77	89.23	–	2227	0.73
APEC	4.16	100.00	100.00	47.77	75.24	24.76	61.5	10982	1.22
CER	4.50	100.00	100.00	20.79	9.25	90.75	1.45	16787	0.32
ECO	5.44	80.00	100.00	36.26	6.58	93.42	1.32	974	0.93
EFTA	15.67	100.00	33.33	34.10	11.82	88.18	–	28417	0.17
EU	3.64	20.00	100.00	36.76	66.94	33.06	–	21046	0.27
Mercosur	4.25	100.00	83.33	14.53	22.35	77.65	–	4653	0.60
NAFTA	5.33	100.00	66.67	25.56	58.82	41.18	–	21134	0.69
SAPTA	2.50	71.43	100.00	25.75	4.81	95.19	2.00	657	0.76
SPARTECA	1.89	40.00	55.56	33.46	12.31	87.69	–	4610	1.55
Average[g]	5.10	81.04	84.40	31.77	27.58	72.42	13.92	8712	0.81

Sources: (a) and (b) WTO website; (c) IMF, DOTS for current export value and WDI for current GDP value; (d) DOTS export value deflated by WTO indices (1990 = 100); (e) sum members GDP over World GDP (based on IMF–DOTS data for 83 countries); (f) World Development Indicators (2001); (g) Averages are unweighted except for averages GDP per capita, which is weighted by GDP.

PTA that has expressed the clearest intention of becoming a true Free Trade Area, achieved only modest liberalization until recent years.[1] While formal national-level trading agreements generally attract the most attention, it is also important to note the substantial effort to facilitate trade via subregional economic zones (SREZs) and infrastructure policies. The theme chapter of the Asian Development Outlook, 2002 provides more background on these arrangements.

The PTAs in the Asia and Pacific region tend to be fairly outward looking and a large percentage of members' trade goes to non-member countries. The trade flows considered in the next section of the paper generally illustrate this openness. This reflects the region's strong ties to the U.S., Europe, and some Latin American markets. Of all the PTAs reviewed, AFTA and APEC members have the strongest links to the international economy. This is reflected in the ratio of exports to gross domestic product (GDP). CER, SAPTA, and SPARTECA, on the other hand, have relatively low ratios of exports to GDP. A number of other indicators of this, and other characteristics of PTAs, are summarized in Table 2.

The PTAs also vary widely in the degree to which they institutionalize the rules of interaction between members. The majority of Asian PTAs are built on the premise of reciprocal trade concessions and thus require some sort of forum for negotiations. However, the frequency of negotiations varies from several times per year to once every few years. Dispute settlement mechanisms frequently specify some sort of bilateral

[1] "As recently as 1989, the fraction of goods eligible for regional preferences (in ASEAN) was only on the order of 3%" Frankel and Wei (1998).

negotiation, and only a few agreements set up a multinational court to arbitrate disagreements between members and oversee implementation of agreements. Many of the agreements are more ambitious in aspiration than in implementation. This informality contrasts with PTAs in other regions that establish stricter rules and more formal institutional arrangements for advancing trade liberalization and for resolving disputes between members (see Table 3).

Table 3
Institutional arrangements under existing PTAs

Name	Type of agreement	Supranational institutions (including meeting frequency)	Provisions beyond tariff reduction
AFTA	FTA (within general cooperation agreement of ASEAN)	ASEAN institutions include Central Secretariat. For the FTA, no separate supranational institutions. Dispute settlement by bilateral negotiations, with presentation of case before a "Senior Economic Officials Meeting" as a means of resolving impasses. There is no standing body for investigating disputes, panels of experts are appointed as needed. ASEAN Economic Ministers serve as final arbiters. Decision-making at annual meetings of heads of state	Trade facilitation, investment, industrial cooperation, services trade. FTA is part of larger regional cooperation plans under ASEAN
ANDEAN	CU	Court of Justice (dispute settlement). General Secretariat (administers integration). Andean Parliament (deliberating body). Also annual meetings of Andean Council of Presidents and Council of Foreign Ministers	Services, migration, investment, some foreign policy, trade facilitation
APEC	General cooperation	No institutions. Annual meetings of heads of state, ministers. Provisions are not binding, so no mechanisms for dispute settlement	Trade facilitation, services, investment, intellectual property rights
CER	FTA	"Australia–New Zealand Affairs Secretariat" under the control of the Ministries of Foreign Affairs (oversees implementation). Dispute settlement by bilateral negotiations. Annual meetings of economic and foreign affairs ministers	Trade facilitation, services, investment
ECO	General cooperation	ECO Secretariat, Regional Council, Council of Permanent Representatives, Regional Technical Agencies. Annual ministers' meetings, biennial meetings of heads of states	Investment, trade facilitation. Coordination of market-oriented reforms
EFTA	FTA	EFTA Secretariat. Standing Committee of EFTA States. Various advisory committees. Parliamentary Committee (representatives from members' parliaments) meets four times a year, ministers meet twice annually	Trade facilitation, migration, investment
EU	CU	European Parliament, Council of the European Union, European Central Bank, Various Committees	Trade facilitation, services, investment, migration, common market, common currency
Mercosur	CU	Secretariat, Mercosur Trade Commission. Council of the Common Market, Common Market Group. Primary dispute settlement by bilateral negotiation, referred to Common Market Group then Council of Common Market in case of impasse	Trade facilitation, investment, peace treaty, maintenance of democracy

Table 3 (*Continued*)

Name	Type of agreement	Supranational institutions (including meeting frequency)	Provisions beyond tariff reduction
NAFTA	FTA	Free Trade Commission, NAFTA Secretariat (dispute settlement). Periodic meetings of heads of state	Trade facilitation, investment, labor, environment
SAPTA	FTA	SAARC institutional structure includes Secretariat, regional centers for research, standing committee of foreign secretaries, standing committees on technical issues. Most decisions made at annual meetings of heads of government. No separate institutions for SAPTA	FTA is part of larger cooperation plans of SAARC
SPARTECA	Non-reciprocal trade preferences	Forum Secretariat, Australian and New Zealand Customs Agencies oversee agreement, primarily assessment of origin of goods traded	

PTAs involving ADB's developing market countries are a varied group. AFTA and SAPTA trade agreements were outgrowths of regional cooperation bodies (the South Asian Association for Regional Cooperation, SAARC and the ASEAN, respectively). These bodies were formed for largely political reasons and encompass a wider range of cross-national interaction in cultural, health, environmental, and other areas as well as trade. AFTA has been very active in drawing up a timetable whereby tariffs would be reduced in progressive steps, with the stated intention of eventually evolving to a Free Trade Area. It has also has an active Secretariat that addresses a number of issues of interest to members.

The Melanesian Spearhead Group (MSG) and SPARTECA are PTAs involving Pacific Island economies (the latter in association with Australia). Trade volume among member countries remains low and these economies remain oriented toward the larger Australian and New Zealand markets.

The ECO is a trade bloc that the Central Asian countries formed after the fall of the Soviet Union disrupted existing patterns of trade among themselves and Russia. It is a less binding arrangement than most PTAs. The focus is on providing broader institutions that facilitate bilateral agreements, rather than cementing a PTA in itself. The few formal diplomatic arrangements for trade agreements have been offset by unilateral policy barriers and unpredictable changes such as Uzbekistan's imposition of exchange controls in October 1996, after decline in cotton prices triggered a balance of payments crisis, and Russia's imposition of special tariffs after its crisis in 1998 (Pomfret, 2001).

The Australia–New Zealand Closer Economic Relations (CER), the industrial country PTA of the region is one of the most advanced free trade areas in terms of implementation: the agreement has eliminated nearly all policy barriers to trade in both goods and services. The agreement not only eliminates tariffs, but also contains provisions for customs harmonization and common product standards.

APEC, the largest trading arrangement that ADB member countries are involved in, has few institutional structures as part of its overall philosophy of loose cooperation and ''open'' agreements. APEC's aspirations to create ''open regionalism,'' while sometimes criticized as being unrealistic, offer a unique policy orientation for a trading arrangement.

While the exact nature of APEC's trade liberalization agenda has been unclear, some credit APEC's efforts with contributing to the formation of FTAs among some of its member countries.

Bilateral PTAs have also been common among less developed countries in the Asia and Pacific Region, especially among India and its neighbors, and the central Asian member countries. India gives duty free access to products from Bhutan, Nepal, and concessionary customs duties to products from Bangladesh. The list of central Asian bilateral agreements is quite long. Bilateral agreements between Georgia and Azerbaijan, Kazakhstan, and Turkmenistan that were negotiated in the second half of the 1990s after the goal of economic cooperation across the Commonwealth of Independent States (CIS) did not materialize. The individual agreements borrow from the CIS institutions—rules of origin, for example, are based on CIS guidelines. The Kyrgyz Republic was also highly involved in bilateral agreements and has reported bilateral PTAs with Armenia, Kazakhstan, Moldova, Russia, Ukraine, Uzbekistan, and Tajikistan. Other bilateral arrangements in Asia and the Pacific include PTAs between Laos and Thailand and New Zealand and Singapore as well as the above-mentioned Australia–New Zealand CER.

Within the Asian region there is no common pattern in the extent of overlapping PTA membership. Aside from common membership in APEC, most of the other common membership involves bilateral agreements. SPARTECA and SAPTA members have relatively few commitments to other PTAs, most likely because these two agreements involve least developed countries. APEC, AFTA, and ECO have a higher number of other commitments because of the extent of bilateral agreements among member countries and AFTA country membership in APEC.

The region's PTAs vary with respect to the average level of income and economic development of their constituent economies (see Table 2), a factor that is likely to affect the degree to which they promote intra-bloc trade. Some PTAs have members whose levels of economic development are fairly uniform with average per capita incomes falling in a narrow range, while others have members that are highly heterogeneous economically. We would expect higher intra-bloc trade among the latter, all other things equal. SAPTA and ECO have the lowest average per capita incomes (less than US $1000) and also the smallest variation in income per capita. Other PTAs in the region have higher average per capita incomes and there is substantial variation in the level of income among members. AFTA, and SPARTECA have the highest variation in GDP within the member countries. AFTA brings the high-tech industrial Singapore together with the primarily rural economies of Cambodia, Vietnamese, and Myanmar. SPARTECA's high coefficient of variation is due to the dispersion between the Pacific Islands and the New Zealand and Australian economies.

3. Trends and geographical concentration of trade in the Asia Pacific region

3.1. Trends in trade

World trade has grown substantially over the past half a century, particularly in the 1990s. As shown in Fig. 1, the growth rates of the volume of world merchandise exports and world GDP have diverged since the 1950, indicating that the degree of trade has

Table 4
Average annual growth of merchandise exports (in percent)

Year	All exports	Agriculture	Mining	Manufacture	GDP	Exports/GDP
1951–1960	7.76	5.03	8.29	8.87	4.52	3.24
1961–1970	8.59	2.94	3.92	10.54	5.42	3.16
1971–1980	5.40	3.56	1.89	7.24	3.86	1.54
1981–1990	3.98	1.55	1.10	5.64	3.17	0.81
1991–2000	6.99	4.45	4.05	7.77	2.25	4.74

Source: WTO International Trade Statistics (2001).

increased more rapidly than overall production. The average annual growth of exports was 6.54%, which was higher than the corresponding expansion rate of GDP of 3.84% (see Table 4) between 1950 and 2000. The tradable component of world GDP increased at the average annual rate of about 3.2% during the 1950s and 1960s, its growth significantly slowed down (to 1.5% or less) in the 1970s and 1980s. In the 1990s, the world's trade to GDP ratio reached its highest rate during the period under consideration surpassing levels of the seventies and eighties. In the 1990s, merchandise exports grew by 7.8%, or 4.7 percentage points higher than world GDP growth over the same period.

Table 5 presents growth rates of exports of manufactured products, and shows this growth has consistently surpassed growth in exports of agricultural and mining products. Manufacturing goods' share in total merchandise exports has increased, while the respective shares of mining and agriculture sector outputs have declined through the years. In 2000, the share of manufactured exports in total exports was estimated at 74.9%, up from about 70% in 1990. For agriculture, the share of total exports number was 9.02 in 2000, down from 12.23% in 1990, while mining fell from 12.23 to 9.02% over the same period.

Observed shifts in the types of manufactured exports suggest that these changes in trade flow are, at least in part, driven by policy changes. Exports of telecommunications and office equipment, items subject to low duties and taxes, doubled from 8.81% in 1990 to 15.19% of total merchandise trade in 2000. The exports of garments and textiles, a category of goods that is more heavily regulated in international trade agreements, such as goods covered by the Multi-Fibre Arrangement, grew more slowly than less regulated goods in the 1990s. Textiles, in particular, grew at a rate lower than that of total merchandise exports. While garment exports continued to be an above average performer, the increase in their share was less than 1%. The respective shares of textile and garment exports were 2.55% and 3.22% in 2000 compared to 3.08% and 3.19% in 1990.

3.2. Geographical patterns of trade

3.2.1. Measures of geographical concentration of trade

A simple measure to describe geographical concentration of trade is the share of a region's trade to total world trade. We use exports as a summary statistic for country trade. The resulting statistic is,

$$s_{r,\mathrm{W}} = \frac{X^{\mathrm{T}}_{r,\mathrm{W}}}{X^{\mathrm{T}}_{\mathrm{W,W}}}$$

Table 5
World merchandise and service exports: 1990, 1995, and 2000

	1990	1995	2000
World merchandise trade (billion dollars)	3388	4934	6186
Share in world merchandise trade (percent)			
Agricultural products (percent)	12.23	11.69	9.02
Food	9.30	8.98	7.15
Raw materials	2.92	2.71	1.87
Mining products	14.25	10.57	13.15
Ores and other minerals	1.56	1.21	1.00
Fuels	10.55	7.21	10.20
Non-ferrous metals	2.15	2.14	1.94
Manufactures	70.54	73.81	74.85
Iron and steel	3.12	3.05	2.32
Chemicals	8.73	9.44	9.28
Other semi-manufactures	7.78	7.88	7.26
Machinery and transport equipment	35.80	38.59	41.48
Automotive products	9.41	9.16	9.24
Office and telecom equipment	8.81	12.17	15.19
Other machinery and transport equipment	17.58	17.25	17.05
Textiles	3.08	3.03	2.55
Clothing	3.19	3.19	3.22
Other consumer goods	8.84	8.64	8.75
Total merchandise exports		100.00	100.00
All commercial services (billion dollars)	845.27	1246.50	1435.00
Share in world exports of commercial services (percent)			
Transportation	28.50	25.20	23.00
Travel	33.80	33.60	32.40
Other commercial services	37.70	41.20	44.60

Source: WTO International Trade Statistics (2001).

where $S_{r,\mathrm{W}}$ is the share of region r to total world trade; $X^{\mathrm{T}}_{r,\mathrm{W}}$ is exports from region r to the world trade; and $X^{\mathrm{T}}_{\mathrm{W,W}}$ is all world exports.

Another measure, called the intra-regional or intra-bloc trade share highlights the importance of intra-regional trade:

$$s_{r,r} = \frac{X^{\mathrm{T}}_{r,r}}{X^{\mathrm{T}}_{r,\mathrm{W}}}$$

The intra-regional trade index is useful for comparing regional trade flows over time in a PTA with constant membership, as it automatically increases with r and thus can be misleading when comparing PTAs of differing sizes.

This problem may be overcome using the simple trade concentration ratio or trade intensity ratio (Frankel, 1997; Petri, 1993):

$$I_{r,r} = \frac{X^{\mathrm{T}}_{r,r}/X^{\mathrm{T}}_{r,\mathrm{W}}}{X^{\mathrm{T}}_{\mathrm{W},r}/X^{\mathrm{T}}_{\mathrm{W,W}}}$$

If this index is one, bloc members are trading with each other in the same intensity as they are trading with non-members.

3.2.2. Regional trade shares

In Table 6, we show how the shares of various regions and economies in total world trade have changed over half a century. North America, Western Europe, and Japan are consistently the top three trading regions or countries. Together they account for 64.3% of world exports and 68.6% of imports. These figures are substantively higher than they were in 1948 at, respectively 59.2% and 61.2%. Recently, the share of China in total world trade has been rising while that of Japan declined in 2000, having its peak in

Table 6
World merchandise trade by region and selected economies: 1948–2000

	1948	1953	1963	1973	1983	1993	2000
World exports (billion dollars)	58.0	84.0	157.0	579.0	1835.0	3641.0	6186.0
Share (percent)							
World	100.0	100.0	100.0	100.0	100.0	100.0	100.0
North America	27.3	24.2	19.3	16.9	15.4	16.8	17.1
Latin America	12.3	10.5	7.0	4.7	5.8	4.4	5.8
C./E. Europe/Baltic States/CIS[a]	6.0	8.1	11.0	9.1	9.5	2.9	4.4
Africa	7.3	6.5	5.7	4.8	4.4	2.5	2.3
Middle East	2.0	2.7	3.2	4.1	6.8	3.4	4.2
Asia	13.6	13.1	12.4	14.9	19.1	26.3	26.7
Japan	0.4	1.5	3.5	6.4	8.0	10.0	7.7
China	0.9	1.2	1.3	1.0	1.2	2.5	4.0
India	2.2	1.3	1.0	0.5	0.5	0.6	0.7
Australia and New Zealand	3.7	3.2	2.4	2.1	1.4	1.5	1.2
World imports (billion dollars)	66.0	84.0	163.0	589.0	1881.0	3752.0	6490.0
Share (percent)							
World	100.0	100.0	100.0	100.0	100.0	100.0	100.0
North America	19.8	19.7	15.5	16.7	17.8	19.8	23.2
Latin America	10.6	9.3	6.8	5.1	4.5	5.2	6.0
Western Europe	40.4	39.4	45.4	47.4	40.0	42.9	39.6
C./E. Europe/Baltic States/CIS[a]	5.8	7.6	10.3	8.9	8.4	2.9	3.7
Africa	7.6	7.0	5.5	4.0	4.6	2.6	2.1
Middle East	1.7	2.0	2.3	2.8	6.3	3.2	2.6
Asia	14.2	15.1	14.2	15.1	18.5	23.4	22.8
Japan	1.0	2.9	4.1	6.5	6.7	6.4	5.8
China	1.1	1.7	0.9	0.9	1.1	2.8	3.5
India	3.1	1.4	1.5	0.5	0.7	0.6	0.8
Australia and New Zealand	2.6	2.4	2.3	1.6	1.4	1.5	1.3

Note: Between 1973 and 1983 and between 1993 and 1999 export and import shares were significantly influenced by oil price developments. Source: Table 11.2, WTO International Trade Statistics (2001).

[a] Figures are significantly affected by: (i) changes in the country composition of the region and major adjustment in trade conversion factors between 1983 and 1993 and (ii) the inclusion of the Baltic States and the CIS mutual trade between 1993 and 1999.

1993. Like China, the share of the group comprising Central and Eastern Europe, Baltic States, and CIS states has expanded in the 1990s.

Asia's share of total world trade of merchandise exports doubled over the past 50 years, while its share of world imports increased by only 60%. Eight countries account for 84% of Asia's export share in 2000 and 82% of its import share. These include Japan, China, and six East Asian trading countries. About half a century ago, the corresponding figures representing the contribution of these countries to Asia's share in world trade were, respectively 32% and 36%.

Table 7 shows the shares of various developing member countries (DMCs) of ADB and Japan and interesting observations can be made from the information that may be useful at least for any commercial endeavor. Japan is less of a destination for exports of DMCs in the 1990s compared to the 1980s. In contrast, China and the newly industrialized economies

Table 7
Percent shares of various regions in exports from the DMCs and Japan

From/to	Southeast			East Asia[a]	South Asia[b]	DMCs	Japan	DMCs and Japan
	NIEs[c]	Asia[d]	China					
NIEs								
1980	7.01	13.41	2.75	30.92	2.84	24.44	9.74	34.18
1985	6.22	10.14	9.83	34.17	2.84	27.67	9.57	37.24
1990	7.26	11.05	10.42	37.37	2.00	28.70	10.82	39.52
1995	9.22	15.38	16.73	47.39	1.81	40.43	8.84	49.28
2000	7.95	13.61	18.29	46.06	1.92	39.83	8.22	48.05
South East Asia								
1980	13.71	17.20	1.04	50.23	2.60	26.44	26.70	53.14
1985	14.59	18.05	1.34	49.66	3.25	29.55	23.59	53.14
1990	15.48	18.42	1.85	46.43	2.53	30.87	18.30	49.17
1995	18.16	24.05	2.74	49.94	2.23	38.39	13.93	52.32
2000	17.36	22.76	3.74	48.97	2.60	38.31	13.39	51.70
China								
1980	26.32	6.59	–	52.84	1.11	31.71	22.23	53.94
1985	33.70	10.39	–	58.85	1.55	38.15	22.29	60.44
1990	47.18	6.60	–	65.29	1.51	52.17	14.68	66.84
1995	31.01	7.01	–	54.82	1.67	37.40	19.11	56.51
2000	24.71	6.95	–	46.11	1.51	30.93	16.72	47.64
East Asia								
1980	11.97	11.70	2.79	32.29	1.83	24.10	10.23	34.33
1985	12.08	9.13	6.39	32.24	2.05	25.95	8.47	34.42
1990	16.04	11.64	4.53	36.03	1.55	29.52	8.18	37.70
1995	17.46	16.09	8.08	44.45	1.52	37.72	8.32	46.04
2000	15.65	14.03	8.84	42.34	1.57	35.45	8.51	43.96
South Asia								
1980	5.34	4.21	2.57	18.39	4.75	15.09	8.10	23.18
1985	4.39	3.22	0.82	17.06	4.48	11.38	10.20	21.58
1990	6.34	4.44	0.43	17.67	3.17	12.45	8.39	20.85
1995	9.39	6.38	0.92	21.03	4.39	18.93	6.50	25.43
2000	8.46	5.52	2.28	19.07	4.25	18.80	4.52	23.33

Table 7 (*Continued*)

From/to	Southeast			East Asia[a]	South Asia[b]	DMCs	Japan	DMCs and Japan
	NIEs[c]	Asia[d]	China					
DMCs								
1980	12.32	12.20	1.69	40.79	2.26	23.25	20.01	43.26
1985	13.63	11.26	5.18	42.18	2.55	27.49	17.40	44.88
1990	16.57	11.14	6.01	43.47	1.91	31.10	14.39	45.48
1995	16.37	14.70	9.34	47.74	1.94	36.97	12.78	49.75
2000	14.84	13.38	9.52	45.03	2.03	35.18	11.95	47.12
Japan								
1980	10.81	10.32	3.92	22.04	1.65	23.89	–	23.89
1985	9.94	6.55	7.11	21.40	1.73	23.26	–	23.26
1990	14.37	11.58	2.14	24.36	1.21	25.71	–	25.71
1995	18.53	17.56	4.95	35.85	1.04	36.95	–	36.95
2000	16.46	14.32	6.35	32.78	0.86	33.66	–	33.66
DMCs and Japan								
1980	11.58	11.28	2.78	31.64	1.96	23.56	10.24	33.80
1985	11.76	8.87	6.16	31.64	2.13	25.34	8.57	33.91
1990	15.63	11.33	4.35	35.29	1.61	28.79	8.23	37.01
1995	17.13	15.70	7.80	43.56	1.62	36.97	8.29	45.25
2000	15.33	13.66	8.56	41.34	1.68	34.72	8.35	43.07

Source: Authors' computation based on *Direction of Trade Statistics* (IMF, 2002).

[a] China, Hong Kong, Japan, Korea, Mongolia.

[b] Bangladesh, India, Maldives, Nepal, Pakistan, Sri Lanka.

[c] Hongkong, Korea, Singapore.

[d] Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam.

have increasingly taken a larger share of DMCs exports. There is increasing trade activity among the DMCs themselves now compared to the 1980s. DMCs and Japan tend to trade more with countries outside this region. Only less than half of the exports from the DMCs and Japan exports go to the region. Two-thirds of Japan's and about 75% of South Asia's exports go outside the region. DMCs in general, and Southeast Asia, NIE, and China in particular tend to export more to the region and this pattern appears to become more pronounced. The Table also shows the effect of the Asian financial crisis.

3.2.3. Intra-bloc export shares

A useful measure for comparisons across time is the share of trade among members of a given group of trading countries or region to total trade of the region. Higher intra-bloc trade shares may indicate a possible preference of members of a region or bloc to trade with each other. Fig. 2 shows the intra-bloc shares of exports for 11 trade blocs while Table 8 lays out the 5-year averages of these shares.[2] The blocs include EU, EFTA, AFTA, NAFTA, SAPTA, SPARTECA, ECO, APEC, CER, Mercosur, and ANDEAN. The period covered in the table is from 1980 to 2000.

[2] The basic data comes from the International Trade Statistics 2001 (WTO, 2001).

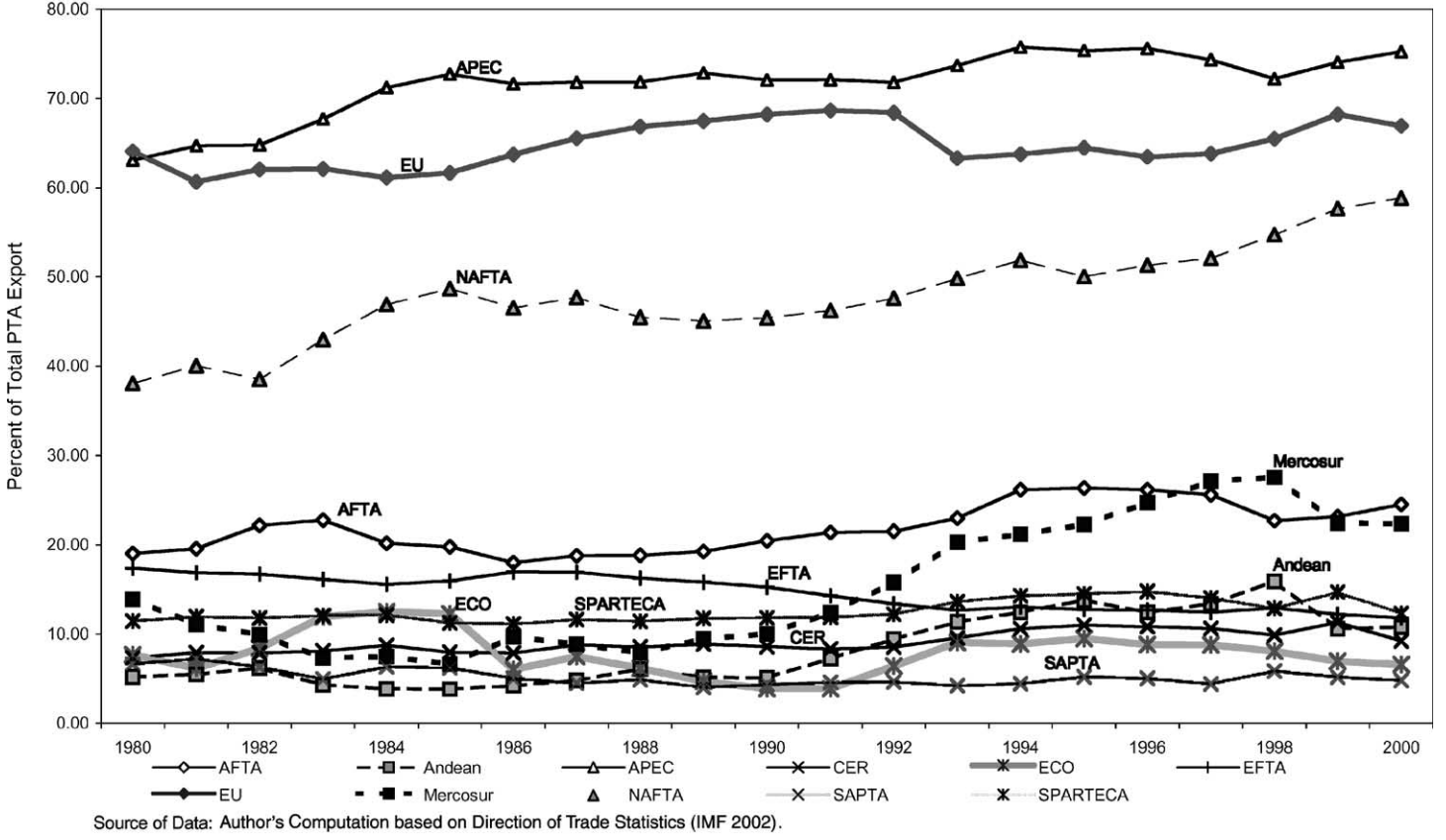

Fig. 2. Intra-bloc export shares of selected PTAs: 1980–2000.

Table 8
Five-year average intra-bloc export shares of selected PTAs, selected years: 1980–2000

PTAs	1980–1984	1985–1989	1990–1994	1995–1999	2000
EU	62.00	65.05	66.47	65.08	66.94
EFTA	16.53	16.39	13.73	12.60	11.82
AFTA	20.75	18.94	22.51	24.81	24.54
NAFTA	41.29	46.68	48.17	53.15	58.82
SAPTA	6.30	4.93	4.44	5.14	4.81
SPARTECA	11.88	11.44	12.78	14.18	12.31
ECO	9.34	7.33	6.42	8.41	6.58
APEC	66.30	72.18	73.08	74.31	75.24
CER	7.99	8.41	9.13	10.73	9.25
MERCUSOR	9.94	8.52	15.94	24.84	22.35
ANDEAN	5.01	4.82	9.13	13.23	10.77

Source: DOTS, IMF (2001); authors' computation.

Regional export shares exhibit a moderately rising trend towards the end of the 1990s. This pattern is most noticeable in the case of NAFTA, APEC or ASEAN. Moderate growth of the respective intra-regional export shares of the PTAs covered in this analysis may more likely be attributed to changes in the composition of these groupings, rather than to any intensification of preference of PTA members to trade among each other. In 1994, Canada and U.S. brought Mexico in to their FTA to form NAFTA. Chile, Mexico, Papua New Guinea joined APEC in 1993, while Peru, Russia, and Vietnam became members in 1998. As for ASEAN, Vietnam, Laos, Cambodia, and Myanmar joined the organization between 1995 and 1998.

There have been instances where intra-bloc trade shares fell (e.g., ECO, Andean Pact, and Mercosur between 1998 and 2000) as a result of external shocks and institutional changes happening within these PTAs. Political instability and economic restructuring in Central Asia combined with the lack of integration of ECO countries in the world economy explain the fall in the ECO trade share. External shocks associated with the Asian financial crisis likely contributed to a decline in Asian PTAs in the late 1990s.

Table 8 shows Asian PTAs (with the exception of APEC which has many Asian countries as members but whose membership extends to North and South American countries as well) tend to have the larger share of their respective trade with non-members—particularly in comparison the EU and NAFTA. This observation may possibly be explained by the nature of the PTAs themselves, as promoting intra-bloc trade among its members. That is, NAFTA or EU members comprise a natural bloc and the preferential policies have aggravated this natural attraction among members to trade with one another. This explanation can hardly be applied, however, to the case of APEC, and we will return to shortly when we take up the apparent limitation of intra-bloc trade shares for measuring the impact of PTAs.

On the other side of the coin, one possible reason why intra-bloc trade shares are low for Asia, Mercosur, or Andean is that these are developing country PTAs. Their smaller per capita GDPs—in turn the outcome of their particular development status, economic shocks, or political instability—are such that their trade will tend to flow towards more

wealthy countries even if their respective members share common borders. The Latin American PTAs—Mercosur and the Andean Pact—trade predominantly with countries outside of the PTA, which reflects the importance of the U.S. or EU as a trading partner in that region.

It warrants note that the high intra-bloc shares for APEC, EU, and NAFTA in do not necessarily indicate that the respective members of these prefer trade with other bloc members to trade with non-members. The index tends to be higher PTAs that include more or larger trading economies. Frankel (1997) cites the case of EU (EEC before) when the PTA expanded from 6 members in 1960s to 12 in the 1990s, resulting in an increase of EEC's intra-regional trade share from 49% in 1962 to 60 in 1990. The small intra-bloc trade share of EFTA (i.e., 12%) may likewise be explained by the fact that this PTA has lost many of its larger economies to the EU.

3.3. Trade intensity indices

The weakness of intra-regional trade shares as measures of trade orientation can be addressed by using simple concentration ratios or trade intensity indicators. The trade concentration ratio is obtained by dividing the intra-regional trade share by the share of the region to total world trade. PTA members are trading among themselves at the same intensity as they are with non-members when this index is one. If there is extra trade that goes on in the region beyond the normal pattern in the absence of the PTAs, then the trade intensity exceeds one.

The estimated trade intensity indices for the 11 PTAs from 1980 to 2000 are displayed in Fig. 3. In this figure, all the estimates are greater than one and display a similar pattern of results as in Frankel (1997).[3] The bigger PTAs such as APEC, EU, and NAFTA, tend to have indices close to one. The smaller ones tend to have bigger ratios, with size of PTAs defined as the PTAs share of world trade. Because our estimates use data up to 2000 and some Asian-based PTAs expanded their membership in the late 1990s, our estimates differ from Frankel's whose data extended only to 1994.

It is interesting to note that Mercosur and the Andean trade blocs have the highest trade intensities, an observation reported as well by Frankel. The Asian PTAs have lower corresponding estimates, no more than 10. The ECO bloc countries, comprising of mostly the Central Asian economies, apparently traded relatively more among themselves in the first half of the 1990s. Based on the data for the second half of that decade, this appears no longer true. This observation may indicate that these countries have adopted a more outward trade orientation in that period. A similar observation may be said of AFTA, but unlike in ECO the intensity index for the Southeast Asian bloc consistently fell in the 1990s. SAPTA countries formed their PTA in the middle of the 1990s. As shown in the figure, the trade intensity index for SAPTA rose up to 1997 but fell subsequently.

We computed the 5-year averages of the intensity indices since 1980 in order to describe more clearly the pattern of trade concentration disclosed by the ratios (see Table 9). APEC and EU have consistently the two lowest trade intensities among the 11 PTAs examined. NAFTA and EFTA switched in the bottom third or fourth places, with NAFTA increasing

[3] See Table 2.3 of Frankel (1997).

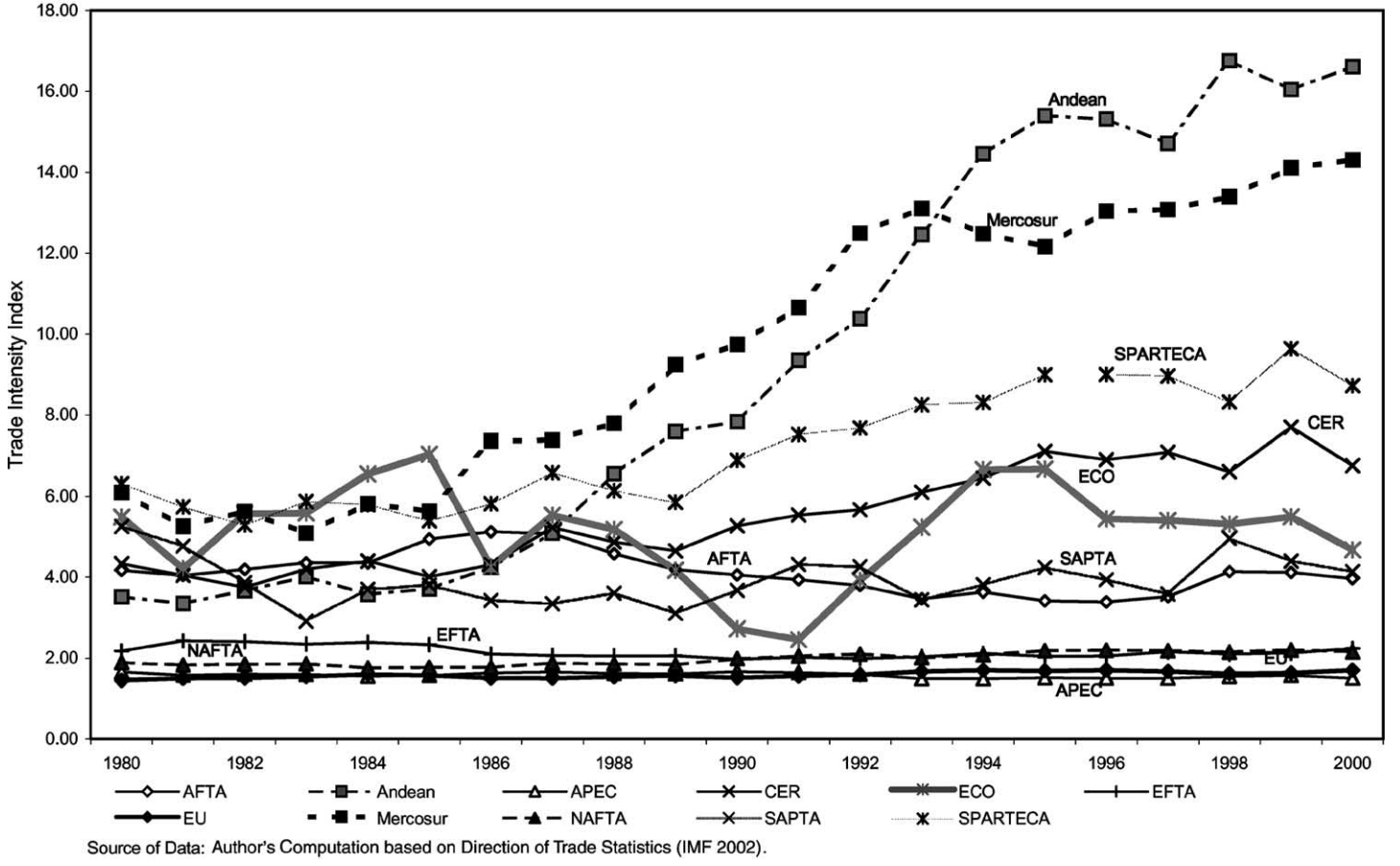

Fig. 3. Trade intensities of selected PTAs: 1980–2000.

Table 9
Five-year average trade intensity indices of selected PTAs, selected years: 1980–2000

PTAs	1980–1984	1985–1989	1990–1994	1995–1999	2000
AFTA	4.22	4.78	3.78	3.72	3.97
Andean Pact	3.63	5.44	10.90	15.65	16.61
APEC	1.60	1.61	1.57	1.53	1.50
CER	4.15	4.62	5.81	7.08	6.76
ECO	5.48	5.24	4.20	5.67	4.67
EFTA	2.35	2.12	2.02	2.10	2.24
EU	1.52	1.54	1.60	1.66	1.70
Mercosur	5.58	7.48	11.70	13.16	14.31
NAFTA	1.83	1.82	2.04	2.18	2.15
SAPTA	4.10	3.46	3.90	4.22	4.14
SPARTECA	5.80	5.96	7.73	8.98	8.72

Source: Authors' computation based on *Direction of Trade Statistics* (IMF, 2002).

its index in the 1990s. The other PTAs in Asia exhibit through time an increasing outward orientation. It is interesting to note that CER and SPARTECA appear to focus their trade within their bloc compared with AFTA, ECO, or SAPTA in the 1990s.

Andean and Mercosur have the top two indices for the 1990s, with the latter exhibiting a sharp increase from being fifth in the first half of the 1980s to being in the top of the group in the second half of the 1990s. This indicates of a surge of intra-bloc trade activity among its members. Earlier and using intra-regional trade share indices, we documented how Andean and Mercosur intra-bloc exports had increased dramatically from 1995 to 1998 but had fallen from 1999 to 2000. What is interesting to note here is that by deflating the intra-regional shares with the respective regional share of total world trade, we observe that Andean and Mercosur remained as having the highest intra-bloc trade intensity. This indicates that the respective trade shares of these regions in world trade has obviously declined by a rate much greater than the decrease of intra-bloc trade. Obviously, this highlights the effect of keeping track of the general economic performance in assessing intra-regional trade activity, and leads us to the analysis of the trade flows using gravity models of trade.

4. Analyzing trade effects of PTAs using a gravity model

4.1. Basic determinants

In this section, we discuss the gravity model of bilateral trade flows used in analyzing the effects of preferential trade agreements.[4] Empirically, trade flows have been found to be

[4] Those responsible in developing the theory of the gravity model include Deardoff (1984) and Helpman (1987). Frankel (1997, p. 61) cites Helpman and Krugman (1985) as the originators of the standard gravity model. The name used for their analytical framework is taken after Newton's theory of gravitation because of the analogy.

higher between countries with larger economies, as if these exerted a larger "gravitional" pull. Also like gravity, trade flows. Additional variables, such as physical area, population, indicators of cultural affinity, and sharing contiguous borders, are usually added to empirical gravity models to elaborate on the "economic mass" and distance variables.

"The total exports from country i to j are specified similarly to equations describing gravitational force": the total merchandise exported by country i to country j (X_{ij}) is defined as follows:

$$X_{ij} = AY_i^{\beta_i} Y_j^{\beta_j} H_i^{\mu_i} H_j^{\mu_j} N_i^{\gamma_i} N_j^{\gamma_j} D_{ij}^{\alpha} \bar{D}_j^{\delta} \varepsilon_{ij} \tag{1}$$

where Y_i represents the gross domestic product of country i; H_i represents the geographic size of country i; N_i represents the population of country i; D_{ij} represents the distance between country i and country j; $\bar{D}_i$ represents the average distance between country i and its export markets in other countries; A is a constant; ε_{ij} is an error term; and β, $\mu > 0$; and γ, α, $\delta < 0$. Taking the logarithm of (1), we get:

$$\begin{aligned}\log X_{ij} = {} & \log A + \beta_i \log Y_i + \beta_j \log Y_j + \mu_i \log H_i + \mu_j \log H_j + \gamma_i \log N_i + \gamma_j \log N_j \\ & + \alpha \log D_{ij} + \delta \log \bar{D}_i + \log \varepsilon_{ij}\end{aligned} \tag{2}$$

The regression equation typically used:

$$\begin{aligned}\log X_{ij} = {} & \log A + \beta_i \log Y_i + \beta_j \log Y_j + \mu_i \log H_i + \mu_j \log H_j + \gamma_i \log N_i + \gamma_j \log N_j \\ & + \alpha \log D_{ij} + \delta \log \bar{D}_i + a\,\mathrm{ADJ}_{ij} + cI_i + dI_j + \log \varepsilon_{ij}\end{aligned} \tag{3}$$

includes several dummy variables ADJ_{ij}, I_i, and I_j to capture additional feature of the country pair such as whether the trading partners have adjacent borders (ADJ) or either partner is an island economy (I). The error term is the standard Ordinary Least Squares (OLS) residual.

Per capita GDP is considered a key variable in the model, and larger economies are expected to engage in greater trade. However, a number of other factors act against the "gravity like" forces of economy size. Country geographic size and population are factors expected to reduce trade orientation by increasing the size of the domestic market and making economic activity more inwardly oriented. For example, Japan and China both have large economies of roughly similar size, but trade little. This may be explained by the fact that China has a lower per capita GDP, which weakens China's capacity to attract trade from Japan. China's large population gives Chinese producers plenty of consumers domestically and tends dampen rather than augment exports. Frankel (1997) explains that countries with large populations tend to be more inwardly oriented than smaller countries because they are better able to exploit scale economies in their large domestic markets. This may explain why bilateral trade flows generally have an inverse relationship to population size. Like population, physical area is expected to reduce trade flows to the extent that countries with relatively small or limited natural resource endowments tend to be smaller and thus depend more on trade to obtain natural resources not available in country.

Krugman (1991) considers the distance between two countries to be an important determinant of geographical patterns of trade. Trade is attractive to the extent of the gains from trading less the transaction cost incurred in realizing such gains. Distance tends to

increase the cost of transacting international exchange of goods and services. Beyond some distance, costs of consummating a cross-border exchange become prohibitive and accordingly no trade occurs. The farther apart two potential trading partners are, the more costly their bilateral trade, which erodes possible gains from trade. Linneman (1966) categorizes the costs of international trade transactions into three types: (i) shipping cost, including freight and insurance, (ii) cost of time, and (iii) ''psychic distance'' or ''cultural cost.'' Distance is not the only determinant for shipping cost. In examining data on freight, insurance, and shipping charges, Frankel (1997) notes that shipping costs vary widely across countries in Central Africa, where two remote trading partners may have relatively low aggregate shipping cost because only commodities that have relatively low shipping cost are traded. Accordingly, commodity composition of trade is needed in order to understand the relationship between distance and shipping cost.

Evidence suggests the effect of distance on trade flow has changed through time. Estimates from a gravity model carried out by Boisso and Ferrantino (1997) using data covering the years 1965–1985 suggest that distance had a deterrent effect on trade until the middle of 1970s, but that since then this effect has declined. They claim that the average distance between trading partners increased in the post-war period, indicating that shipping costs have fallen steadily. Trading partners located far apart from each other will have to require more time in transporting goods between each other, which discourages trade. This cost includes the intrinsic value of the goods that is forgone if these are not delivered on time. The ''psychic distance'' or ''cultural cost'' refers to the lack of familiarity by the citizens of a country about their trading partners (Drysdale and Garnaut, 1982). Cultural or linguistic affinity, shared borders, and whether the trading partner's territories are islands are factors that would tend to reduce cultural distance. Countries sharing a common language or having citizens belonging to the same ethnic group are more likely to transact business with each other.

In the specification of the basic gravity model used in this paper, following Soloaga and Winters (2001) we include two variables in our basic gravity model to capture different aspects of the influence of distance on trade flows. First, we include a variable measuring the distance between the capital cities for each pair of trading countries (D_{ij}). Second, we include a measure of the remoteness of a country captured by the average distance between the countries and the countries with which it trades ($\bar{D}_i$). In examining the effect of PTAs on the direction and volume of trade, it is important estimates controlled for the effect of distance and these other factors on trade flows. Next, we incorporate the variables representing PTAs, along with the other variables outlined as important in determining trade flows, into a gravity model.

4.2. Preferential trade agreements in the gravity model

In adopting the basic gravity model framework to study the effect of PTA membership on trade flows, Aitken (1973), and Braga, Safadi and Yeats (1994) introduce a variable that takes the value of one if the two trading countries are both members of the PTA, and zero otherwise into the model. They interpreted the estimated coefficient of this dummy variable to be the sum of the trade-creation and trade-diversion effects of the PTAs. A positive coefficient for the PTA dummy variable indicates that the PTA tends to generate more trade

amongst members than would be predicted based on the countries' other geographic and economic characteristics. There is no way of discerning, within this specification, of whether the PTA countries trade also more than would be expected with non-members.

Bayoumi and Eichengreen (1995) and Frankel (1997) add a second variable to enable trade creating and diverting effects of PTAs to be separated in the estimates. The variable takes the value of one if the importing country is a member of the PTA and the exporting country is a non-member; or zero, otherwise. The coefficient on the "extra-bloc" variable represents PTA country imports from the rest of the world that would not be expected based on economic and geographic characteristics. A negative value is evidence for trade diversion, as it suggests that members of that PTA import less from non-members than would be expected.

Soloaga and Winters (2001) introduce two additional PTA-related variables in order to capture the effects of PTAs on trade in general. One variable captures the impact of non-discriminatory import liberalization enacted through the PTA, and takes a value of one if the importer is a member of a bloc and zero otherwise. This variable is different from the extra-bloc PTA variable of Bayoumi and Eichengreen, and Frankel, because that variable captures only the extra imports of members from non-members. Soloaga and Winters' specification considers the extra imports of members of the PTA from all trading partners regardless of their membership status. The coefficient on the dummy variable for both countries being PTA members thus represents only the within-bloc trade that is above and beyond the general liberalization that PTA members might undertake. A final dummy variable introduced by Soloaga and Winters seeks to capture the extra exports of PTA members to all their trading partners, and takes a value of one if the exporter is a member and zero otherwise.

Eq. (4) represents the decomposition of the trade effects of PTAs that Soloaga and Winters introduce:

$$\begin{aligned}\log X_{ij} = {} & \log A + \beta_i \log Y_i + \beta_j \log Y_j + \mu_i \log H_i + \mu_j \log H_j + \gamma_i \log N_i \\ & + \gamma_j \log N_j + \alpha \log D_{ij} + \delta \log \bar{D}_i + a\,\mathrm{ADJ}_{ij} + cI_i + dI_j + b_k P_{ki} P_{kj} \\ & + m_k P_{kj} + n_k P_{ki} + \log \varepsilon_{ij} \end{aligned} \tag{4}$$

where P_{ki} is a dummy variable that takes the value of one if exporting country i belongs to PTA k and zero otherwise; and P_{kj} is a similarly defined dummy variable for importing country j belonging to PTA k. The coefficient b_k on the interaction of P_{kj} and P_{ki} represents the additional exports from i to j that occur when both countries are members of the PTA k. The coefficient on P_{kj}, m_k, represents the additional exports from country i, not a member of PTA k, to a country j in PTA k. In other words, this dummy represents the additional imports that country j in PTA k receives from the world outside the PTA. The coefficient n_k has a similar interpretation as country i's exports to non-members of the PTA.

Soloaga and Winters' elaboration of the earlier models adapted to examine the trade effects of PTAs can be understood as seeking to measure the impact of PTAs on the trade of their respective members, and not just on intra-bloc trade as in the traditional approach of Aitken and Braga, Safadi and Yeats. The trade liberalization effects of PTAs are highlighted. The trade of members of the PTA is measured through the sum of the coefficients of the intra-bloc variable and the extra-import and extra-export variables. The total effect of

the PTA on trade with bloc members is thus: $b_k + m_k + n_k$, or the sum of trade diversion (b_k) and general trade liberalization effects on exports (n_k) and imports (m_k). The separate dummy variables allow for us to assess the relative contribution of the PTA to narrow intra-bloc trade as well as general trade with the world. In the most extreme trade-diverting case, the coefficient b_k would be positive (indicating increased exports from when both countries are members of PTA k), and $m_k + n_k$ is negative (indicating that being in PTA k depresses a country's imports from the rest of the world more than that it increases its exports to the rest of the world or vice versa so that the net effect on trade flows between PTA members and the world is negative). In a case where the PTA expanded intra-bloc trade but trade with the rest of the world increased as well, we might also have a positive intra-bloc effect as well as positive import and export effects.

4.3. Modeling the effect of PTAs on Asian trade

Because the focus of the present study pertains to the effect of PTAs on Asian trade, we introduce Asian variables into the gravity model in order to capture the effect of PTAs on Asia's trade. Following Soloaga and Winters, we separate the extra imports and the extra exports that Asia gets because of a PTA. The ''Asia extra import'' effect of a PTA is denoted by the estimation coefficient in Eq. (5) of the interaction between the ASIA dummy variable j that takes the value of one if importer j is in Asia and the dummy variable P_{ki} that is one if the exporting country i is a member of PTA k. The estimation coefficient, m_k^A, measures the extra imports that Asian countries obtain from PTA k, regardless of whether they are members of PTA k or not. The ''Asian extra export'' effect is defined similarly, n_k^A measures the added exports Asian countries provide to member countries of PTA k. It is the estimation coefficient of the interaction between the dummy variable denoting membership of importer j to PTA k and the Asian status variable of exporter i. The estimation equation is thus:

$$\begin{aligned}\log X_{ij} = {} & \log A + \beta_i \log Y_i + \beta_j \log Y_j + \mu_i \log H_i + \mu_j \log H_j + \gamma_i \log N_i \\ & + \gamma_j \log N_j + \alpha \log D_{ij} + \delta \log \bar{D}_i + a\,\mathrm{ADJ}_{ij} + cI_i + dI_j + b_k P_{ki} P_{kj} \\ & + \sum_{k=1}^{k} b_k P_{ki} P_{kj} + m_k P_{kj} + n_k P_{ki} + m_k^A P_{ki}\,\mathrm{ASIA}_j + n_k^A P_{kj}\,\mathrm{ASIA}_i + \log \varepsilon_{ij} \quad (5)\end{aligned}$$

The Soloaga and Winters logic also applies to PTAs that include Asian and non-Asian members. Under our specification, the effect of PTA k on members' trade with Asian members (above and beyond its trade with members in general) is given by: $m_k + n_k + m_k^A + n_k^A$. This comprises: (i) the effect on Asian imports from bloc k, regardless of whether Asian importers belong to PTA k or not ($m_k + m_k^A$) and (ii) the effect on Asia's exports to bloc k, regardless of whether the Asian exporters are members of PTA k or not ($n_k + n_k^A$).

4.4. Data and estimation issues

The data used in estimating the gravity model comes from the 2001 IMF Direction of Trade Statistics (DOTS). Eighty-three countries are included in the analysis, and bilateral

exports for every pair of these countries are extracted from the DOTS database for the years 1980–2000.[5] The number of observations varies per year, and because the model was estimated in logarithms, instances of zero trade between two countries were dropped from the datasets used in estimations.[6] Dropping these cases from our estimation implies that our results should be interpreted as capturing the effect of PTAs on trade flows among trading countries, conditional upon the decision to trade having been made. It seems reasonable to assume that the source of truncation—the decision to not export at all to a particular country—is at best only slightly correlated with memberships in PTAs and geographic variables so that bias in the coefficients is minimal. This is clearly a second-best solution that affects the efficiency of the OLS estimates, but the alternative of explicitly modeling the decision to trade would, we feel, involve imposing too many assumptions on what are essentially highly idiosyncratic economic and political decisions.

Export values are expressed in real terms, being deflated using a merchandise price index (base year 1990) obtained from the WTO International Trade Statistics 2001, then transformed into logarithms for the estimations. Estimates are carried one using both single-year cross-sectional data and panel data constructed from 5-year intervals (1980, 1985, 1990, 1995, and 2000) of the available data. Population and GDP data was obtained from the World Bank's World Development indicators. The distance between capital cities was obtained from John Havemann's (2002) International Trade Data website, while the data on land area was obtained from the *World Factbook* of the US Central Intelligence Agency (2001).

5. Empirical results

In Tables 10–15, we report our gravity model estimation results. The model was estimated two ways. Estimates were carried out using cross-sectional data sets for selected single years of data (i.e., 1980, 1985, 1990, 1995 and 2000). Second, longitudinal estimates were carried out using a panel of data constructed from 1985, 1995, and 2000 data. We discuss these results next, starting with Table 10, which summarizes the estimation coefficients for the basic variables of the gravity model. Tables 11 and 12 summarize the estimated effects of each of the 11 PTAs whose effects on trade flows were assessed. Across the six model estimates, between 68% and 73% of the variation of trade flows was explained by the variables included in the gravity model, including the variables capturing the effects of PTA membership.

5.1. Basic determinants of trade flows

As reported in Table 10, GDP, the distance between capitals, country land area, and sharing a common border are statistically significant at the 95% confidence level or better have the expected sign. Distance between two countries is shown to be the most important

[5] These 83 countries accounted for roughly 73–85% of total global exports during the period 1980–2000.

[6] Across the 83 countries included in our dataset, instances of no trade between pairs of countries accounted for between 16% and 20% of the total country pairs.

Table 10
Gravity model estimates, various years: 1980–2000

Part I: basic gravity variables	Annual cross section data (coefficients)					Panel data[a]
	1980	1985	1990	1995	2000	
Intercept	−1.183**	−0.892**	3.286**	2.354**	2.276**	−1.026**
LogGDP Exporter at 1990 prices	1.408**	1.305**	1.254**	1.098**	1.047**	1.102**
LogGDP Importer at 1990 prices	0.970**	0.996**	0.964**	0.914**	0.866**	0.909**
LogPopulation Exporter (*i*)	−0.209**	−0.145**	−0.172**	0.003	−0.018	−0.030*
LogPopulation Importer (*j*)	−0.026	−0.027	−0.033	0.008	0.031	0.031*
LogDistance btw. Trading partners (*i* & *j*)	−6.555**	−6.693**	−7.108**	−6.192**	−6.006**	−7.162**
LogAvg. Distance to export markets (*i*)	0.308*	−0.025	−0.210*	−0.266**	−0.001	−0.165*
LogArea Exporter (*i*)	−0.318**	−0.306**	−0.266**	−0.137**	−0.140**	−0.173**
LogArea Importer (*j*)	−0.198**	−0.219**	−0.188**	−0.133**	−0.154**	−0.163**
Dummy Var. Exporter *i* is an Island	0.079*	0.069	0.100*	0.173**	−0.004	0.118**
Dummy Var. Importer *j* is an Island	0.151**	0.064	0.094*	0.088*	0.053	0.085**
Dummy Var. for Common Land Border	0.312**	0.426**	0.521**	0.516**	0.450**	0.346**
Adjusted *R* Squared	0.679	0.684	0.731	0.718	0.708	0.707
Std. Error of the Estimate	0.760	0.783	0.779	0.797	0.852	0.697

Note: This is the first of a series of three Tables (10, 11, and 12). Source: Authors' computation.
[a] Covers 1985, 1995, 2000.
* Significant at 95% confidence level.
** Significant at 99% confidence level.

basic factor in determining trade flows. The one exception where the sign of the basic coefficients were contrary to expectations involves the estimated coefficient for the log of population in panel data estimates, for which the estimation coefficient is positive and statistically significant. This is contrary to the usual finding that larger countries tend to trade less. The effect of country remoteness on its trade was usually negative and significant, as one would expect, but in the cross-sectional estimates for 1980 the variable was estimated to have a positive and significant effect.

Turning our attention to the estimated effects of PTA membership, results should be considered in three distinct areas. First, estimates allow examination of the effect of PTAs on the trade flows between PTA members. Second, results should be considered in terms of the effect of PTAs based in Asia and elsewhere on Asia's trade. Lastly, estimation results can be considered in terms of what they suggest regarding the effects of PTAs on total world trade.

Estimates of the effect of different PTAs on the trade flows between members vary remarkably across PTAs. Based on our estimation results, we categorize PTAs into three groups based on whether they are tend to foster intra-bloc trade, foster greater trade with trading partners worldwide, or are estimated to have reduced intra-bloc trade. In the next section, we discuss estimation results for particular PTAs, grouping PTAs according to their apparent trade-diverting or trade augmenting effects.

5.1.1. PTAs fostering intra-bloc trade

As summarized in Table 11, the Andean Pact, ECO, EFTA, Mercosur, SAPTA, and SPARTECA are PTAs showing large positive 'intra-bloc trade' effects. Each of these had

Table 11
Gravity model estimates, various years: 1980–2000

Part II: effects of PTA (EFTA, Mercosur, ANDEAN, SAPTA, SPARTECA, ECO)	Annual cross-section data (coefficients)					Panel data[a]
	1980	1985	1990	1995	2000	
Andean Pact						
Intra-bloc exports (b_k)	0.813**	0.499*	0.950**	1.349**	1.611**	0.942**
Overall bloc imports (n_k)	−0.106	−0.140*	−0.213**	−0.169*	−0.369**	−0.076*
Overall bloc exports (m_k)	−0.010	−0.090	0.051	−0.041	−0.083	−0.051
Asian imports from bloc (Am_k)	−0.162	−0.124	0.005	−0.317*	−0.106	−0.298**
Asian exports to bloc (An_k)	−0.164	−0.312*	−0.088	−0.055	0.110	−0.171*
ECO						
Intra-bloc exports (b_k)	0.745*	0.500	0.116	1.698**	1.712**	0.276
Overall bloc imports (n_k)	−0.038	0.185*	0.367**	−0.247**	−0.151*	0.112*
Overall bloc exports (m_k)	−0.254**	−0.017	0.221**	0.187**	0.035	0.078*
Asian imports from bloc (Am_k)	−0.026	−0.129	0.159	−0.266**	−0.094	−0.056
Asian exports to bloc (An_k)	−0.053	−0.223	−0.114	−0.284**	−0.291**	−0.229**
EFTA						
Intra-bloc exports (b_k)	0.380*	0.415*	0.444**	0.405*	0.453**	0.441**
Overall bloc imports (n_k)	−0.242**	−0.284**	−0.356**	−0.214**	−0.232**	−0.258**
Overall bloc exports (m_k)	0.026	0.023	0.010	0.101*	0.111*	0.053
Asian imports from bloc (Am_k)	−0.129	−0.089	−0.140	−0.037	−0.091	−0.092*
Asian exports to bloc (An_k)	−0.292**	−0.100	0.098	−0.104	−0.074	−0.101*
Mercosur						
Intra-bloc exports (b_k)	0.793**	0.749**	0.588*	0.728**	0.924**	0.599**
Overall bloc imports (n_k)	0.127	−0.031	0.123	0.087	0.092	0.070
Overall bloc exports (m_k)	0.384**	0.731**	0.761**	0.558**	0.421**	0.455**
Asian imports from bloc (Am_k)	−0.470**	−0.335*	−0.561**	−0.397**	−0.401**	−0.189*
Asian exports to bloc (An_k)	−0.168	−0.260*	−0.164	−0.010	−0.006	−0.025
SAPTA						
Intra-bloc exports (b_k)	0.690**	0.464*	0.393*	0.505*	0.579**	0.475**
Overall bloc imports (n_k)	0.027	0.072	−0.002	0.106	−0.110	0.022
Overall bloc exports (m_k)	0.251**	0.302**	0.343**	0.258**	0.188**	0.264**
Asian imports from bloc (Am_k)	−0.177	−0.282*	−0.417**	−0.262*	−0.168	−0.325**
Asian exports to bloc (An_k)	0.049	0.137	0.309*	0.132	0.183	0.047
SPARTECA						
Intra-bloc exports (b_k)	1.292**	1.122**	0.964**	1.157**	1.042**	0.972**
Overall bloc imports (n_k)	0.053	0.068	−0.009	−0.234*	−0.500**	−0.054
Overall bloc exports (m_k)	0.055	0.327*	0.238*	−0.002	−0.443**	0.287**
Asian imports from bloc (Am_k)	−0.107	−0.240	−0.089	0.485**	1.064**	0.000
Asian exports to bloc (An_k)	0.060	0.318*	0.421**	0.434**	0.647**	0.392**
Adjusted R^2	0.679	0.684	0.731	0.718	0.708	0.707
Standard error of the estimate	0.760	0.783	0.779	0.797	0.852	0.697

Note: This is the second of a series of Tables 10–12. Source: Authors' computation.

[a] Covers 1985, 1995, 2000.

* Significant at 95% confidence level.

** Significant at 99% confidence level.

Table 12
Gravity model estimates, various years: 1980–2000

Part III: effects of PTA (EU, APEC, AFTA, CER, NAFTA)	Annual cross-section data (coefficients)					Panel data[a]
	1980	1985	1990	1995	2000	
APEC						
Intra-bloc exports (b_k)	0.155	0.322**	0.368**	0.363**	0.411**	0.429**
Overall bloc imports (m_k)	0.198**	0.308**	0.454**	0.390**	0.382**	0.356**
Overall bloc exports (n_k)	0.356**	0.526**	0.641**	0.589**	0.638**	0.535**
Asian imports from bloc (Am_k)	−0.234*	−0.372**	−0.359**	−0.232**	−0.163*	−0.332**
Asian exports to bloc (An_k)	0.027	−0.215*	−0.211*	−0.268**	−0.464**	−0.382**
EU						
Intra-bloc exports (b_k)	−0.246**	−0.256**	−0.112	0.051	0.046	0.017
Overall bloc imports (m_k)	0.228**	0.364**	0.283**	0.159**	0.305**	0.161**
Overall bloc exports (n_k)	0.168**	0.339**	0.156**	0.256**	0.403**	0.215**
Asian imports from bloc (Am_k)	−0.375**	−0.333**	−0.269**	−0.253**	−0.252**	−0.318**
Asian exports to bloc (An_k)	−0.219**	−0.407**	−0.252**	−0.118	−0.008	−0.190**
CER						
Intra-bloc exports (b_k)	−0.834	−0.503	−0.325	−0.299	−0.268	−0.435
Overall bloc imports (m_k)	0.100	0.227	−0.066	0.076	0.498**	0.309**
Overall bloc exports (n_k)	−0.052	0.057	−0.162	0.029	0.331*	−0.093
Asian imports from bloc (Am_k)	0.347	0.222	0.301	−0.158	−0.623**	0.214*
Asian exports to bloc (An_k)	−0.104	−0.401*	−0.409*	−0.474*	−0.653**	−0.516**
AFTA						
Intra-bloc exports (b_k)	0.166	−0.181	0.319*	0.422**	0.144	0.026
Overall bloc imports (m_k)	−0.039	−0.232**	−0.128*	−0.177**	−0.325**	−0.193**
Overall bloc exports (n_k)	−0.113	−0.117	−0.196**	−0.063	−0.122*	−0.050
Asian imports from bloc (Am_k)	0.377**	0.400**	0.346**	0.144	0.372**	0.264**
Asian exports to bloc (An_k)	0.057	0.267*	0.162	0.126	0.318**	0.191**
NAFTA						
Intra-bloc exports (b_k)	0.250	0.112	−0.066	0.326	0.282	0.210
Overall bloc imports (m_k)	−0.187*	−0.264**	−0.332**	−0.390**	−0.188*	−0.355**
Overall bloc exports (n_k)	−0.333**	−0.422**	−0.427**	−0.416**	−0.575**	−0.480**
Asian imports from bloc (Am_k)	0.348*	0.346*	0.079	0.014	0.115	0.119
Asian exports to bloc (An_k)	0.326*	0.235	0.282*	0.451**	0.799**	0.500**
Adjusted R^2	0.679	0.684	0.731	0.718	0.708	0.707
Standard error of the estimate	0.760	0.783	0.779	0.797	0.852	0.697

Note: This is the third of a series of Tables 10–12. Source: Authors' computation.
[a] Covers 1985, 1995, 2000.
* Significant at 95% confidence level.
** Significant at 99% confidence level.

positive and statistically significant coefficients for intra-bloc trade, only small changes in their overall imports, and increases in their exports to the world over the period covered in the data.[7] This suggests membership in these PTAs led constituent economies to divert

[7] To put these numbers in perspective, SPARTECA with a factor of 13.6 has a base of only about US $120 million, implying that the incremental exports that the PTA is responsible for is equal to about US $1.6 billion at 1990 prices.

Table 13
Summary of effects of PTAs on intra-bloc trade flows, and the imports and exports of the block with the rest of the world

	1980	1985	1990	1995	2000	Average
AFTA	0.00	−0.41	−0.01	0.76	−0.64	−0.06
Andean Pact	5.50	1.28	4.46	14.15	16.45	8.37
APEC	2.58	13.34	28.07	20.94	25.95	18.18
CER	0.00	0.00	0.00	0.00	5.74	1.15
ECO	2.10	0.53	2.87	42.44	35.35	16.66
EFTA	0.37	0.35	0.22	0.96	1.15	0.61
EU	0.41	1.80	1.75	1.60	4.10	1.93
Mercosur	14.01	29.19	21.37	18.28	21.15	20.80
NAFTA	−0.70	−0.79	−0.83	−0.84	−0.83	−0.80
SAPTA	7.71	4.84	4.44	4.79	4.85	5.33
SPARTECA	18.60	27.13	14.93	7.37	0.26	13.66
Overall average						7.79

Source: Authors' computation based on statistically significant estimation coefficients on Tables 11 and 12.

Table 14
Summary of effects of PTAs on Asia's imports and exports with the rest of the world

	1980	1985	1990	1995	2000	Average
AFTA	1.38	1.72	0.05	−0.33	0.75	0.71
Andean Pact	0.00	−0.65	−0.39	−0.67	−0.57	−0.46
APEC	1.09	0.77	2.36	2.01	1.47	1.54
CER	0.00	−0.60	−0.61	−0.66	−0.64	−0.50
ECO	−0.44	0.53	2.87	−0.75	−0.64	0.31
EFTA	−0.71	−0.48	−0.56	−0.23	−0.24	−0.44
EU	−0.37	−0.08	−0.17	0.45	1.86	0.34
Mercosur	−0.18	0.37	0.59	0.45	0.05	0.25
NAFTA	0.42	−0.54	−0.67	−0.56	0.09	−0.25
SAPTA	0.78	0.05	0.72	−0.01	0.54	0.42
SPARTECA	0.00	3.42	3.56	3.85	4.85	3.14
Overall average (weighted to trade shares)						0.67

Source: Authors' computation based on statistically significant estimation coefficients on Tables 11 and 12.

trade toward the economies of other members at the expense of trade with the rest of the world. We will discuss the estimates for each of these PTAs separately, and compare our findings to those of earlier research.

The estimated coefficients for PTA affects on intra-bloc trade, overall imports, and overall exports for EFTA display a pattern of results that suggests the positive incremental effect of membership in this PTA on intra-bloc exports was accompanied by declines in overall imports of the bloc.[8]

[8] Except for estimates carried out using data from the second half of the 1990s, EFTA's intra-bloc trade effect was not accompanied by a significant increase in overall exports of EFTA to the world.

Table 15
Summary of effects of PTAs on total world trade

	1980	1985	1990	1995	2000	Average
AFTA	1.38	1.72	1.20	0.76	0.75	1.16
Andean Pact	5.50	0.11	4.46	6.30	16.45	6.57
APEC	1.09	2.71	6.83	5.94	5.36	4.39
CER	0.00	−0.60	−0.61	−0.66	−0.64	−0.50
ECO	2.10	0.53	2.87	11.24	17.60	6.87
EFTA	−0.30	0.35	0.22	0.96	1.15	0.48
EU	−0.64	−0.49	−0.17	0.45	1.86	0.20
Mercosur	4.09	6.67	5.15	6.73	7.80	6.09
NAFTA	0.42	−0.54	−0.67	−0.56	0.09	−0.25
SAPTA	7.71	2.05	3.24	2.17	4.85	4.00
SPARTECA	18.60	57.56	41.01	68.47	63.51	49.83
Overall average (weighted to trade shares)						2.42

Source: Authors' computation based on statistically significant estimation coefficients on Tables 11 and 12.

A similar pattern in the results was found for the Andean Pact, and estimates of the intra-bloc trade coefficient for this PTA were positive and statistically significant. The magnitude of the intra-bloc trade-diversion effect obtained in this study is about a third lower than the corresponding estimates of Soloaga and Winters (2001). The estimates also show membership in the Andean Pact was generally associated with significantly lower total import levels although the effects on overall exports were, statistically insignificant. Our results contrast with those of Frankel (1997), who estimated found that the intra-bloc trade variable for the Andean Pact usually had statistically significant negative coefficients.

The estimates for the intra-bloc trade variable for Mercosur are all statistically significant and positive, while estimated coefficients for the overall import variable are not significant although most are positive. These results are consistent with those obtained by Frankel (1997) and Soloaga and Winters (2001). Results imply that the increased intra-bloc trade within Mercosur has not eliminated Mercosur's imports from the world. Estimates show Mercosur membership is associated with positive and statistically significant effects on total exports, which differs from the results obtained by Soloaga and Winters (2001).

The estimate of the intra-bloc trade effects of Mercosur membership for the most recent year for which data is available suggests the tendency towards intra-bloc trade orientation among bloc members is growing stronger, not weaker as suggested by Preusse (2001). In this paper, Preusse argues there have been two phases in Mercosur's implementation. In the first phase, intra-Mercosur exports expanded by 28.4%, which the author attributes to the increasing significance of regional production. Intra-Mercosur investments have accompanied the integration process of the region, and have contributed to greater regional production. The strong trade-diverting effects of the first phase were followed by the aborted formation of a full-fledged customs union in 1995 in the wake of the Asian crisis and economic recession of the region, which Preusse argues has reduced intra-bloc trading bias in the PTA.

Yeats (1998), research suggests an explanation for the results obtained in the present study. In assessing Mercosur's trade performance in the first half of the 1990s, Yeats noted that intra-bloc trade increased substantially at the expense of trade with non-member countries. This stemmed from the group's "discriminatory tariffs against nonmembers, which are four to six times higher" than those of the EU or NAFTA. It was further noted that the intra-regional trade and export growth among members was concentrated in products that were not competitive outside of the region. Extending the analysis to 2000, our finding that Mercosur positively and significantly influenced the intra-bloc trade share may well reflect the impact of accumulated inefficiencies induced by relatively high discriminatory protection maintained earlier.

The coefficients of the intra-bloc trade are statistically significant and positive across all our estimates for SAPTA. These findings differ from that of Frankel and Wei (1998) who found SAPTA membership was associated with lower levels of trade between members than would normally be expected. The results reported in Table 11 indicate that SAPTA members traded at nearly twice the level they would be expected to trade given the sizes of their economies, proximities, and similar characteristics. This is based on the coefficient of the intra-bloc trade variable obtained in our panel data estimate. The estimates of the impact of SAPTA membership on overall imports are all not significantly different from zero, while estimates of the effect of membership on total exports are positive and statistically significant. This result suggests there is an orientation toward intra-bloc trade among SAPTA members. Members export at a 27% higher rate than the global average according to our estimates.

The results for ECO suggest membership in this PTA had a positive and statistically significant effect on intra-bloc trade between members in the early 1980s. During these same years, membership in ECO was associated with no significant effects on overall imports and a statistically significant decline in member economies' overall exports. However, these effects dissipated over time as ECO members appears to have carried out structural adjustment and opened up their economies to global trade after 1985. Results in the second half of the 1980s differ markedly from the earlier effects. The estimated effect of membership on intra-bloc trade was not significantly different from zero, while membership was associated with significantly higher total imports and exports in estimated carried out using data from 1980 and 1990. However, in 1995 and 2000 estimates, ECO membership was once again associated with greater intra-bloc trade. Membership in these more years was also associated with lower total imports and higher total exports. Particular caution is warranted in interpreting the gravity model results fro ECO since the transition economies of Central Asia that make up ECO were undergoing dramatic changes in the structure of their economies during the years over which the models were estimated. Basic changes in the structure of economies, sectoral production, and prices may have had more profound implications for trade flows to and from these countries than changes in tariffs or other trade policies carried out under the aegis of ECO. Accordingly, one can reasonably expect that much of the change in trade flows captured in our estimates were likely due in greater part to the broader economic restructuring that was underway rather than to PTA membership.

A final PTA that is estimated to have fostered greater intra-bloc trade was SPARTECA, which involves Australia and New Zealand and several Pacific island countries. The

regression results indicating a strong intra-bloc effect are expected. Trade tended to flow more intensely among the smaller Pacific island economies that are members of SPARTECA and between Australia and New Zealand than between the Pacific island economies and their larger neighbors—relative to the latter's level of trade with the rest of the world. The potential for more trade between Pacific island economies and Australia and New Zealand is limited by the small size of the smaller economies domestic markets. The signs of the coefficients of the intra-bloc dummy variable for SPARTECA membership are positive and statistically significant in our estimates. The estimated coefficient for total imports went from being not significantly different from zero in the 1980s to being negative and statistically significant in the 1990s. The associated expansion of intra-bloc trade over time appeared to occur at the expense of member economies' imports from the rest of the world. The estimates of the coefficients measuring the effect of membership on total exports were all positive and statistically significant in our estimates.

5.1.2. PTAs fostering greater intra-bloc trade and greater trade with the rest of the world

Membership in APEC and EU was estimated to expand significantly trade between members of the PTA as well as between members and to the rest of the world. These results are summarized on Table 12.

The signs of the coefficients of variables capturing the effect of APEC membership on intra-bloc trade and on total imports and exports are all positive and statistically significant. This suggests that APEC is achieving its goals of open regionalism and augmenting total trade. The results obtained in our estimates are consistent with those of Frankel (1997). As with Frankel's estimate, our estimated coefficient for the intra-APEC export dummy variable is a large and positive and is statistically significant. The tendency for greater intra-bloc trade identified in the analysis was accompanied by strong tendencies toward greater trade with the rest of the world as well. While some researchers have argued that the size of the coefficient of the intra-bloc variable for APEC obtained in Frankel's estimate was too high (Polak, 1996), Frankel attributed the strong effect to the large share of total world trade accounted for by APEC member economies. He also noted the large coefficient estimate was not due to the inclusion of *entrepôt* economies, as his estimates excluded Singapore or Hong Kong from APEC's to control for the effect ''extra open'' economies might have on estimates. Frankel concludes that the ''APEC effect is genuine'' and quoting Garnaut (1994), he maintains that the trade augmenting impact identified for APEC is consistent with the type of integration ''where the initiative has remained primarily with enterprises acting separately from state decisions, and where official encouragement of regional integration does not include major elements of trade discrimination.''

Across the years for which the gravity model was estimated, the estimated effect of EU membership on intra-bloc trade shifted from being negative and statistically significant (in the 1980s) to being positive although not statistically significant. All the estimates of the effect of EU membership on total imports and total exports are positive and statistically significant. These results differ from those of Soloaga and Winters (2001), which found that EU has fostered neither overall trade nor intra-bloc trade, as would ordinarily be expected. Soloaga and Winters offer the explanation that deeper economic integration between member economies has reduced EU's imports from non-members. The differences in these estimation results might be explained by differences in the data used to

estimate the gravity model across the two our study and the earlier one by Soloaga and Winters. Soloaga and Winters used data on imports while our estimates were based exports data.[9] Bayoumi and Eichengreen (1997) observed that the strong intra-bloc effect of EEC in the 1980s appeared to have dissipated by the early 1990s.

Our gravity model estimates indicate that CER had no incremental trade effect within or outside the bloc, and most of the estimation coefficients for this PTA were not statistically different from zero. Coefficients associated with trade flows between member countries are no higher than we would expect them to be given the size of countries' economies and their proximity. The signs of the coefficients of the intra-bloc and Asian export variables are almost all negative, except for 2000. In the estimates carried out using data from 2000, many coefficients are statistically significant and suggest CER did not divert trade. The coefficients for the variables capturing the effect of the PTA on total imports and exports are positive and statistically significant.

Frankel's (1997) estimation results for the intra-bloc trade effect for CER differ from ours. He found the intra-bloc trade effects of the PTA were positive and statistically significant. Frankel used total trade data, i.e., sum of exports and imports while we use export data, which may account for the different results obtained in the two studies. Differences in the model specification (e.g., exclusion of language dummy variables in our estimates and the use of several additional dummy variables to gauge the effect of PTA membership on trade included in our model) may also account for the different results obtained.

5.1.3. PTAs that reduced gross trade but did not change intra-bloc trade significantly

In our estimates, AFTA and NAFTA were PTAs that showed no effect in altering intra-bloc trade but appeared to have reduced exports and imports between members and the rest of the world. The estimates obtained in this study for the coefficients of the intra-bloc, overall import, and overall export variables for ASEAN are all not statistically significant. This adds yet another study with results for AFTA that disagree with earlier those obtained in earlier research. Frankel (1997), for example, found membership in AFTA was associated with significantly more intra-bloc trade than would otherwise have been expected. Soloaga and Winters (2001) found AFTA had a negative and statistically significant effect on intra-bloc trade. A possible explanation for why the results of this study differ from earlier research is that the data used in our estimates included new members of ASEAN, namely Cambodia, Lao PDR, Myanmar, and Vietnam; while the earlier estimates did not. As a group of countries that are less developed and less integrated into the global economy than the previous five member countries of ASEAN, their inclusion in the gravity model may have diluted the effect of ASEAN on its trade within and outside the PTA.[10]

[9] It is unclear how use of exports versus imports affects results, although Havrylyshyn and Pritchett (1991) noted some of their gravity model estimates changed depending upon whether they used data on imports or exports to estimate the model.

[10] Sensitivity analysis of the estimates result suggest that results are robust to changes in the specification of the PTA membership variables, but that inclusion of new ASEAN members in the dataset did significantly influence estimation results.

Estimation results related to the effect of NAFTA on intra-bloc trade and on the trade of member economies with the rest of the world failed to reject the null hypothesis that the PTA has no effect. Earlier studies (Frankel, 1997; Soloaga & Winters, 2001) had earlier documented a similar result, so consensus is building that is NAFTA has not affected the trade orientation of its constituent economies. In our panel estimates, NAFTA membership was associated with lower although not statistically significant intra-bloc trade.

Our results suggest NAFTA members' total exports and total imports were lower than expected, and that the negative effect grew stronger over time. Soloaga and Winters had obtained a similar result, finding which is that the coefficient for overall imports of NAFTA members was negative and statistically significant after 1986. This same study found the coefficients capturing the effect of the PTA on total exports of members went from being positive in the early 1980s (specifically, 1980–1983) to being negative in the period after 1984. The results of these two studies suggest that NAFTA members may be reducing their overall trade with the rest of the world. Although our results are essentially the same as those obtained in earlier research, what is new about our results is that we have reached this conclusion using the latest trade data.

5.2. *Gross intra-bloc effect*

Table 13 summarizes the effects of PTAs on the trade flows with their members and non-members. The measure used is the anti-logarithm of the sum of the coefficients of the intra-bloc, overall import and the overall export variables of the PTA minus one. Soloaga and Winters refer to this sum of these logarithms as the ''gross intra-bloc'' effect. This exercise involves adding up the coefficients reported in Tables 10–12. Since not all of these coefficients are statistically significant, we accept the hypothesis that the coefficients having estimates that are not significant at a 95% confidence level or higher are equal to zero.

The estimates of the total trade effects vary markedly across the PTA's treated in our model estimates. APEC, ECO, and Mercosur appear to be the PTAs having the greatest impact on members' trade flows. At the other extreme, estimation results suggest AFTA and NAFTA have reduced the trade of their member economies. The overall effect of the 11 PTAs is an expansion of gross intra-bloc trade by a factor of 7.8 according to our estimates. Earlier studies of the effects of PTAs on trade flows that have applied gravity model estimates have obtained similarly large effects of PTA membership (e.g., Frankel, 1997 and Soloaga and Winters op. cit.).

5.3. *Effect of PTAs on Asian trade*

Our estimation model included two additional variables to capture the effect of PTAs on the trade of Asian region as a whole. The estimated coefficients for the two dummy variables representing Asian imports from and Asian exports to each PTA are also reported in Tables 11 and 12. Overall, our results suggest that PTAs fall into two groups with respect to their effects on Asian trade. In the first group, which tended to have insignificant intra-bloc trade effects and neutral impact on member economies' trade with the world (i.e., AFTA and NAFTA), members generally had higher than expected levels of trade with Asia.

The other PTAs, which displayed significant intra-bloc trade effects and in some cases positive and significant effects on total trade, showed either no significant effects or negative and significant effects on trade with Asia.

Considering PTAs as a whole, empirical estimates suggest trade in Asia has been augmented by the existence of PTAs, including both PTAs within the region and as well as PTAs based in other regions. As summarized in Table 14, results provide little support for the assertion that PTAs have diverted trade to member countries at the expense of trade outside the PTAs. The measure of this trade diversion/augmentation used in Table 14 is the anti-logarithm of the sum the estimated coefficients for the overall import, overall export, Asian import, and Asian export dummy variables in Eq. (4) minus one.[11]

According to our gravity model estimates, the general effect of PTAs on trade in Asia and the Pacific is small compared to the effect of PTAs have in other regions. While some individual PTAs (e.g., ANDEAN, CER, EFTA, and NAFTA) are estimated to reduce trade flows between Asia and the member economies, the overall net effect of the 11 PTAs was positive. The 11 PTAs treated in our estimations are found to be associated with a net expansion of trade within Asia and between Asia and other regions by a factor of 0.67 according to the gravity model estimates presented in this paper. The figures reported on Table 14 reflect the sum of the PTA's effects on overall imports and exports, and on imports and exports between member economies and Asian and Pacific economies. In some cases (e.g., NAFTA), the positive effect of the PTA on Asian trade is outweighed by the negative effects on overall trade. In the case of CER, negative effects of PTA membership on overall trade flows and on trade flows between Australia and New Zealand and Asia and Pacific countries combine to generate a stronger negative effect. The net influence of PTAs based in Asia's subregions, namely those involving countries of the South Pacific and Oceania (SPARTECA), South Asia (SAPTA), and Southeast Asia (AFTA), appear to have been to induce expanded trade in the greater Asian and Pacific region.

The effect of the EU on Asian trade suggested by estimates indicates a more complicated picture. The EU was estimated to have a strong positive effect on trade flows between member economies and the rest of the world—including trade to Asia. However, the specific effect of EU on Asian trade was found to be negative and statistically significant. Overall, the total trade effect dominates the Asia-specific effect, making the net effect of the EU on Asian trade positive. It is also worth noting that cross-sectional estimation results suggest the net effect of the EU on Asian trade has grown more positive over the past two decades. Although not covered in our estimates, the new least developed countries initiative for EU member countries, which grants non-reciprocal trade preferences towards selected small and least developed countries, could carry negative consequences for the EU's level of trade with Asian countries excluded from the arrangement.

Trade between countries in Asia and the Pacific and Mercosur member economies was estimated to have occurred at a rate higher than would be expected in the absence of the PTA. Lastly, estimates show the effect of ECO on Asian trade varied greatly across years of the cross-sectional estimates, which likely reflects the widespread structural changes in the constituent economies during the 1980s and 1990s, but on average had a small positive effect on trade flows to and from the Asia region as a whole and Central Asia.

[11] The formula used is: $Y = AX^{\beta}10^{\beta_j(a_1D_1+a_2D_2)}$.

5.4. PTAs' contribution to world trade

In Table 15, the effects of PTAs on world trade in general are summarized. The indicator used for this purpose is the anti-logarithm of the sum of the estimated coefficients of the intra-bloc, overall import, overall export, Asian import and Asian export variables less one. In general the indicators are positive. Only CER and NAFTA appear to have reduced trade. It was discussed earlier that the effect of NAFTA on its members' trade with the world was significantly negative and this effect dominated the bloc's positive effect on Asia's trade with its members. For CER, the negative effect of this PTA on its Asia's exports to its members explain why CER's effect on world trade is also to reduce its members' trade with the world. Both NAFTA and CER have insignificant effects on intra-bloc trade. On average, world trade is increased because of PTAs by a factor of 2.4. There is no guarantee that these trade flows match the patterns that would take place under full multilateral liberalization, but the gravity model analysis provides evidence that these PTAs create trade.

6. Conclusions

In this study, we estimated a gravity model of bilateral trade involving 11 trading blocs most of whom are from the Asia and Pacific region. The trade data used in estimating the gravity model is that of 83 countries from 1980 to 2000. The estimated coefficients of the basic determinants of the gravity model such as the GDP, distance between capitals of trading partners, population, and physical area explain well cross-country trade flows.

Our estimates of the effect of different PTAs on the trade flows between members vary remarkably across PTAs. Preferential trading agreements are categorized into three groups based on whether they tend to foster intra-bloc trade, foster greater trade with trading partners worldwide, or they reduced trade in general without changing their respective intra-bloc trade. Andean Pact, ECO, EFTA, Mercosur, SAPTA, and SPARTECA belong to the first group in varying intensity with respect to promoting intra-bloc trade. These tend to expand their trade among their respective members at the expense of their members' imports from the world, and exports as well although in a few instances these PTAs have a positive effect on their exports to the world. Interestingly, these PTAs have the propensity of expanding Asia's trade.

APEC, CER, and EU belong to the second group of PTAs that have expanded or not have not changed at all their intra-bloc trade, without reducing trade with the world. APEC and CER in particular illustrate the type of PTAs that adhere to open regionalism. EU, being in this list, is a surprise as other authors are of the view that EU is diverting trade towards its members.

AFTA and NAFTA are the PTAs that have not changed their intra-bloc trade but reduced their overall trade with the world. While other authors have regarded AFTA as trade creating, the result may be explained by the fact that in this analysis the bloc includes its new members. Earlier independent estimates had only included the original AFTA contracting parties. The new AFTA members are less integrated with the world economy as the founding members of this PTA.

In this study, we introduced two new dummy variables that allow the analyst to measure the impact of PTAs on the trades of countries in the Asia and Pacific region, while retaining the innovation made by Soloaga and Winters (2001) to the empirical gravity model analysis. One variable is designed to capture the effects of PTAs on Asia's imports from it. The other variable measures the impact of the PTA on Asia's exports to the trade bloc. The resulting added feature of the gravity model makes possible the impact of PTAs on overall Asia's trade.

In summary, the PTAs in this analysis have contributed significantly to trade expansion both at the global and regional (Asia and Pacific) levels. The results obtained in this study provide evidence that PTAs can create rather than divert trade.

These results suggest to us that PTAs offer a next-best path towards expanding world trade if negotiations for multilateral trade liberalization take a longer time to get completed. It will be important to follow macro-level cross-country research such as this paper with more focused studies on the dynamics of PTA members' policies toward trade with the rest of the world and participation in multilateral trading agreements such as the WTO. One claim that could be tested, for example, is whether negotiating PTAs help developing countries gain experience with trade liberalization on a limited scale that later smoothes the way toward more general trade opening (Michalopoulos, 1999).

Having noted this potential, policy makers need to be aware that PTAs vary. There are PTAs that tend to divert trade towards its members, be unnecessarily costly to administer, or create opportunities for unproductive rent seeking activities. The challenge to policy makers is to continue to innovate on their respective regional trade arrangements. A few ideas include using the regional arrangement to solve for regional spillover problems or facilitate trade and capital movements among members, thereby reducing the cost of doing business and increasing investments and aggregate economic activity of its members.

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