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The Benefits of Regional Infrastructure Investment in Asia: A Quantitative Exploration

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Abstract

Capitalizing on recent estimates of infrastructure financing requirements in Asia, this paper frames a scenario for infrastructure development in the region and estimates the external effects of infrastructure investment. It also assesses quantitatively the economy-wide welfare effects of developing regional infrastructure in Asia, using a global computable general equilibrium model. The results show that developing Asian economies would gain significantly from the expansion of regional infrastructure in transport and communication. With annual investment of around US$800 billion in transport, communication, and energy infrastructure during 2010–2020, developing Asia is likely to reap welfare gains of US$1,616.3 billion (in 2008 prices) in 2020, or 10% of projected aggregate gross domestic product.

JEL Classification:

C68, F15

Contents

1. INTRODUCTION

Rapid trade expansion has been a key driver of the economic success of east and southeast Asian countries over recent decades. Substantial reform has liberalized trade and foreign direct investment regimes, and rapid technological progress has lowered transportation and communications costs. In addition, the development of infrastructure in Asian countries has made an important contribution to their integration into the world economy. The level of infrastructure development in most developing Asian countries is still relatively low, however. The significant dependence on foreign trade and bright long-term growth prospects of these countries suggest the potential for substantial gains from investment in regional infrastructure in Asia. Moreover, the development of regional infrastructure which strengthens the links between Asian economies and their links with the rest of the world is likely to stimulate wider economic participation of the poorest economies in the region.

This paper explores quantifying the welfare effects of developing regional infrastructure in Asia. It aims to answer the following questions: What are the external effects of the development of regional infrastructure in Asia? How much benefit to the region's economy can be expected from the development of regional infrastructure? A global computable general equilibrium (CGE) model is used to simulate the scenario of infrastructure expansion in developing Asian economies. The major conclusion of the simulations is that developing Asian economies would gain significantly from the expansion of regional infrastructure in transport and communication. With annual investment of around US$800 billion in transport, communication, and energy infrastructure during 2010–2020, developing Asia is likely to reap welfare gains of US$1,616.3 billion (in 2008 prices) in 2020, or 10% of its projected aggregate gross domestic product (GDP) that year. These benefits are expected to be particularly strong in two types of economies in the region: those with a high level of dependence on external trade, and those where conditions require expeditious investment to upgrade their infrastructure. Consistent with some previous studies (e.g., Roland-Holst 2009), our quantitative analysis suggests that investment in regional infrastructure holds great promise for Asia's long-term development. By facilitating greater market participation of the poorest economies in the region, regional infrastructure could act as an effective catalyst to spur greater regional integration and economic convergence.

2. A SCENARIO FOR INFRASTRUCTURE DEVELOPMENT IN ASIA

Based on the prospects for economic development in Asia, the Asian Development Bank Institute (2009) estimated the demand for financing infrastructure investment during 2010–2020 in 29 Asian developing countries. If this demand is met, the aggregate infrastructure stock of these countries would increase by 93.3% in 2020 (Table 1). The power sector would record the fastest growth, with an expansion of 147.6% in the value of infrastructure stock during the period. Transport and telecommunication infrastructure in developing Asia would increase more modestly, by 67.1% and 37.1%, respectively. Geographically, the growth of infrastructure stock would be rapid in the People's Republic of China (PRC) and Indonesia, and in India and other south Asian countries, but relatively slow in central Asia, Philippines, and Sri Lanka. Southeast Asian countries would register a relatively large expansion in transport infrastructure during 2011–2020, while south Asia would invest more in telecommunication and energy. In the PRC, power infrastructure would grow much faster than other types of infrastructure during 2011–2020.

Table 1: Projected Growth in the Value of Infrastructure Stock in Developing Asian Countries, 2010–2020

(%)

Country/Region	Transport	Telecommunication	Power	Other	Total
Total of the 29 Asian Developing Countries[a]	**67.1**	**37.1**	**147.6**	**22.8**	**93.3**
People's Republic of China	59.7	8.2	153.7	24.8	**100.9**
Indonesia	110.4	51.1	110.5	25.1	**88.5**
Malaysia	91.4	23.8	66.1	8.2	**71.9**
Philippines	60.4	16.0	66.9	21.3	**46.3**
Thailand	80.5	35.3	64.0	8.2	**58.4**
Viet Nam	37.1	31.7	128.6	24.8	**66.9**
Bangladesh	33.9	84.5	150.7	28.6	**72.0**
India	73.4	94.1	188.9	20.9	**101.0**
Pakistan	36.5	28.1	121.0	22.0	**58.3**
Sri Lanka	39.2	41.7	71.3	10.5	**41.6**
Central Asia[b]	45.7	96.1	58.3	16.5	**51.3**
Others	44.5	196.2	224.2	27.6	**81.3**

a Countries in addition to those listed: Bhutan, Brunei Darussalam, Cambodia, Fiji Islands, Lao People's Democratic Republic, Mongolia, Nepal, Papua New Guinea, Samoa, Timor-Leste, Tonga, and Vanuatu

b Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan, and Uzbekistan.

Source: Author's calculation based on: Asian Development Bank Institute (ADBI). 2009. Demand for Infrastructure Financing in Asia 2010–2020. Internal Report prepared by Centennial Group Holdings, LLC. Tokyo: ADBI.

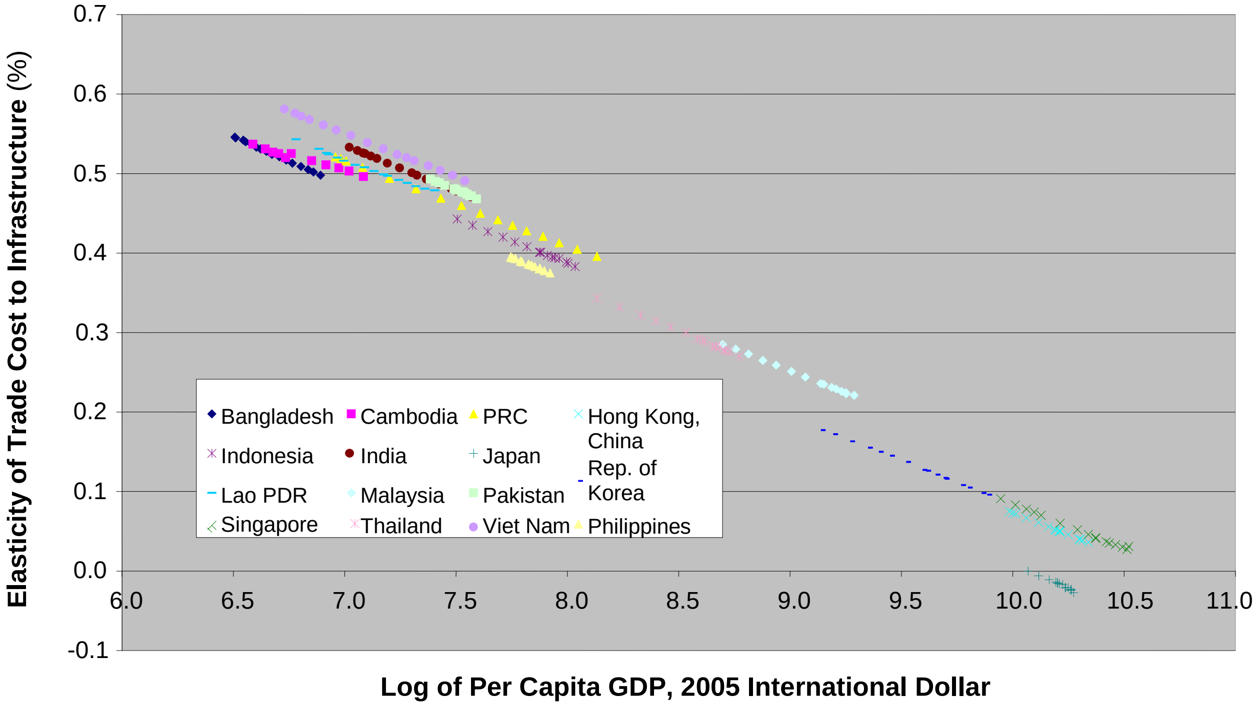
3. ESTIMATING THE EXTERNAL EFFECTS OF INFRASTRUCTURE DEVELOPMENT

In contrast with much private investment, investment in infrastructure can generate positive externalities throughout an economy, leading to social returns that exceed private returns. For regional infrastructure in transport and communication, one of their most important external effects is to increase market access by lowering trade costs. Broadly defined, trade costs include policy barriers (tariffs and nontariff barriers), transportation costs, local distribution costs, information costs, contract enforcement costs, and other costs associated with border-related barriers, such as language and currency conversion. The tariff equivalent of trade costs can range from 30% to 105%, depending on the sector, according to estimates for imports by the United States (World Bank 2005). Based on 1990 bilateral trade data for 19 member countries of the Organisation for Economic Co-operation and Development, Eaton and Kortum (2002) found that the tariff equivalent of trade costs ranged from 58% to 78%. Trade costs in developing countries are typically much higher due to weaker infrastructure and institutions.

Assessing the importance of infrastructure in facilitating trade, Nordas and Piermartini (2004) defined four dimensions of the relationship between infrastructure and trade costs. The first dimension of infrastructure's effect on trade costs is measured by direct monetary outlays for trade. These are determined not only by the distance (both physical and cultural) between trading partners, but also by the quality of infrastructure and the cost and quality of related services. Second, delivery time—whether on time or not—is likely to be influenced by the quality of infrastructure. Third, poor quality infrastructure increases the uncertainty of delivery, which is associated with a higher risk of damage, and therefore with higher losses and insurance costs. The fourth dimension of trade costs is high opportunity cost due to lack of access to good transport and telecommunications services. The quality of infrastructure thus largely determines the time required to get product to market and the reliability of delivery.

Francois, Manchin, and Pelkmans-Balaoing (2009) estimated the elasticity of trade costs with respect to the quality of infrastructure for several Asian economies (Table 2). Their results indicated that a 1% improvement in transport infrastructure decreased the trade cost equivalents for the value traded by 0.03%–0.58% in most developing Asian countries assessed during 1988–2003. For countries with the least-developed transport infrastructure, such as Cambodia and Myanmar, the elasticity of trade to transport infrastructure was as high as 1.17. For communication infrastructure, the trade cost reductions from a 1% improvement were somewhat smaller, ranging from 0.07% to 0.25%. This suggests that upgrading transport infrastructure would contribute more to reducing trade costs in Asia than upgrading communication infrastructure. The impact of both transport and communication infrastructure on a country's trade costs is much related to income. Figures 1 and 2 plot these estimated elasticities against the level of per capita GDP for selected Asian countries. As can be seen, the elasticities for communication infrastructure are positively correlated with income level, while those for transport infrastructure are negatively correlated with income level. In other words, transport infrastructure has a larger impact on trade costs in low-income countries than in high-income countries. On the hand, communication infrastructure has a larger impact on trade costs in high-income countries than in low-income countries.

Figure 1: Trade Cost Elasticity to Transport Infrastructure



PRC = People's Republic of China, GDP = gross domestic product, Lao PDR = Lao People's Democratic Republic, Rep. = Republic.

Source: Francois, Manchin, and Pelkmans-Balaoing. 2009. Regional Integration in Asia: The Role of Infrastructure. Chapter 7 in *Pan-Asian Integration: Linking East and South Asia,* edited by Joseph F. Francois, Ganeshan Wignaraja, and P. Rana. United Kingdom: Palgrave Macmillan.

Table 2: Trade-Cost Equivalents of a 1% Change in Infrastructure —Elasticities Over Time (%)

Year	Country	Communication Infrastructure	Transport Infrastructure	Country	Communication Infrastructure	Transport Infrastructure
1988	Bangladesh	0.165	0.546	Cambodia	0.070	1.172
1989		0.165	0.545		0.070	1.172
1990		0.166	0.542		0.070	1.172
1991		0.166	0.540		0.070	1.172
1992		0.167	0.537		0.070	1.172
1993		0.167	0.533		0.166	0.537
1994		0.167	0.531		0.167	0.531
1995		0.168	0.528		0.168	0.527
1996		0.168	0.524		0.168	0.525
1997		0.169	0.521		0.169	0.520
1998		0.170	0.517		0.168	0.525
1999		0.170	0.513		0.170	0.516
2000		0.171	0.509		0.171	0.511
2001		0.171	0.505		0.171	0.507
2002		0.172	0.502		0.172	0.503
2003		0.172	0.498		0.173	0.496
1988	PRC	0.169	0.521	Hong Kong, China	0.237	0.075
1989		0.169	0.519		0.237	0.073
1990		0.170	0.516		0.238	0.072
1991		0.171	0.508		0.238	0.067
1992		0.173	0.494		0.239	0.061
1993		0.175	0.481		0.240	0.056
1994		0.177	0.469		0.241	0.051
1995		0.178	0.460		0.241	0.050
1996		0.180	0.450		0.241	0.050
1997		0.181	0.442		0.242	0.046
1998		0.182	0.435		0.241	0.052
1999		0.183	0.428		0.241	0.050
2000		0.184	0.421		0.243	0.040
2001		0.185	0.413		0.243	0.040
2002		0.187	0.405		0.243	0.039
2003		0.188	0.396		0.243	0.036
1988	Indonesia	0.181	0.443	India	0.167	0.533
1989		0.182	0.435		0.168	0.529
1990		0.183	0.427		0.168	0.525
1991		0.184	0.420		0.168	0.526
1992		0.185	0.414		0.169	0.522
1993		0.186	0.408		0.169	0.519
1994		0.187	0.401		0.170	0.513
1995		0.188	0.394		0.171	0.507
1996		0.189	0.387		0.172	0.501
1997		0.190	0.383		0.173	0.498

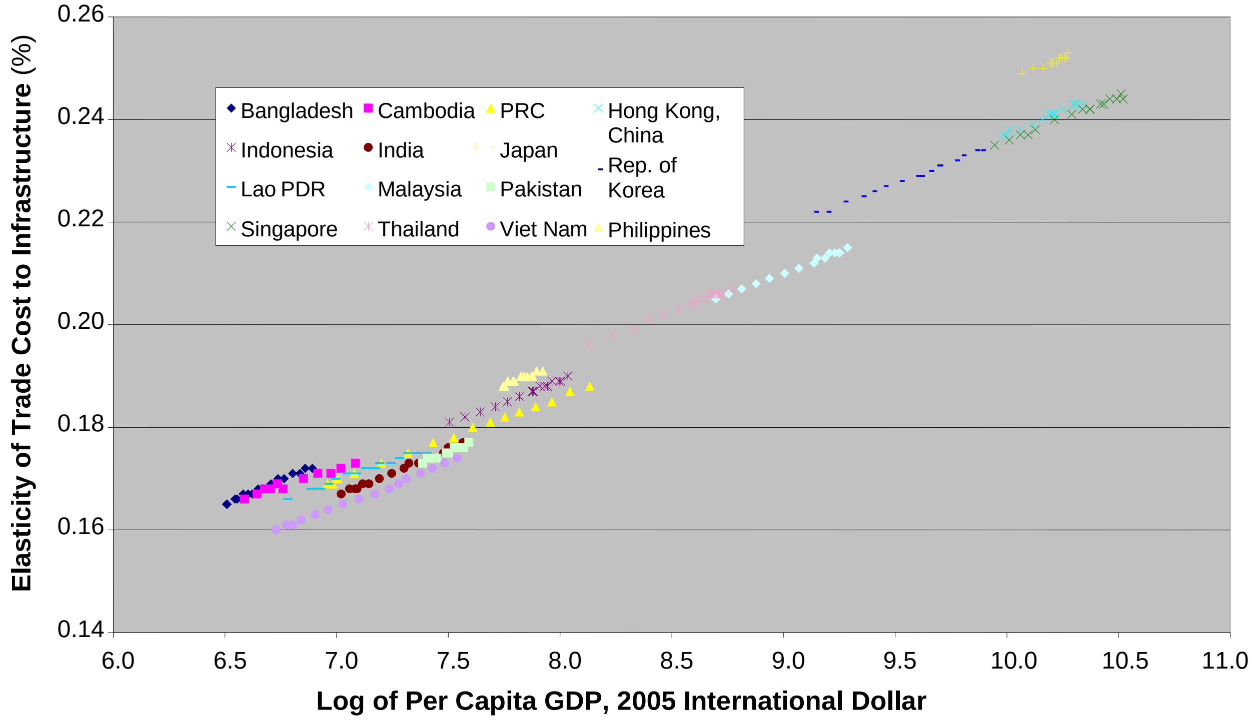
Year	Country	Communication Infrastructure	Transport Infrastructure	Country	Communication Infrastructure	Transport Infrastructure
1998	Indonesia	0.187	0.401	India	0.173	0.493
1999		0.187	0.401		0.174	0.487
2000		0.188	0.397		0.174	0.485
2001		0.188	0.395		0.175	0.481
2002		0.189	0.393		0.176	0.478
2003		0.189	0.389		0.177	0.471
1988	Japan	0.249	0.000	Rep. of Korea	0.222	0.177
1989		0.250	-0.006		0.222	0.172
1990		0.250	-0.011		0.224	0.163
1991		0.251	-0.014		0.225	0.155
1992		0.251	-0.015		0.226	0.150
1993		0.251	-0.015		0.227	0.145
1994		0.251	-0.016		0.228	0.137
1995		0.251	-0.017		0.229	0.127
1996		0.252	-0.021		0.230	0.121
1997		0.252	-0.023		0.231	0.117
1998		0.252	-0.021		0.229	0.126
1999		0.252	-0.021		0.231	0.116
2000		0.252	-0.024		0.232	0.108
2001		0.252	-0.024		0.233	0.105
2002		0.252	-0.024		0.234	0.098
2003		0.253	-0.027		0.234	0.096
1988	Lao PDR	0.166	0.543	Myanmar	0.070	1.172
1989		0.168	0.531		0.070	1.172
1990		0.168	0.526		0.070	1.172
1991		0.168	0.524		0.070	1.172
1992		0.169	0.520		0.070	1.172
1993		0.170	0.516		0.070	1.172
1994		0.171	0.511		0.070	1.172
1995		0.171	0.508		0.070	1.172
1996		0.172	0.503		0.070	1.172
1997		0.172	0.499		0.070	1.172
1998		0.173	0.497		0.070	1.172
1999		0.173	0.492		0.070	1.172
2000		0.174	0.488		0.070	1.172
2001		0.175	0.484		0.070	1.172
2002		0.175	0.481		0.070	1.172
2003		0.175	0.479		0.070	1.172
1988	Malaysia	0.205	0.285	Pakistan	0.173	0.493
1989		0.206	0.279		0.174	0.490
1990		0.207	0.273		0.174	0.488
1991		0.208	0.265		0.174	0.485
1992		0.209	0.259		0.175	0.480
1993		0.210	0.251		0.175	0.481
1994		0.211	0.244		0.175	0.479
1995		0.212	0.236		0.176	0.477

Year	Country	Communication Infrastructure	Transport Infrastructure	Country	Communication Infrastructure	Transport Infrastructure
1996	Malaysia	0.214	0.229	Pakistan	0.176	0.474
1997		0.214	0.223		0.176	0.476
1998		0.213	0.235		0.176	0.476
1999		0.213	0.231		0.176	0.474
2000		0.214	0.224		0.176	0.472
2001		0.214	0.226		0.176	0.472
2002		0.214	0.224		0.176	0.472
2003		0.215	0.221		0.177	0.468
1988	Philippines	0.188	0.394	Singapore	0.235	0.091
1989		0.189	0.390		0.236	0.083
1990		0.189	0.389		0.237	0.078
1991		0.189	0.393		0.237	0.074
1992		0.188	0.395		0.238	0.070
1993		0.188	0.395		0.240	0.060
1994		0.189	0.393		0.241	0.052
1995		0.189	0.390		0.242	0.046
1996		0.190	0.386		0.242	0.042
1997		0.190	0.383		0.243	0.037
1998		0.190	0.386		0.242	0.041
1999		0.190	0.385		0.243	0.035
2000		0.190	0.381		0.245	0.027
2001		0.190	0.380		0.244	0.033
2002		0.191	0.378		0.244	0.030
2003		0.191	0.375		0.244	0.031
1988	Thailand	0.196	0.343	Viet Nam	0.160	0.581
1989		0.198	0.332		0.161	0.576
1990		0.199	0.322		0.161	0.572
1991		0.201	0.315		0.162	0.568
1992		0.202	0.307		0.163	0.561
1993		0.203	0.300		0.164	0.555
1994		0.204	0.291		0.165	0.548
1995		0.206	0.282		0.166	0.539
1996		0.206	0.276		0.167	0.531
1997		0.206	0.278		0.168	0.524
1998		0.204	0.292		0.169	0.520
1999		0.205	0.288		0.170	0.516
2000		0.205	0.283		0.171	0.510
2001		0.206	0.282		0.172	0.504
2002		0.206	0.277		0.173	0.498
2003		0.207	0.270		0.174	0.491

PRC = People's Republic of China, Rep. of Korea = Republic of Korea, Lao PDR = Lao People's Democratic Republic.

Source: Francois, Manchin, and Pelkmans-Balaoing. 2009. Regional Integration in Asia: The Role of Infrastructure. Chapter 7 in *Pan-Asian Integration: Linking East and South Asia,* edited by Joseph F. Francois, Ganeshan Wignaraja, and P. Rana. United Kingdom: Palgrave Macmillan.

Figure 2: Trade Cost Elasticity to Communication Infrastructure



Using the estimated historical elasticities reported in Table 2, the linear regression equations between elasticity of trade costs with respect to the quality of infrastructure and the logarithm of per capita GDP were estimated for Bangladesh, Cambodia, PRC, India, Indonesia, Lao People's Democratic Republic, Malaysia, Pakistan, Philippines, Thailand, and Viet Nam. The values of these elasticities were then forecast for 2010–2020 based on United Nations population projections and assumed baseline GDP growth rates for these economies. To apply these forecasted elasticities to the scenario for infrastructure growth presented in Table 1, the per capita stock of transport infrastructure and per capita stock of communication infrastructure were used as proxies of infrastructure quality. This allowed estimation of trade cost reductions resulting from infrastructure expansion for each year during 2010–2020. The results, expressed as the accumulated reduction, in 2020, of trade costs during 2010–2020, are presented in Table 3.

For energy infrastructure, the principal externality is improvements in the efficiency of energy production and use. In an assessment of cross-border energy infrastructure—the oil pipeline between Kazakhstan and the PRC, Roland-Holst (2008) suggested that it may bring down the costs of the PRC's oil imports from Kazakhstan by 40%. Looking at the Greater Mekong Subregion (GMS), Integriertes Ressourcen Management (2008) found that an energy-integrated GMS could save overall GMS energy costs by 19%. Based on these empirical findings, it is projected that the overall efficiency of energy supply in developing Asia (excluding newly industrialized economies) would improve by 20% in 2020 as a result of investment in regional energy infrastructure.

Table 3: Accumulated Reduction in Trade Costs in 2020 Resulting from Infrastructure Investment in 2010–2020

(% of trade value)

Country/Region	From Transport Infrastructure	From Communication Infrastructure
PRC	14.0	0.7
Indonesia	25.3	6.6
Malaysia	11.4	1.7
Philippines	15.6	0.0
Thailand	12.1	5.9
Viet Nam	13.2	3.1
Bangladesh	12.9	9.9
India	21.6	11.2
Pakistan	12.9	1.2
Sri Lanka	10.6	6.5
Central Asia[a]	11.5	12.1
Rest of Asia[b]	20.3	21.3

PRC = People's Republic of China.

[a] Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan.

[b] Afghanistan, Bhutan, Brunei Darussalam, Cambodia, Lao People's Democratic Republic, Maldives, Mongolia, Myanmar, Nepal, and Timor-Leste.

Source: Author's calculation.

Table 4: Simulated Gains in Real Income from Investment in Regional Infrastructure in Asia, by Type of Infrastructure, 2020

	Transport		Transport and Communication		Transport, Communication, and Energy	
Country/Region	(% of Baseline GDP)	(2008 US$ billion)	(% of Baseline GDP)	(2008 US$ billion)	(% of Baseline GDP)	(2008 US$ billion)
Japan	0.4	22.4	0.3	24.2	0.3	24.4
Developing Asia	6.0	967.7	8.6	1388.3	10.0	1616.3
NIEs[a]	2.8	84.2	3.0	91.7	2.9	89.3
PRC	4.7	345.8	4.9	356.8	6.0	435.1
Indonesia	11.6	92.7	17.9	142.6	20.6	164.3
Malaysia	22.5	75.3	28.9	96.6	31.2	104.3
Philippines	8.9	24.4	8.9	24.4	10.1	27.6
Thailand	16.2	80.5	28.2	139.7	31.8	157.4
Viet Nam	19.2	32.4	24.7	41.7	29.0	48.9
Bangladesh	6.2	11.2	15.6	28.1	16.6	29.9
India	6.0	161.0	12.2	326.2	14.8	395.6
Pakistan	3.8	12.5	4.3	14.4	5.3	17.6
Sri Lanka	6.8	4.5	13.9	9.1	16.9	11.1
Central Asia[b]	5.9	19.6	14.7	48.5	17.4	57.6
Rest of Asia[c]	12.5	23.5	36.3	68.4	41.2	77.7
Rest of the world	0.1	91.7	0.2	134.0	0.2	140.7
Total	**1.2**	**1081.8**	**1.7**	**1546.6**	**2.0**	**1781.5**

4. GAUGING THE ECONOMY-WIDE GAINS OF REGIONAL INFRASTRUCTURE

A global CGE model is utilized to investigate the economy-wide effects in Asia and the rest of the world of the development of regional infrastructure in Asia. The CGE model used is a recursive dynamic version of the global model developed by Zhai (2008). A key feature of the model is the incorporation of firm heterogeneity and the fixed costs of exporting—in addition to variable trade costs. This allows investigation of the intra-industry reallocation of resources and exporting decisions by firms, thereby capturing both the intensive and extensive margin of trade in the model. The dynamics of the model originate from exogenous population and labor growth, labor-augmented technological progress, as well as from capital accumulation driven by savings. The model is benchmarked on the Global Trade Analysis Project (GTAP) 7.0 database with base year of 2004, and is solved for subsequent years from 2005 to 2020 (GTAP 2009). First established is a baseline scenario, which assumes no reduction of trade costs from 2004 to 2020 and serves as a basis of comparison for counterfactual scenarios with policy shocks. Three scenarios of a seamless Asia are then considered. In the first scenario, the trade cost reductions expected from transport infrastructure investment in Asia are gradually introduced during 2010–2020. In the second scenario, the trade costs reductions expected from investment in both transport infrastructure and communication infrastructure are introduced over the same period. The third scenario combines the expected positive external effects from investment in transport, communication, and energy infrastructure introduced over the same period. The differences between the counterfactual scenarios and the baseline scenario reflect the impacts resulting from the development of regional infrastructure.

Table 4 presents the simulation results for real income gains (measured as equivalent variation) from regional infrastructure investment. It shows that global gains in real income from an expansion of regional transport infrastructure in developing Asia would amount to US$1,081.8 billion in 2020 (in 2008 prices), or an increase of 1.2% over baseline income. If the trade cost reduction effects of communication infrastructure investment are added, the global gains in 2020 increase to US$1,546.6 billion, or 1.7% over baseline GDP. When investment in regional infrastructure for transport, communication, and energy sectors are considered together, global income in 2020 would rise by US$1,781.5 billion over baseline income. Around 90% of the global gains would be captured by Asian developing economies. Developing Asia as whole would reap income gains of US$967.7 billion in 2020 under the scenario of investment in expanded regional transport infrastructure, US$1388.3 billion under the scenario of investment in both transport and communication infrastructure, and US$1616.3 billion from investment for development of regional infrastructure for transport, communication, and energy—equivalent to 6.0%, 8.6%, and 10.0%, respectively, of the baseline income for developing Asia.

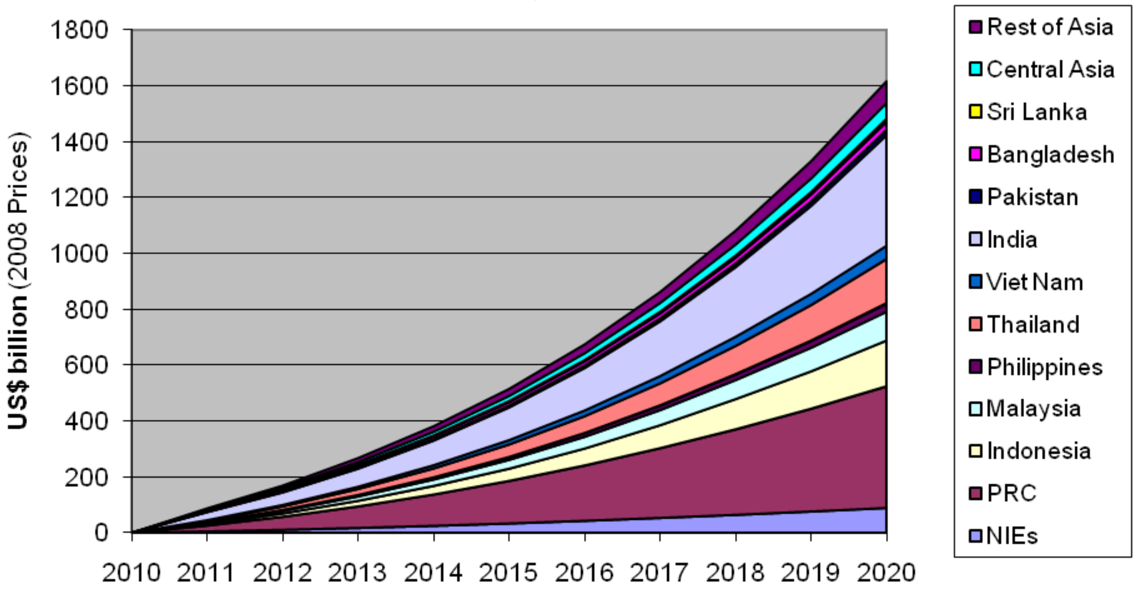
The PRC and India would be the biggest beneficiaries of investment in regional infrastructure, with aggregate real income gains of about US$830 billion in 2020 under the scenario of expansion of regional infrastructure in transport, communication, and energy. In relative terms (i.e., gains as a share of baseline GDP), Southeast Asian countries such as Malaysia, Thailand, and Viet Nam would be the major winners, mainly due to their high level of trade dependence and large infrastructure investment. Their real income gains in 2020 would be about 30% of their baseline GDP that year under the scenario of investment in all three infrastructure sectors. Real income gains in 2020 from regional transport infrastructure investment would be relatively small for south Asian and central Asian economies, ranging from about 4% to 7% of their baseline GDP levels. However, due to the relative low level of existing telecommunication infrastructure, demand for communication infrastructure investment in these countries is enormous. These investments thus tend to generate large welfare gains. When the benefits of investment in regional communication infrastructure are added to those of regional transport infrastructure, the real income gains in 2020 for

Bangladesh, India, Sri Lanka, and central Asia would more than double to 12% to 16% of their baseline GDP levels. The benefits of energy infrastructure are relatively evenly distributed across countries, mainly reflecting our assumption of a uniform gain of 20% in energy efficiency across countries.

Although it is assumed that there is no infrastructure expansion in Japan and NIEs, those countries would benefit from investment in regional infrastructure in the developing economies of Asia. This spillover effect is especially strong in NIEs, which would gain US$89.3 billion (2.9% of their aggregate GDP) in 2020 relative to the baseline scenario. Non-Asian economies would also gain slightly from the development of regional infrastructure in Asia. These results highlight the nondiscriminatory nature of regional infrastructure, which could not only serve as an important tool to stimulate regional integration in Asia, but also facilitate the global participation of the region's economies.

Trends in simulated real income gains for developing Asia over 2010–2020, by country and country group, are plotted in Figure 3. Aggregate annual gains for the region would vary from US$87.8 billion (2008 prices) in 2011, to US$515.3 billion in 2015, to US$1,616.3 billion in 2020. On average, aggregate annual gains in the second half of the period (2016–2020), at around US$1,113.0 billion, would be much larger than in the first half (2011–2015), at about US$284.4 billion. The higher growth rate after 2016 can be explained by the effects of cumulative infrastructure investments made during 2011–2015. This trend is visible in every country in the analysis. It is worth noting that there are also large benefits after 2020, when no new or replacement investments take place. However, these benefits decline over time with the depreciation of infrastructure stock.

Figure 3: Simulated Real Income Gains in Developing Asian Countries, 2010–2020



Source:

Source: Author's computable general equilibrium model simulations.

To get a sense about the overall gains generated by investment in regional infrastructure, the present value (in year 2008) of annual real income gains accumulated over 2011–2020 and beyond are calculated for selected countries and regions, assuming an annual discount rate of 5% (Table 5). The present value of such income gains for developing Asia as a whole from the expansion of regional transport infrastructure would be US$7,840 billion; US$11,240 billion from the investments in both transport and communications; and

US$12,980 billion from the investments in transport, communications, and energy. The PRC and India would gain US$3,549 billion and US$3,142 billion in income, respectively.

Table 5: Simulated Present Value of Accumulated Real Income Gains from Investment in Regional Infrastructure in Asia, by Type of Infrastructure

(2008 US$ billion)

	Transport			**Transport and Communication**			**Transport, Communication, and Energy**		
Country/Region	**2010–2020**	**Post-2020**	**Total**	**2010–2020**	**Post-2020**	**Total**	**2010–2020**	**Post-2020**	**Total**
NIEs[a]	248.8	445.5	694.3	275.2	484.9	760.2	268.2	472.2	**740.4**
PRC	1,016.1	1,829.2	2,845.2	1,047.9	1,887.4	2,935.3	1,247.7	2,301.5	**3,549.2**
Indonesia	251.6	490.4	742.0	371.0	754.2	1,125.2	415.4	869.2	**1,284.5**
Malaysia	201.7	398.4	600.1	261.8	511.2	773.0	278.0	551.9	**829.9**
Philippines	70.4	129.2	199.7	69.8	129.3	199.1	77.9	146.2	**224.1**
Thailand	206.6	425.9	632.5	362.0	738.8	1,100.8	402.6	832.8	**1,235.4**
Viet Nam	97.1	171.4	268.5	119.6	220.8	340.5	136.5	258.9	**395.4**
India	424.5	851.7	1,276.2	884.2	1,725.4	2,609.6	1,049.0	2,092.6	**3,141.6**
Pakistan	37.8	66.4	104.1	42.2	76.4	118.6	50.0	93.1	**143.1**
Bangladesh	31.2	59.1	90.3	96.1	148.8	244.9	100.3	158.0	**258.3**
Sri Lanka	13.0	23.6	36.7	26.2	48.3	74.5	30.6	58.6	**89.2**
Central Asia[b]	62.9	103.7	166.6	144.3	256.8	401.1	163.7	304.5	**468.3**
Rest of Asia,[c]	62.1	124.4	186.6	192.7	362.1	554.7	210.4	410.9	**621.3**
Australia, and New Zealand	25.6	47.1	72.7	33.9	61.9	95.8	34.7	63.6	**98.3**
Japan	64.9	118.7	183.6	70.1	128.0	198.1	68.5	129.2	**197.7**
Rest of the world	182.9	437.9	620.8	280.8	647.2	927.9	282.6	680.9	**963.5**
Total	**2,997.2**	**5,722.7**	**8,719.9**	**4,277.8**	**8,181.3**	**12,459.1**	**4,816.1**	**9,423.9**	**14,240.0**

PRC = People's Republic of China, NEI = newly industrialized economy.

[a] Hong Kong, China; Republic of Korea; Singapore; and Taipei,China.

[b] Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan.

[c] Afghanistan, Bhutan, Brunei Darussalam, Cambodia, Lao People's Democratic Republic, Maldives, Mongolia, Myanmar, Nepal, and Timor-Leste.

Source: Computable general equilibrium model simulations.

Finally, the impact of investment in regional infrastructure in Asia on the region's trade pattern is examined (Table 6). The simulation shows that the significant expansion of regional infrastructure in developing Asia would boost both global and regional trade. Global exports would expand by 21.1%, while developing Asia's exports and imports would both jump by more than 70%. The countries with low levels of foreign trade and low-quality infrastructure, such as Bangladesh and India, would experience the largest increases in trade. It is not surprising that the expansion of intra-Asia trade would be larger than extra-Asia trade, in that the development of regional infrastructure in Asia is simulated. As a result, the share of intra-regional trade in Asia in 2020 would rise by 6.6 percentage points from 47.5% in the baseline to 54.7% in the scenario of development of transport, communication, and energy infrastructure.

Table 6: Trade Effects of Investment in Transport, Communication, and Energy Infrastructure, 2020 (% change from baseline)

Country/Region	Total Exports	Exports to Asia	Exports to Non-Asian Countries	Total Imports	Imports from Asia	Imports from Non-Asian Countries
Japan	12.0	34.9	-8.2	16.3	41.1	-8.1
Developing Asia	72.6	99.3	51.3	78.1	96.5	59.1
NIEs[a]	12.7	36.8	-21.4	16.3	31.0	0.9
PRC	65.9	92.7	53.0	72.1	97.0	44.4
Indonesia	194.3	231.1	137.8	212.9	231.7	183.4
Malaysia	58.4	94.8	12.5	79.1	91.7	56.5
Philippines	48.1	78.3	8.7	49.6	56.0	35.3
Thailand	126.4	195.9	50.4	142.8	152.3	131.2
Viet Nam	98.5	97.5	99.1	90.8	104.1	62.4
Bangladesh	219.7	358.6	205.9	186.5	259.5	63.3
India	250.5	342.1	215.9	217.3	319.7	190.7
Pakistan	55.3	184.0	22.9	39.6	110.7	6.8
Sri Lanka	120.8	370.0	52.0	97.7	136.2	44.0
Central Asia[b]	108.1	302.3	45.8	105.3	224.5	58.7
Rest of Asia[c]	213.3	290.0	147.1	245.7	257.2	225.4
Rest of the world	2.7	47.7	-8.2	3.4	41.2	-8.2
Global	**21.1**	**67.8**	**3.4**	**21.1**	**61.9**	**2.7**

PRC = People's Republic of China, NEI = newly industrialized economy.

[a] Hong Kong, China; Republic of Korea; Singapore; and Taipei,China.

[b] Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan.

[c] Afghanistan, Bhutan, Brunei Darussalam, Cambodia, Lao People's Democratic Republic, Maldives, Myanmar, Mongolia, Nepal, and Timor-Leste.

Source: Computable general equilibrium model simulations.

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