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On Cargo Security Measures and Trade Costs

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Preliminary

Abstract

Can tighter cargo security measures lead to higher trade costs and thus to increased trade frictions? This paper examines the impact of the Container Security Initiative (CSI), implemented by the US in several foreign ports after the September 11 terrorist attacks. It analyzes detailed monthly data for all containerized US imports from 1999 to 2006, by foreign port and country of origin. The analysis exploits these longitudinal data at the port-level and the varying starting dates across CSI ports to identify the causal effect of the initiative on import costs. While significantly higher monetary import charges over time are observed in the data, and particularly so for CSI ports, the results find no significant evidence of a "CSI effect" on these trade costs, once underlying port-specific trends and unobservable trade route heterogeneity are controlled for. Similarly, we find no significant evidence of an impact on trade flows or implicit costs.

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1 Introduction

After the September 11 terrorist attacks, the US Customs Services, now Customs and Border Protection (CBP), implemented the Container Security Initiative (CSI), a novel cargo security measure entailing the pre-screening of outbound containers destined for the US by US customs officials detailed to certain foreign seaports. Although "cargo security" may encompass different security concerns, like cargo theft or smuggling, and the CSI may in fact have some indirect effects on these broader security dimensions, the CSI is a direct response to September 11 and its main focus is on anti-terrorism. Indeed, there is now increased concern about the risk posed by containers being used as Trojan horses, by which weapons, bombs or terrorists could be transported into the US, especially into metropolitan areas where many major ports are located. Thus, a distinctive feature of the CSI is its intent to push back the border in order to secure the US and its waterborne supply-chain infrastructure against terrorist attacks.

The merits of the program aside, questions exist as to whether and to what extent security measures such as the CSI increase trade costs and constitute a new form of non-tariff barrier. This is an interesting empirical question, especially as opposite arguments find their way into the public policy debate on these measures. On the one hand, it is argued that by facilitating the flow of legitimate trade and thus the overall flow efficiency, as well as by reducing risk and thus insurance charges, these measures may well lower trade costs. So, according to this view, which we associate with CBP, the CSI may not simply just "push back the border", it may even make it thinner.[1] On the other hand, tightened security measures along the international supply chain are seen as involving additional requirements or procedures that may result in increased costs of moving goods across borders. This is often the view of traders. The EU Market Access Database, for instance, contains an entry for the CSI as

[1] CBP seems to support this view in the information on the CSI on its website (http://www.cbp.gov/xp/cgov/trade/cargo_security/csi/).

an alleged trade barrier "causing significant additional costs and delays to shipments of EU machinery and electrical equipment to the US."[2]

This paper examines the net impact of the CSI on US import costs and the extent to which, on average, the program may be playing a trade facilitating or trade impeding role. It analyzes very detailed monthly data for all containerized US imports over the period 1999–2006, by foreign port and country of origin. The effects of the program are evaluated through detailed panel data analysis, controlling for underlying trends and unobserved heterogeneity at the trade route level. The gradual implementation of the CSI across ports allows us to exploit that variation in our identification strategy. We examine the direct evidence from observed monetary costs, as well as from total costs in general, which would include other less obvious inconvenience costs, inferred from a gravity approach. In the end, we find no significant evidence of a causal effect of the CSI on import cost in our data.

2 The CSI

While less demanding cargo security measures may have sufficed in a world where the main concern was about threats to the cargo, they seemed inadequate in a post September 11 world preoccupied with threats from the cargo. Reflecting this changing face of cargo security, security measures along international trade borders have tightened considerably in the last few years.

A distinctive feature of the CSI is its emphasis on containerized trade. This is better appreciated once the importance of such trade is put into perspective. Over 90 percent of world trade is transported by container. In the United States approximately 40 percent of all incoming trade arrives via ship, mostly in containers. This amounts to millions of sea containers per year (18.6 million TEUs in 2006).[3] Besides the traffic levels being large, the

[2] The EU Market Access Database (http://mkaccdb.eu.int) reflects complaints from EU businesses about barriers to trade in non-EU countries. Barrier id 060106, "Container Security Initiative (CSI)," Last update/check 19/12/2008.

[3] A twenty-foot equivalent, or TEU, is a nominal unit of measure equivalent to the standard $20 \times 8 \times 8$ cubic feet shipping container.

route network is also quite wide. Based on our data, which we describe in the next section, the US received containerized imports from over 200 countries during the period 1999–2006. These imports arrived from 1799 foreign ports and entered through 213 different US ports.

Another distinctive feature of the CSI, which we exploit in our identification strategy, refers to its implementation. While the US has adopted other measures like the 24-hour rule and international protocols at the WCO, these are mostly applicable at once and to all global imports.[4] The CSI differs in this regard, which provides for a unique quasi-experimental evaluation. The CSI does not apply to global imports, nor even necessarily to all US imports from a CSI country. Furthermore, the CSI has entered into force on a rolling basis, even within CSI countries.

In order to work against the perceived threats from "spoiled" containers, CBP first implemented and piloted the CSI in three Canadian ports in March 2002 (Halifax, Montreal, and Vancouver). Since then, many other ports have successively joined the CSI, which, as of the end of 2006, was in force in 50 foreign ports in 29 countries. Table 1 shows these CSI ports and the dates on which they joined the program.

Under the CSI program, a group of US customs officers work with the host country to target all the containers that pose a security risk. According to CBP, the CSI is comprised of four main elements: 1) Identification of high-risk containers; 2) Pre-screening and evaluation of containers prior to shipping, usually at the port of departure; 3) Use of technology (large-scale X-ray and gamma ray machines and radiation devices) to ensure efficient and timely screening of containers and to prevent any delays to the flow of trade; 4) Use of enhanced and more secure containers, enabling US customs officers at the port of arrival to identify containers that have been tampered with while in transit.

[4] Peterson and Treat (2008) survey some of the mayor security initiatives in place during this period.

3 Data

The data we analyzed come from highly disaggregated import files with over a quarter billion records.[5] Our source database contains information on all products imported into the US at the HS 10-digit level, including the the country of origin, the mode of transportation, the foreign port of loading, and the US port of arrival. The information on transport mode is used to form detailed panel data-sets of US imports by vessel in containers. These panel data comprise the totality of such waterborne, containerized imports over the period 1999–2006 at a monthly frequency.

We retain from the import records information on the customs value and import charges (in US current dollars), as well as the weight of the shipment in kilograms. Import charge is our main variable of interest and represents the aggregate cost incurred in bringing the merchandise from alongside the carrier at the port of export and placing it alongside the carrier at the first US port of entry. This charge does not include any tariffs that are then applied upon importation. All monetary variables are converted into real values using monthly import price indexes. These refer to all imports, excluding petroleum, and were obtained from BLS.

Additionally, we observed in the data the foreign country of origination and the last foreign port of loading of the imported good, as well as the first US port of cargo unload. In using this information for our analysis, one possibility would be to use the information on the country of origin only and define our CSI variable according to whether or not the imported goods originate from a CSI country. This country-level approach is obviously unappealing. Not all US imports of goods originating in a CSI country may be shipped from a CSI port in that country. Furthermore, some US imports from non-CSI countries may still enter into the US from a CSI port in some other foreign country and thus be subject to CSI inspection.

[5] The results in this paper do not reveal any confidential information in these data. Similar information at a higher aggregation level are available from the Maritime Administration at the US Department of Transportation.

Using the available information on foreign ports is therefore preferable since it frames the analysis at the port level. However, we may not want to lose the information on the country of origin, since foreign ports may handle shipments to the US from other foreign source countries to varying degrees and so some of the observed variation in import charges may simply reflect routing effects. For instance, among the top foreign ports by value of shipments to the US, a large percentage of the shipments to the US from ports like Hong Kong (about 91 percent in 2006) and Antwerp (about 83 percent) consist of merchandise originating in third countries, while virtually all shipments to the US from Nagoya originate in Japan.

We thus use the information on the home port of arrival, the foreign port of loading and the foreign country of origin to refer to the combination as the observed import route ijk. This information allows us to distinguish US imports from foreign country k via foreign port j, where j may or may not be located in country k. For instance when looking at containerized imports from Indonesia, we may distinguish those coming directly from Indonesia (say from the the port of Jakarta) and those coming through a third country (say from the port of Singapore). This route representation is not perfect, however. While we observe the last port of consignment, there is no further information in the data on previous foreign ports transited, if any. For the purpose of our analysis, the main concern this raises is that some of the containerized imports may have been subject to CSI measures at an unobserved CSI port, whether this is the first port of exit in the country of origination or some other intermediate port.

A CSI indicator variable is created to identify the status of all foreign ports as CSI or non-CSI ports. The information on the starting date for each CSI port was collected from CBP and is reported in table 1. In our analysis, if a port joined the CSI program during the second half of a month, the starting month is rounded-up to the next month. The port of Antwerp, for instance, became a CSI port in February 23, 2003. According to this rule, it is identified as a CSI port in our monthly data starting in March 2003.

Another indicator variable, to be used in the gravity analysis, records free trade agreements in force between the US and the exporting country during the period of analysis. Also for this analysis, we draw real GDP information for the exporting country from the World Bank World Development Indicators.

Table 4 (upper panel) presents the simple average of import charges for the first two years (1999-2000) and final two years (2005-2006) in our panel. These are expressed both on a per-value and a per-weight basis. As the table shows average import charge for imports from all foreign ports increased significantly between these two periods. In terms of charge per value, the average increase is about 6 percent for all ports, and the breakdown by CSI status indicates that both CSI and non-CSI ports exhibited increased costs. Yet by this measure the increase in import costs seems larger for non-CSI ports.

Average charge per weight shows a sharper increase during these two periods. This average increased for all foreign ports by about 51 percent. By this metric, both CSI and non-CSI port exhibit significant increases in import charges. The increase for CSI ports, however, seems larger.

The numbers in Table 4, while informative, are unconditional statistics and should be interpreted carefully. Our empirical analysis handles some of the interpretation difficulties that may arise from this table. For instance the table does not account for pre-CSI tendencies. A rough correction may be to look at a second pre-CSI period (say 2001) to infer trends. However, the 2005-2006 average includes CSI ports that were not yet CSI ports in 2005 and even some that did not become CSI ports until late-2006. The longitudinal analysis that follows provides a finer treatment for trends and CSI participation timing, while also controlling for other factors unrelated to CSI that may affect import costs.

4 Empirical Framework

We identify import charges as our outcome variable of interest. Let us refer to these costs as C_{ijkt}, where i indexes the US port of arrival, j is the last foreign port of consignment, k is the country of origination, and t defines the observation period.

For all imported goods, we model the log of import charges using the following fixed effect specification:

$$\ln C_{ijkt} = \beta' X_{ijkt} + \alpha_{ijk} + \lambda_t + \kappa_j t + \sigma I_{jt} + \varepsilon_{ijkt}, \tag{1}$$

where X_{ijkt} is a vector containing a set of observable, time varying determinants of maritime transport costs, as identified in prior literature, that we will discuss shortly. α_{ijk} represent our route fixed effect, which accounts for stable unobserved factors along the ijk route that may affect import costs. λ_t is a time fixed effect that accounts for global factors common to all ports and $\kappa_j t$ stands for trend terms that control for underlying, port-specific trends, such as wage increases across ports. Finally, I_{jt} is an indicator variable that indicates whether port j is part of CSI at period t. Thus σ is our parameter of main interest, representing the average impact of CSI on US import charges, while holding all else constant.

The controls in X_{ijkt} include three variables constructed from the value and weight information recorded in the data. The first is defined as the log of the value-to-weight ratio of imports via ijk at time t, $\ln V_{ijkt}$. The second variable is the log of the weight of such imports, measured in metric tons, $\ln W_{ijkt}$. The third variable measures the sum of all containerized trade destined to the US that is shipped via foreign port j at time t, $\overline{W}_{jt}$. This is also entered in Equation (1) in log form, $\ln \overline{W}_{jt}$.

The first two variables (V and W) control for the fact that higher value and heavier shipments incur higher import charges, due to insurance and transport costs. The third variable ($\overline{W}$) allows for possible economies of scale effects.[6] As in Blonigen and Wilson (2008) and Clark, Dollar and Micco (2004), we include these variables to control for trade cost differentials due to difference in cargo volume and value composition. To flexibly estimate their role in Equation (1), however, we let these factors enter nonlinearly; for instance, to allow for non-linear pricing or initial scale economies that may gradually die out due to congestion effects. Thus, we also include square terms of these three variable: $(\ln V_{ijkt})^2$, $(\ln W_{ijkt})^2$, $(\ln \overline{W}_{jt})^2$. Finally, we include in X_{ijkt} a set of indicator variables for calendar months in order to control for any seasonality in our data.

The analysis of equation (1) explores the potential effect of the CSI on explicit monetary import charges. To examine the effect of the CSI on other implicit frictions, we estimate a import gravity equation. This relates to the now large literature on border effects pioneered by McCallum (1995).

Our gravity specification is given by

$$\ln M_{kt} = \alpha_k + \beta \ln Y_{kt} + \delta \ln c_{kt} + \gamma F_{kt} + \sigma \ln I_{kt} + \varepsilon_{kt}, \tag{2}$$

where M_{kt} is the real import value of US imports from country k at time t, α_k is a partner country fixed effect to account for multilateral resistance (Feenstra, 2004), Y_{kt} is country k's real GDP, c_{kt} is the ad-valorem value of import charges, F_{kt} is an indicator variable for FTAs in force at time t and I_{kt} is the share of country k's exports to the US subject to the CSI. Aggregate trade flows specifications such as equation (2) are well-established in the literature.[7] We estimate this equation in the next section, as well as an alternate version that uses our disaggregated port-level data.

[6]The term captures the relative importance of seaport j in terms of overall US import traffic handled. To a large extent, the selection of CSI ports has been driven by this factor. Thus, we expect a positive correlation between $\overline{W}_{jt}$ and I_{jt}.

[7]Anderson and Neary (2003) derive a similar gravity model for aggregate trade flows in the monopolistic competition framework.

5 Estimation

The estimation of Equation (1) is carried out using the fixed effect estimator, where the trade routes define the fixed effects. These effects are absorbed in the estimation as are any other time invariant determinants of import costs like distance, etc.[8] This fixed effect estimation, in a sense, resembles a difference-in-difference analysis, where changes in import charges, before and after the CSI, for a route containing a CSI port are contrasted with changes in import charges for non-CSI routes.

As we described in Section 3, our data are very rich. Our analysis requires monthly data to examine the timing of the CSI and we have included many months worth of data prior to the first CSI case to properly capture pre-CSI tendencies. So to maintain analytical data-sets of manageable dimensions, we work with an aggregate measure of C_{ijkt}. Our main analysis considers the case of imports aggregated over all products. We believe this is a reasonable baseline, since we focus on containerized trade and control for cargo volume and value composition. However, we later explore different product sub-samples as robustness checks.

Also, while we retain the detail of foreign route jk, a second aggregation is done along the subscript i, which indexes the US port of arrival. One possibility would be to aggregate over all US ports, effectively treating the US as a single port. Such aggregation, however, would not permit us to distinguish shipments from a given foreign port to a US port on the West Coast versus a US port on the East Coast, even though the routes are clearly different. This could possibly introduce some spurious variation and affect the estimation of the CSI coefficient. To address this, we follow the regional classification used by the Maritime Administration and group all US arrival seaports into nine regions: North Atlantic, South Atlantic, Gulf, South Pacific, North Pacific, Great Lakes, Hawaii, Alaska, and Puerto Rico

[8] Blonigen and Wilson (2006, 2008) propose including port dummies to approximate port efficiency. We are less interested in obtaining estimates of these parameters than in measuring the shifts due to the CSI. So we use a with-in estimator over our longitudinal panel. Blonigen and Wilson use product variation to estimate these effects with their cross-sectional data.

and the US Virgin Island. Table 3 shows some import and port statistics for the different regions.

The results of the estimation of Equation (1) over this sample of over 600 thousand records are in Table 5. As a comparison, we first fit the model through OLS without route fixed effects. As the OLS regression shows, the model does a good job in explaining overall variation in the data.[9] In this specification, which does not even account for distance, the coefficients for the value-to-weight ratio and weight come up with the expected sign and are highly significant. Indeed these two variables are very strongly correlated with import cost and this relationship would remain true across all specifications.

If we look at the estimated coefficients for these variables from our fixed effects model, we find again a strong positive correlation. The coefficients for the value-to-weight ratio in FE2 and FE3 show that import costs increase with value-to-weight, but that these increments diminish marginally. The direct effect of the weight variable on import charges is highly significant and linear.

The sign of the effect of the overall volume of shipments to the US handled at the foreign ports varies between the OLS and FE specifications. The OLS results indicate a significant positive coefficient, suggesting average congestion effects. Our fixed effects specifications, however, consistently indicate the opposite. The coefficient for the linear term comes up negative in FE1-FE3, suggesting the presence of economies of scale. Meanwhile, the coefficient for the quadratic term in FE2-FE3 is positive, suggesting that these scale economies effects gradually die out.

The estimated coefficient for the CSI is also fragile to the model specification. In particular, the coefficient for CSI comes up negative at about -8 percent when estimated through OLS. Moving to a more general fixed effect specification (FE1 and FE2), however, alters the sign of the CSI estimated coefficient and moves the point estimate closer to zero at about 2 percent. After introducing port-specific trends in FE3, the coefficient for CSI falls closer to

[9] Fixed effect estimation produces pseudo R-squared statistics and are not reported. Yet they are generally similar to the R-squared for the OLS regression.

zero and becomes insignificant. That is, after controlling for fixed port effects and the ports' underlying trends, there is no appreciable break in import charges at the start of the CSI that can be attributed to a CSI effect.

Two interesting modifications to Equation (1) are considered in Tables 6 and 7. These are approaches to two different sensitivity concerns. The first deals with the issue that the CSI may have had a different impact on ports that joined the CSI earlier versus those that joined later, perhaps due to modified program elements or uncontrolled port characteristics. Thus the CSI variable is split into two indicator variables to indicate early and late CSI ports separately. All ports that joined the CSI during the first three years of the initiative are said to have joined CSI-I: these constitute about two thirds of the CSI ports. The remaining third, joining during 2005 and 2006, are said to have joined CSI-II. The results of this analysis are in Table 6. In general, there is no evidence of a CSI effect in either case once fixed port effects and the ports' underlying trends are incorporated (FE3).

The second sensitivity check looks for breaks in import charges, not only immediately after the implementation of the CSI, but also some time before and after the implementation using an event study approach (Jacobson, LaLonde and Sullivan, 1993). This allows us to examine both potentially anticipated and lagged responses to the CSI. To do this we replace the CSI indicator variable in Equation (1) with a set of indicator variables that identify the time at which ports becomes CSI, identified as CSI (0), as well as a month before and after that, CSI (-1) and CSI (1), two months before and after that, CSI (-2) and CSI (2), and so on. We include 37 terms in total for the time the ports joined CSI and each of the 18 months before and 18 month after that time. The results are in Table 7 and correspond to a specification analogous to FE3. In general, most estimated coefficients for CSI are close to zero and not statistically significant. While there are very few significant ones, there is not a sustained pattern that could credibly indicate an anticipated or lagged CSI effect, nor a CSI effect in general.

Turning to our gravity approach, we first fit an aggregate version customary in the literature. To estimate this regression we aggregate our port-level data up to the country level. Also, given the lack of international GDP numbers at a monthly or quarterly frequency, we sum up all observations to yearly figures. Column F1 in Table 8 shows the coefficients of gravity equation 2, estimated by a Fixed Effects model. With an R-square of over 0.9, this fitted model exhibits the goodness of fit typical of gravity equations. The estimated coefficients for FTA, partner country's GDP and ad valorem charges also show expected signs, although only the linear coefficient for import charges is statistically significant. The coefficient for variable CSI, in particular, which measures the share of exports from each partner country that are subject to the CSI, comes up positive at 0.03, although it is not significant.

Column F2 in Table 8 shows the estimated coefficient of an alternate gravity equation where we use our most disaggregated data to fit the model. While the available gravity theory does not lend itself to this route-level analysis, we estimate this variant to explore possible CSI effects that may become undetected upon aggregation. In general, the fitted regression does not do well in capturing the variation in the data. The coefficient for the CSI variable, now a port-level indicator variable, in particular, is not different than in the aggregate gravity equation. Specifically, the estimated CSI coefficient is small and positive, but statistically insignificant.

6 Final Remarks

Overall, we find no compelling evidence of any significant systematic effect of the CSI in either import charges or trade disruption. This reflects the evidence in our data, up through the end of 2006. Up to that time, the anecdotal evidence is that actual CSI "interventions" at participating CSI ports had been kept to a minimum, partly due to a heavy reliance on risk management techniques as opposed to actual physical scans.[10]

[10] No public data on CSI inspections is available.

Cargo security frameworks continue to evolve, however, and thus it is hard to assess the external validity of these results in the future. In particular, the SAFE Port Act enacted by US Congress in 2006 requires 100 percent scanning of all cargo destined to the US by 2012. If implemented, this requirement would certainly take us to another level. We hope that the data and analysis developed in this paper can inform the discussions on this area and that the current results can serve as useful benchmarks for future evaluations.

References

Anderson, James E. and Eric van Wincoop. 2004. "Trade Costs." *Journal of Economic Literature* 42(3):691–751.

Anderson, James E. and J. Peter Neary. 2003. "Gravity with Gravitas: A Solution to the Border Puzzle." *American Economic Review* 93(1):170–92.

Blonigen, Bruce A. and Wesley W. Wilson. 2006. "New Measures of Port Efficiency." NBER working paper 12052.

Blonigen, Bruce A. and Wesley W. Wilson. 2008. "Port Efficiency and Trade Flows." *Review of International Economics* 16(1):21–36.

Clark, Ximena, David Dollar and Alejandro Micco. 2004. "Port Efficiency, Maritime Transport Costs and Bilateral Trade." NBER working paper 10353.

Feenstra, Robert C. 2004. *Advanced International Trade: Theory and Evidence.* Princeton: Princeton University Press.

Jacobson, Louis, Robert J. LaLonde and Daniel G. Sullivan. 1993. "Earning Losses of Displaced Workers." *American Economic Review* 83(4):685–709.

McCallum, John. 1995. "National Borders Matter: Canada-U.S. Regional Trade Patterns." *American Economic Review* 85(3):615–23.

Peterson, Joann and Alan Treat. 2008. "The Post 9/11 Global Framework for Cargo Security." *USITC Journal of International Commerce and Economics* .

Table 1: CSI Ports and Starting Date

Port	Country	Region	Month	Year
Halifax	Canada	Americas	3	2002
Montreal	Canada	Americas	3	2002
Vancouver	Canada	Americas	3	2002
Rotterdam	Netherlands	Europe	9	2002
Le Havre	France	Europe	12	2002
Bremerhaven	Germany	Europe	2	2003
Hamburg	Germany	Europe	2	2003
Antwerp	Belgium	Europe	2 [a]	2003
Singapore	Singapore	Asia	3	2003
Yokohama	Japan	Asia	3 [a]	2003
Hong Kong	China	Asia	5	2003
Gothenburg	Sweden	Europe	5 [a]	2003
Felixtowe	United Kingdom	Europe	5 [a]	2003
Genoa	Italy	Europe	6 [a]	2003
La Spezia	Italy	Europe	6 [a]	2003
Pusan	Korea	Asia	8	2003
Durban	South Africa	Africa	12	2003
Port Klang	Malaysia	Asia	3	2004
Tokyo	Japan	Asia	5 [a]	2004
Piraeus	Greece	Europe	7 [a]	2004
Algeciras	Spain	Europe	7 [a]	2004
Nagoya	Japan	Asia	8	2004
Kobe	Japan	Asia	8	2004
Laem Chabang	Thailand	Asia	8	2004
Tanjung Pelepas	Malaysia	Asia	8 [a]	2004
Naples	Italy	Europe	9 [a]	2004
Zeebrugge	Belgium	Europe	10 [a]	2004
Gioia Tauro	Italy	Europe	10 [a]	2004
Liverpool	United Kingdom	Europe	11	2004
Thamesport	United Kingdom	Europe	11	2004
Tilbury	United Kingdom	Europe	11	2004
Southampton	United Kingdom	Europe	11	2004
Livorno	Italy	Europe	12 [a]	2004
Marseille	France	Europe	1	2005
Dubai	United Arab Emirates	Middle East	3 [a]	2005
Shanghai	China	Asia	4 [a]	2005
Shenzhen	China	Asia	6 [a]	2005
Kaohsiung	Taiwan	Asia	7 [a]	2005
Santos	Brazil	Americas	9 [a]	2005
Colombo	Sri Lanka	Asia	9 [a]	2005
Buenos Aires	Argentina	Americas	11 [a]	2005
Lisbon	Portugal	Europe	12	2005
Port Salalah	Oman	Middle East	3	2006
Puerto Cortes	Honduras	Americas	3 [a]	2006
Barcelona	Spain	Europe	9 [a]	2006
Valencia	Spain	Europe	9 [a]	2006
Chi-Lung	Taiwan	Asia	9 [a]	2006
Caucedo	Dominican Republic	Americas	9 [a]	2006
Kingston	Jamaica	Americas	9 [a]	2006
Freeport	Bahamas	Americas	9 [a]	2006

Note: (*a*) The port became a CSI port during the second half of the starting month. The calendar months reported in the table are rounded up to the next month for the analysis.

Table 2: Import Values by Foreign Port

	1999-2000 US imports		2005-2006 US imports	
	$ million	%	$ million	%
Not CSI	214,765	34.2	331,972	35.1
Shenzhen (Yantian), China	19,573	3.1	93,494	9.9
Shanghai, China	20,328	3.2	82,832	8.8
Hong Kong, China	87,799	14.0	81,191	8.6
Tokyo, Japan	33,287	5.3	30,378	3.2
Bremerhaven, Germany	17,299	2.8	29,965	3.2
Rotterdam, Netherlands	17,733	2.8	27,685	2.9
Kaohsiung, Taiwan	22,099	3.5	26,490	2.8
Pusan, Korea	23,951	3.8	26,164	2.8
Nagoya, Japan	23,024	3.7	26,135	2.8
Antwerp, Belgium	15,581	2.5	21,719	2.3
Kobe, Japan	15,693	2.5	14,362	1.5
Laem Chabang, Thailand	5,826	0.9	14,060	1.5
Yokohama, Japan	12,903	2.1	11,490	1.2
Le Havre, France	9,053	1.4	11,363	1.2
Singapore	12,140	1.9	10,884	1.2
La Spezia, Italy	5,657	0.9	9,723	1.0
Hamburg, Germany	4,016	0.6	9,398	1.0
Santos, Brazil	4,431	0.7	9,142	1.0
Genoa, Italy	5,109	0.8	8,338	0.9
Puerto Cortes, Honduras	5,011	0.8	7,777	0.8
Chi-Lung, Taiwan	9,663	1.5	7,138	0.8
Felixstowe, UK	8,979	1.4	6,389	0.7
Southampton, UK	3,180	0.5	5,346	0.6
Livorno, Italy	4,355	0.7	5,095	0.5
Liverpool, UK	2,637	0.4	4,655	0.5
Gothenburg, Sweden	2,365	0.4	4,175	0.4
Port Klang, Malaysia	3,656	0.6	3,500	0.4
Colombo, Sri Lanka	2,829	0.4	3,397	0.4
Valencia, Spain	1,900	0.3	2,794	0.3
Durban, South Africa	1,422	0.2	2,649	0.3
Buenos Aires, Argentina	1,807	0.3	2,432	0.3
Thamesport, UK	3,006	0.5	2,350	0.2
Barcelona, Spain	1,267	0.2	2,174	0.2
Naples, Italy	1,410	0.2	1,501	0.2
Tanjung Pelepas, Malaysia	-	0.0	1,460	0.2
Zeebrugge, Belgium	1,330	0.2	1,107	0.1
Lisbon, Portugal	180	0.0	907	0.1
Gioia Tauru, Italy	548	0.1	854	0.1
Piraeus, Greece	387	0.1	655	0.1
Tilbury, UK	264	0.0	629	0.1
Algeciras, Spain	463	0.1	582	0.1
Freeport, Bahamas	126	0.0	424	0.0
Dubai, UAE	559	0.1	276	0.0
Caucedo, Dominican Republic	-	0.0	234	0.0
Kingston, Jamaica	452	0.1	230	0.0
Halifax, Canada	322	0.1	129	0.0
Port Salalah, Oman	71	0.0	106	0.0
Marseille, France	118	0.0	64	0.0
Vancouver, Canada	161	0.0	53	0.0
Montreal, Canada	27	0.0	27	0.0

Note: US imports refer to all general imports arriving in the US by vessels in containers, expressed in 2000 constant USD. Hong Kong and China are coded as separate countries in the data.

Table 3: Import and Port Statistics by US Coastal Region, 1999-2006

Coastal Region	US Imports ($ million)		No. of Source Foreign Ports	
(No. of Arrival Ports)	All Foreign Ports	CSI-50	All Foreign Ports	CSI-50
North Atlantic (42)	703,088	443,575	1,634	50
South Atlantic (13)	402,941	230,331	1,502	50
Gulf (34)	134,205	70,729	1,263	50
South Pacific (24)	1,424,857	986,203	1,502	50
North Pacific (20)	319,913	238,520	931	49
Great Lakes (53)	5,185	3,367	589	48
Hawaii (5)	1,999	1,450	241	38
Alaska (8)	61	30	63	23
PR/US VI (14)	25,785	9,747	985	50
US (213)	3,018,034	1,983,951	1,808	50

Note: US imports refer to all general imports arriving in the US by vessels in containers during 1999-2006, expressed in 2000 constant USD.

Table 4: Average Import Charge and Other Mean Values by Foreign Port

		1999-2000	2005-2006	Change %
Charge/Value	All Ports	0.088	0.093	5.9**
	CSI	0.072	0.073	1.4+
	Non-CSI	0.098	0.105	7.2**
Charge/Weight	All Ports	0.514	0.745	44.9**
	CSI	0.487	0.726	49.1**
	Non-CSI	0.532	0.757	42.2*
Log Charge	All Ports	8.893	8.771	-1.4**
	CSI	8.714	8.540	-2.0**
	Non-CSI	9.012	8.915	-1.1**
Log Value/Weight	All Ports	1.400	1.533	9.5**
	CSI	1.700	1.927	13.3**
	Non-CSI	1.200	1.286	7.2**
Log Weight	All Ports	10.459	10.278	-1.7**
	CSI	10.156	9.852	-3.0**
	Non-CSI	10.661	10.545	-1.1**
Log Port Volume	All Ports	16.100	16.430	2.0**
	CSI	18.227	18.454	1.2**
	Non-CSI	14.687	15.164	3.2**

Note: Values for 1999-2000 and 2005-2006 are simple averages for these periods. All monetary figures are expressed in 2000 constant USD. Change is the rate of change of these mean values. Significant at the 10 percent (+), 5 percent (*) and 1 percent (**) level.

Table 5: Import Charge Regressions

	OLS	FE1	FE2	FE3
CSI	-0.078**	0.020*	0.021**	-0.003
	(0.009)	(0.008)	(0.008)	(0.010)
Log Value/Weight	0.434**	0.380**	0.397**	0.397**
	(0.004)	(0.003)	(0.006)	(0.006)
Log Weight	0.940**	0.859**	0.852**	0.851**
	(0.002)	(0.002)	(0.008)	(0.008)
Log Port Volume	0.010**	-0.016**	-0.134**	-0.126**
	(0.001)	(0.003)	(0.016)	(0.017)
Log Value/Weight Sq			-0.005**	-0.005**
			(0.002)	(0.002)
Log Weight Sq			0.000	0.000
			(0.000)	(0.000)
Log Port Volume Sq			0.004**	0.004**
			(0.001)	(0.001)
R-squared	0.821			
N	670016	670016	670016	670016

Note: Dependent variable is log import charges, $\ln C_{ijkt}$. All regressions include a constant term, month indicator variables and a comprehensive set of time effects. FE regressions incorporate route fixed effects. FE3 adds port-specific trends. Estimated standard errors corrected for unknown heteroskedasticity and clustering reported in parenthesis. Significant at the 5 percent (*) and 1 percent (**) level.

Table 6: Import Charge Regressions, Early vs Late CSI

	OLS	FE1	FE2	FE3
CSI-I	-0.096**	0.021*	0.025**	-0.001
	(0.010)	(0.009)	(0.009)	(0.011)
CSI-II	0.109**	0.013	-0.001	-0.007
	(0.019)	(0.016)	(0.016)	(0.020)
Log Value/Weight	0.435**	0.380**	0.397**	0.397**
	(0.004)	(0.003)	(0.006)	(0.006)
Log Weight	0.940**	0.859**	0.852**	0.851**
	(0.002)	(0.002)	(0.008)	(0.008)
Log Port Volume	0.010**	-0.016**	-0.136**	-0.126**
	(0.001)	(0.003)	(0.016)	(0.017)
Log Value/Weight Sq			-0.005**	-0.005**
			(0.002)	(0.002)
Log Weight Sq			0.000	0.000
			(0.000)	(0.000)
Log Port Volume Sq			0.004**	0.004**
			(0.001)	(0.001)
R-squared	0.821			
N	670016	670016	670016	670016

Note: Dependent variable is log import charges, $\ln C_{ijkt}$. All regressions include a constant term, month indicator variables and a comprehensive set of time effects. FE regressions incorporate route fixed effects. FE3 adds port-specific trends. Estimated standard errors corrected for unknown heteroskedasticity and clustering reported in parenthesis. Significant at the 5 percent (*) and 1 percent (**) level.

Table 7: Import Charge Regressions, Event Study

CSI (-18)	0.011	(0.019)
CSI (-17)	-0.001	(0.020)
CSI (-16)	0.004	(0.020)
CSI (-15)	0.015	(0.018)
CSI (-14)	0.022	(0.018)
CSI (-13)	0.009	(0.019)
CSI (-12)	-0.009	(0.020)
CSI (-11)	0.013	(0.019)
CSI (-10)	0.013	(0.019)
CSI (-9)	-0.008	(0.018)
CSI (-8)	0.026	(0.018)
CSI (-7)	0.037 *	(0.018)
CSI (-6)	0.013	(0.017)
CSI (-5)	0.009	(0.019)
CSI (-4)	-0.014	(0.018)
CSI (-3)	0.005	(0.018)
CSI (-2)	0.015	(0.018)
CSI (-1)	0.017	(0.019)
CSI (0)	0.005	(0.019)
CSI (1)	-0.000	(0.018)
CSI (2)	0.037 *	(0.017)
CSI (3)	0.006	(0.018)
CSI (4)	0.030	(0.017)
CSI (5)	0.046 *	(0.018)
CSI (6)	-0.012	(0.019)
CSI (7)	-0.012	(0.019)
CSI (8)	0.046 **	(0.017)
CSI (9)	-0.013	(0.020)
CSI (10)	-0.003	(0.020)
CSI (11)	0.036 *	(0.018)
CSI (12)	0.003	(0.019)
CSI (13)	-0.034	(0.020)
CSI (14)	-0.016	(0.020)
CSI (15)	0.023	(0.018)
CSI (16)	0.007	(0.018)
CSI (17)	0.007	(0.019)
CSI (18)	0.039 *	(0.017)
Log Value/Weight	0.397 **	(0.006)
Log Weight	0.851 **	(0.008)
Log Port Volume	-0.126 **	(0.017)
Log Value/Weight Sq	-0.005 **	(0.002)
Log Weight Sq	0.000	(0.000)
Log Port Volume Sq	0.004 **	(0.001)
N	670016	

Note: Regression includes a constant term, month indicator variables, a comprehensive set of time effects, port-specific trends and route fixed effects. Estimated standard errors corrected for unknown heteroskedasticity and clustering reported in parenthesis. Significant at the 5 percent (*) and 1 percent (**) level.

Table 8: Import Gravity Regressions

	FE1	FE2
CSI	0.030	0.031
	(0.060)	(0.079)
FTA	0.500	-0.005
	(0.441)	(0.094)
Log Real GDP	1.048	-0.167
	(0.769)	(0.155)
Log Ad Valorem Charge	-12.728**	-7.215**
	(3.367)	(0.501)
Log Ad Valorem Charge Sq	10.238	2.142**
	(11.060)	(0.621)
R-squared	0.962	0.101
N	1386	638384

Note: Dependent variable is log of real imports. FE1 uses data aggregated to the country and year level. It includes a constant term, country fixed effects and year effects. CSI refers to the log of country k's export share subject to the CSI during the year. FE2 uses monthly and port-level data. It includes a constant term, month indicator variables, country fixed effects, a comprehensive set of time effects and port-specific trends. CSI in FE2 refers to a port-level indicator variable. Estimated standard errors corrected for unknown heteroskedasticity and clustering reported in parenthesis. Significant at the 5 percent (*) and 1 percent (**) level.