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Transportation Research Procedia 25 (2017) 416–424

Transportation Research Procedia

www.elsevier.com/locate/procedia

World Conference on Transport Research - WCTR 2016 Shanghai. 10-15 July 2016

Railway shippers' heterogeneous preferences with random parameters latent class model

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Abstract

Railway shippers' preferences heterogeneity is caused by their attitudes and perception towards attributes of various rail freight services, and is differentiated amongst shippers. Random Parameter Latent Class (RPLC) model is applied to elicit Chinese railway shippers' preferences heterogeneity in both continuous and discrete way. With a Discrete Choice Experiment (DCE) conducted in southwest area of China, 83 respondents are counted to calculate their utilities towards five rail service attributes: cost, time, frequency, reliability and safety. Results by RPLC model are compared with MNL, ML and LC model, and shows that quality attributes are more preferred by railway shippers than price attributes. Further market segmentation with RPLC clarifies that heterogeneous valuation of railway freight service quality dimension does exist among shippers, and segmentation according to shippers latent variables can be more suitable than the traditional exogenous market segmentation way. For railway companies in China, multidimensional freight services could be provided by the combination of different attributes and levels, to attract more and more shippers making railway as their first choice.

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Keywords: Preference heterogeneity; RPLC model; Discrete Choice Experiment; service attributes; market segmentation; China railway

1. Introduction

In the past decades, rail transport in China has promoted domestic economy to a great deal, since its cost advantages in medium and long distance, and large capacity to move bulk cargoes, such as coal, ore, steel, and cereals. On one hand, shippers are attracted by its lower price and faster speed, and would like to choose railway, instead of road or

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10.1016/j.trpro.2017.05.419

waterways if available, as their main transport mode. On the other hand, more than 50% of railway freight volumes are heavy shipments, which occupy most of network capacity, especially for the main railway corridors like Beijing and Guangzhou, etc.

However, in recent years, the market share of China railway freight transport has been declining. In 2013, the total freight volume by road, rail, water (waterways and sea), air, and pipeline constituted 45 billion tons and 18,648 billion ton-km, in contrast to 17 billion tons and 6,945 billion ton-km in 2004. Even though the railway freight volume has increased from 25 billion tons in 2004 to 40 billion tons in 2013, its market share (in tons) has decreased to 9% in 2013, compared to 15% in 2004 (National Bureau of Statistics of China, 2015).

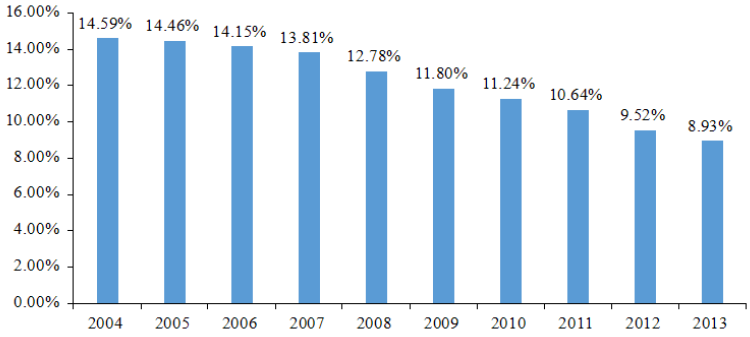

Fig. 1. Market share of railway freight transport from 2004 to 2013(in tons).

In the past, the increase of railway freight volume was normally limited by the network capacity, which has been released to some extent by recent volume declining of bulk cargoes like coal. Therefore, network capacity limitation should not be the most important, nor the only reason for the dropping of China railway freight transport market shares. Another cause for market shares dropping is the unattractive services of railway transport. Especially for China railway, which is the most densely trafficked railway network in the world by far, its near-monopoly position in the supply of railway transport services has led to a self-centered service supply mode (Scales et al., 2011). Less flexible and less diversified services of railway transport has made itself more and more unattractive when shippers are willing to pay more for higher quality freight transport. With recent volume declining of bulk cargoes, China railway companies have to improve its service quality to keep railway companies' market shares, by putting forward new pricing and marketing strategies, as well as more attractive services, to improve its service quality and meet shippers' needs. Therefore, understanding shippers' preferences and heterogeneity towards rail services are of vital importance.

McGinnis (1979), Fowkes (1991), Matear and Gray (1993), Cullinane and Toy (2000), and Danielis et al. (2005), etc. have studied freight service preferences and choice behaviors between freight transport modes. Besides, Fowkes et al. (2004), Arunotayanun and Polak (2011), De Jong et al. (2014), and Chu (2014) studied within-mode preference choice. However, as far as we can establish, these studies do not present estimations specifically focused on railway shippers. Besides, there are no studies focusing on China railway freight services.

Thus, the main contribution of our study is to develop and apply a survey based approach for the railway services market in China, and addresses heterogeneity in preferences from the side of current railway shippers, in contrast with existed studies that estimate either average preferences for rail carriers or preferences across all modes of transport.

The outline of this paper is as follows. Section 2 presents a brief review of the literature on relevant performance attributes and preference results. Section 3 describes the design of the choice experiment, as well as the data collection process. An appropriate measurement method is presented in Section 4. Next, Section 5 reports the results. And Section 6 contains our conclusions.

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