Exotic Trade and Trade in Exotics:

The effect of containerization on the extensive margin of trade

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Abstract

We look at how technological change presented by the introduction of reefer containers in international trade has led to an expansion in the extensive margins of trade. We consider products that were not widely traded before containerization due to their high sensitivity to temperature variations and spoilage. Using self-collected data on world-wide container adoption as well as product temperature sensitivity, empirical estimations suggest that containerization has enabled these products to become more tradable in the 1970s and 1980s. Of special concern are non-traditional (exotic) trades such as chocolates, explosives, pharmaceuticals, and photo film and sensitive instruments. Empirical evidence suggests that containerization has increased the likelihood of these products being traded by up to 20%. Trade crossing the equator which is especially prone to temperature variations is also found to benefit from containerization.

JEL classification: F13

Introduction

The importance of the extensive margin of trade to the welfare effects of improvements in the access to international markets (Hummels and Klenow, 2005) has led to interest amongst academic researchers into the determinants of changes to the extensive margins of trade. Of central interest within this literature has been the role of trade liberalization, such as that for Costa Rica (Arkolakis et al., 2008) and India (Mukerji, 2009) and the US (Debaere and Mostashari, 2010), but has also extended to entry into the WTO (Felbermayr and Kohler, 2010), the creation of a single currency in Europe (Flam and Nordström, 2006) and structural change (Kehoe and Ruhl, 2013). Neglected within this literature has been the role of technological change.

Within this paper we focus on the effect of what has arguably been the defining technological change in the transportation of goods and commodities in the last century, the container, on the extensive margin of trade, defined in this case to measure the exporting and importing of new-products to new-destinations. To identify the effects of containerization we rely on differences in the timing of its adoption on bilateral trade routes, under an assumption that the main economic benefits of containerization, those that arise from the inter-modality of transport, are realized only when both countries shared the same technology.

The major concern in trying to describe these effects as causal is the reverse-causality between trade flows and the adoption of the container. An anticipation of the future growth of international trade required a replacement for the technology for unloading general cargo through *break-bulk* shipping, which had changed little since antiquity and was regarded as expensive and slow (McKinsey, 1967). The benefits to containerization, which had been used for internal-US freight since 1956,[1] were well known and containerization was adopted in order to facilitate future trade and did not itself cause this trade.[2] In addition the capital investments required to adopt the container were large and expensive and took place many years prior to the expected growth of trade.[3] The period from 1996 to 1983 has been labeled as era of the global adoption of the container technology and was characterized by significant investment by port owners in container lift cranes, storage etc., ocean shippers in new or modified vessels, and by complementary investments in road and rail infrastructures. In this paper we choose to focus instead on a set of products,

[1] When the *Ideal- X*, a converted World War II tanker redesigned to carry 58 containers, made its maiden voyage from Port Newark to Houston, Texas.

[2] For example a 1972 report written by the McKinsey consultancy group entitled 'Containerization – A 5-year balance sheet' states in reference to the expensive, inefficient and slow nature of freight transport using the break-bulk method that something had to change and that "In 1965 it was already becoming clear that, for freight transport along major national and international routes in and between developed countries, that something had to be containerization" (McKinsey 1972, p.1-1). Or, Levinson (2006, p. 201) writes that during the period before the use of containers in international trade flows "ports, railroads, governments, and trade unions around the world spent those years studying the ways that containerization had shaken freight transportation in the United States".

[3] McKinsey (1972) estimate that by the end of 1972 global investment in the infrastructure necessary to containerize was around £4,000 million (about £21,000 million in current prices). The deep-sea container port opened on the River Thames in London in November 2013 cost a reported £1.5 billion.

temperature sensitive products (henceforth TSPs), where the expected future growth of the extensive margin of trade was not a motivation to containerize. For these products we argue, containerization of a bilateral trade route was more obviously an exogenous event.

TSPs comprise of chilled and frozen food items but also manufactured products such as pharmaceuticals, chemicals, and camera film and processed food such as chocolate and other confectionary. Transportation of such goods is distinct from general cargo, requiring refrigeration to maintain temperatures and guarantee the integrity of the products involved, in particular over longer journeys (Arduino and Parola, 2010). Before the advent of refrigerated containers the shipping of TSPs was done in specialized vessels (known as reefer ships), and by specialist shippers - this was largely done by tramp rather than the liner shipping lines used for most general cargo.[4] It also required ports to invest in storage of refrigerated cargo and therefore often used specialized ports. The traditional reefer commodities were of frozen meat (carcasses), dairy produce (mainly butter), citrus fruits, deciduous fruits[5] and bananas. These trades were characterized by their large volumes and in the case of bananas their year-round harvest periods.

Of primary interest in this paper was the use of reefer containers for the transportation of small volumes of new and difficult to transport commodities outside of the traditional reefer fleet.[6] According to Drewry (1990) the shipping of new types of TSPs in reefer containers was an important part of the growth of total trade in TSPs over the 1970s and 1980s and distinct from trade in traditional reefer commodities. For this group of products, the advent of containerization meant that their international trade became cost-effective for the first time, but only as part of larger containerized cargoes of non-TSPs. For example, electric points for integral reefer containers were available on almost all liner containerships by the late 1970s.[7] These slots were available only in small quantities and were not necessarily, and according to Drewry (1983) not very often, used for perishable goods as they could also be used for containerized general cargo. As the shipping consultants Drewry write "where they are used, it is often for minor reefer cargoes" (Drewry, 1983, p13) of the type we are interested in here.[8] The infrequency with which reefer slots were used demonstrates that the small volume in which much

[4] There were also part-referigerated ships carrying part-refrigerated cargoes in 'season'.

[5] Apples, pears, and grapes.

[6] The first purpose-built reefer container vessels were introduced to the Europe-Australia trade in 1969, and incorporated central refrigeration machinery to provide cold air to over 300 (porthole) containers. According to evidence from the Containerisation International Yearbook for 1974 the first fully-cellular refrigerated vessel entered service in 1973 (the Remuera operated by Australian National Line between Europe and Australia/New Zealand).

[7] Reefer containers are known as either porthole or integrated reefers depending on the method of their refrigeration. The temperature in porthole containers is controlled via a refrigeration unit on board the ship, while for integral reefers they are part of the container itself. Porthole containers have the advantage over integral reefer containers that they do not require their own power supply on board ship, but the disadvantage that they require specialised refrigeration equipment at the dock-side.

[8] They also relied on a technology that had been developed for the use in the specialist reefer industry, but which could be adopted by vessels and ports relatively easily.Integral reefers had been around since the mid-1950s, when road trailers were converted with insulation and basic refrigeration units on US coastal routes. However, these were generally rudimentary and temperatures could not be accurately controlled. According to Drewry these were largely sidelined in the initial stages of the containerization by the refer industry

of this trade in TSPs occurred and indicates that trade in these products would not by themselves have justified the size of the capital investments needed to adopt the container.

That the realized volumes of trade in TSPs were small does not by itself preclude the possibility that the growth in TSP trade was expected to have been large and it was this that justified the investment in the container technology. The anticipation of future growth of trade in TSPs would however have justified an expansion of the specialized reefer shipping fleet and not containerization.[9] For larger volume trade specialist reefer ships were favored.[10] Container ships with reefer capabilities had lower fixed costs, but higher variable costs compared to reefer-ships or even fully-refrigerated container ships (Drewry, 1983).[11] As a consequence, average costs were lower compared to shipping using specialist reefer ships when trade volumes were small, or for collections of products that required different ambient temperatures and temperature ranges, but were higher for large volume, frequent, bilateral trade (See Figure 1).[12] It is also worth noting that owners of the reefer shipping fleet do not appear to have recognized the potential that containerization might have on expanding the range of products that they could carry extensive margin of trade, and the adoption of the container was much more uneven and much slower than for general cargo as a consequence. [13] Reefer shippers recognized the potential loss of market share to carriers of general cargo with reefer containers but sought to protect their markets in traditional reefer commodities by improving efficiency through other means.

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by the introduction of porthole reefer containers. Porthole containers were more similar to the technology that was used to refrigerate entire ships. Innovations in the cooling systems used in integral reefers took place during the 1970s and 1980s (Containerisation International, 1989).

[9] It was for this reason that there was surprisingly little impact on the traditional reefer trades from the containerization of the deep-sea general cargo. As the shipping consultants Drewry write "Even viewed on an historical basis, the wholesale containerization of deep sea trades has actually had little impact upon the market share of the major tramp operators" (Drewry, 1990: p14-15).

[10] Shippers sought ways to avoid the expense of refrigerating cargo. Over shorter-distances ro/ro (roll-on, roll-off) ships with fans to ventilate rather than refrigerate cargo were used. There were also developments over this time period in coating products or irradiating it.

[11] The containerization of the banana trade used for example integral-reefer container ships.

[12] Consistent with this Drewry (1983) report that the smallest class of full reefer-ships (60,000-199,000 cu.ft) were inactive for twice as long as the next category of size (200,000-299,000 cu.ft).

[13] due to issues about spoiling, there was also a debate over whether temperature sensitive cargoes such as bananas could be carried in containers. It was also recognized that insulating each box rather than the whole ship was an inefficient use of available space.

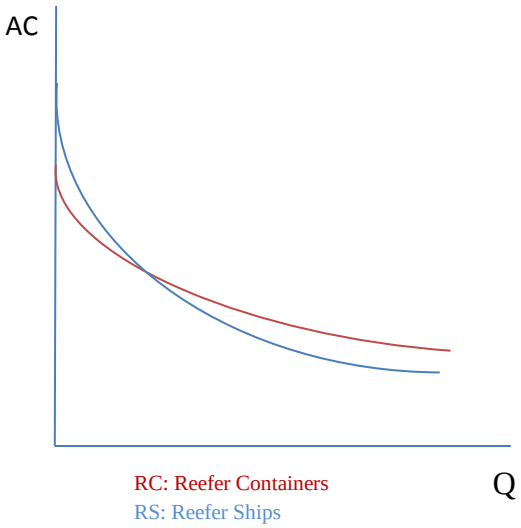

Figure 1: Average cost of shipping in reefer containers versus reefer ships

Within the reefer industry, trade in kiwifruits is often held up as an example of the new trades that were made possible by containerization, but also the cost-advantages of the transportation of TSPs using specialized reefer-vessels as volumes grew. Known as the Chinese gooseberry up until their name change in the early 1960s, the kiwifruit is very temperature sensitive, requiring close temperature management to lengthen its shelf-life; temperature has to be kept between -0.5 and 0.5 degrees. Kiwifruits were first harvested for the domestic market in New Zealand from the early 1940s and they were exported in small volumes to countries such as the UK and Australia in 1952-53 and to the US in 1962. In the early 1970s export volumes amounted to only a few hundred trays (each containing between 33-42 fruits).[14] It also has a short harvest period, primarily in May-July, and therefore was not suited to dedicated liner shipping, either by reefer vessels or by whole reefer-container ships. Export volumes grew quickly following successful marketing campaigns by the Kiwifruit Export Promotion Committee, which was formed in 1970 and the Kiwifruit Authority, which was formed in 1977 (Skallerud and Olsen, 2011). By 1987 exports were 45 million trays (Drewry, 1990). These initial shipments were carried by the container lines of Europe, exploiting the availability of container vessels for trade in general cargo (Drewry, 1990). By the 1984 volumes of kiwifruit exports from New Zealand had grown sufficiently such that the

[14] A standard 20ft container can accommodate 2,088 trays (12 pallets each with 174 trays) (Drewry, 1988).

economies of scale now favored conventional reefer ships and within a few years the majority of trade was carried in this way.[15] This was partly for reasons of cost but also to ensure sufficient capacity.

As the kiwifruit example shows, the decision to adopt the container on the route between New Zealand and Europe occurred as a result of the economies of scale and efficiencies offered by the containerization of general cargo on the trade route between Australia, New Zealand and Europe. The new trade in kiwifruit was therefore contingent on the frequency and size of vessels on a liner-container route. The containerization of a bilateral trade route, was from the perspective of trade in TSPs, an exogenous event. We exploit this to identify the effect of containerization on the extensive margin of trade in TSPs using non-containerized trade routes as a counterfactual.

To determine which products are temperature-sensitive we rely on information from an engineering study by Rytter (2009) into the transport of temperature sensitive goods in Europe. Within that study 4-5 digit ISIC codes are classified on a scale of 1 to 4 according to their temperature sensitivity. This index takes into account the various temperature demands that a product requires during transportation, such as the temperature and temperature range a product will tolerate, but also factors such as their potential for contamination by and of other materials. A value of 1 on the index is given to products which are not temperature sensitive and a 4 is given to goods which are most temperature sensitive. We concentrate on those products that are considered to be either sensitive or very-sensitive on this scale.

There is variation in this index both within and across categories of trade. In total there are 268 products that are classified as temperature sensitive or very sensitive (either a 3 or 4) in 1978, 1095 that are not temperature sensitive and 471 that are somewhat sensitive (degree 2). Of the 278 products within chemicals 252 are classed as only slightly sensitive and 26 are sensitive or very sensitive, whereas in manufactured goods 477 are classed as not sensitive and 16 are slightly sensitive.

To determine the start of containerization on a bilateral trade route we use information taken from Bernhofen et al. (2013). Drawing on various editions of the Containerisation International Yearbook, these authors document the date at which the first port within a country is capable of handling containerized trade. As in that paper we consider the start of containerization on a bilateral trade route to occur only when both countries have started containerized trade.[16]

[15] According to Drewry (1988) there were 9 shipments of kiwifruits from New Zealand using reefer-ships in 1985, 23 in 1986 and 42 in 1987.

[16] Bernhofen et al. (2013) estimate that 122 of the 157 countries within their sample had containerized by 1983.

Reefer Containers

It is also important to note that during the period up to the mid-1960s innovation of reefer containers was undertaken by equipment manufacturers in order to serve the specialized reefer market (Drewry, 1990). For the shipping lines the relatively short-distances, combined with limited market size limited the incentive to innovate (Drewry, 1990).

However, as reefer containers gained popularity and due to the technical sophistication of the temperature control units, there was a shift towards chilled commodities and more products were shipped in reefer containers on deep-sea routes[17].

Reefer containers come in two forms: integral and porthole. Porthole containers are containers that are connected to a central refrigeration unit in the ship. This type of containers is more appropriate for large volume, homogeneous cargoes. Porthole containers require shore side infrastructure to insure continuous temperature control. Integral containers have their own machinery and only require an external supply of electricity to operate at sea or on land. Typically, integral containers are more expensive than porthole containers but they are more suitable for small and high value shipments as well as highly temperature-sensitive products (such as pharmaceuticals).

The containerization of deep sea reefer trades from 1969 onwards was a pronounced shock to the conventional reefer market. The threat of containerization led the owners of conventional reefer vessels to lower their costs in order to withstand the inevitable assault by the container lines upon their traditional markets. Thus the move towards large-scale palletization of reefer cargoes began as a defensive measure against containers rather than as a natural development from break-bulk, labor-intensive handling methods[18].

The first major advance in reefer container shipping occurred towards the end of the 1960s when the extension of containerization into new deep sea trades radically altered the demands placed on the equipment used, and led to the adoption of totally new concept- the porthole reefer box. The very first liner service to incorporate refrigerated cargoes into its regular liftings (on the Europe-Australia trade) seized the opportunity presented by the northbound meat cargoes on this route to develop the concept of the fully cellular containership with complete holds dedicated to reefer boxes. Containerization helped the trade of chilled meat (versus frozen meat) due to better control of temperatures (around -1.5 degrees)[19].

[17] *Dewry Shipping Consultants Ltd (1990)*
[18] *Dewry Shipping Consultants Ltd (1990)*
[19] *Dewry Shipping Consultants Ltd (1990)*

The major costs in conventional handling of reefer commodities are the same as those for conventional ships. Ships are tied up in ports while large numbers of dockers unload or load them, while multiple handling, particularly in the destination country, is expensive and can be damaging.

Support for this claim is provided by the reaction of the reefer shipping industry to containerization, who despite their experience in shipping perishable goods do not appear to have anticipated that containerizing their fleet might open new markets to them. Instead their reaction appears to have been an attempt to protect current market share,[20] and in some quarters displays evidence of resistance to the introduction of containerization. By the end of the 1980s, two decades or so after the start of the international containerization era (Rua, 2013), the general characterization of the reefer industry prior to containerization had not changed. The bulk of the shipping was still of traditional reefer commodities and was still conducted by a specialized shipping fleet.[21] Containerization had made some impact, although this was limited because the response by some reefer carriers was to improve efficiency through the adoption of alternative technologies,[22] and because not all products were suited to be carried in containers.[23] According to Drewry (1990) the impact of containerization of trade in traditional reefer commodities could be summarized as belonging to either the wholesale containerization of large volume commodity trades e.g. meat and dairy trade between Australia/New Zealand and Europe/US, or the partial containerization of large volume commodity trades such as South African fruit to Europe and trade in bananas on some routes.

Descriptive Statistics

We use trade flow data that comes from the OECD International Trade by Commodities Statistics (ITCS) database. The advantage of this dataset is that it records commodity trade for OECD countries from 1961 at the SITC 5-digit product level. The dataset reports export and import trade flows for all OECD countries with the rest of the world. Hence, a partner country can be an OECD or non-OECD country[24].

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[20] As Drewry (1990) writes "It is worth stressing again that most major reefer containership operators containerised their own conventional trades, rather than appropriating the business of competitors." (p16).

[21]

[22] For example, through the greater use of pallets. Pallets had been primarily used on the dock-side to help with the transportation of products. The extension of their use onto ships, which itself required investments in new ships able to accommodate palletized trade, reduced the amount of labor required needed to load and unload ships. On shorter trade routes, especially those involving routes that were largely across land, there was also greater use of ro-ro (roll-on roll-off) shipping, often using ventilated rather than refrigerated lorries.

[23] Rates of spoiling for some fruits were faster when placed in containers.

[24] OECD countries until 1990 are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States.

To investigate products that are sensitive to temperature variation, we use data from engineering sources[25] in which products are classified on a scale of 1 to 4 according to their temperature sensitivity with one being temperature non-sensitive and four being very sensitive.

There are 1760 products under the 5-digit SITC (Rev. 2) product classification excluding oil and special commodities and transactions[26]. There are 148 countries (including 23 OECD countries) in the sample and 3404 country pairs. Under this product classification, there are 268 products that are classified as temperature sensitive in 1978 (3 or 4 on the temperature sensitivity measure). Temperature sensitive products are unevenly distributed across the various SITC codes. Over half are within the food and live animals sector, a further 25% are amongst the miscellaneous manufacturing goods and 12% are in Chemicals. There are no temperature sensitive products in animal goods and manufactured goods.

The Extensive Margin of Trade

We define the extensive margin as the number of products traded between a given country pair. We define export/import status to be a country-pair-product variable that is either zero or one depending on whether the OECD country i exports (imports) a positive amount of product k to (from) country j in a given year. The minimum value of flows in the dataset is 1000 USD. The extensive margin is then calculated as the total number of positive country-pair-product combinations.

Figure 2 plots the number of country-product combinations for positive trade flows (imports) of four OECD countries: Japan, Netherlands, Sweden, and USA. One observes an overall upward trend in country-product combinations. The jumps in 1970 and 1978 are related to revisions in the classifications in which many products were added.

A similar picture is painted when we plot the extensive margins by temperature sensitivity for one country, the USA. In figure 3, the largest group of products is by far the temperature non-sensitive products followed by the somewhat sensitive products and then the very sensitive and sensitive products.

[25] *Transport of Temperature Sensitive Goods in Europe: Definition, Limitations, Flow Analysis and Case Studies*, (2009).
[26] In effect, for some products, the 4-digit product code would be the most disaggregated level. For these products, the 4-digit product classification is used.

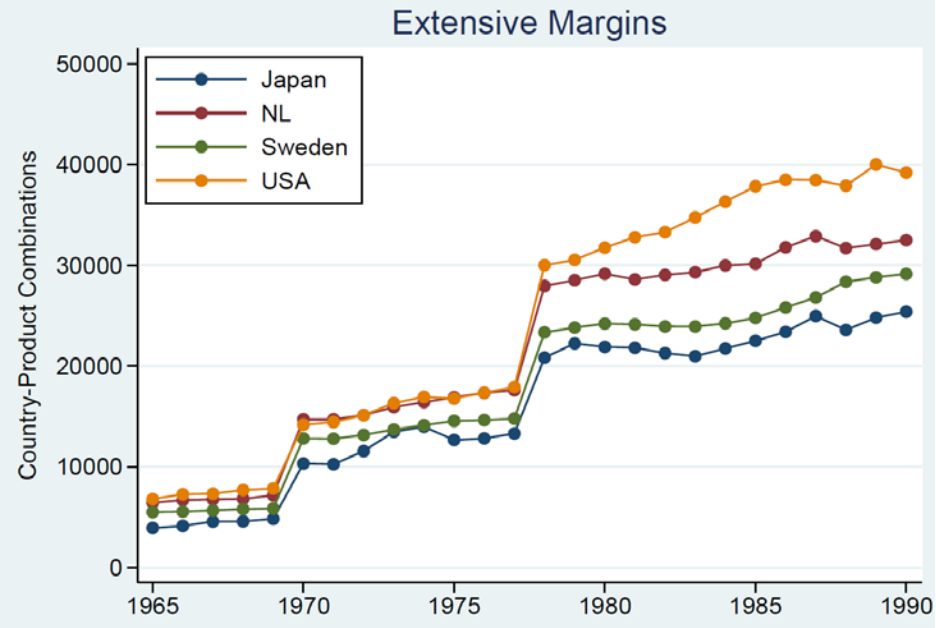

Figure 2: Plotting Extensive Margins (imports)

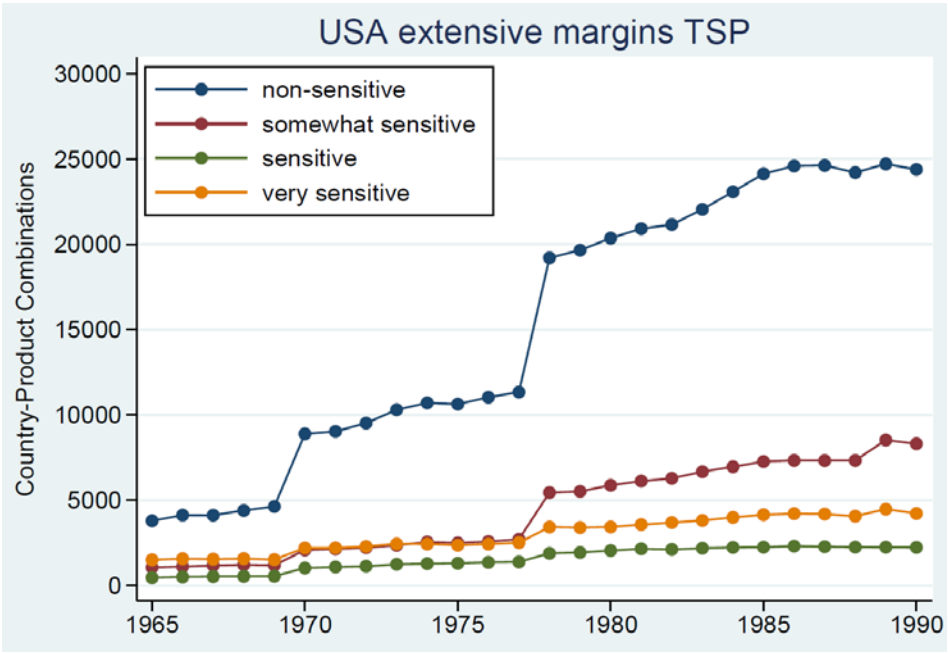

Figure 3: Extensive margins by temperature sensitivity (USA imports)

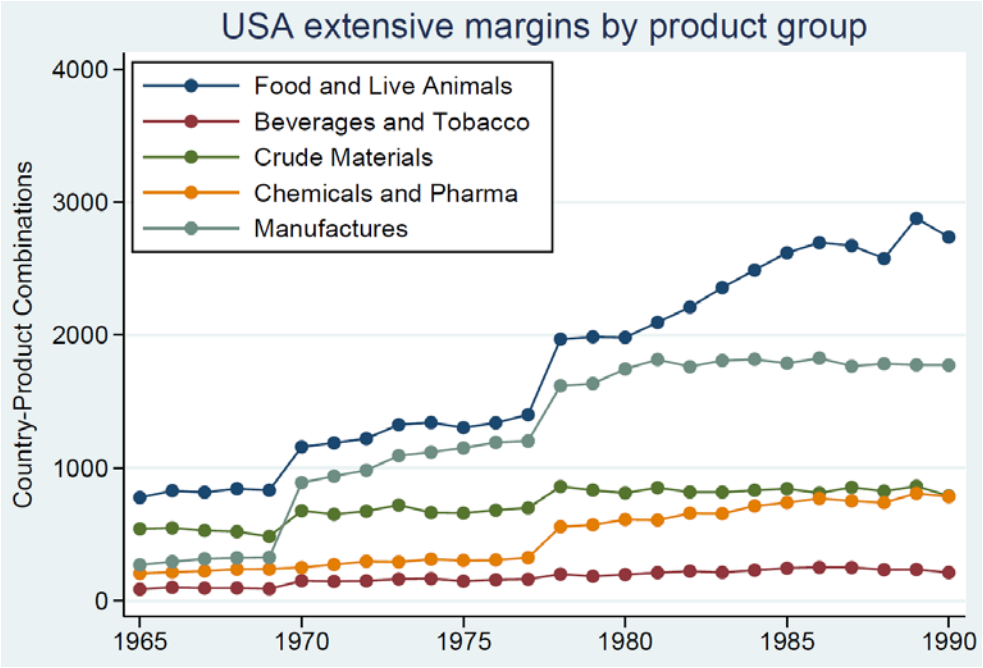

Figure 4: Extensive margins of TSP by product group (USA imports)

In figure 4, we plot US extensive margin development in TSP trade by SITC (one-digit) industry. The largest industry in terms of country-product combinations is Food and Live Animals, which also portrays the steepest growth trend. This is followed by Manufactures, Crude Materials, Chemicals and Pharmaceuticals, and lastly Beverages and Tobacco.

Based on the above figures, we choose two points in time to study the evolution of the extensive margin; 1977 compared to 1970, and 1987 compared to 1978. In Table 1, we present summary statistics for the numbers of products exported and imported by the country-pairs in the sample. We notice that mean number of products exported increases from 135 in 1970 to 161 and from 237 in 1978 to 262 in 1987. Similarly, the mean number of products imported increases from 76 in 1970 to 92 in 1977 and from 132 in 1978 to 176 in 1987. There is also an increase in standard deviation signaling that the disparity between heavily traded and non-heavily trade routes has gone up in both years.

Table 1: Summary Statistics

Variable	No of Pairs	Mean	Std. Dev.	Min	Max
Exports 1970	3256	135	201	0	1019
Exports 1977	3256	161	217	0	1034
Exports 1978	3256	237	344	0	1721
Exports 1987	3256	262	354	0	1700
Imports 1970	3256	76	170	0	1042
Imports 1977	3256	92	186	0	1061
Imports 1978	3256	132	286	0	1755
Imports 1987	3256	176	334	0	1757

Table 2 shows the number of TSPs imported into the US in each of the four years by major SITC category (industry). As can be seen there is an increase in imports of all categories in the period between 1970 and 1977, in particular in machinery and transport equipment (43%), miscellaneous manufacturing (35%), and Chemicals (30%). Between 1978 and 1988, the largest increase is machinery and transport equipment (60%) and then food and live animals and miscellaneous manufacturing (35%). Exports draw a similar picture except that extensive margins seem to decrease between 1978 and 1987. In all sectors, only a small share of the total possible number of country-product combinations have positive trade flows.

Table 2: USA TSPs extensive margins by SITC industry

	Imports				*Exports*				*Total*
SIC industry	**1970**	**1977**	**1978**	**1987**	**1970**	**1977**	**1978**	**1987**	*Possible*
Food & live animals	1158	1400	2028	2741	3039	3534	3926	3348	16576
Beverages and Tobacco	150	162	200	250	139	173	348	293	1036
Crude materials	678	698	860	854	686	829	806	735	5624
Chemicals & related prod	250	324	557	751	1135	1278	1879	1596	3996
Machinery & transport	35	50	55	88	177	200	201	194	296
Misc. manufacturing	889	1202	1618	1766	3140	3707	4111	3286	8436
Totals	3160	3836	5318	6450	8316	9721	11271	9452	35964

In Table 3 we provide further detail on the trade flows in table 2. In this table we display the number of product-country combinations of US imports for the years 1977 and 1987 according to whether they were a continuation of imports in the previous decade or were new import flows. We also display the number of product-country combinations that occurred in 1970 and not repeated in 1977 and of the new product-country imports in 1978 which of these were of a product that had been exported previously and whether that country had exported a temperature sensitive product to the US previously. We repeat the same analysis for 1987.

Table 3: USA TSPs Entry and Exit

	year	same	exit	new	New product old country	new country old product	new product new country	old country old product
Imports	1977	2547	666	1337	0	122	0	1215
	1987	4216	1147	2301	86	1	0	2214
Exports	1977	7150	1239	2640	0	558	0	2082
	1987	7690	3599	1778	60	26	1	1691

As is evident from this table, whist there is some exit of product-country combinations this is less than the amount of new import flows that occur in both time periods. In 1977 there were 1337 new import flows of temperature sensitive products compared to 1970 and 2640 in 1988. In the period up to 1977 this appears to have occurred primarily as a result of a growth of old products being imported into the US, 91% of the new imports in that year. The remaining growth is coming from the country-margin. This applies to the period up to 1987 as well. However, there is some additional growth coming from new products in this period. According to the information within the table, some 96% of the new imports to the US were of products that had previously been imported in 1978, while 4% were of products that had not been previously imported.

Empirical Specification

We attempt to identify the effect of the container technology on the growth of new trade between pairs of countries. We restrict the sample to TSPs since our identification strategy rests on the use of containers in transporting these products. The dependent variable is import status which is a country-pair-product variable that take the value of zero or one depending on whether the OECD country i imports a positive amount of product k from country j in a given year t.

The time periods we are interested fall in the 1970s and the 1980s because the first reefer containers were employed in 1969. The technology was further developed in 1980s when integral reefer containers spread and took hold. Based on the graphs plotted earlier, we identify two points in time that are natural to capture the effects of the technological change on the extensive margin. These are 1977 and 1987. These dates are chosen because they fall before major classification changes occur and to take into account the variation in the introduction of containerisation (Bernhofen et al. (2013)).

Since we are interested in newly traded goods only, we restrict the sample to products that are either untraded in periods t and t+1 or untraded in period t and become traded in period t+1. We therefore estimate the following equation:

$$\left(y_{\{ijk,t+1\}}\middle|\left(y_{\{ijk,t\}}=0\right)\right)=\beta_1+\beta_2\log networkdepth_{\{ij,t\}}+\beta_3\, cont_{\{ij,t\}}+\beta_4\, cont_{\{ijk,t\}}+X'_{\{ij\}}\lambda+\alpha_i+\alpha_j+\epsilon_{\{ijk,t+1\}}\ (1)$$

Let $y_{\{ijk,t+1\}}$ be the import status of product k between the OECD country i and country j at time t+1. This variable takes the value 0 or 1 and is conditional on the import status in the previous period being zero. Since the dependent variable is either zero or one, the estimated equation becomes a linear probability model in which the probability of product k being imported by country i is estimated. The control variables on the right hand side include network depth, which is defined as total trade flow in containerisable products between countries i and j at time t. This variable controls for the intensity of existing trade flow in containerisable products. The sign of the coefficient of this variable is expected to be positive since reefer container technology is contingent on containerisation (the first follows the latter) and the limited trade in TSPs is likely to benefit from a strong existing containerisable trade. The rationale behind it is that the intensity of existing containerisable trade makes it easier to trade new TSPs because the stronger the containerisable trade implies higher propensity to place reefer containers on container ships (refer to the introduction).

The container variables we use in the above equation are both the country-pair specific container variable ($\mathrm{cont}_{\{ij,t\}}$) and the product-specific container variable ($\mathrm{cont}_{\{ijk,t\}}$). The first variable is similar to the variable used in Bernhofen et al. (2013) and reflects the state of containerization in the trading partner countries (1 if the two countries adopted containerization and 0 otherwise). The second containerization variable incorporates the containerisability of the product being traded and takes the value of one only if the product is suitable or partially suitable for transport in containers and both trading partners have adopted containerization. We also include interaction terms between the network depth variable and the container variables in some estimations.

Finally, we include a number of gravity and policy variables and these are: distance, common language, border, colonial links, common currency, free trade agreements (FTAs), and GATT membership. We also control for trade preferences. These variables are summed up in the matrix X. We also include a full set of country as well as country-product dummies to control for unobserved country and product characteristics.

Data Sources

Containerization data is taken from Bernhofen et al. (2013), and is included in the appendix for convenience. In the paper, the authors collect data on the time of adoption of containerisation for 157 countries and construct a variable that switches to one when a country is containerised. The country can become containerised either by port or rail, the latter being more relevant for landlocked countries. Containerisability or the suitability of

products for containers is also taken from Bernhofen et al. (2013). Gravity control variables are taken from CEPII[27]. Temperature sensitivity information is obtained from Rytter (2009).

Econometric Results

In table 4, we present the results of estimating equation (1). The sample is restricted to trade in TSPs. We define TSPs in this exercise as products with temperature sensitivity grade of 3 or 4 as defined earlier. We restrict the sample because containerization is a plausibly exogenous determinant of the growth of the extensive margin for the international trade in TSPs outside of the traditional reefer markets as we have argued earlier. The table is split into 2 panels– panel A, import status in 1977 and panel B, import status in 1987. The container variables, the network depth variable and their interaction terms are introduced gradually. In columns 1, we only include the bilateral container variable ($\mathrm{cont}_{\{ij,t\}}$) and the network depth variable. In columns 2, we add in the product specific container variable ($\mathrm{cont}_{\{ijk,t\}}$). In columns 3, the interaction terms between the two container variables and the network depth variable are added. In columns 4, sample restriction is lifted and we include all products. In this table, we allow the container variables to switch on for early containerizers only. These are the countries that adopted containerization early on by 1972 (refer to Appendix Table 2).

Referring to the results in Panel A where the dependent variable is import status in 1977, the coefficients of bilateral containerization are positive and significant in column 1. Containerization increases the likelihood of the temperature sensitive product k being imported by 9%. Once the containerizability variable is included (columns 2), the coefficient of bilateral container variable becomes smaller while the coefficient of the containerizability variable is positive and significant. How we should interpret these results goes as follows. Containerization increases the likelihood of a temperature sensitive product being traded by about 5% compared to temperature sensitive trade of non-containerized countries. Now the suitability of a product to be placed in a container adds to the likelihood of the containerizable product being traded by an additional 4% compared to non-containerizable temperature sensitive trade as well as all trade of non-containerized countries. The coefficients of the network depth variables are positive and significant and suggest that the stronger the existing trade network in containerizable goods, the more likely that product k will be traded. In columns 3, we add in interaction terms between the container variables and the network depth variables. The container variables are now insignificant or only slightly significant while the full effects are captured by the interaction terms. The coefficient of the existing trade network variable is also insignificant. What one should take from this is that existing trade in containerizable products in combination with containerization and containerizability of the product increases the likelihood of trading the temperature sensitive product k. The

[27] www.cepii.fr

results in columns 2 and 3 are what one would expect given that reefer containers are contingent on scheduled containerships calling at ports and slots were reserved for reefer containers on containerships. Finally in column 4, we remove the restriction on the sample and include all products with all temperature sensitivity grades. The coefficients of the container variables are positive and significant.

Looking at Panel B with import status in 1987 as the dependent variable, we observe the following. Containerization increases the likelihood of temperature sensitive products being traded by around 8%. This effect is explained entirely by the containerizability of the product as can been seen from column 2 where the container variable coefficient becomes insignificant. When interaction terms are included, then the containerizability variable turns negative and insignificant and is offset by the interaction term with the network depth variable. This is telling us that temperature sensitive product k's likelihood of being traded is increasing in the network depth of the containerized country pairs. Again, this is consistent with the idea that an established container trade is a prerequisite for limited trade of TSPs in reefer containers to be shipped. In column 4, when all products are included, both container variables are positive and significant increasing the likelihood of all goods to be traded when the countries adopt the technology.

The results confirm that containerization played an important role in stimulating the extensive margin of trade in TSPs.

Table 4: Benchmark Results

Dep var:	Panel A: Import Status 1977				Panel B: Import Status 1987			
	(1) LPM Temp sens products	(2) LPM Temp sens products	(3) LPM Temp sens products	(4) LPM All Products	(1) LPM Temp sens products	(2) LPM Temp sens products	(3) LPM Temp sens products	(4) LPM All Products
$Cont_{ij}$	0.086***	0.045***	-0.031	0.035***	0.081***	0.008	-0.056**	0.055***
	(0.0025)	(0.0085)	(0.0195)	(0.0019)	(0.0028)	(0.0104)	(0.0199)	(0.0023)
$Cont_{ijk}$		0.043***	-0.052*	0.042***		0.076***	-0.018	0.032***
		(0.0088)	(0.0202)	(0.0022)		(0.0107)	(0.0207)	(0.0025)
$log\ network\ depth_{ij}$	0.001***	0.001***	0.000	0.000***	0.001***	0.001***	0.001***	0.000***
	(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0001)	(0.0001)	(0.0001)	(0.0000)
$log\ network\ depth_{ij} * cont_{ij}$			0.008***				0.006**	
			(0.0023)				(0.0019)	
$log\ network\ depth_{ij} * cont_{ijk}$			0.010***				0.009***	
			(0.0024)				(0.0020)	
N	607036	607036	607036	3811894	757320	757320	757320	5170502
vce	robust	robust	robust	robust	robust	robust	robust	robust
FE	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001
All regressions control for FTA, GATT membership, border, common language, distance, colonial links, trade preferences as well as importer and exporter-product fixed effects.
Bilateral network depth controls for total bilateral containerisable trade in 1970 or 1978.
Container variable switches on for early containerisers only, i.e. countries that adopt containerization between 1966 and 1972.
Temperature sensitive products: products of temperature sensitivity 3 & 4
Containerisable products: products classified as containerisable or of limited containerisability (classes A and B)

Robustness Checks

Some of the robustness checks we perform involve looking at export status, allowing for country pairs to containerize at the start of the time interval in question, checking different temperature sensitivity grades, and the containerizability of products.

In Table 7, we test the robustness of the results to exports, i.e. the dependent variables become exports status in 1977 and 1987. The results generally confirm what is found for imports. The only difference is that network depth does not seem to matter for (containerizable) exports in the period up to 1977.

In table 8, we allow the container variables to switch on at the beginning of the period. This means that the container variables reflect the state of adoption of the country pairs in 1970 when the dependent variable is import status in 1977, and 1978 when the dependent variable is import status in 1987. The results confirm largely the results in table 6 when only early containerizers are considered.

In table 9, we change the sample based on temperature sensitivity measures. We restrict the sample to products that are extremely temperature sensitive, i.e. products with temperature sensitivity grade 4. Again the results in table 6 are affirmed here.

Falsification Tests

If containerization were expected to increase trade in TSPs, then one expects containerization to have a positive impact on the creation of trade in traditional reefer commodities such as bananas, citrus, and deciduous fruit (apples, pears, and grapes) as it did for other TSPs. The trade in these commodities was already established by the time containerization was first introduced.[28] They were transported in bulk in specialized reefer ships. Their trade was so large and established that it did not make sense to transport them in reefer containers.[29] We use this as a falsification exercise to test our container variables. Since the literature informs us that these commodities were not transported in reefer containers for economic reasons, one expects that our identification equation would not estimate an effect of containerization on the extensive margins of these products. We estimate equation (1) for bananas, citrus fruit, and deciduous fruit separately for the two years 1977 and 1987 as before. We find that in no case is the container coefficient significant which lends support to the hypothesis that containerization was not expected to stimulate the trade in reefer commodities.

[28] Drewry (1983)

[29] Later on, there were attempts to containerize banana and citrus trades on some routes. However, the dominant method of transporting these commodities remains bulk reefer shipping (Drewry (1992)).

Table 5: Falsification – Traditional reefer products

Imports	(1) Bananas	(2) Citrus	(3) Deciduous Fruit
1977			
$Cont_{ijk}$	0.011	-0.009	0.021
	(0.0353)	(0.0212)	(0.0173)
N	2828	5723	8804
1987			
$Cont_{ijk}$	0.071	-0.006	-0.032
	(0.0404)	(0.0178)	(0.0244)
N	2871	14749	8692

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001
All regressions control for FTA, GATT membership, border, common language, distance, colonial links, trade preferences as well as importer and exporter-product fixed effects.
Container variable switches on for early containerisers only, i.e. countries that adopt containerization between 1966 and 1972.
Containerisable products: products classified as containerisable or of limited containerisability (classes A and B)
Deciduous: Apples, pears, grapes

Equatorial and Special Commodities Reefer Trades

Temperature sensitive products are especially prone to slight changes in temperature. Products need to be transported in ranges of temperatures that are extremely narrow and do not allow for much variation. For instance, kiwi fruit need to be transported at a temperature that ranges between -0.5° and 0.5°. On the one hand, temperatures too high could lead to speeding the ripening process while too much cooling could lead to freezing and hence spoilage. Besides, there are limits to the duration of transport without spoilage occurring. These concerns traditionally inhibited the trade between countries that are separated by great distances. Of special concern was the crossing of the equator where the temperatures could increase dramatically with exposure to the sun. This puts to the test the precision by which the transport ships are capable to control the cargo temperatures. This is an area where one expects reefer containers to perform very well in transporting temperature sensitive goods moving in limited quantities across the equator especially in integral reefer containers later on.

In table 6, we introduce an additional bilateral variable, equator, to signal that the ship transporting the goods between countries i and j has to cross the equator. We also interact this variable with our container variables. The variables of interest here are equator and the interaction terms between the equator and the container variables. The results of estimating equation (1) suggest additional benefit from containerization for transporting the TSPs across the equator. Trade that crosses the equator is approximately 1% more likely to occur after containerization in both 1977 and 1987. Also, containerizable products that cross the equator are 4% more likely to be traded than non-containerizable products.

Some products may have benefitted more than others from the new technology. This is because some products are especially suited for transportation in containers. Meat products from Australia and New Zealand, for instance, benefited from the container ships travelling between the two countries and Europe. Traditionally, hard-frozen carcasses were transported in bulk reefer ships between Australia/NZ and Europe. The better

temperature control units present in some reefer containers were a boost to transporting chilled and processed meat. Similarly reefer containers were especially suited for transporting exotic fruit, chocolates, pharmaceuticals, explosives, as well as photo film and sensitive measuring instruments. To investigate how containerization may have impacted the trade is these special commodities, we restrict the sample to each of these products separately. In column 2-7, reefer containers have large effects on the extensive margins of meat chocolates, pharmaceuticals, as well as photo film and instruments. We find that these products are 10% to 14% more likely to be traded in 1977 and 9% to 19% more likely to be traded in 1987 between containerized pairs. Little or no effect is found on the trade in exotic fruit. Explosives are 8% more likely to be traded in 1977 but no effect is found for them in 1987.

Table 6: Equatorials and Special Commodities Trade

Imports	(1) Equator	(2) Meat	(3) Exotic fruit	(4) Chocolates	(5) Pharma	(6) Explosives	(7) Photo & Instruments
1977							
$Cont_{ij}$	0.048***						
	(0.0089)						
$Cont_{ijk}$	0.039***	0.095***	0.006	0.114***	0.141***	0.077***	0.117***
	(0.0092)	(0.0078)	(0.0078)	(0.0163)	(0.0154)	(0.0159)	(0.0069)
$Equator$	0.009***						
	(0.0008)						
$Equator * Cont_{ij}$	-0.036**						
	(0.0121)						
$Equator * Cont_{ijk}$	0.039**						
	(0.0127)						
N	607036	38420	12265	2778	27991	12011	131197
1987							
$Cont_{ij}$	0.015						
	(0.0109)						
$Cont_{ijk}$	0.070***	0.085***	0.049*	0.188***	0.116***	0.029	0.113***
	(0.0112)	(0.0091)	(0.0228)	(0.0499)	(0.0107)	(0.0173)	(0.0079)
$Equator$	0.013***						
	(0.0008)						
$Equator * Cont_{ij}$	-0.044***						
	(0.0097)						
$Equator * Cont_{ijk}$	0.040***						
	(0.0101)						
N	757334	41298	11600	2699	57698	11889	142830

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001
Dependent variable is import status 1978 in columns 1 and 2 and import status 1988 in columns 3 and 4.
All regressions control for bilateral network depth, FTA, GATT membership, border, common language, distance, as well as importer and exporter-product fixed effects.
Container variable switches on for early containerizers only, i.e. countries that adopt containerization between 1966 and 1972.
Containerizable products: products classified as containerizable or of limited containerizability (classes A and B)
Exotic: Pineapples, Dates, Avocadoes, Other

Conclusion

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Appendix 1 Countries in the Sample

Algeria, Angola, Argentina, Australia, Austria, Bahamas, Bahrain, Bangladesh, Belgium-Luxembourg, Belize, Benin, Bermuda, Bolivia, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, China, Chinese Tapei (Taiwan), Colombia, Comoros, Congo, Costa Rica, Cuba, Cyprus, Democratic Republic of Congo, Denmark, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Ethiopia, Fiji, Finland, Former Burma, Former Czechoslovakia, Former USSR, Former Yugoslavia, France, French Guiana, Gabon, Gambia, Germany, Ghana, Greece, Guadeloupe, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Ivory Coast, Jamaica, Japan, Jordan, Kenya, Kiribati, Korea, Kuwait, Lao People's Democratic Republic, Lebanon, Lesotho, Liberia, Libya, Madagascar, Malawi, Malaysia, Mali, Martinique, Mauritania, Mexico, Mongolia, Morocco, Mozambique, Nepal, Netherlands, Netherlands Antilles, New Caledonia, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Rwanda, Saint Lucia, Samoa, Sao Tome and Principe, Saudi Arabia, Senegal, Sierra Leone, Singapore, Somalia, South Africa, Spain, Sri Lanka, Sudan, Surinam, Sweden, Switzerland, Syria, Thailand, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Uganda, United Arab Emirates, United Kingdom, Tanzania, United States, Uruguay, Venezuela, Vietnam, Yemen, Zambia, Zimbabwe

Appendix 2 Containerization Data

Panel A: Countries that containerize by port or rail 1966-1983 (115 countries)

1966	Germany(P)*	Netherlands(P)*	UK(P)(R)*	USA(P)*	India (R)
1968	Australia(P)*	Austria(R)*	Belgium(P)*	Canada(P)*	Denmark(P)*
	France(P)*	Hungary(R)	Ireland(R)*	Italy(P)*	Taiwan(P)
	Spain(R)*	Sweden(R)*	Switzerland(R)*		
1969	Finland(P)*	Yugoslavia(R)	Japan(P)*	Norway(R)*	Portugal(P)*
1970	Hong Kong(P)	USSR(R)	Greece(P)*	Israel(P)	Romania(R)
	Singapore(P)				
1971	Ivory Coast(P)	New Zealand(P)*	Philippines(P)	Poland(P)	Trinidad(P)
1972	Bulgaria(R)	Czechoslovakia(R)			
1973	Bahamas(P)	Brazil(P)	Iceland(P)*	Jamaica(P)	Malaysia(P)
1974	Cameroon(P)	Chile(P)	Colombia(R)	Nigeria(P)	Panama(R)
	South Africa(P)				
1975	Thailand(P)	Honduras(P)	Indonesia(P)	Korea Rep(P)	Peru(P)
1976	Argentina(P)	Benin(P)	Kenya(P)	Mexico(P)	N. Caledonia(P)
	Saudi Arabia(P)	UAE(P)			
1977	Bahrain(P)	Cyprus(P)	Ghana(P)	Iran(P)	Jordan(P)
	Kuwait(P)	Lebanon(P)	Morocco(P)		
1978	Ecuador(P)	Egypt(P)	Tanzania(P)	Haiti(P)	Iraq(P)
	Mozambique(P)	Oman(P)	P. N. Guinea(P)	Samoa(P)	Sierra Leone(P)
1979	Algeria(P)	Angola(P)	China(P)	Congo(P)	Djibouti(P)
	El Salvador(P)	Syria(P)	Neth.Antilles(P)	Nicaragua(P)	Pakistan(P)
	Qatar(P)	Sri Lanka(P)			
1980	Guatemala(P)	Liberia(P)	Libya(P)	Madagascar(P)	Sudan(P)
	Uruguay(P)				
1981	Brunei(P)	Bangladesh(P)	Belize(P)	Costa Rica(P)	Dem.Rep.Congo(P)
	Dominican Rep(P)	Fiji(P)	Guadeloupe(P)	Togo(P)	Venezuela(P)
	Tunisia(P)	Turkey(P)*			
1982	Gambia(P)	Kiribati(P)	Mauritania(P)		
1983	Bermuda(P)	Ethiopia(P)	Guinea(P)	Malta(P)	Myanmar(P)

(P) denotes that the country containerized by port first.
(R) denotes that the country containerized by rail first.
(*) denotes that the country is an OECD country.

Panel B: Countries that do not containerize by port or rail 1966-1983 (30 countries)

Chad	Mongolia	Senegal	Cuba	GuineaBissau
Nepal	Somalia	Bolivia	Eq. Guinea	Guyana
Bolivia	Eq. Guinea	Guyana	Niger	Suriname
Burkina Faso	Laos	Uganda	Burundi	French Guiana
Paraguay	Viet Nam	Cambodia	Malawi	Rwanda
Cen. African Rep	Gabon	Mali	Zambia	Zimbabwe

Appendix 3: Robustness

Table 7: Export status 1977 and 1987

Dep var:	Panel A: Export Status 1977				Panel B: Export Status 1987			
	(1) LPM Temp sens products	(2) LPM Temp sens products	(3) LPM Temp sens products	(4) LPM All Products	(1) LPM Temp sens products	(2) LPM Temp sens products	(3) LPM Temp sens products	(4) LPM All Products
$Cont_{ij}$	0.065***	0.028***	-0.004	0.039***	0.093***	0.055***	0.005	0.099***
	(0.0020)	(0.0083)	(0.0123)	(0.0016)	(0.0021)	(0.0066)	(0.0223)	(0.0017)
$Cont_{ijk}$		0.038***	0.030*	0.032***		0.040***	-0.040	0.009***
		(0.0085)	(0.0125)	(0.0018)		(0.0068)	(0.0229)	(0.0018)
$log\ network\ depth_{ij}$	0.000	0.000	0.000	0.000***	0.003***	0.003***	0.003***	0.002***
	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
$log\ network\ depth_{ij} * cont_{ij}$			0.004*				0.005*	
			(0.0016)				(0.0022)	
$log\ network\ depth_{ij} * cont_{ijk}$			0.001				0.007***	
			(0.0016)				(0.0023)	
N	583134	583134	583134	3625536	716603	716603	716603	4841141
vce	robust	robust	robust	robust	robust	robust	robust	robust
FE	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001
All regressions control for FTA, GATT membership, border, common language, distance, colonial links, trade preferences as well as exporter and importer-product fixed effects.
Bilateral network depth controls for total bilateral containerisable trade in 1970 or 1978.
Container variable switches on for early containerisers only, i.e. countries that adopt containerization between 1966 and 1972.
Temperature sensitive products: products of temperature sensitivity 3 & 4
Containerisable products: products classified as containerisable or of limited containerisability (classes A and B)

Table 8: Containerized countries at start of period

Dep var:	Panel A: Import Status 1977				Panel B: Import Status 1987			
	(1) LPM Temp sens products	(2) LPM Temp sens products	(3) LPM Temp sens products	(4) LPM All Products	(1) LPM Temp sens products	(2) LPM Temp sens products	(3) LPM Temp sens products	(4) LPM All Products
$Cont_{ij}$	0.080***	0.042***	-0.092**	0.034***	0.032***	-0.039***	-0.024**	0.006***
	(0.0025)	(0.0090)	(0.0288)	(0.0020)	(0.0016)	(0.0081)	(0.0077)	(0.0014)
$Cont_{ijk}$		0.040***	-0.043	0.040***		0.073***	0.014	0.027***
		(0.0093)	(0.0297)	(0.0022)		(0.0083)	(0.0079)	(0.0016)
$log\ network\ depth_{ij}$	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	-0.001***	0.000***
	(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0001)	(0.0001)	(0.0001)	(0.0000)
$log\ network\ depth_{ij} * cont_{ij}$			0.014***				-0.001	
			(0.0032)				(0.0005)	
$log\ network\ depth_{ij} * cont_{ijk}$			0.009*				0.007***	
			(0.0033)				(0.0005)	
N	607036	607036	607036	3811894	757334	757334	757334	5170861
vce	robust	robust	robust	robust	robust	robust	robust	robust
FE	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001
All regressions control for FTA, GATT membership, border, common language, and distance as well as country fixed effects.
Bilateral network depth controls for total bilateral containerisable trade in 1968 or 1978.
Container variable switches on at beginning of period (either 1968 for trade in 1978 or 1978 for trade in 1988)
Temperature sensitive products: products of temperature sensitivity 3 & 4
Containerisable products: products classified as containerisable or of limited containerisability (classes A and B)

Table 9: Considering only very temperature sensitive products (grade 4)

Dep var:	Panel A: Import Status 1977				Panel B: Import Status 1987			
	(1) LPM Temp sens products	(2) LPM Temp sens products	(3) LPM Temp sens products	(4) LPM All Products	(1) LPM Temp sens products	(2) LPM Temp sens products	(3) LPM Temp sens products	(4) LPM All Products
$Cont_{ij}$	0.077***	0.043***	-0.038	0.035***	0.072***	0.005	-0.066***	0.055***
	(0.0028)	(0.0085)	(0.0196)	(0.0019)	(0.0031)	(0.0103)	(0.0200)	(0.0023)
$Cont_{ijk}$		0.035***	-0.029	0.042***		0.071***	-0.013	0.032***
		(0.0088)	(0.0204)	(0.0022)		(0.0107)	(0.0210)	(0.0025)
$log\ network\ depth_{ij}$	0.001***	0.001***	0.000*	0.000***	0.001***	0.001***	0.000***	0.000***
	(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0001)	(0.0001)	(0.0001)	(0.0000)
$log\ network\ depth_{ij} * cont_{ij}$			0.009***				0.007***	
			(0.0023)				(0.0019)	
$log\ network\ depth_{ij} * cont_{ijk}$			0.007**				0.008***	
			(0.0024)				(0.0020)	
N	403885	403885	403885	3811894	527307	527307	527307	5170861
vce	robust	robust	robust	robust	robust	robust	robust	robust
FE	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product	Imp, exp-product

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001
All regressions control for FTA, GATT membership, border, common language, and distance as well as country fixed effects.
Bilateral network depth controls for total bilateral containerisable trade in 1968 or 1978.
Container variable switches on for early containerisers only or countries that adopt containerization between 1966 and 1972.
Temperature sensitive products: products of temperature sensitivity 4.
Containerisable products: products classified as containerisable or of limited containerisability (classes A and B)

Appendix 4: List of Temperature Sensitive Products (TSPs)