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Chapter 3

Geographical Simulation Analysis of the Lao-Chinese High-Speed Railway

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Abstract: This paper studies the economic impact of the Lao-Chinese High-Speed Railway project using the geographical simulation model developed by the Institute of Developing Economies with the support of ERIA (IDE/ERIA-GSM). It specifically examines how the service frequency of passenger and cargo trains affects the economies within and beyond Laos. In addition, it also investigates the impact of transit-oriented development (TOD) of the railway station areas. First, cargo trains are found to benefit Thailand and China more than Laos. Nonetheless, Laos gains the most from passenger trains. Finally, Transit-Oriented-Development (TOD) offers, by far, the largest positive impact on Laos.

Keywords: Transit-oriented development, high-speed railway; urban planning; services
JEL Classification:

1. Introduction

The construction of the Lao-Chinese High-Speed Railway (LCHSR) began in December 2016, and is planned to be completed by December 2, 2021, the 46th National Day of Laos. The LCHR is obviously a part of a planned Kunming-Singapore railway. Despite the name, the LCHR lies wholly within Laos, connecting Boten, a border crossing point with China in the north, and the to-be-defined new border crossing with Thailand at the capital city of Laos. The project's cost is estimated at approximately 6 billion USD, or more than 40% of Laos' GDP in 2016. The project will be co-financed by China and China's loans to Laos and will be built entirely by China. The construction has progressed significantly as of late 2018, with many tunnels dug and bridges erected that are clearly visible from the national roads in northern Laos. Despite the huge cost of the project, any quantitative study of its economic impact is very limited. Using IDE-GSM, Isono (2015) has studied the impact of the LCHR for the Laos section of the high-speed railway link between China and Thailand through Laos. It found the project will generate higher economic growth in these countries in general, and services in Laos in particular. The LCHR is nevertheless different from most other high-speed railways, as it plans to operate both passenger and cargo trains separately

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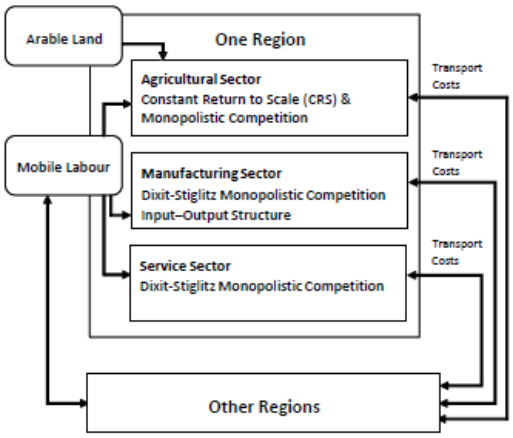
and with a different frequency on the same single-track railway. The project has also obvious transnational objectives whereby the benefits and impact are expected beyond Laos. The purpose of this paper is twofold. First, it quantitatively examines how a different frequency of different types of trains will impact the growth in Laos and the neighboring countries by industry, and by sub-national regions. Second, it examines the indirect impact arising from transport-oriented development, urban development in the provinces with the high-speed railway stations. The rest of this paper is structured as follows. Section 2 summarizes the historical/theoretical background, basic structures, the baseline scenario, and the simulation procedure for IDE/ERIA-GSM. Section 3 describes various simulated scenarios. Section 4 discusses the results. Finally, Section 5 concludes with some policy recommendations.

2. Geographical Simulation Model by the Institute of Developing Economies

2.1. What is IDE/ERIA–GSM?

Since 2007, the IDE–Japan External Trade Organization (JETRO) has been developing IDE–GSM. The theoretical foundation of the IDE/ERIA–GSM, which is co-developed with ERIA, follows the 'New Economic Geography' (NEG), in particular, Puga and Venables (1996), who captured the characteristics of multi-sector and country general equilibrium.

Figure 3-1. Basic Structure of the IDE/ERIA–GSM Geographical Simulation Model



Source: IDE/ERIA–GSM Team.

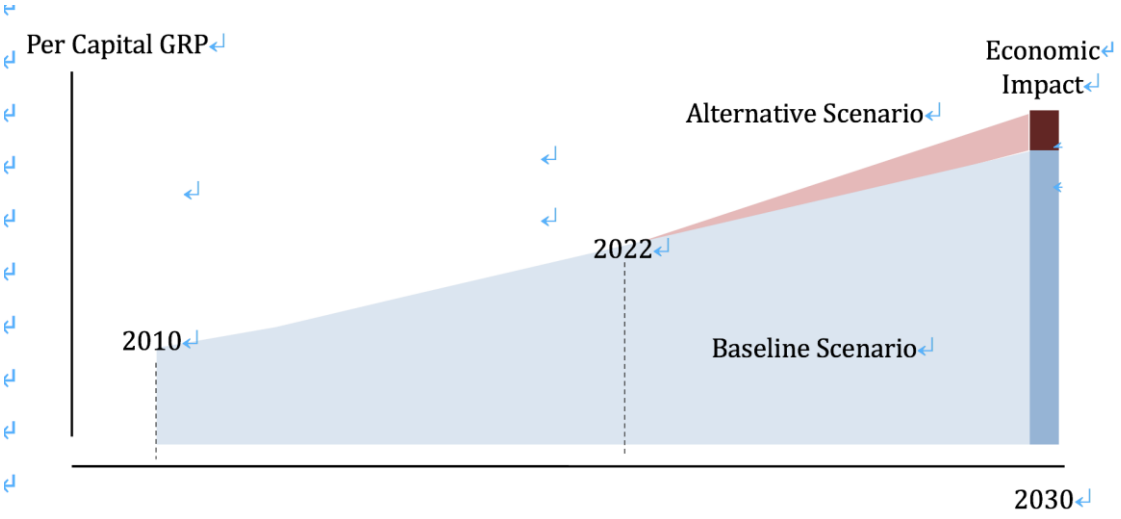
The IDE/ERIA–GSM features agriculture, five manufacturing sectors (automotive, electrical and electronics, textiles and garments, food processing, and other manufacturing) and the service sector. The model allows workers to move within countries and between sectors. A notable difference of the IDE/ERIA–GSM from that of Puga and Venables (1996) lies in the specification of the agricultural sector. The IDE/ERIA–GSM explicitly incorporates land size in its production, and keeps its

technology as a constant return to scale.[1] This model incorporates into the simulations the type of physical or institutional integration that will favourably or adversely affect the regions of interest at the sub-national level. It also incorporates the impact of policy measures to facilitate international transactions on the magnitude and location of trade traffic. These enable us to identify potential bottlenecks and the way to reap the full benefit of economic integration. The basic structure of IDE/ERIA–GSM is depicted in Figure 3-1. Each region possesses seven economic sectors (agriculture, five manufacturing sectors, and the service sector).

2.2. Base Line Scenario and Alternative Scenarios

We consider the differences of gross regional product (GRP) between the baseline scenario and the alternative scenarios (Figure 3-2), in order to calculate the economic impact of development of various logistical infrastructure. The baseline scenario assumes national and subnational growth based on official statistics and various international organizations' estimations from 2010 onwards. The alternative scenario assumes that several logistical infrastructure projects are completed in or after 2022. We compare the GRP between these two scenarios by 2030. 2030 is selected because it is the final year of Laos' highly ambitious long-term development plan, formally known as Vision 2030, by which per capita GDP and GNP is to quadruple that achieved in 2016. If the GRP of a region under a scenario with specific scenarios is higher (lower) than that under the baseline scenario, we regard this surplus (deficit) as a positive (negative) economic impact of the development of logistical infrastructure.

Figure 3-2. Image Diagram: Difference between the Baseline and Alternative Scenarios



GRP = Gross regional product.
Source: IDE/ERIA–GSM Team.

[1] For further details of IDE–ERIA GSM, see Kumagai et al. (2013).

3. Alternative Scenarios

Table 3-1. Official Plan of Frequency of Passenger and Cargo Trains

Section	Passenger			Cargo		
	Preliminary	Short-Term	Long-Tern	Preliminary	Short-Term	Long-Tern
LN-OU	2	5	8	2	5	8
OU-LP	2	5	8	2	5	8
LP-VT	3	7	10	3	7	10
VT-VC	3	7	10	3	7	10
VC-TH				4	7	12

Source: Feasibility Study of the LCHSR.

Note: Loungnamtha (LV), Oudomxay (OU), Louangphabang (LP), Vientiane (VT), and Vientiane Capital (VC).

According to the feasibility study of the project, there would be five main stations in each of four provinces and one in the capital of Laos, namely, Loungnamtha (LV), Oudomxay (OU), Louangphabang (LP), Vientiane (VT), and Vientiane Capital (VC) (Table 3-1). Initially, there would be 2 pairs of passenger trains and 2 pairs of cargo trains between LV-OU and OU-LP, and 3 pairs of passenger trains between LP-VT and VT-VC. The difference is the cargo train lines run farther to Thailand and with an even higher frequency. The frequency would then be increased to 5 (LN-OU-LP) and 7 (LP-VT-VC) pairs of trains respectively in the short-term. In the long-term, the frequency would be 8 (LN-OU-LP) and 10 (LP-VT-VC).

Two observations are made from this planned frequency in Table 3-1. First, the passenger train focus is more on the route between the capital city (VC) and the former capital city (LP). LP has been listed as a world heritage site by UNESCO since 1995, and is by far the most popular tourist destination in Laos, and to which tourist visitors are limited by access difficulties. Most international tourists entering Laos through the capital city need to travel by car for 7 or more hours to reach LP. The LCHSR is expected to shorten this time significantly, and the planned frequency of the passenger train services seems to be considering this fact. On the other hand, the cargo train service focus is more on the link between the capital city of Laos and Thailand.

Simulation of the possible planned frequency is described in Table 3-1, but interpretation would be very complicated arising from the different frequency at different sections. Since the object of this paper is to examine the impact of the different types of trains, i.e. passenger or cargo, the simulation is done with following scenarios 1 to 5 (S1 to S5), by which all sections would operate with the same service frequency. This makes it easier to focus on the impact generated by the service frequency. In addition, S6 and S7 are added to quantify the impact of TOD, expressed as the increase in productivity by the services in the provinces that the LCHSR passes through.

S1: 4 pairs of passenger trains daily from 2022
S2: 6 pairs of passenger trains daily from 2022
S3: 4 pairs of cargo trains daily from 2022
S4: 6 pairs of cargo trains daily from 2022

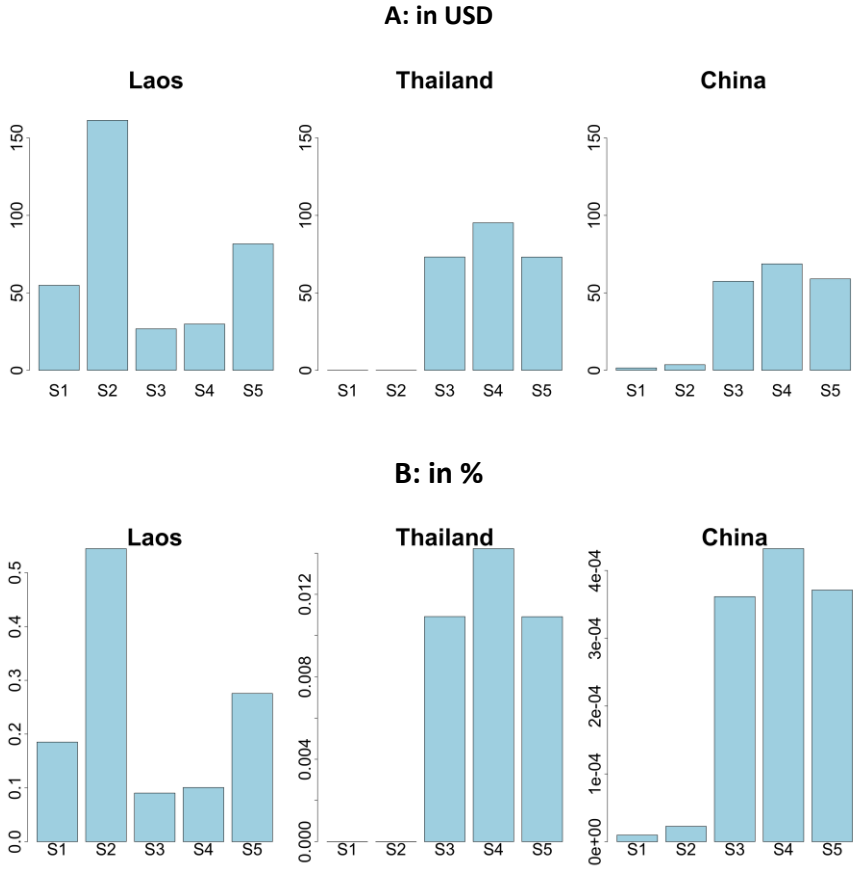
S5: 6 pairs of passenger trains and 6 pairs of cargo trains daily from 2022
S6: S5 and productivity of service increase by 5%
S7: S5 and productivity of service increase by 10%

3. Results

The results for S1 to S5 are presented in this section because they are, in a strict sense, the direct outcome of the LCHSR. The impact of urban development around the stations is presented in section 4.

3.1. By Country

Figure 3-3. Impact by Selected Country



Source: IDE-GSM.

First, the results by the selected country are shown in Figure 3-3. When only passenger trains are operated (S1 and S2), the gains for China and Thailand are very small (Figure 3-3-A). Nevertheless, Laos gains significantly even when only 4 pairs of train operate daily. This gain almost triples when the frequency of the daily passenger train service increases from 4 to 6 pairs of trains. However, when only cargo trains are operated (S3 and S4), the gains for Laos decrease substantially. On the contrary, Thailand and China gain significantly with these cargo trains. The gains for Thailand and China are significantly higher than for Laos in both S3 and S4. Finally, the gains for

Laos, Thailand, and China become about the same when 6 pairs of passenger trains and 6 pairs of cargo trains operate daily (S5).

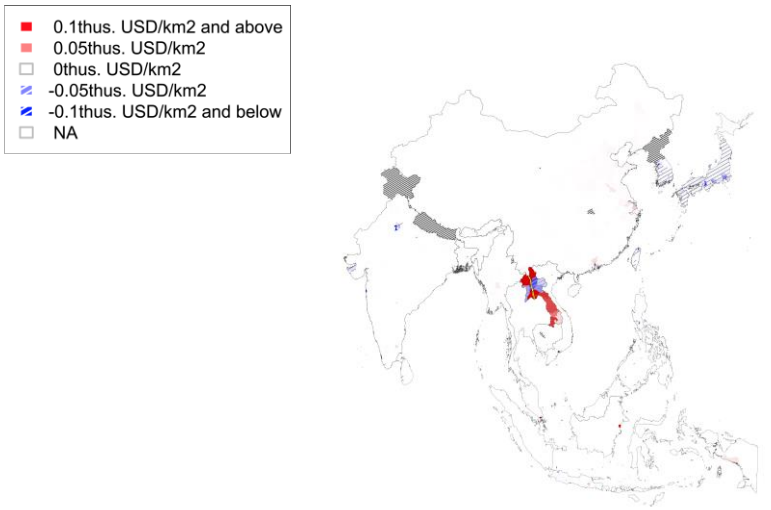
It should be noted that the frequency of the passenger and cargo trains simulated in this analysis does not consider the high-speed railway between Bangkok to Korat in northeastern Thailand, nor the extension of this project to the capital city of Laos. This may partly be the reason for the smaller impact of the passenger trains for Thailand. Furthermore, more than one million Lao nationals cross into Thailand from the capital city of Laos over the First Lao-Thai Mekong Friendship Bridge annually to shop, visit hospitals, etc. on Thai side by car and bus. While some shift in the mode of transport may occur, any additional inflow of Lao nationals into Thailand by the LCHRS cannot be large. Foreign tourists may prefer the high-speed railway, but most travel first to Bangkok, so movement would be mostly in the opposite direction, and hence a larger positive impact by the passenger train service for Laos. A small impact by the passenger train service to China is expected, as there would be a much smaller number of Lao tourists travelling to China compared to Chinese tourists traveling to Laos.

I submit that a relatively larger benefit by the cargo train service to Thailand and China is to be expected. Border trade statistics between Thailand and Laos are the largest through the Fourth Lao-Thai Mekong Friendship Bridge, because of the transit trade between Thailand and China through the bridge and along the North-South Economic Corridor. Goods need to be produced first before being transported as cargo. Unless more goods are produced in Laos, it is simply inevitable for it to benefit less from the cargo train service.

3.2. By Region

S1: Sub-regional regions that the LCHSR passes through in Laos adjacent to China and Thailand gain significantly in this scenario (Figure 3-4). Some coastal regions in China also gain, but with a much smaller magnitude. This seems to suggest that when only a smaller number of passenger trains operate, the regions at both ends of Laos' section would gain the most, at the expense of the regions in between.

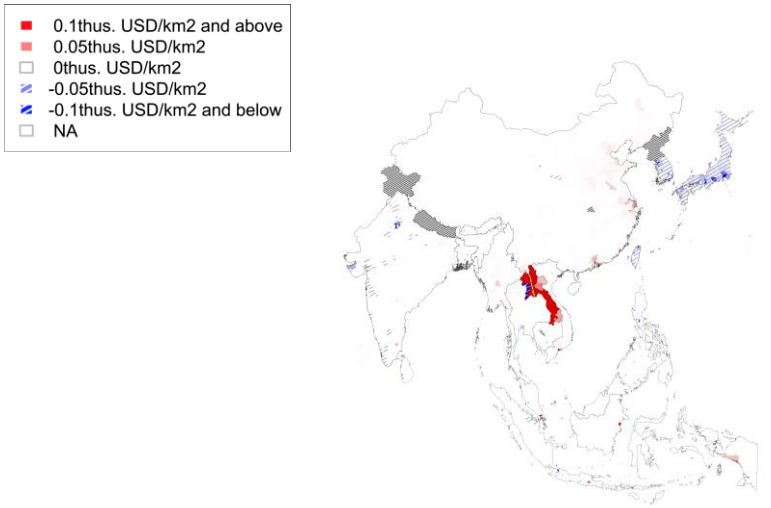
Figure 3-4. Impact by the Selected Country and Sub-national Region (S1)



Source: IDE-GSM.

S2: When more passenger trains operate (6 pairs), the loss by the regions in between disappears (Figure 3-4). All regions in Laos, except those to the west of the Mekong river will gain significantly. Laos' sub-national regions on the west bank of the Mekong river, especially Xayyabouly province, will suffer a significant loss. As roads in Laos are generally in a worse condition compared to the roads in Thailand, most foreign tourists entering Laos from Thailand would generally travel to the border region closest to their destination in Laos before crossing into Laos. Diversion of tourists heading to LP, the world heritage city, could be the reason for the loss by Xayyabouly province.

Figure 3-5. Impact by the Selected Country and Sub-national Region (S2)

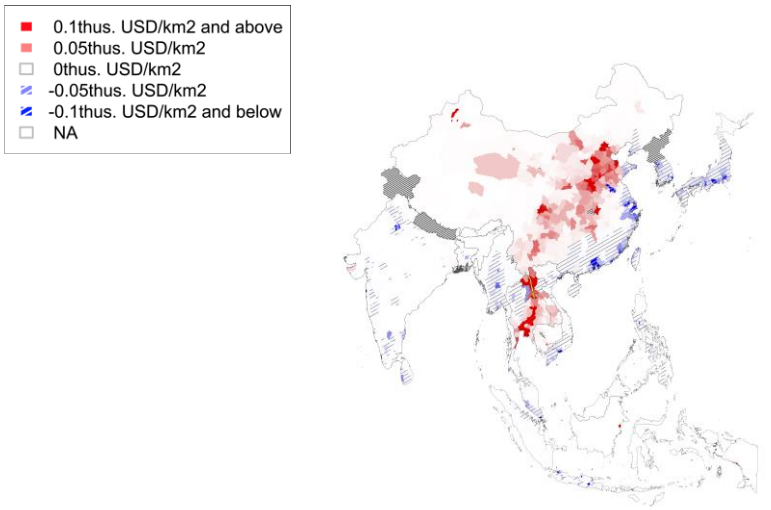


Source: IDE-GSM.

S3: Whereas the gains from passenger trains are largely observed in Laos for S1 and S2, regional gains by cargo trains extend well beyond Laos, and seemingly along the railway to Bangkok and Beijing (Figure 3-6). It should be noted that sub-national regions in coastal China and western Thailand are negatively affected in S3. Competition among sub-national regions in Laos, China, and Thailand seem to become more obvious when the provinces with the high-speed railway service have access to the cargo trains. Nonetheless, the loss here is in comparison to the baseline scenario which already assumes a growth trend and as such does not mean that these regions' economy would shrink in reality.

This result shows the strength of IDE/ERIA GSM, which I consider reflects the better impact of the logistical infrastructure development in the real world. First, it shows that most countries are large enough to prevent the whole country from evenly benefiting from any logistical infrastructure development. Some regions would gain, and some would lose, against the baseline scenario, depending on their relative connectivity based on the additional infrastructure in question. This should be taken positively, as it can be an effective tool to understand what infrastructure is needed for the development of which regions.

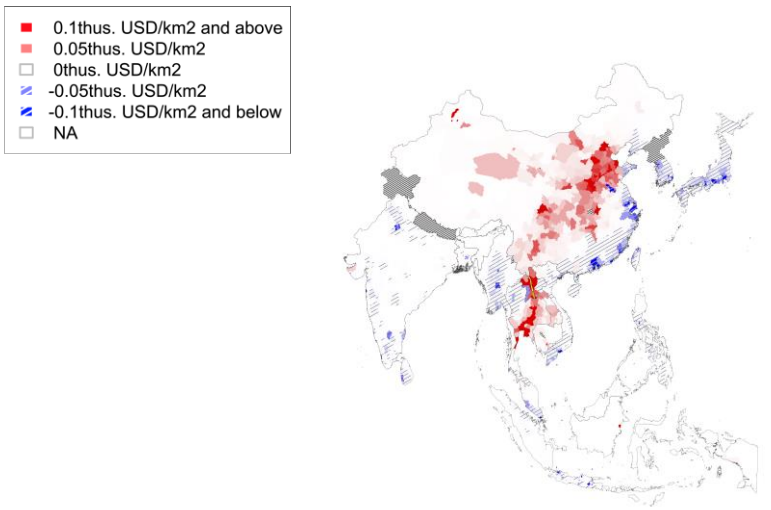
Figure 3-6. Impact by the Selected Country and Sub-national Region (S3)



Source: IDE-GSM.

S4: The gains for the sub-national regions in Laos, China, and Thailand are enhanced with more daily cargo train services (4 to 6 pairs).

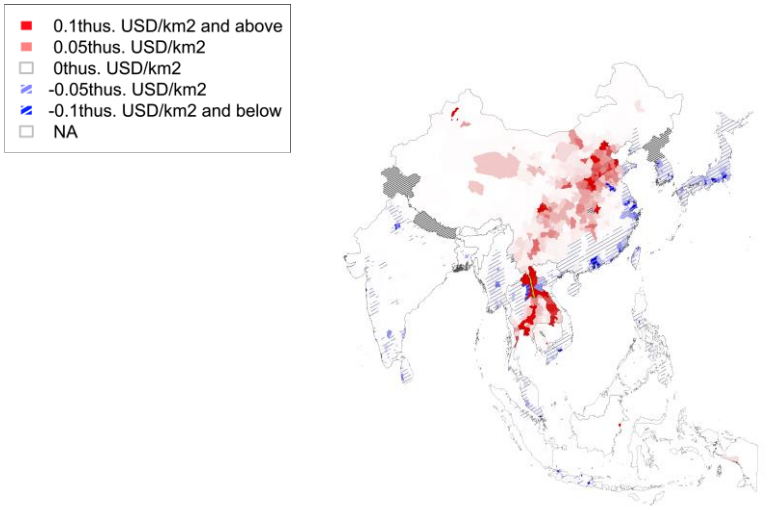
Figure 3-7. Impact by the Selected Country and Sub-national Region (S4)



Source: IDE-GSM.

S5: When both passenger and cargo trains operate with 6 pairs of trains respectively, the gain for Laos, China, and Thailand becomes more or less the same. Interestingly, the gain for Laos is significantly lower than when only passenger trains are available. From Figure 3-8, the decreasing gain for Laos arises mainly from the enhanced loss in the regions on both sides of but not directly adjacent to the LCHSR.

Figure 3-8. Impact by the Selected Country and Sub-national Region (S5)



Source: IDE-GSM.

3.3. By Industry

Services account for almost all the sectoral gains in Laos in S1 (Table 3-2). This should be expected, because passenger trains essentially move people and not manufactured goods. On the whole, Thailand loses in this scenario, while Vietnam gains only a little. Vietnam's gain occurs in the services, food, and other manufacturing sectors. China's gain is the largest in other manufacturing, followed by food and the automotive industries. A positive impact is also observed in Myanmar. It should be noted that the overall gain/loss is different from the gain/loss at the industry level. Even if a country loses in aggregate terms, some of its industries may still gain. In other words, the competition is not only among regions, but also industries.

Table 3-2. Impact by Selected Country and Industry (S1) (Million USD by 2030)

	Laos	Vietnam	Thailand	Japan	China	Cambodia	Myanmar
ALL	54.87	0.05	(0.03)	(2.23)	1.55	(0.01)	0.08
AGR	(0.03)	0.00	(0.01)	(0.03)	(0.06)	0.00	0.01
AUTO	0.01	0.00	0.02	(0.19)	0.10	0.00	0.00
E&E	(0.01)	(0.01)	(0.02)	(0.40)	0.06	0.00	0.00
APPL	0.07	0.00	(0.01)	(0.05)	(0.12)	0.00	0.00
FOOD	0.07	0.01	0.01	(0.10)	0.17	0.00	0.00
OTH	0.14	0.01	0.01	(0.55)	1.32	0.00	0.00
SER	54.63	0.03	(0.04)	(0.89)	0.07	0.00	0.07
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: IDE-GSM.

The gain for Laos in S2 increases by more than three times, mostly from services (Table 3-3). Although by a much smaller scale, Laos' gains from other manufacturing, apparel, and the automotive industries increase between two to three times. The gains by China, Vietnam, and Myanmar double.

Table 3-3. Impact by the Selected Country and Industry (S2) (Million USD in 2030)

	Laos	Vietnam	Thailand	Japan	China	Cambodia	Myanmar
ALL	161.40	0.10	(0.04)	(6.05)	3.61	(0.02)	0.20
AGR	(0.18)	(0.01)	(0.02)	(0.07)	(0.17)	0.00	0.02
AUTO	0.03	0.00	0.06	(0.54)	0.25	0.00	0.00
E&E	(0.04)	(0.01)	(0.06)	(1.10)	0.12	0.00	0.00
APPL	0.18	(0.01)	(0.03)	(0.15)	(0.34)	(0.01)	0.00
FOOD	(0.03)	0.03	0.03	(0.28)	0.42	(0.01)	0.01
OTH	0.36	0.03	0.07	(1.55)	3.18	0.00	0.00
SER	161.10	0.08	(0.08)	(2.36)	0.10	0.01	0.17
MIN	(0.02)	0.00	0.00	(0.01)	0.04	0.00	0.00

Source: IDE-GSM.

The top gainer in S3 is Thailand, followed by China and then Laos (Table 3-4). Gains in Thailand come mostly from food, apparel, and the automotive industries. For China, the top gainer industries are food, followed by mining, then apparel and the automotive industries. Gains in Laos shift from services to manufacturing, such as apparel, food, and mining. Cambodia gains in apparel abut shows some losses in services. It is obvious from the results thus far that cargo trains bring about growth for manufacturing, whereas passenger trains generate growth mostly in the service sector.

Table 3-4. Impact by the Selected Country and Industry (S3) (Million USD by 2030)

	Laos	Vietnam	Thailand	Japan	China	Cambodia	Myanmar
ALL	26.78	(1.81)	73.15	(4.04)	57.47	0.66	(1.37)
AGR	(0.15)	(0.02)	(0.19)	0.01	(0.14)	0.00	(0.02)
AUTO	0.45	(0.01)	15.89	(1.82)	5.01	0.00	(0.02)
E&E	(0.02)	0.02	(1.87)	0.24	(1.20)	0.00	0.00
APPL	14.32	(0.46)	27.80	(0.93)	10.55	0.71	(0.02)
FOOD	7.14	(1.04)	40.13	(2.01)	29.97	0.01	(1.17)
OTH	3.24	(0.01)	(4.53)	0.19	(1.64)	(0.01)	(0.03)
SER	(3.94)	0.11	(4.24)	0.32	(2.37)	(0.06)	(0.11)
MIN	5.74	(0.40)	0.17	(0.03)	17.29	0.00	0.00

Source: IDE-GSM.

Benefits from S4 resemble that for S3, but by a slightly larger extent for Thailand, China, Laos, and Cambodia (Table 3-5).

Table 3-5. Impact by the Selected Country and Industry (S4) (Million USD by 2030)

	Laos	Vietnam	Thailand	Japan	China	Cambodia	Myanmar
ALL	29.86	(2.11)	95.23	(5.16)	68.72	0.94	(1.72)
AGR	(0.17)	(0.02)	(0.24)	0.01	(0.18)	0.00	(0.02)
AUTO	0.51	(0.01)	20.86	(2.35)	6.69	0.00	(0.03)
E&E	0.02	0.03	(2.39)	0.29	(1.53)	0.00	0.00
APPL	16.46	(0.57)	36.33	(1.18)	13.96	1.02	(0.02)
FOOD	8.42	(1.27)	51.64	(2.55)	38.04	0.01	(1.47)
OTH	3.26	0.02	(5.93)	0.29	(2.71)	(0.01)	(0.04)
SER	(4.47)	0.13	(5.21)	0.36	(3.13)	(0.08)	(0.14)
MIN	5.84	(0.40)	0.17	(0.03)	17.59	0.00	0.00

Source: IDE-GSM.

Laos becomes the top gainer again, followed by Thailand and China, in S5, if 6 pairs of both passenger and cargo trains operate daily (Table 3-6). The top gaining industry in Laos is services, but significant growth is also observed in the apparel industry.

Table 3-6. Impact by the Selected Country and Industry (S5) (Million USD by 2030)

	Laos	Vietnam	Thailand	Japan	China	Cambodia	Myanmar
ALL	81.63	(1.77)	73.11	(6.27)	59.01	0.65	(1.29)
AGR	(0.19)	(0.02)	(0.20)	(0.02)	(0.20)	0.00	(0.01)
AUTO	0.46	(0.01)	15.91	(2.02)	5.11	0.00	(0.02)
E&E	(0.03)	0.02	(1.90)	(0.17)	(1.14)	0.00	0.00
APPL	14.39	(0.47)	27.78	(0.99)	10.43	0.70	(0.02)
FOOD	7.21	(1.03)	40.15	(2.12)	30.14	0.01	(1.17)
OTH	3.38	0.00	(4.52)	(0.36)	(0.32)	(0.01)	(0.03)
SER	50.67	0.14	(4.28)	(0.57)	(2.29)	(0.05)	(0.04)
MIN	5.73	(0.40)	0.17	(0.03)	17.29	0.00	0.00

Source: IDE-GSM.

4. Transport-Oriented Development

The benefits in scenarios 1-5 are significant, but is not enough given the huge cost of these projects. When a logistical infrastructure such as a railway line is implemented, the regions and industries located along the railway line can expected to grow more in one or more ways. Nonetheless, this can be enhanced by encourage more people and more industries to use the service more frequently. This is especially true for Laos, where a relatively small number of people live widely dispersed over a large area.

In this section, I examine the effect of the TOD around the station areas of the LCHSR. Although TOD is used, it is used with a broader sense to

include urban development around these railway stations. TOD is expressed as the increase in productivity of services in provinces with LCHSR service stations. The additional productivity is set at 5% in S6, and 10% in S7. 6 pairs of both passenger and cargo trains are assumed to be operating in both these scenarios.

The gain in Laos becomes significantly higher with TOD (Table 3-7 and Table 3-8). The overall gain for both Thailand and China remains more or less the same as in the other scenarios. However, there are two significant drawbacks for the TOD scenarios in this study. First, although the overall gain for Laos becomes very large, all industries except services and mining would lose in both S6 and S7. This may be a result of the movement of labor to the service sector which has the higher productivity set in S6 and S7. This could certainly be improved with other scenarios that increase industrial productivity. This was done previously by an IDE/ERIA GSM analysis, such as by Nishimura et al. (2016), that expresses the development of SEZ (Special Economic Zone) areas to increase industrial productivity.

Table 3-7. Impact by the Selected Country and Industry (S6) (Million USD by 2030)

	Laos	Vietnam	Thailand	Japan	China	Cambodia	Myanmar
ALL	616.68	(3.48)	71.90	0.39	70.55	0.73	(0.85)
AGR	(6.32)	(0.70)	(1.07)	0.11	(0.94)	0.01	0.08
AUTO	(1.03)	0.01	14.69	(1.40)	6.92	0.00	(0.01)
E&E	(2.40)	0.08	(2.65)	1.09	0.64	0.01	0.00
APPL	(0.76)	(0.49)	27.44	(1.01)	13.61	0.74	(0.01)
FOOD	(15.38)	(1.48)	38.77	(1.64)	30.38	0.01	(0.83)
OTH	(22.25)	(0.68)	(1.14)	1.36	(0.15)	(0.01)	0.00
SER	659.30	0.05	(4.42)	1.92	(2.85)	(0.04)	(0.07)
MIN	5.51	(0.28)	0.28	(0.04)	22.94	0.00	0.00

Source: IDE-GSM.

Table 3-8. Impact by the Selected Country and Industry (S7) (Million USD by 2030)

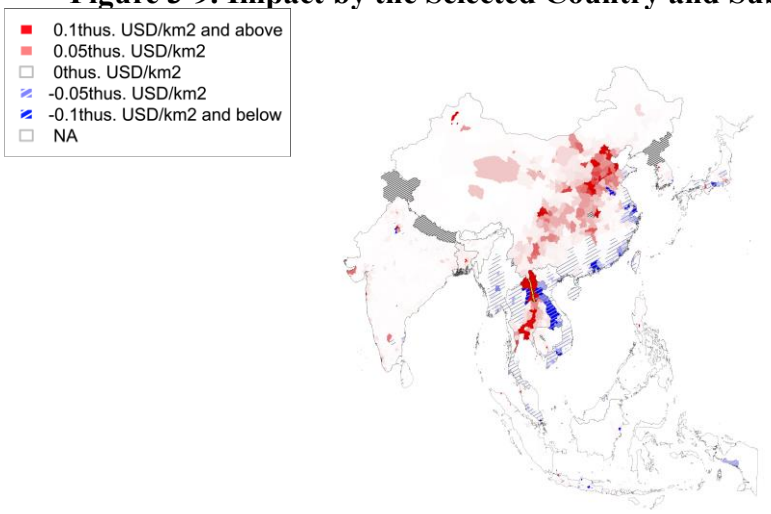
	Laos	Vietnam	Thailand	Japan	China	Cambodia	Myanmar
ALL	1,163.37	(5.04)	71.50	7.47	82.52	0.82	(0.42)
AGR	(12.17)	(1.37)	(1.92)	0.24	(1.65)	0.03	0.17
AUTO	(2.40)	0.03	13.52	(0.81)	8.74	0.00	(0.01)
E&E	(4.56)	0.14	(3.35)	2.36	2.37	0.02	0.00
APPL	(14.66)	(0.51)	27.12	(1.01)	16.66	0.78	(0.01)
FOOD	(36.27)	(1.88)	37.47	(1.19)	30.54	0.02	(0.50)
OTH	(45.92)	(1.28)	2.80	3.04	(0.38)	(0.01)	0.02
SER	1,274.02	(0.01)	(4.53)	4.89	(2.59)	(0.01)	(0.08)
MIN	5.33	(0.16)	0.39	(0.05)	28.83	0.00	0.00

Source: IDE-GSM.

In short, installation of new logistical infrastructure would increase access to the nearby regions. Concentration on other development projects towards them would enhance the benefit. As shown in this section, TOD would increase Laos' gain, mostly from services, from the LCHSR. Although I have not conducted a particular simulation for that, SEZ or industrial estate development, around the railway stations is also expected to generate gains for other industries in Laos.

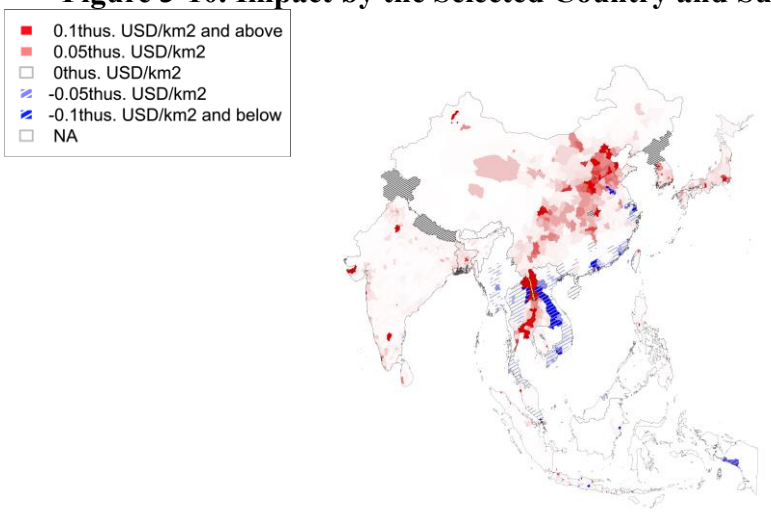
The other drawback for the TOD scenario is to increase regional disparity (Figure 3-9 and Figure 3-10). With TOD, growth in the provinces along the railway is accompanied by less growth in other regions of the country. Nevertheless, the LCHSR is only one of many ongoing and planned development projects in Laos. It is indeed possible for the losing provinces to grow through one or more of such projects.

Figure 3-9. Impact by the Selected Country and Sub-national Region (S6)



Source: IDE-GSM.

Figure 3-10. Impact by the Selected Country and Sub-national Region (S7)



Source: IDE-GSM.

5. Summary

In this paper, I have examined the economic impact of the frequency of passenger and cargo train service by the LCHSR. Also, I have examined the economic impact of TOD around the railway's station areas. Although the LCHSR is being constructed in Laos by Chinese construction companies and workers, the benefit in that study shows that, in addition to Laos, Thailand and China will also benefit significantly. The findings in this study are summarized as follows with particular focus on these three countries.

First, Laos would gain more than the other countries from the passenger train service, and such gain increases significantly with a higher frequency of passenger train services. Second, Thailand and China would benefit more from cargo train services. Nonetheless, when both passenger and cargo trains operate, the gain would be the highest for Laos, followed closely by Thailand and China. Third, TOD would make Laos by far the biggest gaining country.

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