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Straw effects of new highway construction on local population and employment growth☆

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ABSTRACT

Growing concern surrounding the existence of 'straw effects' is evident in recent studies that reveal how new road network accessibility negatively causes lower economic productivity in lagging areas by increasing the level of local dependency on major metropolitan areas. This paper examined the potential 'straw effects' of two new highways, the Central Inland Highway and Seoul–Chuncheon Highway, on regional population and industry growth in Korea using Difference-In-Differences (DID) analysis, including specific analysis of lagged areas of the Central Inland region. The findings revealed that there is no evidence of the 'straw effects' and that it is not only the newly built highways that contribute to increasing local population and employment in lagging areas but also existing highway accessibility.

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1. Introduction

New highway construction as a local economic growth strategy has been supported by planners and policy makers in many countries over the past half century. While some scholars have argued that the construction of new highways should have a positive impact on enhancing local economic productivity in lagging areas, such as a socioeconomically disadvantaged area (Boarnet, 2014; Cervero, 2002, 2003; Chi, Voss, & Deller, 2006), other studies revealed a possible negative impact: the so-called 'straw effect' (Behrens, Lamorgese, Ottaviano, & Tabuchi, 2007; Ono & Asano, 2005). High-speed transport modes such as highways and bullet trains can significantly increase both the volume and speed of inter-regional migration, and the efficiency of domestic trades at a national level by reducing travel time and cost. The decision to support new road infrastructure provision therefore plays a critical role in regional economic development. For these reasons, road infrastructure investment in many countries is regarded as social overhead capital[1] (SOC). For instance, hosting a large-scale international event such as the Olympic Games or the World Expo often initiates new highway or high-speed railway development to meet the increasing demand of domestic and foreign visitors. However, there are still uncertainties regarding the effect of these newly built transport networks on socioeconomically disadvantaged areas or lagging areas.

Most of the early studies found that new transport infrastructure provision has a positive effect on regional economic growth (Carlino & Voith, 1992; Garcia-Mila & McGuire, 1992; Jia, Kato, & Hayashi, 2009; Keeler & Ying, 1988). Other studies found that the introduction of new highway infrastructure may have differential impacts on the local economy (Krugman, 1993; Lee & Kim, 2014). Interestingly, recent studies in Japan highlight a possible negative effect on local economic growth, referring to the so-called 'straw effects' of the high-speed bullet train (Shinkansen) development in the mid-1990s (Ono & Asano, 2005).

Ono and Asano (2005) define 'straw effects' as a negative economic externality of new transport accessibility. A process occurs whereby a large city absorbs the function of local services and

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[1] Social Overhead Capital refers to basic services without which primary, secondary and tertiary productive activities cannot function. It facilitates a great variety of economic activities subject to public control.

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industrial activities from neighbouring smaller cities and towns. This is as a consequence of the existence of higher accessibility network, which becomes newly available to the larger city via high-speed transport, such as Shinkansen. The straw effects have been evident in the major cities in Japan where a rapid growth of urban population and employment has been apparent since the construction of the high-speed railway. In contrast, smaller regional towns and rural areas on the high-speed railway pathway have suffered from a decrease in local population and job opportunities. Consequently, dependency on the provision of urban services and workplaces has increased, which results in unbalanced regional development. In particular, the number of local employees in typical local businesses, such as accommodation and retail sectors, has dramatically decreased due to a greater 'range of goods' provided by neighbouring major cities. The straw effects of new transport infrastructure therefore cause unbalanced regional development and higher local dependency on major cities (Kakumoto, 1995).

Despite growth in the attention given to this phenomenon, there has been limited international research that has looked at the negative externalities of newly built highway network accessibility associated with decreasing local population and industry restructuring in lagging areas. This paper will determine if straw effects exist as a result of two newly built highways in Korea using a Difference-in-Differences analysis. Two newly built highways in Korea, the Central Inland Highway (2004) and the Seoul–Chuncheon Highway (2009), were selected as case studies. We assumed the following three possible effects of the highway construction on local population redistribution and industrial restructuring: (1) positive effects, (2) differential effects and (3) straw effects.

2. Positive, differential and straw effects

Past studies on the impact of new transport infrastructure on local economy suggest three likely outcomes: (1) constant positive effects, (2) differential effects and (3) straw effects. Firstly, a constant positive effect shows that the population in both the major city and local town increased due to increased accessibility to the new highway network. Secondly, a differential positive (mixed) effect shows population growth in the major city, but little impact on local population growth in lagging areas. Lastly, a straw effect refers to a sharp decline in the local population of small towns and the transformation of major cities into metropolitan cities, where the local population of these small towns was absorbed (sucked-in).

Fig. 1 shows a conceptual framework of the three possible effects of new highway construction on population redistribution between a major city and a local town (lagging areas). The size of circles with population size shows three possible effects after new transport infrastructure. As a first consequence, new high-speed transport infrastructure between a major city enjoying a market size advantage and a lagging area can decrease the attractiveness of the latter. This is called the 'straw effect' because economic activities migrate to developed locations through new infrastructure, just as juice in a glass is sucked up by a straw (Behrens et al., 2007). The simple two-location theoretical framework shows that, as trade barriers fall, the dispersion push of competition weakens faster than the agglomeration pull of size differences. In other words, unless the prices of non-tradables are much higher in the major city, better transportation improves its market potential more than it improves the market potential of its less developed trading partner.

2.1. Constant positive effects

Many early studies in the US focus on the positive effects of highway development. Keeler and Ying (1988) found that new highway development improved local economic productivity in specific industries, such as the freight sector. Similarly, Garcia-Mila and McGuire (1992) argued that the increase of highway investment had a positive impact on the agglomeration economy of the State. The study of Carlino and Voith (1992) also found a significant relationship between economic productivity and highway density in each state in the US from 1967 to 1986. Many planners regarded highways as a positive force in local economy, popular in design concepts for urban renewal projects such as the revitalisation of declining downtowns (Boarnet, 2014). In international studies, Holl (2004), who investigated the efficiency of the Portuguese highway network, found that the network had a significant positive impact on business location decisions. Kim and Im (2002) tested a ripple effect of highway construction on local economic growth by estimating economic surplus in a tourism industry in Korea. As an international comparison study, Kim and Park (2006) examined the impact of new highway developments on regional economic performance in three Asian countries, Korea, China and Japan. The study found that the impact estimations varied among the three countries. In China there was little to no impact on regional economy, except for the Northeast region of China, while robust regional economic growth was apparent in the Southeast region of Korea. In addition, past international studies favour the positive effects of new highway developments and hint that local economic productivity is closely related to the accessibility of major highway networks, regardless of the size of local populations.

2.2. Differential effects

Recently some studies have noticed differential effects of new highway construction and have found that there is often a mixed effect, such as a positive impact on the major metropolitan areas but a relatively marginal impact on other regional towns in terms of the scale economies. These studies argue that the positive effects of new highway network accessibility can be limited to the socio-economically advantaged areas, while very little effect is found in those lagging areas (Islam, 2010; Kim, 2011; Munnel, 1992).

Many international studies found that an investment in road infrastructure provision in non-metropolitan areas has a differential effect between the major cities and local areas, despite having overall positive effects (Munnel, 1992; Rephann & Isserman, 1994). New highway construction is positively related to increasing a household income in the manufacturing and retail sectors in the vicinity of metropolitan areas. However, studies found that there was relatively small income growth found in the retail sector in local areas where the local population was less than 25,000 people. Chandra and Thompson (2000) further studied the differential effect of a new highway network by selected industry sectors and found a negative impact of a new highway development on the three industry sectors of agriculture, retail and government. More recently Islam (2010) investigated the possible effects of new highway investment in 410 counties of the Appalachian region using a spatial auto-regression model. The study found that differential effects exist in the Appalachian region and categorised the effects into four major characteristics: distressed, transitional, competitive and attainment. In counties categorised as distressed or transitional, the positive impacts on economic productivity are evident. However, there are fewer or no significant effects in those competitive or attainment counties.

Recent Korean studies have also found that differential effects vary in regional land use patterns and housing markets (An, Kang,

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