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Have Asian trade agreements reduced trade costs?[☆]

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ABSTRACT

Regionalization of trade in East Asia increased in the 1990s, and has been accompanied by a growing number of trade agreements. The wave of trade agreements is in part a response to the need to facilitate trade in order to make regional value chains more profitable. This paper draws on a rich Australian database for the period 1990–2007, which allows us to control for distance and commodity characteristics and to identify cross-country variation in trade costs. The results, indicating the extent to which East Asian countries' trade costs have fallen over the regionalization period relative to changes in other regions' trade costs, provide evidence of the existence of effective policy steps to facilitate trade and also that these steps have multilateral as well as bilateral or regional benefits.

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1. Introduction

As tariffs and quantitative restrictions on trade have fallen over recent decades, attention has shifted towards other obstacles to trade. Anderson and van Wincoop (2004), using a broad definition of trade costs[1], estimated that in the high-income countries trade costs amount on average to a 170% *ad valorem* barrier to trade, and that tariffs and non-tariff barriers accounted for less than a fifth of the at-the-border trade costs. Trade facilitation has been part of WTO trade negotiations for the first time in the current Doha Development Round.

In East Asia reducing trade costs has been the subject of unilateral action, bilateral agreements, regional trading arrangements (e.g., ASEAN) and broader plurilateral agreements (e.g., Asia Pacific Economic Cooperation, or APEC). The pace of such actions has accelerated markedly since the turn of the century, following a strong increase in intraregional trade during the 1990s and development of regional value chains. However, it is difficult to establish whether trade facilitation measures have actually reduced trade costs, and if so to what extent. Although many trade facilitation measures in East Asia have been negotiated bilaterally or within a regional context, their impact is likely to be non-discriminatory (e.g., simplifying border procedures will generally reduce the costs of trade with all partners).

This paper utilizes a rich dataset for 1990–2007 from an important third country market, Australia, to examine whether policy measures to reduce trade costs are reflected in variations in East Asian countries' actual trade costs over time. We define trade costs as the gap between free-on-board (fob) values when a good reaches the port in the exporting country and import values that include cost, insurance and freight (cif). This is a narrower definition of trade

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[1] That is, all costs of getting a good to the final user apart from the marginal cost of producing the good itself.

costs than that of Anderson and van Wincoop, but is an economically meaningful measure of the wedge between the cost of producing and moving a good to the exporter's port and the price paid by the importer upon the good's arrival in the destination country.[2] The cif/fob price gap is operationally useful because some national statistical offices have data on fob and cif values at disaggregated levels.[3] We utilize such data for Australian imports since 1990 at the six digit HS level (that is, with about 5000 commodity categories); with 228 identified trading partners, the dataset contains about 2.3 million observations. Variations in trade costs across Australia's trade partners will depend upon commodity-specific factors and trading-partner country characteristics. Australia provides a good natural experiment of the trade costs associated with each of its trade partners, including East Asian countries, because it is a fairly large economy, with little geographical discrimination in its trade policies, and limited transport modes (all imports arrive by air or sea).[4]

Our approach is to estimate trade cost functions in terms of exogenous country characteristics such as distance and of commodity characteristics such as bulk. With these estimated relationships as the benchmark, we examine East Asian countries' trade costs in greater detail to test whether their deviation from the global relationships or their changes over time track trade facilitation policies. The second section of the paper reviews the history of trade facilitation measures in Asia. Section 3 presents the global estimates of trade cost functions. The fourth section presents the empirical results on trade costs in East Asia. The final section draws conclusions.

2. Trade facilitation in East Asia

Trade facilitation is difficult to track because policies may be announced which are not implemented or which have minimal impact on actual trade costs. On the other hand, little-publicized administrative improvements are potentially a great source of reduced trade costs, especially in low-income countries. In Southeast Asia some large gains in border efficiency predate our period of study (e.g., the customs reforms in Indonesia in the second half of the 1980s), but this is not true for all countries. Some trade facilitation measures (such as coordination of border opening times) require bilateral agreement, which again may be ongoing rather than the result of a dramatic policy change.

Plurilateral agreements on trade facilitation are easier to date. The APEC group, which initially focused on reducing traditional trade barriers (the 1994 Bogor Agreement on reducing tariffs) and then addressed sectoral issues (the 1996 Early Voluntary Sector Liberalization Initiative), shifted its attention to trade facilitation in 2001.[5] APEC members agreed to reduce trade costs by 5% over five years; in 2006 a target of a further 5% cut over the next quinquennium was adopted. Countries announced lists of trade-facilitating measures, but despite the quantitative goal there is no benchmark against which to gauge whether the announced measures actually reduced trade costs by 5%.

The only regional trading arrangement (RTA) in East Asia, the Association of Southeast Asian Nations (ASEAN), was formed in 1967. For a quarter century ASEAN made little progress in regional trade liberalization. Even after the announcement of the ASEAN Free Trade Area (AFTA) in 1992, progress in cutting intra-ASEAN tariffs was slow, with lengthy exclusion lists. Empirical studies of the impact of tariff preferences within ASEAN produce generally small magnitudes.[6]

There were, however, steps towards reducing trade costs with ASEAN members adopting common documentation and moving towards a single window (i.e. one stop at the border for immigration, customs, quarantine and so on) and single border crossings (rather than separate stops for exit and entry). Already in the early 1990s, the emergence of sub-regional economic zones, especially Sijori (Singapore, Johor state of Malaysia and Riau province of Indonesia), reflected areas of ASEAN where trade costs were being reduced in order to support economic integration and regional value chains (Pomfret, 1996). This process was extended and consolidated with the expansion from six to ten members during the second half of the

[2] There is a semantic issue of whether this narrow definition should be referred to as transport costs rather than trade costs. Because policy steps to reduce trade costs have been primarily at-the-border measures and should be picked up to some extent in the cif/fob price gap, we refer here to the gap as trade costs, rather than transport costs, which may be thought of more specifically as payments to the shipping line. This is common practice in the international trade literature, but Korinek and Sourdin (2008) do describe the cif/fob price gap as transport costs.

[3] Both fob and cif values are collected by the Australian Bureau of Statistics, and also by New Zealand, the United States and some Latin American countries (Hummels, 2007, 152–153; Korinek & Sourdin, 2008). An alternative approach of matching fob values reported by exporting countries to cif values reported by importing countries is subject to large measurement errors (Hummels & Lugovskyy, 2006).

[4] Zero cells will always exist at the 6-digit level of aggregation, but because Australia is a reasonably large economy – the world's 14th largest importer in 2006 (WTO International Trade Statistics 2007, Table 1.9) – there are relatively few zero cells. Apart from trade with New Zealand and other Pacific islands, no significant preferential trading arrangements influence Australia's trade. Hummels (2007), reviewing the recent literature on trade costs, emphasises the difficulty of measuring costs of land transport (the mode used by over a fifth of international trade) and how they interact with costs of sea and air transport, which are to varying degrees substitutes.

[5] APEC, created in 1989, now includes Australia, Brunei, Canada, Chile, China, Hong Kong, Indonesia, Japan, South Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, the Philippines, Russia, Singapore, Taiwan, Thailand, the USA and Vietnam At the November 1994 Bogor summit APEC leaders adopted the goal of trade liberalization by APEC's developed country members by 2010 and by the developing economies by 2020. In 1996 the USA pushed the Early Voluntary Sectoral Liberalization (EVSL) Initiative for APEC liberalization in fifteen sectors, but by 1998 the EVSL had collapsed acrimoniously.

[6] Manchin and Pelkmans-Balaoing (2008) survey the literature, and point out that preference margins were reduced by MFN tariff cuts. Singapore and Brunei have such low tariffs that preferential treatment is trivial, and for the other four original members the preference margins were less than 5% on 84% of total intra-ASEAN trade in 2001–2003.

1990s and accelerated progress towards AFTA.[7] Reflecting the accelerated pace of regional integration, an initiative to establish an ASEAN Economic Community was launched at the 2003 ASEAN summit in Bali, and at the January 2007 summit the target date for creation of a single ASEAN market was brought forward to 2015. The ASEAN Economic Community project is an attempt to unify and extend the ASEAN Free Trade Area, the ASEAN Investment Area and the ASEAN Framework Agreement on Services, and is clearly aimed at facilitating trade. Although trade facilitation measures within ASEAN are agreed at a regional level or among a subset of members, most trade facilitation is non-discriminatory; improved documentation, port logistics and so forth reduce costs of trade with all partners.

During the 1990s intraregional trade and investment in East Asia began to increase rapidly.[8] Before the mid-1990s trade was primarily between individual Asian countries and countries outside the region, but by 1996 intraregional trade accounted for 50% of the East Asian countries' total trade, compared to about a third at the start of the 1980s.[9] As Asian incomes and demand rose, regional markets became more important. At the same time regional value chains began to emerge, a pattern documented in the "Emerging Asian Regionalism" project (ADB, 2008).[10] The emergence and rapid growth of regional value chains created pressures for trade facilitation because fragmentation of the production process is only profitable if the cost of moving components across borders is low in terms of both money and time.

After the 1997–1998 Asian Crisis there was an upsurge of interest in Asian regionalism, initially in the monetary sphere, culminating in the 2000 Chiang Mai Initiative which created formal swap arrangements among the central banks of the ten ASEAN countries plus China, Japan and Korea (the ASEAN + 3 group). Despite some advocacy of an Asian sequence of regional arrangements, the money-first approach made little progress after 2000 (Pomfret, 2005). In the twenty-first century, East Asian regional agreements have primarily concerned trade.

The spread of trade agreements in Asia has been documented by Kawai and Wignaraja (2007) and ADB (2008). An upper limit is provided in the table 'FTA by Status' maintained by the Asia Regional Integration Center (ARIC) at the ADB, which recorded 207 agreements proposed, negotiated or in force by the end of June 2008.[11] However, it is difficult to generalize about the agreements' content, and many of the agreements lack much serious content (Pomfret, 2007a,b).[12] The agreements are not primarily about tariff barriers, but more often about reducing border and behind-the-border trade costs.

At the same time as ASEAN was deepening its own regional integration, it looked for new institutional arrangements with its northeast Asian trading partners. ASEAN had been considering in 2000 a proposal for integration among ASEAN + 3, but foot-dragging by Japan and Korea (Munakata, 2006, p. 117–118) led to ASEAN and China moving swiftly in 2001 towards negotiating a trade agreement. In November 2002 ASEAN and China signed the framework agreement on Comprehensive Economic Cooperation, which foreshadowed establishment of an ASEAN-China Free Trade Area within ten years. In June 2003 China and Thailand signed an "early harvest" agreement to eliminate tariffs on 108 edible vegetables and 80 edible fruits and nuts from 1 October 2003, and early harvest measures involving other ASEAN members were introduced on 1 January 2004. In November 2004 the formal Agreement on Trade in Goods between ASEAN and China was signed; it envisaged establishment of a free-trade area by 2010 for six ASEAN members and by 2015 for the four newest ASEAN

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[7] AFTA was formally completed in 2002, when internal tariffs had been reduced to 5% or less, but the real issue is the number of excluded sensitive items. The pace of establishing AFTA noticeably accelerated in the late 1990s as unprocessed agricultural products were phased in and manufactured and processed agricultural products were transferred to inclusion lists. The climax was Malaysia's removal in 2005 of assembled and knocked-down automobiles from its exclusion list, signaling that even its most high profile import-competing industry would be opened up to free trade within ASEAN. By 2006 all temporary exclusions had been brought on to the inclusion lists of the original six ASEAN members and the unprocessed agricultural products still considered 'sensitive' (less than 150 tariff lines) will be included by 2010, leaving only a General Exceptions List of 377 tariff lines, representing less than 1% of all tariff lines and mainly connected to the protection of national security, public morals and articles of historical significance.

[8] The increased regionalization of the East Asian economy is described in Frankel and Kahler (1993), Hatch and Yamamura (1996), Aggarwal and Morrison (1998, pp. 65–86), Lincoln (2004, pp. 42–113), Munakata (2006, pp. 37–61), and Rajan (2006). Gaulier, Lemoine and Ünal-Kesenci (2006) and Athukorala (2007) emphasize China's growing role in this process.

[9] The share of intraregional trade in total exports dipped after the Asian Crisis, but climbed back to 52% in 2004, when the import share was 57% (Munakata, 2006, p. 47). These are higher than equivalent measures for NAFTA and similar to those for the EU in the mid-1980s. Trade intensity indices also show increasing trade within the East Asia region during the 1990s (Sohn, 2002; Ng & Yeats, 2003).

[10] Japan started the trend towards integrated production chains when it invested heavily in Southeast Asia after the yen's post-1985 appreciation. Ando and Kimura (2005) calculate very high shares of machinery (HS84-92) in East Asian countries' trade in 1996 and 2000, and conclude that this structure is especially suited to production fragmentation; using a large Japanese firm-level dataset from 2000, they also find that such networks are a feature not just of large Japanese firms but also of small and medium-sized Japanese enterprises. Regional networks became denser in the 1990s and China played an increasingly central role. Xing (2007) calculates intra-industry trade, IIT (measured at the 3-digit SITC level), to have accounted for 6% of China's bilateral trade with Japan in 1980, 18% in 1992 and 34% in 2004 and finds that Japanese foreign direct investment performed a significant role in enhancing IIT. Zhang et al. (2005) have comparable estimates. Kimura, Takahashi and Hayakawa (2007), Haddad (2007) and Gruenwald and Hori (2008) provide evidence that Asian IIT is vertical intra-industry trade associated with fragmentation of production rather than the horizontal intra-industry trade due to product differentiation observed in Europe.

[11] Available at http://www.aric.adb.org/1.php (accessed 1 February 2009). Menon (2007) reports that, by October 2006, the number of bilateral agreements signed between individual ASEAN members and other Asian countries and between Asian countries and other countries had reached 176, of which 50 had been implemented. Including South Asia and Australasia as well as the East Asian countries, Tumbarello (2007) counts 32 such agreements coming into force between 2001 and June 2007.

[12] Some of the agreements are paper agreements only, and those that have come into force are often driven by a small number of specific issues. The Japan-Thailand agreement, for example, excluded areas with significant trade barriers such as rice; its principal results were to reduce the tariff on components imported by the mainly Japanese-owned carmakers in Thailand and to ease restrictions on temporary migration of Thai chefs into Japan. Some recent agreements have been driven by areas not covered by other bilateral agreements, and would previously not have merited the name RTA (such as bilateral tax agreements in the past). Some cross-regional agreements involve trade flows that are, and always will be, tiny, such as Korea-EFTA or Thailand–Bahrain.

Table 1
Average trade costs, Australian imports, 1990–2007.

Year	All imports	Air	Sea	ASEAN5	ASEAN	ASEAN + 3	Asian APEC	ASEAN/Total
1990	0.080	0.066	0.085	0.097	0.103	0.098	0.089	1.29
1991	0.076	0.057	0.082	0.090	0.085	0.084	0.077	1.12
1992	0.075	0.062	0.079	0.080	0.078	0.077	0.071	1.04
1993	0.073	0.061	0.076	0.078	0.103	0.096	0.086	1.41
1994	0.070	0.058	0.074	0.069	0.083	0.080	0.074	1.19
1995	0.067	0.055	0.071	0.062	0.075	0.073	0.068	1.12
1996	0.066	0.053	0.070	0.061	0.077	0.075	0.070	1.17
1997	0.066	0.054	0.070	0.057	0.063	0.063	0.060	0.95
1998	0.064	0.047	0.071	0.056	0.063	0.063	0.060	0.99
1999	0.056	0.041	0.062	0.050	0.060	0.060	0.057	1.07
2000	0.057	0.040	0.063	0.055	0.064	0.063	0.058	1.12
2001	0.057	0.040	0.063	0.053	0.070	0.066	0.061	1.22
2002	0.051	0.038	0.054	0.044	0.046	0.046	0.043	0.90
2003	0.051	0.037	0.056	0.048	0.053	0.053	0.049	1.04
2004	0.055	0.040	0.061	0.057	0.071	0.068	0.062	1.29
2005	0.055	0.039	0.060	0.059	0.052	0.053	0.050	0.95
2006	0.051	0.037	0.055	0.051	0.043	0.045	0.043	0.84
2007	0.049	0.036	0.053	0.046	0.039	0.042	0.041	0.79

Source: see Appendix A.
Notes: the means in the first three columns are import-weighted (*ad valorem* trade costs = $\sum cif / \sum fob - 1$) and hence biased downwards because goods or trading partners with higher trade costs will be under-represented. The ASEAN averages are unweighted means for the original five members, the ten current members, and the current members plus China, Japan and South Korea (ASEAN + 3). Asian APEC includes ASEAN + 3, Hong Kong, Taiwan and Papua New Guinea. The final column is the ASEAN average divided by the world average.

members. In addition, the framework agreement foresaw more comprehensive liberalization, with agriculture, human resource development, information and communication technology, investment, and development of the Mekong River Basin identified as priority areas (Sen, 2004, p. 76) and collaboration on illegal immigration, drug smuggling, counterterrorism and other security concerns also on the agenda (Kwei, 2006, p. 121). The accelerated pace and broad scope of China-ASEAN negotiations reflected the growth of regional value chains involving China and Southeast Asian nations and the corresponding need to reduce trade costs.

In sum, there has been considerable activity aimed at reducing trade costs in East Asia. Some of this is in a broad Asia-Pacific context, but most determinedly it has centred on ASEAN since the mid-1990s and subsequently included China, and to a lesser extent Japan and Korea. This has coincided with increased regionalization of East Asian trade and the growing importance of regional value chains, which have driven unilateral, bilateral and regional moves to reduce trade costs. In other parts of the world, regional agreements and trade facilitation measures were at low ebb between the early 1990s and the start of the twenty-first century.[13] Globally, greater attention is being paid to trade facilitation since the turn of the century, although progress appears slow, with the Doha Development Round stalled and RTAs paying less purposeful attention to reducing trade costs. Thus, we expect to see a differentially large reduction in trade costs for East Asian countries after the early 1990s, with the gap perhaps narrowing in the 2000s.

3. Determinants of trade costs

As noted above, the Australian Bureau of Statistics (ABS) data provide annual fob and cif values of Australia's imports for 1990–2007 at the HS six-digit level of aggregation, as well as reporting weight for many commodity groups and separating out sea, air and parcel post.[14] After deleting parcel post, re-imports into Australia, country categories such as "Unidentified", ships supplies and Australian forces overseas and the miscellaneous category (HS99), we had a usable dataset of 2,097,969 observations, or between 103,000 and 133,000 observations per year. The weighted average *ad valorem* trade costs (cif − fob)/fob for Asian trading partners in 1990–2007 are reported in Appendix A.

Overall, average trade costs associated with imports into Australia fell continuously and substantially from 8.0% in 1990 to 4.9% in 2007, despite the large increase in the price of oil after 1998 (Table 1). Average trade costs are higher than Australia's applied tariff rates, which were 4.5% in 2002 and 3.8% in 2006.[15] The pattern of falling costs applies to both sea and air transport (Fig. 1). Trade costs relative to value are lower for air freight than for sea transport, because in general higher value goods are sent by air.

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[13] There were, of course, important trade facilitation measures before the early 1990s, e.g. in the European Union the Single Market program was completed in 1992.

[14] This section is based on Pomfret and Sourdin (2008) where the data and estimation techniques are treated in greater detail.

[15] Average tariff rates as reported in the WTO *2008 Trade Policy Review of Australia*, available at www.wto.org.
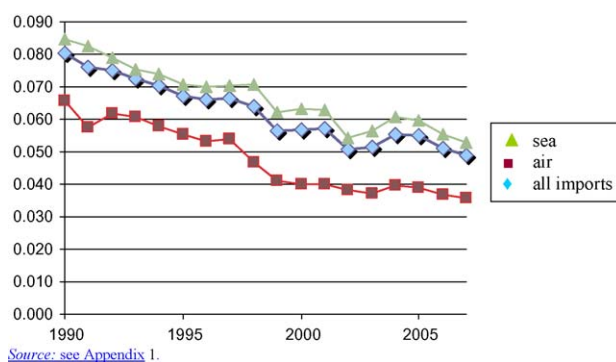
Fig. 1. Average trade costs, Australian imports, 1990–2007. *Source:* see Appendix A.

Table 2
Average trade costs by country 2007.

Ad valorem trade costs	Number of observations
Less than 2%	13
2–3.9	31
4–5.9	57
6–7.9	43
8–9.9	23
10–11.9	17
12–13.9	8
14–15.9	4
16–17.9	3
18–19.9	3
20.0% or more	9
Total	211

Source: see Appendix A.
Note: the countries at the extreme ends of the distribution are minor trading partners. Those with trade costs over 20% are Bhutan, Pitcairn Islands, Tonga, Norfolk Island, Guyana, Morocco, Christmas Island, Nauru and Yemen. Puerto Rico, Swaziland, Chad, Papua New Guinea, Grenada and Anguilla have trade costs of 1.5% or less; some of these averages are based on a very small number of transactions.

Globally, air shipping has increased rapidly over the last forty to fifty years, due to a substantial decline in relative costs of air shipping and also to a continuous decline in the bulk/value ratio of world trade, associated with an increasing share of manufactures. Bulk commodities (e.g. oil, iron ore, coal and grains), which are shipped almost totally by sea, constitute the majority of world trade by weight, but have been a smaller and shrinking share of international trade by value. In the Australian data this pattern is visible during the 1990s, when the share of imports arriving by air increased from 26.9% in 1990 to 31.2% in 2000, but the share then declined and by 2007 was almost the same (27.0%) as in 1990. At the same time, the gap between *ad valorem* trade costs by air and by sea increased, from sea being less than 30% higher in 1990 to being almost 50% higher in 2007 (Table 1). This suggests that the shift to air became more attractive for a greater range of higher value goods, while the overall share of sea was maintained by the increasing value of bulk goods as oil and other primary product prices surged in the decade after 1998.

Table 2 illustrates the distribution of trade costs by country in 2007. Although there is a wide range, over half of the 211 trading partners exporting to Australia in 2007 had average trade costs between 3.5% and 7.9%. The outliers with trade costs less than 2% or over 20% of fob value tend to be minor trading partners.[16] The ten largest sources of imports all have trade costs between 2.9% and 6.3%, but there is no clear pattern of these countries' average trade costs being determined by distance or level of development.

The cif–fob gap clearly depends upon distance and the commodities traded. The simple correlation between *ad valorem* trade costs and the distance between a country and Australia is −0.001. The negative sign disappears if a simple regression is run in logarithms or with a squared distance term, but the coefficient is always less than 0.1.[17] A country selling bulky goods will, other things equal, have higher transport costs than a country selling high value/bulk goods (e.g. if Indonesia sells oil

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[16] Among ASEAN countries the highest values are for Indonesia 5.5% and the Philippines 5.4%. The outliers are the smallest economies, Laos 1.6%, Cambodia 2.6% and Brunei 3.2%. The volatility of the Lao measures, with a high of 43.2% in 1993, affects the unweighted averages reported in Table 1, but because they trade in few commodity lines the small economies have little impact on the econometric results reported in the next section.

[17] Distances are taken from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) database, available at www.cepii.fr/anglaisgraph/bdd/distances.htm. The correlations are similar irrespective of which of the four distance measures are used. Even with the most favourable non-linear specification, a doubling of distance increases *ad valorem* trade costs by less than a tenth.

Table 3
Baseline regressions, 2006: dependent variable $\log((\text{cif} - \text{fob})/\text{fob})_i^k$.

	Full sample	Air only	Sea only
Log distance	0.297 (0.0126)	0.182 (0.0258)	0.349 (0.0136)
landlocked	−0.174 (0.0272)	−0.269 (0.0566)	−0.199 (0.0292)
Log value/weight	−0.310 (0.00359)	−0.250 (0.006)	−0.381 (0.00465)
Log total imports	−0.0238 (0.00304)	−0.0189 (0.0075)	−0.379 (0.00457)
TI corruption index	−0.0167 (0.00260)	−0.0586 (0.0060)	0.00339 (0.00264)
Sea	−1.467 (0.0150)		
constant	−2.978 (0.142)	−2.835 (0.289)	−4.723 (0.152)
Number of observations	18,682	5716	12,966
F	$F(6, 18675) = 1992.89$	$F(5, 5710) = 389.64$	$F(5, 12960) = 1592.34$
R^2	0.390	0.254	0.381
Root MSE	0.800	0.996	0.681

Source: Pomfret and Sourdin (2008).
Note: standard errors are in parentheses.

and Laos sells rubies to Australia then Lao trade costs will be lower). For the over half a million observations identified by consistent measures of weight, the correlation between weight/value and costs is 0.0013.[18] In sum, *ad valorem* trade costs are related to distance and to weight, but both of these are weak correlations implying that the variation in *ad valorem* trade costs is principally determined by other variables.

A number of other variables have been identified in the literature as influencing transport costs. Transport costs are subject to scale economies and may depend upon the potential size of the bilateral trade. Unbalanced trade can influence trade costs, if the ship or plane has to travel empty in one direction.[19] Shipping costs may also be influenced by how many shipping lines serve the bilateral route and by how much monopoly power shippers have.[20] The number of transhipments that may be necessary for trade from minor trading partners is likely to be positively related to transport costs; geographical isolation and the number of borders to be crossed can be proxied by "landlockedness". Trade costs are also influenced by institutional and policy factors. Limao and Venables (2001) identified onshore infrastructure as an important variable, and Clark, Dollar, and Micco (2004) focused on port efficiency. Port costs may be high for geographical reasons (e.g. lack of deep water harbours) or low for scale reasons (e.g. a Rotterdam or Hong Kong effect, which encompasses more than pure exporting country variables), and port costs may be high because corruption leads to extra demurrage costs or because political obstacles restrict investment in port facilities. A consensus has emerged among economists that institutions are the fundamental determinant of differences in growth performance, but in empirical work there has been a tendency to rely on aggregate indicators such as the corruption and institutional quality measures reported by Transparency International, the Fraser Institute, the Heritage Foundation, or the World Bank.

In our estimating Eq. (1), *ad valorem* trade costs $((\text{cif} - \text{fob})/\text{fob})_i^k$ for commodity k from country i depend on the distance between the county and Australia $(d_{i,A})$, a dummy for landlocked countries to proxy added border crossings (B_i), the value/weight ratio $(VW_i^k = \text{cif value divided by weight in kilograms})$, total imports into Australia from the exporting-country (M_i), and a measure of institutional quality in the exporting country:

$$\left(\frac{\text{cif} - \text{fob}}{\text{fob}}\right)_i^k = f(d_{i,A}, B_i, VW_i^k, M_i, \text{institutions}_i) \tag{1}$$

Some of the variables, e.g. landlockedness, should become insignificant when estimating trade costs associated with air transport and Eq. (1) will be estimated separately for both sea and air freight. However, the choice of transport mode may be endogenous, e.g., air freight may be a way of avoiding inefficient internal transport and ports in the exporting country.

Table 3 reports OLS regression results using 2006 data for the first four of the right-hand side variables in (1) and the Transparency International Corruption Perceptions Index.[21] Distance and the value/weight ratio have the expected signs and

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[18] For 556,468 observations quantity is reported in metric tons, kilograms, grams or metric carats. For other observations quantity data include measures by number (e.g. horses), square meters and many commodity-specific units.

[19] A potential complication from using Australia as the yardstick for measuring countries' trade costs is the importance of bulk commodities in Australian exports; there may be an indirect non-random impact on Australian import costs from the empty space in returning bulk carriers. The relationship is, however, complicated by increasing specialization of ship design; even with balanced bilateral trade, container ships may travel empty in one direction and bulk carriers travel empty in the other direction.

[20] Hummels, Lugovskyy and Skiba (2007) show that one-sixth of importer/exporter pairs are served by a single liner service, and over half are served by three or less. They also present evidence of shipping companies charging higher rates on goods with inelastic demand, which is consistent with the exercise of market power. In contrast, the measures of market power in Clark et al. (2004) are not statistically significant.

[21] The Transparency International Corruption Perceptions Index is on a scale from 0 to 10, with a higher number indicating less corruption; 163 countries were covered in 2006 and 180 in 2007. Distance (great circle distance between each country's largest city and Sydney) and landlocked dummies are from the CEPII database.

Table 4
Regression by HS two-digit Industry, 2006.

HS two-digit category[a]	Sea						Air					
	$1d_{i,A}$	B_i	$1VW_i^k$	$l\sum M_i$	TI	Constant	$1d_{i,A}$	B_i	$1VW_i^k$	$l\sum M_i$	TI	Constant
03	0.141**	−0.075	−0.401***	−0.011	−0.003	−3.185***	0.393***	0.573	−0.388***	−0.056	−0.024	−2.534
04	0.535***	−0.484**	−0.183*	−0.004	−0.000	−7.219***	−0.620	Drop	−0.160	0.557**	−0.441	−5.229
05	0.268	1.069	−0.401***	−0.014	0.079*	−4.389*	0.243	−0.746	−0.266**	−0.239	−0.061	2.236
07	0.240***	0.228	−0.229***	−0.015	0.039**	−4.139***	−0.254	−1.057	0.128	−0.061	−0.003	2.056
08	0.315***	−0.577*	−0.419***	−0.035**	0.035**	−4.353***	−0.100	Drop	0.011	0.111	−0.093	−2.461
09	0.432***	−0.236*	−0.173***	−0.004	−0.002	−6.386***	−0.048	1.049*	−0.167	−0.006	−0.079	−0.334
10	0.518**	0.501	−0.314***	0.065	0.090*	−8.753***						
11	0.578***	−0.254	−0.413***	−0.036	0.067***	−6.935***						
12	0.402***	−0.026	−0.323***	−0.013	−0.068	−5.579**	0.356**	0.246	−0.455***	−0.031	−0.048	−2.905
13	0.255	−0.654*	−0.055	−0.063	0.050	−4.330**	0.848***	0.003	−0.715***	0.033	0.007	−7.817***
14	−0.635*	Drop	−0.404***	−0.035	−0.120***	5.235						
15	0.221**	−0.123	−0.254***	−0.036**	0.027	−3.782***	0.434*	−0.464	−0.154	0.036	−0.079	−5.496*
16	0.194**	0.091	−0.309***	0.021	0.014	−4.649***	0.509**	−0.125	−0.471***	−0.126	0.080	−2.326
17	0.541***	−0.197	−0.263***	0.002	−0.027	−7.018***	0.249	0.414	−0.266*	−0.189	0.192*	−0.277
18	0.654***	−0.275	−0.164**	0.071**	−0.052*	−9.738***	0.495**	−0.115	0.323***	−0.004	−0.098	−6.154***
19	0.446***	0.039	−0.382***	0.002	−0.030**	−5.819***	−0.428	1.507	0.411	0.149	−0.146	−1.500
20	0.354***	−0.209*	−0.274***	−0.061***	−0.006	−4.133***	−0.211	1.070*	0.100	0.071	−0.003	−1.646
21	0.436***	−0.128	−0.351***	−0.061***	−0.016	−4.807***	0.314*	0.259	−0.087	0.140***	−0.039	−7.095***
23	0.157	−0.077	−0.570***	−0.011	0.051**	−3.845***						
24	0.336	−0.961**	−0.088	−0.137**	0.039	−3.189	0.369	−0.552	−0.539***	−0.082	−0.034	−0.860
25	0.215**	−0.590	−0.390***	−0.022	−0.038	−3.276***	0.471	−0.865	0.075	−0.119	0.075	−4.486
26	0.330	Drop	−0.538***	0.092**	0.005	−7.300***	−0.663*	0.574	0.105	−0.127	−0.211**	6.989
27	0.239*	0.446	−0.305***	0.047	−0.018	−5.274***	−0.426	−0.612	−0.027	−0.008	0.018	2.353
28	0.517***	0.048	−0.416***	0.015	0.050***	−7.521***	0.123	−0.246	−0.144***	0.001	0.023	−3.020*
29	0.501***	−0.548***	−0.367***	0.001	0.026***	−7.265***	0.172*	−0.107	−0.310***	0.068***	−0.045**	−3.999***
31	0.152	0.558	−0.427***	0.012	0.004	−3.680***	0.200*	−0.217	−0.287***	−0.019	−0.025	−2.077
32	0.472***	−0.285*	−0.424***	−0.037	0.038***	−6.006***	0.288***	−0.251	−0.323***	−0.004	−0.028	−3.087***
33	0.385***	−0.447**	−0.315***	−0.054***	−0.013	−4.670***	0.419***	−0.401	−0.134**	0.050	0.014	−6.526***
34	0.348***	−0.128	−0.181***	−0.041**	−0.027*	−4.590***	0.231	0.431	−0.221***	−0.019	−0.026	−2.673
35	0.444***	0.076	−0.370***	0.017	−0.034	−6.526***	0.219	−0.111	−0.147***	0.044	−0.020	−4.331***
38	0.337***	−0.231*	−0.541***	0.006	0.029**	−5.451***	0.329***	0.141	−0.156***	0.056**	−0.081***	−5.022***
39	0.312***	0.060	−0.284***	−0.045***	0.003	−4.266***	0.119	−0.100	−0.162**	0.051	−0.130***	−2.602
40	0.356**	−0.010	−0.240***	0.037	0.016	−6.657***						
44	0.421	Drop	−0.442***	−0.080	0.033	−3.905						
47	0.397***	Drop	−0.451***	0.078*	0.096***	−8.007***	0.145	−0.256	−0.110***	0.057**	−0.059**	−3.603***
48	0.385***	−0.213**	−0.260***	−0.013	−0.028***	−5.320***	0.656**	−0.233	−0.216*	0.006	−0.068	−6.479**
51	0.438**	−0.282	−0.542***	−0.121***	0.039	−3.374	0.484	0.513	−0.036	0.057	−0.208**	−5.937*
52	0.162	−0.112	−0.327***	−0.045*	0.021	−2.835*	0.319*	−0.846***	−0.101	−0.083	−0.112***	−1.523
53	−1.118	1.375	−0.590***	0.082	−0.110	7.186	0.000	0.737	−0.195*	−0.034	−0.102*	0.444
54	0.420***	0.121	−0.373***	−0.028	−0.010	−5.311***	0.189	−0.371	−0.143**	0.005	−0.171***	−2.000
55	0.293***	−0.393	−0.306***	−0.045	−0.022	−3.789***	0.530***	−0.209	−0.380***	0.015	−0.069*	−5.326***
56	0.177	0.016	−0.186***	0.001	−0.009	−4.124**	0.459*	0.413	−0.368***	−0.036	−0.116*	−3.138
60	0.371***	−0.201	−0.155***	0.047	0.034	−7.332***						
68	0.074	−0.245	−0.371***	−0.076	−0.041	−0.602	0.192	−0.671	−0.239**	0.080	−0.093	−4.086
69	0.479	−0.219	−0.315***	0.046	0.002	−7.625*	0.856***	0.148	−0.174***	0.048	−0.091	−10.937***
70	0.379	−0.120	−0.484***	−0.067	−0.022	−3.668*	−0.007	0.691	−0.002	0.223***	−0.118*	−6.056***
71							0.105	−0.322	−0.143***	0.041	−0.071*	−2.820*
72	0.215***	−0.249	−0.447***	−0.005	0.028**	−4.544***	0.206	−0.284	−0.046	−0.026	−0.122***	−2.191
73	0.264***	−0.423***	−0.330***	−0.029	−0.019	−4.044***	−0.105	1.229**	−0.098	0.127	−0.172*	−3.038
74	0.561***	−0.238	−0.076*	0.050	0.026	−10.124***	0.349*	0.680	−0.348***	−0.022	−0.029	−3.300
75	0.372	1.236**	−0.156*	0.173	−0.028	−10.980**	0.374*	−0.430	−0.300***	0.015	−0.025	−4.889**
76	0.324***	−0.109	−0.124***	0.026	−0.003	−6.599***	−0.462	−0.355	−0.335***	−0.091	−0.038	6.034*
81	0.124	Drop	−0.420***	0.063	0.033	−5.543*	−0.274	−0.061	−0.317***	−0.015	−0.080*	2.271
83	0.433***	−0.363	−0.271***	−0.059	0.040	−5.636***						
85	0.436***	−0.223	−0.225***	−0.020	−0.016	−6.286***						

Source: Pomfret and Sourdin (2008).

Notes: categories with less than thirty observations are omitted.

  [a] Details of HS commodities in Appendix B.
  * Significant at 10%.
  ** Significant at 5%.
  *** Significant at 1%.

are statistically significant at the 1% level. The landlocked dummy has a negative sign and is statistically significant, which is difficult to explain as the literature strongly indicates that landlockedness is associated with higher trade costs. Bilateral trade (M_i) and the corruption index both have the expected negative relation to *ad valorem* costs. The mode of transport, captured by a dummy variable of 1 for sea and 0 for air in the first column of Table 3, indicates that sea transport is less

expensive than air transport, and this result is probably related to the negative and also significant coefficient on the value/weight ratio.

To examine whether the determinants of trade costs differ according to the mode of transport, the last two columns of Table 3 split the sample into goods arriving by sea and goods arriving by air. Distance and weight have the expected signs with both modes and the coefficients are larger for imports arriving by sea than for air freight. The sum of imports from the trading partner (M_i) has the expected negative sign for both modes, significant at the 1% level for sea and at the 10% level for air, suggesting that scale may be important, especially for sea transport. Finally, the institutional quality variable has the expected negative sign for air transport (as in the full sample), but for imports arriving by sea the coefficient is zero. In the presence of corruption, exporters prefer air transport in order to minimize costs and delays within the exporting country; goods for which poor institutions may be unimportant, such as bulk commodities, are shipped by sea, whereas more time-sensitive, easily pilfered or otherwise institution-sensitive goods are sent by air and, among the latter set of goods, the lower the perceived corruption in the exporting country the lower the trade costs.

To capture commodity-specific influences on trade costs, we included dummies for the HS two-digit categories. For goods arriving by sea these dummies were almost never significantly different from zero.[22] For goods coming by air, however, the coefficients on the dummies were mostly statistically significant, suggesting that commodity-specific features (perhaps capturing timeliness, fragility and so forth) influence air transport costs.

Table 4 reports results for the basic regression run at the industry level (i.e. by 2-digit HS categories). The standard form includes log distance, the landlocked dummy, log value/weight, log of total bilateral imports and the Transparency International corruption perceptions index.[23] For goods shipped by sea, distance and weight are the key determinants of *ad valorem* trade costs in almost all categories, with only occasionally statistically significant coefficients on the landlocked dummy (often with the wrong sign), on the size of bilateral trade variable, and on the corruption variable (a statistically significant negative sign for only five categories—HS14, 18, 19 34 and 48). In sum, the sea results in Table 4 provide a fairly traditional picture of the determination of transport costs.

For air freight, distance and value/weight are also the most frequently statistically significant exogenous variables. The striking difference to the sea results is that the corruption index is negative and statistically significant for 17 out of the 55 categories in Table 4. These categories are mainly manufactured goods; they include no raw or lightly processed animal or vegetable products (18 cocoa and cocoa products is the only agricultural category), and are sectors in which global value chains are well-developed, such as electrical equipment, clothing, rubber and plastic.[24]

In sum, the rich Australian dataset presents a striking picture of falling trade costs since 1990, but trade costs still remain a significant component of the wedge between the prices of domestic and imported goods. On average, *ad valorem* trade costs are larger than *ad valorem* tariffs on imports into Australia. Trade costs vary substantially across countries and this is only partially explained by geography or by commodity composition. The econometric results reported in Tables 3 and 4 find that distance and weight have the expected relationship to trade costs; both variables are statistically significant for imports arriving by air and by sea, but the coefficients are larger and confidence intervals tighter for sea. Costs fall with the volume of trade, but the relationship is only statistically significant for sea transport, not for air. Good institutions, as measured by the Transparency International corruption perceptions index, are associated with lower trade costs, but the relationship is only statistically significant for air freight; the institutional variable is commodity-specific, important for manufactured goods and irrelevant for primary products.

4. Trade costs for East Asian countries

The simple average *ad valorem* trade costs for the ten ASEAN countries declined from 10.3% in 1990 to 3.9% in 2007, which is a much more pronounced drop than in the global average (Table 1). The unweighted ASEAN average is, however, heavily influenced by some outlier observations, especially for Laos.[25] A more robust indicator of Southeast Asian countries' trade costs is the average for the five original ASEAN members (Indonesia, Malaysia, Philippines, Singapore and Thailand), which fell by over 50% between 1990 and 2007. A similar picture applies to the Asian APEC members.[26]

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[22] Only HS44 (wood and wood products), 63 (miscellaneous textiles) and 71 (pearls and precious stones) had coefficients significantly different from zero at the 1% level; the first two are heterogeneous and the third is not a major sea-freighted category.

[23] Categories with few observations ($n < 30$) were omitted. There may be a selection bias due to the weight variable excluding goods whose quantity is measured by number, area, volume and so forth.

[24] HS26 is ores and slag and 29 organic chemicals. HS39 and 40 are plastic and rubber products, 48 is paper and paperboard products, and 68 is articles of stone, plaster etc. HS52, 54, 55, 56 and 60 are textiles and clothing categories. HS72, 73, 74 and 75 are metals and metal products. HS85 is electrical machinery and equipment.

[25] The extreme case of *ad valorem* trade costs for Laos being over 43% in 1993 explains the local peak in the ASEAN average, despite the five original ASEAN members having slightly lower trade costs in 1993 than in 1992.

[26] The Asian APEC column in Table 1 includes ASEAN+3, Hong Kong, Papua New Guinea and Taiwan. New Zealand is omitted because the Closer Economic Relations Agreement involves deeper integration with Australia. Russia, whose *ad valorem* trade costs are higher than any of the countries covered and are volatile, is omitted because it is unclear how actively Russia has embraced the APEC trade facilitation targets.
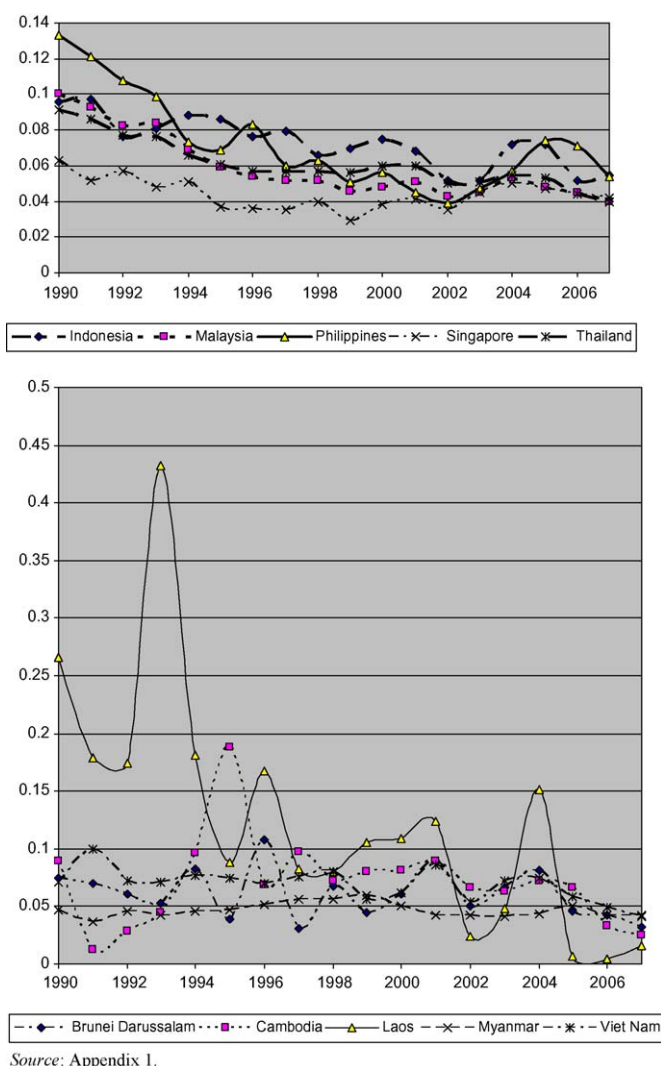
Fig. 2. Average trade costs, ASEAN member countries, 1990–2007. *Source*: Appendix A.

The weighted *ad valorem* trade costs for individual Asian countries are provided in Appendix A. By any aggregate measure, East Asian trade costs appear to have fallen faster than the global average, although – surprisingly in light of the account in Section II – most of the relative improvement occurred before 2002. The country variations for 2007 are small, with all of the ASEAN + 3 countries having trade costs below the median value for all countries in the dataset. China has the highest trade costs (6.3%) followed by Indonesia (5.5%), reinforcing the point that trade costs depend on factors other than distance or the size of bilateral trade. The lowest trade costs among the ASEAN + 3 in 2007 were for Laos (1.6%) and Cambodia (2.5%), suggesting that commodity-specific factors are important.

Fig. 2 shows the *ad valorem* trade costs of individual ASEAN countries' exports to Australia from 1990 to 2007. For the original five ASEAN members there is a substantial decline in trade costs during the 1990s and convergence towards the lowest-cost country, Singapore, although in the 2000s there is no clear tend. For the other five ASEAN members it is harder to identify a pattern; the values for Laos and to a lesser extent Brunei and Cambodia are volatile, reflecting the small number of trade items. For the other two new members, Myanmar and Vietnam, trade costs fell significantly after they joined ASEAN in the late 1990s. For seven of the ASEAN countries average trade costs converged from above to a range of 4–5.5% in 2007, with Brunei, Cambodia and Laos below 4%.

In the remainder of this section we control for country and commodity characteristics and scale in order to draw conclusions about the reduction in trade costs that may be explained by policy or administrative reforms rather than by changes in the commodity-composition of trade. Table 5 reports results of a country-fixed-effects regression for the entire panel for 1990–2007. Country fixed effects include distance, landlockedness and institutional factors, so the estimating equation includes as explanatory variables the value/weight ratio of each commodity and the total exports of each country to

Table 5
Regressions with ASEAN–Year Interaction Terms, 1990–2007: dependent variable $\log((\text{cif} - \text{fob})/\text{fob})_i^k$.

	(1)	(2) Sea	(3) Air		(1)	(2) Sea	(3) Air
Log(value/weight)	−0.291***	−0.345***	−0.248***	Constant	−1.206	2.475	−8.989***
	(0.001)	(0.002)	(0.002)		(0.025)	(0.025)	(0.785)
Log(imports)	−0.040***	−0.046***	−0.042***	Sea	−1.408***		
	(0.001)	(0.001)	(0.001)		(0.004)		
1991	−0.032***	−0.026**	−0.042**	ASEAN10*1991	0.031	0.027	0.036
	(0.008)	(0.009)	(0.016)		(0.026)	(0.026)	(0.062)
1992	−0.054***	−0.048***	−0.055***	ASEAN10*1992	0.022	0.021	0.033
	(0.008)	(0.009)	(0.016)		(0.025)	(0.025)	(0.063)
1993	−0.081***	−0.061***	−0.102***	ASEAN10* 1993	0.050*	0.017	0.140*
	(0.008)	(0.009)	(0.016)		(0.025)	(0.025)	(0.062)
1994	−0.125***	−0.110***	−0.142***	ASEAN10*1994	−0.004	−0.033	0.062
	(0.008)	(0.009)	(0.016)		(0.026)	(0.027)	(0.062)
1995	−0.144***	−0.151***	−0.133***	ASEAN10*1995	−0.009	−0.046	0.092
	(0.008)	(0.009)	(0.016)		(0.025)	(0.025)	(0.060)
1996	−0.188***	−0.196***	−0.182***	ASEAN10*1996	−0.018	−0.053*	0.103
	(0.009)	(0.009)	(0.017)		(0.025)	(0.025)	(0.063)
1997	−0.133***	−0.158***	−0.101***	ASEAN10*1997	−0.055*	−0.121***	0.127*
	(0.008)	(0.009)	(0.016)		(0.025)	(0.024)	(0.061)
1998	−0.127***	−0.158***	−0.083***	ASEAN10*1998	−0.028	−0.037	0.034
	(0.008)	(0.009)	(0.016)		(0.025)	(0.024)	(0.062)
1999	−0.352***	−0.278***	−0.481***	ASEAN10*1999	−0.045*	−0.075**	−0.033
	(0.008)	(0.009)	(0.015)		(0.023)	(0.023)	(0.056)
2000	−0.327***	−0.258***	−0.444***	ASEAN10*2000	0.038	0.019	0.035
	(0.008)	(0.008)	(0.015)		(0.023)	(0.023)	(0.056)
2001	−0.284***	−0.215***	−0.393***	ASEAN10*2001	−0.032	−0.046*	−0.051
	(0.008)	(0.008)	(0.015)		(0.023)	(0.023)	(0.057)
2002	−0.345***	−0.310***	−0.402***	ASEAN10*2002	−0.116***	−0.155***	−0.029
	(0.008)	(0.008)	(0.015)		(0.023)	(0.023)	(0.056)
2003	−0.383***	−0.371***	−0.409***	ASEAN10*2003	−0.053*	−0.076***	0.016
	(0.008)	(0.008)	(0.015)		(0.023)	(0.023)	(0.057)
2004	−0.354***	−0.321***	−0.414***	ASEAN10*2004	0.090***	0.085***	0.071
	(0.008)	(0.008)	(0.015)		(0.022)	(0.023)	(0.055)
2005	−0.333***	−0.273***	−0.430***	ASEAN10*2005	0.065**	0.054*	0.038
	(0.008)	(0.008)	(0.015)		(0.022)	(0.023)	(0.056)
2006	−0.349***	−0.300***	−0.437***	ASEAN10*2006	−0.046*	−0.074**	0.026
	(0.008)	(0.008)	(0.015)		(0.023)	(0.023)	(0.059)
2007	−0.407***	−0.386***	−0.441***	ASEAN10*2007	0.006	−0.008	0.092
	(0.008)	(0.008)	(0.015)		(0.023)	(0.023)	(0.058)
R^2	0.389	0.350	0.239				
N	525,469	332,512	192,957				

Notes: fixed effects; robust standard errors in parentheses.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

Australia, as well as year fixed effects and an interaction term between ASEAN countries and year. The usable dataset contained 525,469 observations.[27]

The negative and statistically significant time dummies in Table 5 indicate the declining trade costs associated with exports to Australia over 1990–2007. Controlling for country fixed effects, commodity characteristics and scale, *ad valorem* trade costs fell relative to 1990 and the magnitude of the decline was larger in 1999–2007 than in 1990–1998. The rate of decline was generally faster for goods sent by air than for goods shipped by sea (columns 2 and 3), although this was not true for 1995–1998. The aggregate pattern and especially the accelerated rate of decline are primarily driven by the falling costs of air freight after 1999.

The ASEAN–year interaction term suggests that in 1991 and 1992 *ad valorem* trade costs fell by less for Southeast Asian countries than for the rest of the world, although the coefficients are not statistically significant. Over the decade 1994–2003, however, trade costs associated with ASEAN exports to Australia fell more rapidly than those for the rest of the world. The differences are small for 1994–1996 and only statistically significant (at the 5% level) for four years (1997, 1999, 2002 and 2003), but the signs are consistently negative and the coefficients are fairly large for 1997–2003. The picture for 2004–2007

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[27] This is smaller than the total dataset because consistent weight data were not available for all commodities. The interaction term is between all ten current ASEAN members and year. Running the regressions with ASEAN5 interaction terms made little difference, probably because there are relatively few commodities exported by the five non-founding members.

is less clear; these are years of substantially lower trade costs for all countries and the ASEAN countries are sometimes ahead of the rest of the world in trade facilitation (2006), sometimes behind (2004–2005) and sometimes average (2007).

Breaking the sample down by mode of transport suggests that ASEAN-specific trade facilitation has reduced trade costs on maritime trade with third countries more than it has reduced costs associated with airborne trade. This may reflect the specific trade facilitation measures introduced by ASEAN countries over the last dozen years, which may have a maritime bias. However, within the constraints of the present paper's analysis this finding remains unexplained.

5. Conclusions

This paper provides measures of trade costs that can be used to assess the impact of trade facilitation measures. Transport and related trade costs are often viewed as technologically determined, but distance or bulk only capture part of the variation in trade costs by country and many measured 'trade costs' are amenable to reduction by appropriate policies. The data constrained us to define trade costs as cif–fob, which is, as argued in the introduction, a useful measure, but it may be too narrow for some purposes because it is more akin to 'transport costs' than to all of the costs of trading across international borders. Moreover, by focussing only on dollar values of trade costs, we do not directly address the role of time, which some authors (Hummels, 2001; Evans & Harrigan, 2005) identify as more important than financial costs, at least for some goods.

The Southeast Asian countries have made concerted attempts to reduce trade costs during the 1990s and 2000s. The impact is visible in our dataset: the average *ad valorem* trade costs on ASEAN members' exports to Australia fell from over 10% in 1990 to less than 4% in 2007, compared to the drop from 8% to 5% in the *ad valorem* trade costs on all exports to Australia. For the five original ASEAN members the decline corresponds to the decade before 2002 when AFTA was being established, and for the two large new member countries it occurred after joining ASEAN in the late 1990s.

The econometric analysis allows us to control for country or commodity effects on trade costs. The result reported in Table 5 present a striking picture of falling trade costs over the period 1990–2007, with ASEAN countries reducing trade costs by less than the global average in the early 1990s, but then by more than the average from the mid-1990s until 2003. This corresponds to the period during which AFTA was being established and suggests that the importance of AFTA lies in the environment for trade facilitation, as well as in the preferential tariff reductions stressed in the literature. However, it may be that both the plethora of trade agreements and the falling trade costs had a common origin, of which the emergence of regional value chains which put pressures on governments to reduce trade costs is the strongest candidate. Whether a result of trade agreements or not, the trade facilitation measures introduced by ASEAN countries after the mid-1990s are visible in the reduced costs of trade with a third country.

Acknowledgements

Appendix A. Average trade costs by country, Australian imports from selected Asian countries, 1990–2007

Country of origin	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Afghanistan	0.070	0.050	0.103	0.047	0.052	0.104	0.023	0.034	0.043	0.072	0.051	0.047	0.051	0.077	0.080	0.066	0.078	0.189
Bangladesh	0.182	0.179	0.178	0.161	0.150	0.145	0.159	0.148	0.161	0.146	0.144	0.154	0.138	0.123	0.169	0.150	0.102	0.088
Bhutan				0.008	0.012	0.040		0.127	0.155	0.034	0.040	0.157	0.118	0.013	0.057	0.122	0.419	0.205
Brunei Darussalam	0.074	0.070	0.061	0.053	0.083	0.039	0.108	0.031	0.068	0.045	0.061	0.089	0.051	0.067	0.081	0.046	0.042	0.032
Cambodia	0.090	0.013	0.029	0.045	0.096	0.188	0.069	0.097	0.072	0.080	0.081	0.090	0.066	0.063	0.072	0.066	0.033	0.025
China	0.093	0.091	0.085	0.087	0.081	0.075	0.073	0.071	0.069	0.064	0.063	0.058	0.050	0.060	0.070	0.065	0.059	0.063
Hong Kong (SAR of China)	0.065	0.061	0.059	0.057	0.054	0.053	0.054	0.056	0.048	0.045	0.047	0.038	0.037	0.042	0.049	0.047	0.040	0.047
India	0.115	0.116	0.115	0.112	0.099	0.091	0.085	0.091	0.080	0.069	0.067	0.065	0.060	0.060	0.075	0.074	0.061	0.057
Indonesia	0.096	0.097	0.076	0.081	0.088	0.086	0.076	0.079	0.066	0.070	0.075	0.068	0.052	0.052	0.072	0.072	0.052	0.055
Iran	0.067	0.073	0.088	0.092	0.098	0.073	0.108		0.095	0.097	0.063	0.068	0.071	0.054	0.076	0.065	0.061	0.082
Iraq	0.128			0.249				0.095	0.102	0.074	0.066		0.063	0.095	0.101	0.161	0.052	0.060
Israel	0.057	0.075	0.066	0.055	0.057	0.050	0.049	0.050	0.047	0.045	0.048	0.041	0.044	0.052	0.069	0.056	0.053	0.050
Japan	0.075	0.073	0.070	0.063	0.063	0.063	0.063	0.065	0.066	0.061	0.060	0.056	0.054	0.051	0.050	0.053	0.052	0.048
Jordan	0.189	0.342	0.225	0.278	0.300	0.451	0.338	0.392	0.425	0.157	0.120	0.047	0.117	0.137	0.169	0.159	0.147	0.123
Kazakhstan				0.110	0.122	0.100	0.158	0.067	0.071	0.090	0.112	0.079	0.121	0.117	0.081	0.061	0.075	0.051
Korea, Dem People's Rep	0.072	0.021	0.076	0.041	0.036	0.058	0.063	0.062	0.130	0.083	0.098	0.070	0.041	0.024	0.059	0.062	0.062	0.058
Korea, Republic of	0.072	0.077	0.066	0.062	0.065	0.064	0.068	0.056	0.052	0.059	0.055	0.047	0.043	0.043	0.049	0.051	0.045	0.045
Kyrgyzstan			0.083	0.185	0.058	0.058	0.162	0.087	0.130	0.154	0.122	0.151	0.095	0.298	0.147	0.269	0.142	0.023
Laos	0.266	0.179	0.174	0.432	0.181	0.088	0.167	0.082	0.080	0.105	0.109	0.124	0.024	0.048	0.151	0.007	0.005	0.016
Lebanon	0.151	0.156	0.138	0.145	0.133	0.111	0.102	0.123	0.105	0.111	0.087	0.107	0.113	0.084	0.101	0.108	0.105	0.094
Macau (SAR of China)	0.073	0.067	0.075	0.076	0.071	0.077	0.066	0.074	0.055	0.049	0.050	0.036	0.043	0.053	0.060	0.059	0.051	0.048
Malaysia	0.100	0.093	0.082	0.084	0.069	0.059	0.054	0.052	0.052	0.046	0.048	0.051	0.043	0.045	0.053	0.048	0.045	0.040
Maldives	0.109	0.197	0.100	0.059	0.347	0.095	0.080	0.427	0.072	0.079	0.073	0.008	0.090	0.048	0.132	0.060	0.037	0.019

Appendix A. (*Continued*)

Country of origin	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Mongolia	0.075			0.043	0.038	0.350	0.075	0.117	0.027	0.163	0.126	0.052	0.044	0.061	0.071	0.132	0.065	0.077
Myanmar	0.047	0.037	0.046	0.042	0.046	0.047	0.052	0.056	0.056	0.060	0.051	0.042	0.043	0.041	0.044	0.050	0.042	0.042
Nepal	0.141	0.211	0.367	0.340	0.345	0.307	0.326	0.237	0.210	0.191	0.128	0.157	0.152	0.140	0.144	0.144	0.129	0.120
Pakistan	0.079	0.077	0.073	0.070	0.062	0.054	0.053	0.054	0.053	0.053	0.059	0.061	0.054	0.059	0.073	0.082	0.071	0.070
Papua New Guinea	0.008	0.004	0.006	0.020	0.025	0.029	0.026	0.032	0.037	0.029	0.022	0.030	0.015	0.015	0.016	0.016	0.019	0.013
Philippines	0.133	0.121	0.108	0.099	0.073	0.069	0.083	0.060	0.063	0.051	0.056	0.045	0.039	0.047	0.057	0.074	0.071	0.054
Russian Federation			0.110	0.153	0.167	0.096	0.168	0.161	0.091	0.127	0.114	0.086	0.180	0.164	0.222	0.125	0.138	0.079
Singapore	0.063	0.052	0.057	0.048	0.051	0.037	0.036	0.035	0.040	0.029	0.038	0.041	0.035	0.045	0.050	0.047	0.044	0.042
Sri Lanka	0.103	0.116	0.105	0.094	0.082	0.079	0.085	0.070	0.081	0.071	0.066	0.066	0.056	0.068	0.071	0.072	0.066	0.068
Syria	0.070	0.175	0.257	0.289	0.187	0.174	0.180	0.176	0.175	0.127	0.134	0.146	0.143	0.155	0.179	0.191	0.104	0.118
Taiwan	0.074	0.074	0.065	0.061	0.059	0.057	0.060	0.057	0.055	0.050	0.046	0.043	0.038	0.044	0.048	0.048	0.044	0.048
Tajikistan									0.074			0.064	0.052	0.146	0.012	0.037	0.018	0.021
Thailand	0.091	0.086	0.077	0.076	0.066	0.061	0.057	0.057	0.057	0.056	0.060	0.060	0.050	0.051	0.055	0.053	0.044	0.040
Turkmenistan								0.045	0.034	0.048	0.045		0.121	0.049	0.062	0.050	0.042	0.040
Uzbekistan				0.033	0.017		0.183	0.067		0.188	0.029	0.100	0.193	0.088	0.165	0.121	0.141	0.133
Viet Nam	0.071	0.100	0.072	0.071	0.077	0.074	0.070	0.076	0.080	0.056	0.062	0.086	0.054	0.072	0.075	0.059	0.049	0.041
World	**0.080**	**0.076**	**0.075**	**0.073**	**0.070**	**0.067**	**0.066**	**0.066**	**0.064**	**0.056**	**0.057**	**0.057**	**0.051**	**0.051**	**0.055**	**0.055**	**0.051**	**0.049**
ASEAN5	0.097	0.090	0.080	0.078	0.069	0.062	0.061	0.057	0.056	0.050	0.055	0.053	0.044	0.048	0.057	0.059	0.051	0.046
ASEAN	0.103	0.085	0.078	0.103	0.083	0.075	0.077	0.063	0.063	0.060	0.064	0.070	0.046	0.053	0.071	0.052	0.043	0.039
ASEAN + 3	0.098	0.084	0.077	0.096	0.080	0.073	0.075	0.063	0.063	0.060	0.063	0.066	0.046	0.053	0.068	0.053	0.045	0.042

Source: Authors' calculations from Australian Bureau of Statistics data.
Notes: the country means and world average are import-weighted (*ad valorem* trade costs = $\sum cif / \sum fob - 1$) and hence biased downwards because goods or trading partners with higher trade costs will be under-represented.
The ASEAN averages are unweighted means for the original five members, the ten current members, and the members plus China, Japan and South Korea.

Appendix B. HS nomenclature (2007 edition)

01	Live animals.
02	Meat and edible meat offal.
03	Fish and crustaceans, molluscs and other aquatic invertebrates.
04	Dairy produce; birds' eggs; natural honey; edible products of animal origin, nes.
05	Products of animal origin, not elsewhere specified or included.
06	Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage.
07	Edible vegetables and certain roots and tubers.
08	Edible fruit and nuts; peel of citrus fruit or melons.
09	Coffee, tea, maté and spices.
10	Cereals.
11	Products of the milling industry; malt; starches; inulin; wheat gluten.
12	Oil seeds and oleaginous fruits; misc. grains, seeds, fruit; industrial or medicinal plants; straw and fodder.
13	Lac; gums, resins and other vegetable saps and extracts.
14	Vegetable plaiting materials; vegetable products not elsewhere specified or included.
15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes.
16	Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates.
17	Sugars and sugar confectionery.
18	Cocoa and cocoa preparations.
19	Preparations of cereals, flour, starch or milk; pastrycooks' products.
20	Preparations of vegetables, fruit, nuts or other parts of plants.
21	Miscellaneous edible preparations.
22	Beverages, spirits and vinegar.
23	Residues and waste from the food industries; prepared animal fodder.
24	Tobacco and manufactured tobacco substitutes.
25	Salt; sulphur; earths and stone; plastering materials, lime and cement.
26	Ores, slag and ash.
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes.
28	Inorganic chem.; organic/inorganic. compounds of precious or rare-earth metals, radioactive elements or of isotopes.
29	Organic chemicals.
30	Pharmaceutical products.
31	Fertilisers.
32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter; etc.
33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations.
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, etc.
35	Albuminoidal substances; modified starches; glues; enzymes.
36	Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations.
37	Photographic or cinematographic goods.
38	Miscellaneous chemical products.

Appendix B. (*Continued*)

39	Plastics and articles thereof.
40	Rubber and articles thereof.
41	Raw hides and skins (other than furskins) and leather.
42	Articles of leather; saddlery and harness; travel goods, handbags and similar containers; etc.
43	Furskins and artificial fur; manufactures thereof.
44	Wood and articles of wood; wood charcoal.
45	Cork and articles of cork.
46	Manufactures of straw, of esparto or of other plaiting materials; basketware and wickerwork.
47	Pulp of wood or of other fibrous cellulosic material; recovered (waste and scrap) paper or paperboard.
48	Paper and paperboard; articles of paper pulp, of paper or of paperboard.
49	Printed books, newspapers, pictures and other products of the printing industry; manuscripts, typescripts.
50	Silk.
51	Wool, fine or coarse animal hair; horsehair yarn and woven fabric.
52	Cotton.
53	Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn.
54	Man-made filaments.
55	Man-made staple fibres.
56	Wadding, felt and nonwovens; special yarns; twine, cordage, ropes and cables and articles thereof.
57	Carpets and other textile floor coverings.
58	Special woven fabrics; tufted textile fabrics; lace; tapestries; trimmings; embroidery.
59	Impregnated, coated, covered or laminated textile fabrics; textile art. of a kind suitable for industrial use.
60	Knitted or crocheted fabrics.
61	Articles of apparel and clothing accessories, knitted or crocheted.
62	Articles of apparel and clothing accessories, not knitted or crocheted.
63	Other made up textile articles; sets; worn clothing and worn textile articles; rags.
64	Footwear, gaiters and the like; parts of such articles.
65	Headgear and parts thereof.
66	Umbrellas, sun umbrellas, walking-sticks, seat-sticks, whips, riding-crops and parts thereof.
67	Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles of human hair.
68	Articles of stone, plaster, cement, asbestos, mica or similar materials.
69	Ceramic products.
70	Glass and glassware.
71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal and articles thereof; imitation jewellery; coin.
72	Iron and steel.
73	Articles of iron or steel.
74	Copper and articles thereof.
75	Nickel and articles thereof.
76	Aluminium and articles thereof.
77	(Reserved for possible future use in the Harmonized System)
78	Lead and articles thereof.
79	Zinc and articles thereof.
80	Tin and articles thereof.
81	Other base metals; cermets; articles thereof.
82	Tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal.
83	Miscellaneous articles of base metal.
84	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof.
85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles.
86	Railway or tramway locomotives, rolling-stock and parts thereof; railway or tramway track fixtures and fittings and parts thereof; mechanical traffic signaling equipment of all kinds.
87	Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof.
88	Aircraft, spacecraft, and parts thereof.
89	Ships, boats and floating structures.
90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof.
91	Clocks and watches and parts thereof.
92	Musical instruments; parts and accessories of such articles.
93	Arms and ammunition; parts and accessories thereof.
94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not elsewhere specified or included; illuminated signs, etc.
95	Toys, games and sports requisites; parts and accessories thereof.
96	Miscellaneous manufactured articles.
97	Works of art, collectors' pieces and antiques.

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