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The valuation of shipment time variability in Greater Mekong Subregion

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ABSTRACT

The value of shipment time variability is estimated using the stated preference data from shippers engaging in cross-border transport in Greater Mekong Subregion. Respondents are asked to choose between two alternatives which differ in terms of shipment time, cost, shipment time variability and departure time. In the study route, two bottlenecks (border and seaport) violate stability of shipment time. These two shipment time distributions are convoluted by Monte Carlo method. The results show that the value of schedule delay late is 5.6 times larger than normal travel time savings.

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1. Introduction

Trade activity with large economic markets such as the US, Europe, China and Japan is one of the most important factors to achieve economic growth of developing countries. However, land-locked developing countries (LLDCs), such as Lao PDR are remote from large economic markets and consequently, their economic growth is duller than coastal countries (World Bank, 2009). This notion of "remote" does not simply imply physical distance but also recognizes the issue of long and instable shipment time, particularly at borders and seaports (Arvis et al., 2007), which consequently lead to higher shipment costs. In the context of the Greater Mekong Subregion (GMS), which is an economic area bound together by the Mekong River, covering Cambodia, China (Yunnan and Guangxi Zhuang Autonomous Region), Lao PDR, Myanmar, Thailand, and Vietnam, Lao PDR suffers from shipment time variability in accessing seaport of Thailand. On the cross-border route between Vientiane (the capital of Lao PDR) and the Laem Chabang seaport (the busiest seaport in Thailand), shipment times can differ by up to 10 h at the border and 15 h at the seaport (Banomyong, 2000). By contrast, trucks tend to be operated at almost free flow speed on the inter-city and -national roads of developing countries (Hanaoka and Kawasaki, 2010). As Japan External Trade Organization (JETRO) (2009) conducts several trials of haulage by trucks in the economic corridors of GMS regions, no traffic congestion on the link was observed. In addition, in the interview surveys, most of the shippers testify that there was no congestion on the road that adversely affected the time schedule. However, the border and seaport were the cause of the delay. Hence, the contributors of shipment time variability from Vientiane and Laem Chabang seaport are determined to be the border and seaport.

In the GMS, several efforts have been made so that cross-border haulage is facilitated, for instance, implementing a single stop at the border, promoting shared truck use between countries, and providing ICT tools (Economic Research Institute for ASEAN (ERIA), 2010). These programs have resulted in haulage cost reductions due to shortening and stabilizing shipment time. However, at this moment, the valuation of these projects using cost–benefit analysis only takes into account shipment time saving. Disregarding stabilizing shipment time is obviously an underestimation of the project's benefit. Since shipment time variability in developing countries is considerable, it substantially contributes to total shipment cost. Thus, the value of shipment time variability needs to be estimated for the accurate evaluation of cross-border transport projects in GMS. Most of the practices for estimating value of shipment time variability are being demonstrated in US and European context for passenger transport using stated preference (SP) data (i.e. Small et al. (1999), Bates et al. (2001), Lam and Small (2001)). Recently, however, several practices were found for the derivation of shipment time variability in the context of freight transport. Fowkes and Whiteing (2006) estimate that for the case of rail freight transport considering nine types of commodities in Great Britain. HEATCO (2006) estimates the value of delay for commercial goods delivery in countries of European Union (EU) plus Switzerland. De Jong et al. (2009) and Halse et al. (2010) estimate value for shipment time reliability in freight transport in Netherlands and Norway, respectively, which are conducted for the purpose of using cost–benefit analysis of transport infrastructure project. Similar to passenger transport case, most of practices in the context of freight transport are conducted by using SP data instead of revealed preference (RP) data. Winston (1981) and Small et al. (1999) are the only cases using RP data to estimate the value of shipment time variability in the US. In the recent estimation of value of shipment time variability, some of the experimental studies

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(e.g. Beuthe and Bouffioux (2008), Bolis and Maggi (2003), Wigan et al. (2000)) consider the level of service of freight transport, which is expressed as the percentage of shipments that arrives at the destination in due time, in order to estimate its monetary value as the percentage of shipment increases. Nevertheless, these practices are not modeled in the context of cross-border haulage and thus the two bottlenecks are not considered for estimating shipment time variability. In the case of this paper, total shipment time variability should be derived based on shipment time variability of the two bottlenecks. In light of the foregoing, this paper estimates the economic value of shipment time variability as for cross-border freight transport in GMS using SP data. The model for analysis is developed through a case study of cross-border haulage between Vientiane and Laem Chabang seaport.

The remainder of this paper is organized as follows. Section 2 describes the research target in which we mention the current situation of cross-border transport from Lao PDR to the seaport of coastal countries. In Section 3, the model for estimating schedule variability is formulated. In Section 4, method for specifying the arrival time distribution is addressed. Here, two shipment time distributions at border and seaport are convoluted. Subsequently, the value of the schedule delay is estimated and discussed in Section 5 while Section 6 concludes.

2. Target of the research

2.1. Study range

The route studied herein is the cross-border haulage by trucks between Vientiane and Laem Chabang seaport located in Thailand as shown in Fig. 1. Regarding the seaport, only Laem Chabang seaport is considered in this paper since most of the cargoes from Vientiane are bound for this seaport (Japan International Cooperation Agency (JICA), 2011). Since we assume that maritime transport is generally needed in the trade between Lao PDR and the main economic markets such as US, Europe, China, and Japan, the seaport is included in the study range. The trade rule is assumed to be free on board such that for the case of Lao PDR exports, the seller (exporter) is liable for all costs and risks such as pilferage and damage to cargoes until cargoes are loaded onto the vessels at the seaports. Thereafter, the buyer (importer) bears all costs and risks. Fig. 2 summarizes the conceptual route explored in this paper. Trucks leave warehouses or truck terminals in Vientiane and arrive at Laem Chabang seaport after one border crossing at Thanaleng/Nong Khai border. Railway has been available to transport container cargo from Vientiane to Laem Chabang seaport from 2009, but its modal share is very small for this route (Japan International Cooperation Agency (JICA), 2011). The interview survey revealed that the low frequency of rail operation is the main reason that railway is not used as much as trucks in this route.

Since our target route is up to Laem Chabang seaport, and the target goods are intended to be transported through maritime, container cargo is set as the target cargo. In the container transport, lot size is identical although the container can be 20 and 40 ft containers. In this case, differences in the value of time seem to be relatively small among the cargo types in the containers. As Halse et al. (2010) demonstrated, there is a weak relationship between type of goods and value of time. Hence, in this paper, cargo type in the container is treated as homogenous for the estimation of the value of shipment time variability.

2.2. Current situation of cross-border haulage

Here, we present the current situation of the cross-border freight transport in GMS particularly between Vientiane and Laem Chabang seaport. The information here is mostly based on face-to-

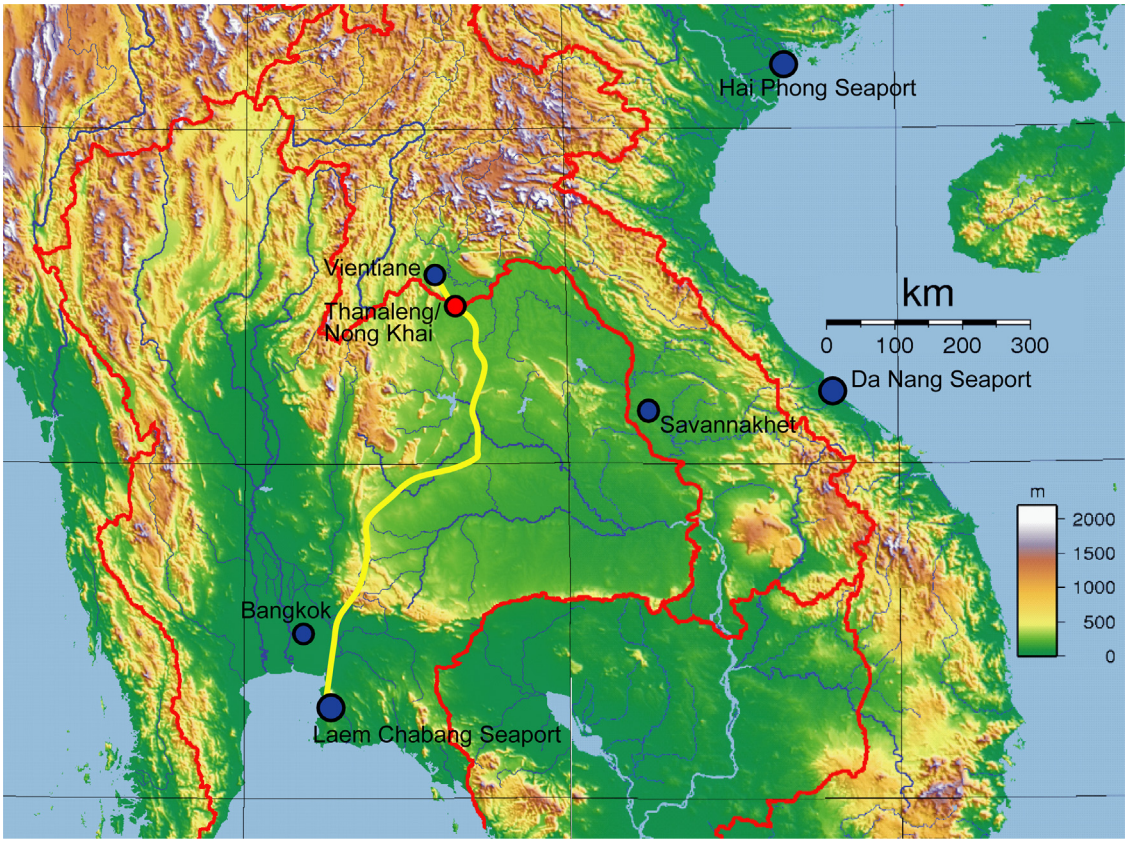

Fig. 1. Map of study area.

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