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# Estimating the Benefit of Document-Handling Process Improvement for Seaport Reliability: The Case of Indonesia

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## Abstract

Low level of seaport reliability is one of the crucial problems amidst the increasing trend of seaborne trade in Indonesia. Main seaports in Indonesia are suffering because of longer dwelling time relative to other international seaports in South East Asian countries partly due to poor administrative process. This paper examines the Indonesian sea transport market focusing on measuring the benefit of seaport service reliability improvement in terms of handling the seaborne trade documents. Using open-ended question of contingent valuation method, our estimates show a moderate benefit, a cost reduction of the administrative process ranging from US\$10.8–90.3 per TEU for each day. The cost reduction is even higher for the subsample of importing firms, indicating that the improvement of document-handling plays a more crucial role in accelerating the import activities in Indonesia.

**JEL Classification:** O18; P25; R11

## Keywords

Seaborne Trade — Seaport Reliability — Document-Handling Process — Cost Saving — Indonesia

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## 1. Introduction

Seaport is one of important infrastructure for an archipelagic country like Indonesia. The presence of seaport plays a major role in dealing with both the international and (inter-islands) domestic trades. In regional development point of view, seaport brings perpetuity benefits since it works as a catalyst for greater economic growth within the region (Talley, 2009). Lacking in seaport capacity and its supporting infrastructure will result in slow movement of goods and services flow, which in turn directly affects the regional economic performance.

Despite the importance of seaport infrastructure in Indonesia, in fact, the latest statistics rather shows a relatively poor performance of Indonesian seaport. Table 1 reports recent performance of Indonesian Main Seaports which serving international and domestic seaborne trade, namely Manado, Makassar, Belawan (Medan), Tanjung Perak (Surabaya), and Tanjung Priok (Jakarta).

On average, the dwelling time of Indonesia's main seaport is ranging from 5 to 6.6 days, which relatively less efficient compared to Malaysian international seaports (i.e. Port Klang and Tanjung Pelepas) whose average dwelling time is 2–3 days. The performance is much more inferior compared with Singapore or Hongkong, which are able to keep the dwelling time less than a day. This longer dwelling time is due to complicated and disorganized administration process. A study by the The Customs of Indonesia (2015) reveals that longer dwelling time is mostly from pre-clearance process, in which many importers fail to submit proper import documents. As a result, many import goods

are detained in the port yard and thus, reduces the seaport reliability in handling import activities.

Nonetheless, the government agencies related to seaborne trade have formulated some initiatives to shorten and simplify the document-handling process in order to reduce the dwelling time up to 20 percent. This paper hence tries to quantify the benefit from seaport reliability improvement in terms of the administrative export and import procedures simplification in Indonesia's main seaports.

The term of reliability may have a different measurement. Yet in most cases, it is defined as the variability in travel times over repeated journeys, which produce uncertainty for transport users (Li et al., 2010). The definition is independent of congestion, in which the travelers anticipate in advance (Noland & Polak, 2002). Small (1982) is the first study incorporating the concept of travel time reliability in terms of schedule delay, under a model of scheduling choice. However, as the term is related to uncertainty part of travel time, recent studies on the reliability is often measured as the variance or standard deviation of travel time (Li et al., 2010). Moreover, empirical study in benefit from reliability of transportation infrastructures has been thoroughly undertaken, particularly in road, public passenger transport (Li et al., 2010; Kato et al., 2014; Kouwenhoven et al., 2014), or even High Occupancy Toll (HOT) Lanes (Carrion & Levinson, 2013). Noland & Polak (2002), Small & Verhoef (2007), and Carrion & Levinson (2012) provide a detailed review of current evidence on travel time reliability during past 20 years.

In the recent maritime transport literature, only a few of researchers who have measured the benefit of reliability

**Table 1.** Recent Performance of Indonesian Main Seaports

	Manado	Makassar	Medan	Surabaya	Jakarta
Dwelling time (days)	5.0	6.3	5.5	6.6	5.2
Draft (m)	09–12	9.7–16	06–10	9.6–10.5	13.5
BOR (%)	64.4	68.2	65.0	66.5/41.9	45.3
YOR (%)	70.0	70.4	42.6	50.8/206.4	50.2

Source: The Customs of Indonesia (2015)

Note: BOR and YOR for Surabaya are for non-container and container terminals, respectively

improvement of sea transport infrastructures. To our knowledge, there are only two studies measuring the reliability of the sea transport infrastructures. Brooks et al. (2012) evaluate the willingness to pay of Australian freight shippers for various attributes, which include freight rate, transit time, and reliability measured in percent of on-time shipment, of Australian several possible shipment possibilities, including coastal shipping. The study finds a mean WTP of about A\$200 for each percentage point increase in short shipping's on-time reliability. Another study by Kawasaki et al. (2014) measures the value of shipment time variability, in the form of time-schedule delay, using stated preference model in Greater Mekong Sub-region. The study finds that the value of delay is about five times of normal travel time savings, and suggests a higher value of schedule delay late than of schedule delay early.

This study evaluates the benefit valuation of improving the reliability of document handle process of seaborne trade in Indonesia. It aims to measure the cost-saving perceived by firms doing seaborne trade for improvement in the administrative process using open-question of contingent valuation method in a seaport users' survey which covers four main seaports in Indonesia, namely Tanjung Priok (Jakarta), Tanjung Perak (Surabaya), Makassar, and Belawan (Medan). The survey was addressed to managers in charge of manufacturing firms, which are dealing with inter-island and/or export-import activities. The survey was asking the benefit valuation in form of per TEUs cost-saving can be made for reducing one-day document-handling process. Our estimates show a moderate benefit, a cost reduction of the administrative process ranging from US\$10.8–90.3 per TEU for each day. The cost reduction is even higher for the subsample of importing firms, indicating that the improvement of document-handling plays a more crucial role in accelerating the import activities in Indonesia.

The remainder this paper is organized as following. The section 2 gives the explanation on data and estimation strategy. The section 3 analyzes the estimation results. The section 4 provides the conclusion.

## 2. Conceptual Framework

One of the main problems of seaborne trade inefficiency in Indonesia originated from administrative process. Nevertheless, doing improvement in document handling process is relatively limited. Figure 1 illustrates the perception of the overall process, including document handling procedure in the Customs, taken from Monitoring Investment Climate of Indonesia (MICI) 2015. There are three aspects asked: (1) whether process in the Customs are longer, (2) whether it has a higher complexity of document procedure, and (3) whether it involves more expensive cost. For the document

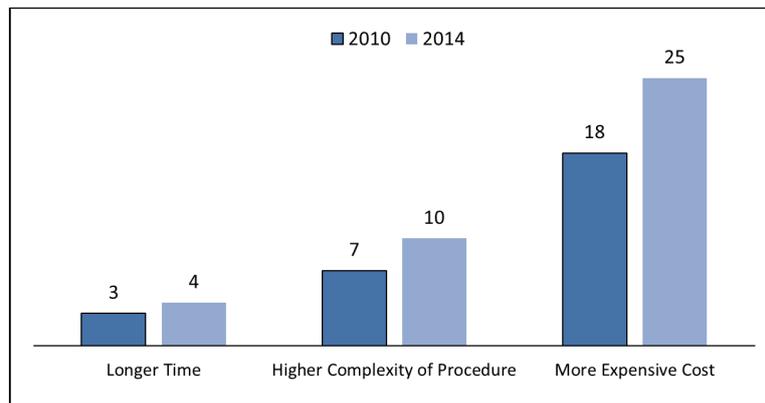
process, there is a slight increase in the respondents' perception from 2010 to 2014, indicating that the process is getting more difficult and complicated than the previous.

Such striking result reflects the recent level of complexity of document handling process and regulation of seaborne trade in Indonesian. There are about 17 government bodies and agencies related to the seaborne export/import activities, some of which have overlapping authorities each other. Despite the presence of Indonesia National Single Window (INSW) to simplify the administrative process, seaborne export/import activities remain with manual experience and face-to-face procedures. At the same time, the Customs also detects a substantial amount of indiscipline importers who do not completely submit the import documents yet but insist to transport the imported goods. Both factors, in turn, lead longer dwelling time and worsen seaport reliability.

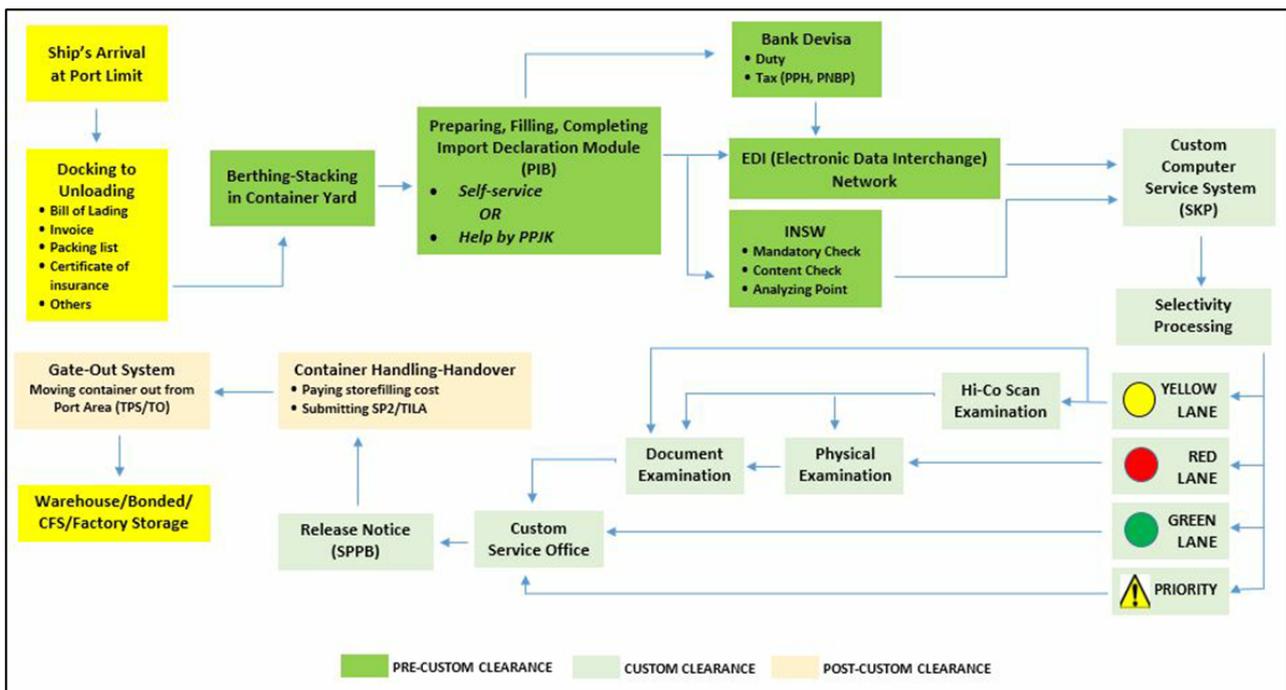
Figure 2 further illustrates the import procedure established by the Customs, which can be divided into three main phases, namely: pre-custom clearance, custom clearance, and post-custom clearance. Time needed to complete all of these phases are also known as dwelling time. Pre-custom clearance, the first phase, starts when containers in the ship are ready to be unloaded until the importer submits Import Declaration (PIB) and necessary documents to the Customs Service System (SKP). When containers are moved to and stacked in Container Yard, at the same time importers may prepare, fulfill, and complete Import Declaration module by either manual or online system (INSW). In addition, they have to pay duties and taxes charged to Foreign Exchange bank. This payment data will be sent through EDI Network. Finally, importers are ready to submit Import Declaration to the Customs Service System (SKP).

The next phase is customs clearance. After the Import Declaration has been submitted, the Customs Officer will verify those documents and make a decision on lane selectivity. There are four possibilities of lane selectivity, namely: priority lane, green lane, red lane, and yellow lane. Depends on the type of lane, an arrangement of documents and physical examination will be conducted over containers if it is required. After going through this process, the Customs Office will issue a release notice (SPPB). Finally, the last phase is post-custom clearance. This phase starts once the release note has been issued, which importers use for unloading the containers from the yard. Importers need to hand container-handling over and paying store-filling cost before bringing the containers out through the gate-out system.

A large portion of the bottleneck in import shipment is in pre-custom clearance phase, instead of the other phases. These obstacles are including the length of time needed by relevant agency to verify submitted documents in order to issue Restriction and Prohibitions (LARTAS), the length of time to validate LARTAS through INSW system,



**Figure 1.** Perception on Overall Process at the Customs (Percent of Respondents)  
Source: Institute for Economic and Social Research (2014)



**Figure 2.** Procedures for Seaborne Import  
Source: The Customs of Indonesia (2015)

and how fast the importer's initiative to submit the verified and completed documents of Import Declaration. Moreover, these obstacles are significantly affecting the length of dwelling time. It takes 3–4 working days to complete pre-custom clearance phase, which accounted for 62%–71% of dwelling time. Compared to this period, custom clearance and post-custom clearance phase only take maximum 0.82 and 1.5 working days, respectively. Henceforth, improving the document-handling consequently in importation process will provide significant improvement in Indonesian seaport reliability. Recent report from the Customs reveals that improving document handling process may reduce 23 percent of dwelling time in Tanjung Priok, from 8 to 6.08 days.

Figure 3 illustrates further the conceptual framework of this study. Long and unreliable document-handling process directly indicates the low-quality of the service reliability. In the demand side, bigger economic activities in Indonesia accelerate wider trade activities, including seaborne trade. It needs better support from all types of infrastructures, including soft infrastructures in the form of seaborne-traded

document handling. Thus, there is an increasing demand for improving the seaborne-trade document-handling. For exporting/importing firms, shorter document-handling process is associated with potential benefit in form of lower cost per TEU they have to spend.

### 3. Data and Estimation Strategy

We use dataset obtained from a survey of held in June–August 2015 as part of collaborative research titled “ASEAN Maritime Connectivity” between The Institute for Economic and Social Research and ERIA. The survey target is manufacturing firms, forwarder, trucking industry, and sea liner industry. The survey was dedicated to digging information on how seaports' stakeholders interact with their seaport and its supporting infrastructures. The survey is able to collect 322 respondents. Yet, some respondents, particularly in Jakarta, refused to fill some items in the questionnaire. As a result, we only use 278 respondents at most.

To elicit the benefit on the improvement of administra-



Figure 3. A Framework of Document Handling Process and the Demand for Improvement

tive procedure, respondents were asked an open question “How much cost you can save if the administrative process can be reduced by a day?”. We avoid asking their direct willingness to pay to reduce undervaluation problem, zero valuation or unwillingness to report. Similarly, we prefer using an open-ended question rather than any contingent valuation methods to avoid respondents’ confusedness.

To examine how the benefit may vary across stakeholders’ characteristics, we consider following linear regression:

$$y_i = \beta_0 + \sum_{l=1}^L \delta_l X_i^l + \sum_{k=1}^K \delta_k Z_i^k + \varepsilon_i \quad (1)$$

where  $y_i$  is the stated potential cost can be saved from one-day reduction in administrative process of firm  $i$  in natural logarithm.  $X_i^l$  represents firm  $i$ ’s characteristics, which include sales and number of labor, firm age, ownership, and share of export/import, share of seaborne export/import, and dummy for being part of global production network (GPN), industrial zone, and understanding/using Indonesian National Single Window (INSW).  $Z_i^k$  is other characteristics, i.e. seaport pool area.

For firm characteristics, we expect that firm size (which measured by sales and number of labor) has a positive association with the benefit as bigger firms tend to have a tighter schedule on export/import activities. Any delay will give more cost for bigger firms than for smaller firms. Firm age represents the experience of any respective firm in dealing with its industry, including its seaborne trade. More experienced firms potentially have longer relationship with sea transport industry as well as stakeholders in government agencies, and hence may affect their valuation. The share of export/import and share of seaborne export/import tell the demand from firms on the maritime transport, including seaport services. Being part of global production network leads firms to have stricter schedule in meeting the production chain, and thus we expect a higher valuation. Firms located in industrial zone are also expected to have a higher valuation in a sense that they may request faster document-handling process. We also argue that firms which know and use INSW may have different valuation with those which do not know or use INSW.

We also include the seaport characteristics to examine whether the quality of seaport affects the valuation. Better seaport infrastructures tend to provide more spaces for supporting infrastructures, including agencies who deal with export/import document process. A bigger seaport is also associated with the higher level of importance of respective seaport in Indonesian maritime connectivity. Accordingly, a better seaport infrastructures will have a higher valuation.

We estimate Equation (1) for exporting sample and importing firms subsample to examine whether there is different behavior for importing firms. As pointed out by the Customs, one of the main problems in longer dwelling time is in import pre-custom clearance procedure, and hence we

expect longer importing document process may somewhat affect the valuation. Response to the valuation question shows that 157 out of 322 responses, or 48.8 percent, report zero valuation. Since the responses are either zero, or some positive numbers, and the zero valuation takes a substantial portion, we thus applied a left-censored Tobit regression technique to estimate Equation (1).

## 4. Results and Analysis

### 4.1 Descriptive Analysis

Table 2 presents the descriptive analysis of variables within the model. Our dataset contains 322 observations at firm-level, where 43.5 percent are involved in international trade activities. From this portion, 20.8 percent are fully-importer, 14.9 percent are fully-exporter, and 20.8 percent are both exporter and importer. These firms are located in a various regions, consisted of 60 firms in North Sumatera, 87 firms in DKI Jakarta and Banten, 40 firms in West Java, 75 firms in East Java, and 60 firms in South Sulawesi.

Most of these firms are likely to utilize sea transportation to deliver their export or import products, instead of air or land transportation. With 47 percent share of export on average, a firm may handle 59 percent of its export through seaborne. Similarly, a firm whose share of import is 46 percent may handle 55 percent of its import through seaborne. If the firm is part of global network production chain, the share of export will be 4 percent higher and the share of import will be 1.4 percent higher. It indicates that the sea transportation takes a major role in developing Indonesian trade sector.

From the data, we found that a firm could generate cost-saving by 1.03 million Rupiah per TEU on average if the length of time required to process documents of import are cut by one day. However, this amount of cost-saving is varied in each province. For example, the average cost-saving for firms in DKI Jakarta and East Java are IDR355.3 and IDR836.9 thousand Rupiah per TEU, respectively. Meanwhile, in North Sumatera, the average cost-saving is 418.3 thousand Rupiah per TEU. The largest cost-saving are generated by firms in South Sulawesi, which around 2.2 thousand Rupiah per TEU. We expect these amounts have a correlation with seaport characteristics and trade activities in each region, such as dwelling time, shipping frequency, seaport services, size of the ship, etc.

Dwelling time indicates the length of time needed to unload containers from the ship onto container yard and then move them out from the storage. For this variable, we found that the average dwelling time is 3.5 days, with a range between 1 and 5.5 days. The longest average dwelling time is in East Java (4.6 days), meanwhile, the shortest is in South Sulawesi (1.6 days).

Since the government has established INSW system to ease the administration process of import, it is expected

**Table 2.** Descriptive Analysis of Variables

Variable	Obs	Mean	Std.Dev.	Min	Max
Cost saving (in million IDR)	321	1.03	3.79	0	50
Total sales (in bill. IDR)	313	245	904	0	10,200
Share of export (%)	322	47	44	0	100
Share of import (%)	322	46	44	0	100
Share of seaborne import (%)	322	55	47	0	100
Share of seaborne export (%)	322	59	46	0	100
Total labor (people)	321	564	1,677	1	23,999
Firm age (years)	315	21	15	0	108
Pool area (hectare)	322	840	551	92.5	1,634
Time for document-handling (hours)	231	213	349	0	4,320
Dwelling time (days)	219	4	3	0.5	30
Document handling	322	0.65	0.48	0	1
Global network production	322	0.09	0.29	0	1
Industrial zone	322	0.29	0.46	0	1
Source of capital	322	0.32	0.47	0	1
INSW	322	0.42	0.49	0	1

that dwelling time will decrease significantly. There is 42 percent of our respondents which have been using INSW for their foreign trade activities. Interestingly, there is no significant difference in the length of dwelling time for firms which use INSW facility and which do not. For the firms which used INSW, the length of dwelling time is 3.4 days on average. Meanwhile, if the firms do not use INSW, it will take 3.5 days. However, this will vary in each of provinces. Firms in Banten, West Java, and East Java experience with positive benefit from INSW as their dwelling time is decreasing by 0.4 up to 1 day on average.

The difference in average length of dwelling time also varies based on firm's source of capital. Firms whose capital is from foreign direct investment enjoy less dwelling time (3.2 days) compared to domestic firms (3.7 days). However, the foreign capital firms will earn more benefit in terms of cost-saving than the domestic firms when the dwelling time is cut by one day. As a comparison, the value of cost-saving in foreign firms are IDR1.21 million per TEU, while for domestic firms are only IDR 0.97 million per TEU on average. This suggests that the foreign firms actually realize that there is still a room for pushing the cost to be more efficient.

About 65 percent of our respondents used a logistics service provider to help them processing document of export and import. It will take 3.7 days for a firm to process the documents of export and import with a help from the logistics service provider. In contrary, it only takes 3 days if the firm decides to not use a logistics service provider. This indicates that a firm actually does not really need to use logistic service because it does not guarantee that the length of time for processing documents will be completed earlier.

## 4.2 Econometric Results

We examine the benefit of time reduction in administrative documents. We argue that some firms' characteristics determine their stated benefit of improvement in the administration process. Table 3 and Table 4 provide the results of left-censored Tobit estimates under robust standard errors for the full sample and importing firms' sample, respectively.

### 4.2.1 Full sample

Estimates in Table 3 suggest a positive result for sales variable, yet statistically insignificant in most specifications. As mentioned earlier, as some respondents refused to completely answer all the questions, there are only 278 complete observations. The estimation result reports pseudo-R<sup>2</sup> between 0.10–0.11, which is relatively comparable with other similar studies. The result also finds statistically significant sigma, which indicates that using OLS will provide inconsistent estimates (Wooldridge, 2001).

The firm size has a positive association with the benefit valuation, yet statistically weak. In specification (2), one percent increase in sales corresponds to 0.5 percent increase in the benefit. However, the estimate turns to be insignificant in the specification (3) as more control variables are introduced. The number of labor, as another proxy of firm size, also indicates a positive relationship with the benefit, although the results remain insignificant. The estimate suggests that the valuation is rather invariant across firm size. There is no tendency that bigger firms may be benefited more per TEU than smaller firms.

We obtain a positive significant relationship between share of import and share of seaborne import and the benefit valuation. Yet, the result is logical as one of the main problems in seaborne trade lies in importation procedure. One percent increase in import share potentially increases the valuation by 0.5 percent. Meanwhile, one percent increase in the share of seaborne import may raise the valuation by 0.5–0.6 percent. Firms with higher import and seaborne import share mean more frequent in dealing with import document. Hence, reducing one-day document-handling process brings more time and cost saving than those with lower import and seaborne import share. In contrast, export attributes rather exhibit a negative relationship with the cost-saving valuation, despite statistically insignificant. Firms with a higher portion of export or higher portion of seaborne export elicit lower valuation.

Among dummy variables representing firm characteristics, we find that being part of GPN, located inside industrial zone, owned by foreign, and knowing and using INSW provides a positive association with the valuation. Nevertheless, depending on the specifications, all those variables are statistically significant, except being part of GPN. Being in industrial zone reveals lower valuation as industrial zone

**Table 3.** Estimation Result for Full Sample

Dependent variable: log(cost saving)	(1)	(2)	(3)	(4)
Total sales	0.667 (1.58)	0.733*** (1.74)	0.691 (1.64)	0.639 (1.60)
Share of export	-0.0318 (-1.53)	-0.0312 (-1.50)	-0.0312 (-1.50)	-0.0238 (-1.20)
Share of seaborne export	-0.0106 (-0.46)	-0.00667 (-0.28)	-0.00663 (-0.28)	-0.000742 (-0.03)
Share of seaborne import	0.0782* (3.92)	0.0857* (4.25)	0.0823* (4.02)	0.0928* (4.78)
Share of import	0.0723* (3.50)	0.0739* (3.56)	0.0732* (3.53)	0.0720* (3.63)
Total labor	0.424 (0.73)	0.635 (1.07)	0.550 (0.94)	0.906 (1.50)
Firm age	-1.154 (-1.33)	-1.307 (-1.51)	-1.262 (-1.48)	-1.148 (-1.37)
Document handling (1= by third party, 0 otherwise)	-2.789** (-2.16)	-2.846** (-2.21)	-2.939** (-2.30)	-1.974 (-1.50)
Global network production (1=part of GPN, 0 otherwise)	2.261 (1.16)	3.017 (1.51)	2.694 (1.33)	2.948 (1.44)
Industrial zone (1=in industrial zone, 0 otherwise)	-3.012*** (-1.83)	-1.359 (-0.77)	-1.453 (-0.83)	-1.453 (-0.84)
Source of capital (1=foreign, 0 otherwise)		-3.674** (-2.14)	-3.868** (-2.25)	-3.134*** (-1.85)
INSW (1=know and use, 0 otherwise)			1.756 (1.38)	2.100*** (1.68)
Pool area				3.352* (3.06)
Constant	-14.79*** (-1.80)	-17.13** (-2.07)	-16.19*** (-1.94)	-41.29* (-3.75)
Sigma	8.835* (15.12)	8.745* (15.13)	8.704* (15.09)	8.521* (15.41)
Observations	278	278	278	278
F-stat	17.36	17.05	15.84	17.25
Pseudo R2	0.0996	0.103	0.104	0.111

Note: *t* statistics in parentheses. \*\*\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*  $p < 0.010$

tends to be closer to the seaport and has better access to government agencies dealing with the document-handling. Any problem with the process can be fast addressed. Similarly, firms who use the third party to deal with their document-handling process tend to report lower valuation. Using the third party such as freight forwarder enables the firm to reduce face-to-face interactions, which may incur additional cost, with the related government agencies. The presence of the third party also provides some degree of risk sharing for any delay risk in document-handling deliveries. From specification (4), firms which know or use INSW system report 1.4 percent higher valuation than those which do not. INSW provides easiness in and simplifies the document-handling process of export/import activities, and hence knowing and using this initiative may raise the expectation of a better service of document-handling process.

For seaport characteristics, we use seaport pool area and find a positive association between the valuation and the seaport pool area. Bigger seaport tends to have more facilities and has more capability to provide a wider range of document-handling process as well as the lower time needed. Thus, firms tend to expect more from a bigger seaport, which in turn increase their valuation.

#### 4.2.2 Importing firms subsample

Table 4 provides estimation results for importing firms only. Focusing on this subsample enables us to add a variable of time needed for the document-handling process as one of the explanatory variables. The obtained result shows

a positive and robust estimate of the delay variable. One percent longer time for the document-handling process by the importer may increase 0.9 percent of their valuation. Importing firms experiencing with a longer delay in the document-handling process put higher values on the improvement. This result also indicates a decreasing marginal benefit of the improvement.

The other estimates result from importing firms subsample provide consistent estimates with the results from full sample, despite the varying level of significance. The bigger firm tends to have a positive association with the benefit, despite statistically weaker. Importing firms with a higher share for seaborne trade both, export and import, tend to obtain higher benefit from the document-handling improvement. The share of seaborne import consistently has a significant effect on the valuation of specifications.

Estimates for dummy variables are also consistent and rather have stronger magnitude than that of full sample estimates. Importing firms value higher benefit when they are part of the global production network. Being part of global production network increases the valuation by 3.5–2.6 percent. Using the third party for handling the import documents enable importers to share the risk burden of uncertainty in the document-handling process. The magnitude is even much higher than that in full sample estimates.

Furthermore, a dummy variable for ownership is negative and statistically significant, indicating that firms whose capital is mostly from a foreign source, experience with lower benefit from the improvement. A possible explana-

**Table 4.** Estimation Result for Importing Firms

Dependent variable: log(cost saving)	(1)	(2)	(3)	(4)
Time for document-handling process	1.244* (3.32)	1.189* (3.15)	1.161* (3.11)	1.001* (2.66)
Total sales	-0.0285 (-0.08)	0.0664 (0.19)	0.0325 (0.09)	0.00554 (0.02)
Share of export	-0.0166 (-0.77)	-0.0158 (-0.73)	-0.0170 (-0.79)	-0.00896 (-0.43)
Share of seaborne export	0.000532 (0.02)	0.00380 (0.17)	0.00411 (0.18)	0.00585 (0.27)
Share of import	0.0232 (1.29)	0.0244 (1.35)	0.0251 (1.39)	0.0234 (1.36)
Share of seaborne import	0.0366** (2.04)	0.0427** (2.38)	0.0400** (2.19)	0.0460* (2.67)
Total labor	0.138 (0.21)	0.330 (0.50)	0.291 (0.45)	0.511 (0.78)
Firm age	-0.905 (-1.10)	-1.088 (-1.34)	-1.069 (-1.31)	-1.024 (-1.28)
Document handling (1= by third party, 0 otherwise)	-4.089* (-3.46)	-4.268* (-3.62)	-4.377* (-3.75)	-3.476* (-2.93)
Global network production (1=part of GPN, 0 otherwise)	2.635 (1.55)	3.373*** (1.89)	3.165*** (1.78)	3.497*** (1.97)
Industrial zone (1=in industrial zone, 0 otherwise)	-3.258** (-2.29)	-1.490 (-0.97)	-1.528 (-1.00)	-1.482 (-0.99)
Source of capital (1=foreign, 0 otherwise)		-3.509** (-2.27)	-3.703** (-2.41)	-3.155** (-2.10)
INSW (1=know and use, 0 otherwise)			1.489 (1.33)	1.765 (1.60)
Pool area				2.722* (2.96)
Constant	5.147 (0.72)	2.698 (0.38)	3.402 (0.47)	-15.91*** (-1.67)
Sigma	7.301* (14.62)	7.207* (14.50)	7.172* (14.50)	7.035* (14.68)
Observations	201	201	201	201
F-stat	5.090	5.025	4.977	5.215
Pseudo R2	0.0464	0.0510	0.0526	0.0587

Note: *t* statistics in parentheses.\*\*\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*  $p < 0.010$

**Table 5.** Benefit Estimation from Reducing Document Handling Process for One Day

	Benefit	
	Low	High
Full sample	145.2	1,218.7
Importing firms	725.2	3,464.6

Note: All values measured in thousand Indonesian Rupiah (IDR)

tion is that foreign firms tend to use priority line, which enables them to cut some document process and shorter document-handling process. As the time needed is relatively shorter than any other lines, these firms obtain lower benefit from further reduction in the document process.

#### 4.3 Benefit Estimate

The estimates in Table 3 and Table 4 are then used as the basis for calculating the economic benefit of the document-handling process improvement in the seaport. Using those estimates, average benefit is estimated, such that  $\bar{y} = \frac{1}{N} \sum_{i=1}^N \hat{y}_i$ , where  $\bar{y}$  and  $\hat{y}_i$  are the average benefit in form of average cost saving and estimated cost saving, respectively. Table 5 provides the average estimate for both full sample and importing firm subsample.

Given our several specifications, the average benefit can be obtained from reducing document handling process for one day is ranging between 142.2–1218.7 thousand Rupiah (equal to US\$10.8–90.3) per TEU. The estimate is signifi-

cantly increasing for importing firms' benefit, ranging from 725.2–3464.6 thousand Rupiah (equal to US\$53.7–256.6) per TEU. This result is logical since the improvement in import document-handling process provides more benefit for importing firms. As a comparison, these numbers are much higher than the daily additional cost of warehouse or daily penalty cost of a long-stay container in Tanjung Priok Terminal.

## 5. Remarks

In this paper, we estimate seaport users' benefit of port reliability improvement in the document-handling process in Indonesia. This study is perhaps the first study eliciting the benefit of seaborne trade service reliability of document handling process in Indonesia. Using firms survey in four main cities in Indonesia, namely Jakarta, Surabaya, Medan, and Makassar, we asked the respondents their valuation on a one-day reduction of document-handling procedure for their importing activities.

A questionnaire was used to collect data on maritime connectivity in four Indonesian cities, namely Jakarta, Surabaya, Medan, and Makassar. The data contains the firms' response to the delay of import document-handling process of firms and their valuation of benefit from reducing the document process by one day. Using an open-ended contingent valuation method, the estimates show that firms' valuation

is mainly affected by their export/import activities, particularly their seaborne trade. For importing firms, a longer delay in document handling creates increasing additional cost. As a result, there is a positive association between the valuation and delay in document process.

Given our model specification, we obtain the benefit is ranging between 142.2–1,218.7 thousand Rupiah (US\$10.8–90.3) and 725.2–3,464.6 thousand Rupiah (US\$53.7–256.6) per TEU, for the full sample and importing firms, respectively. These numbers, thus can guide the policymakers for establishing cost-benefit analysis of soft-infrastructure improvement in seaborne trade activities.

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## References

- Brooks, M.R., Puckett, S.M., Hensher, D.A., & Sammons, A. (2012). Understanding mode choice decisions: A study of Australian freight shippers. *Maritime Economics & Logistics*, 14(3), 274–299, DOI: <https://doi.org/10.1057/mel.2012.8>.
- Carrion, C., & Levinson, D. (2012). Value of travel time reliability: A review of current evidence. *Transportation Research Part A: Policy and Practice*, 46(4), 720–741, DOI: <https://doi.org/10.1016/j.tra.2012.01.003>.
- Carrion, C., & Levinson, D. (2013). Valuation of travel time reliability from a GPS-based experimental design. *Transportation Research Part C: Emerging Technologies*, 35, 305–323, DOI: <https://doi.org/10.1016/j.trc.2012.10.010>.
- Institute for Economic and Social Research. (2014). *Monitoring Indonesian Climate Investment*. Jakarta.
- Kato, H., Kaneko, Y., & Soyama, Y. (2014). Economic benefits of urban rail projects that improve travel-time reliability: Evidence from Tokyo, Japan. *Transport Policy*, 35, 202–210, DOI: <https://doi.org/10.1016/j.tranpol.2014.06.004>.
- Kawasaki, T., Hanaoka, S., & Nguyen, L.X. (2014). The valuation of shipment time variability in Greater Mekong Subregion. *Transport Policy*, 32, 25–33, DOI: <https://doi.org/10.1016/j.tranpol.2014.01.001>.
- Kouwenhoven, M., de Jong, G.C., Koster, P., van den Berg, V.A., Verhoef, E.T., Bates, J., & Warffemius, P.M. (2014). New values of time and reliability in passenger transport in The Netherlands. *Research in Transportation Economics*, 47, 37–49, DOI: <https://doi.org/10.1016/j.retrec.2014.09.017>.
- Li, Z., Hensher, D.A., & Rose, J.M. (2010). Willingness to pay for travel time reliability in passenger transport: A review and some new empirical evidence. *Transportation Research Part E: Logistics and Transportation Review*, 46(3), 384–403, DOI: <https://doi.org/10.1016/j.tre.2009.12.005>.
- Talley, W.K. (2009). *Port Economics*. Abingdon, Oxon: Routledge.
- Noland, R.B., & Polak, J.W. (2002). Travel time variability: A review of theoretical and empirical issues. *Transport Reviews*, 22(1), 39–54, DOI: <https://doi.org/10.1080/01441640010022456>.
- Small, K.A. (1982). The scheduling of consumer activities: Work trips. *The American Economic Review*, 72(3), 467–479.
- Small, K.A., & Verhoef, E.T. (2007). *The Economics of Urban Transportation*. New York: Routledge.
- The Customs of Indonesia. (2015). *The Role of Custom in Indonesian Logistics Chain*. Jakarta.
- Wooldridge, J.M. (2001). *Econometric Analysis of Cross Section and Panel Data*. Cambridge, Massachusetts: The MIT Press.

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