Prospects for Emerging East Asian Cooperation and Implications for the United States

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PREFACE

The Korea Economic Institute (KEI) in Washington, D.C., in cooperation with the School of International Service (SIS) at American University, also in Washington, D.C., cosponsored an academic symposium at SIS on 20–22 October 2010 on “Tomorrow’s Northeast Asia.” This volume contains the papers that were presented at the symposium and subsequently refined.

The 2010 symposium focused on emerging and future challenges facing Northeast Asia. Papers and discussions fell under five broad topics:

• Prospects for emerging East Asian cooperation and implications for the United States

• The emerging role of South Korea on a global stage

• The future of energy security in Northeast Asia

• Engaging and transforming North Korea’s economy

• Finding room for a six-party solution to North Korea’s nuclear crisis.

The sponsors and authors welcome comments on the material in this volume. This is the 21st in a series of annual academic symposia on Asia-Pacific economic and security issues that bring together leading academics and policy professionals from throughout the region.

Louis W. Goodman Charles L. (Jack) Pritchard
Dean President
School of International Service Korea Economic Institute
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December 2010
HISTORY OF KOREA ECONOMIC INSTITUTE
ACADEMIC SYMPOSIA

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      Washington, D.C.

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2002 University of Pennsylvania

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1996 University of Michigan

1995 University of Chicago

1994 University of California–Berkeley

1993 Princeton University

1992 Columbia University

1991 Indiana University

1990 University of California–San Diego
ESTIMATING THE POTENTIAL SIZE OF INTER-KOREAN ECONOMIC COOPERATION

Doowon Lee

ABSTRACT

Even though inter-Korean economic cooperation has been growing steadily for the past two decades, the volume of inter-Korean trade is still small compared to the other emerging Asian economies’ trade volume with South Korea. This paper tries to estimate the potential size of inter-Korean trade volume on the basis of the assumption that North Korea will be a normal market economy. First, this paper estimates the bilateral gravity model of South Korea with its major trading partners, and will apply this result to inter-Korean trade. Conventional gravity models usually have three explanatory variables of GDP, GDP per capita, and distance. However, this paper has augmented this conventional model by removing GDP per capita and adding RTA (regional trade agreement) dummy and TL (trade liberalization) index. According to this augmented gravity model, inter-Korean trade volume would increase by 6 to 8 times as of 2008 if North Korea became a normal market economy. Even though there exists a substantial gap between the actual and the potential trade volumes, this gap has been narrowed during the previous two decades.
Introduction

Since inter-Korean economic cooperation began at the end of 1980s, the volume and scope of inter-Korean economic cooperation have increased over time. Even though the magnitude of inter-Korean economic cooperation has fluctuated from time to time, mostly because of noneconomic factors, its volume has increased gradually and steadily. The total trade volume between the two Koreas was merely $19 million in 1989 when inter-Korean trade was initiated. This figure was increased to almost $2 billion as of 2008 and 2009. Furthermore, it is believed that inter-Korean economic transactions, including trade and investment, will grow exponentially once North Korea transforms itself into a normal market economy. When North Korea becomes a normal market economy, its cheap labor and abundant natural resources are expected to attract South Korean investment, and they would be combined with South Korea’s capital and technology. Also, South Korea would be a natural trading partner with North Korea given its geographical adjacency and structural complementarity. This potential has not fully materialized owing to the fact that North Korea is one of the most closed economies in the world, and its resource allocation is severely distorted by noneconomic forces.

The purpose of this paper is to estimate the potential volume of inter-Korean economic cooperation such as trade and investment. The potential for inter-Korean economic cooperation can be estimated on the basis of the assumption that North Korea will be a normal market economy. Under this assumption, we can estimate the natural amount of trade and investment between South Korea and North Korea.

The economic model this paper uses in this estimation is the gravity model. The gravity model is widely used to estimate the natural trading volume in bilateral or multilateral trade of nations. In this paper, the author will estimate the bilateral gravity model of South Korea with its major trading partners and will apply this result to inter-Korean trade and investment. According to the conventional gravity model, a nation is supposed to have larger trade volume with its trading partner if the trading partner’s GDP, income level, and geographical adjacency are larger. For example, according to the estimation made by Bank of Korea, the per capita gross national income (GNI) of North Korea as of 2008 was $1,065. In Asia, countries such as Pakistan, Vietnam, Cambodia, and India had per capita

---

1 According to the South Korea’s Ministry of Unification, the total volume of inter-Korean economic cooperation as of 2008 was $1.82 billion, and in 2009 it was $1.68 billion.

2 The Bank of Korea publishes only the per capita GNI for North Korea, which would be close to per capita GDP.
GNPs similar to that of North Korea in 2008. Even though these countries have per capita incomes similar to North Korea’s, their trading volume with South Korea is much larger than that of North Korea. For example, the total trading volume between South Korea and India was $15.6 billion in 2008, and the equivalent figure for Vietnam was $9.8 billion. These figures are much larger than the 2008 inter-Korean trade volume of $1.8 billion. The large trade volume between India and South Korea can be explained by the large population of India. However, the large difference between South Korea–Vietnam trade and South Korea–North Korea trade can not be fully explained by Vietnam’s population size. Even when we consider the population factor, the per capita trade volume of South Korea–Vietnam (in other words, the bilateral trade volume of South Korea–Vietnam divided by the Vietnamese population) is significantly larger than the per capita trade volume of South Korea–North Korea. The former was $114 and the latter was $78 in 2008. This simple comparison demonstrates that inter-Korean trade would grow substantially once North Korea becomes a normal market economy.

The same logic can be applied to inter-Korean investment. Until now, foreign direct investment from South Korea to North Korea has been limited and largely influenced by noneconomic factors. For example, the construction of a light-water reactor (1997–2003) was interrupted by the conflict between North Korea and the United States. Also, the Mt. Kumgang tourism project (1998–2008) was halted by the death of a South Korean tourist shot by a North Korean soldier. Even though the Kaesong industrial complex project is still going on, its fate is uncertain owing to the sinking of a South Korean ship during the summer of 2010. Even though North Korea had initiated several open-door policies to attract foreign capital in the past, the policies did not apply to South Korea. As a result, investment from South Korea to North Korea has been limited and has fluctuated severely so far.

This paper does not distinguish between inter-Korean trade and inter-Korean investment as these two activities are included in inter-Korean economic cooperation. Generally speaking, however, inter-Korean economic cooperation has been largely dominated by inter-Korean trade. Therefore, in the remainder of this paper the focus will be on the estimation of inter-Korean trade.

This paper is composed of four sections. The next section provides a descriptive analysis of inter-Korean economic cooperation. That is followed by a review of the existing literature that has used the gravity model in estimating bilateral trade. According to the IMF World Economic Outlook for April 2010, the per capita GDPs of Pakistan, India, Vietnam, and Cambodia in 2008 were $1,022, $1,020, $1,042, and $825, respectively.
trade volume. The author then estimates the potential amount of inter-Korean trade using the augmented gravity model. The final section provides policy implications for future development of inter-Korean economic cooperation and summarizes the findings of this paper.

Review of the Inter-Korean Economic Transaction

Let us first briefly describe the historic evolution and current status of inter-Korean economic cooperation. When we analyze the North Korean economy, even a simple calculation such as summing up North Korean trade volume can be tricky. Several institutions publish the external trade data of North Korea. This paper relies on data published by the Korea Trade-Investment Promotion Agency (KOTRA). KOTRA publishes annual external trade data for North Korea by collecting trade data of North Korea’s major trading partners. For example, KOTRA collected 79 countries’ trade data with North Korea for its 2009 report. As KOTRA does not collect trade data of every country that trades with North Korea, this report does not show a comprehensive picture of North Korean trade. Nonetheless, this report is considered more reliable and consistent than other publications because KOTRA uses its field offices to verify each country’s trade data with North Korea. KOTRA began to carry out this job because other data sources had made frequent mistakes, such as confusing North Korea and South Korea and combining noncommercial trade with commercial trade. According to KOTRA, inter-Korean economic cooperation has been increasing rather steadily (Table 1).

Even though inter-Korean economic transactions are not regarded as international trade, it is de facto conducted like international trade. Therefore, from this point on, let us assume that inter-Korean economic transactions are indeed international trade. This implies that inflow from North Korea to South Korea would be regarded as imports from North Korea to South Korea. Likewise, outflow from South Korea to North Korea would be regarded as exports from South Korea to North Korea. When we incorporate data from Table 1 with the other external trade data of North Korea, we can come up with the composition of North Korean trade across major trading partners. This result is shown in Figure 1.

As we can see in Figure 1, South Korea has always been a major trading partner of North Korea. In particular, in recent years, South Korea—taking roughly one-third of the North Korea’s total trading volume—has become the second-largest trading partner to North Korea. Another interesting finding from Figure 1 is that North Korea has increased its dependence on trade, measured by the
total trade volume divided by its GNI, since the mid-1990s. This implies that international trade is getting to be a more and more important part of the North Korean economy, and the relative importance of inter-Korean economic trade is growing over time.

Inter-Korean economic transactions include several categories of commercial and noncommercial economic activities. When we break down these activities, we arrive at Table 2, which shows that inter-Korean economic transactions incorporate many different activities such as general trade, commission-based trade, economic cooperation projects, humanitarian aid, and social-cultural projects.

Table 1: Inter-Korean Economic Transactions: Trade Inflow and Outflow, 1989–2009

<table>
<thead>
<tr>
<th>Year</th>
<th>Inflow from North Korea to South Korea</th>
<th>Outflow from South Korea to North Korea</th>
<th>Total of inflow and outflow</th>
<th>Annual growth Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>18,655</td>
<td>69</td>
<td>18,724</td>
<td>–28.08</td>
</tr>
<tr>
<td>1990</td>
<td>12,278</td>
<td>1,188</td>
<td>13,466</td>
<td>726.27</td>
</tr>
<tr>
<td>1991</td>
<td>105,719</td>
<td>5,547</td>
<td>111,266</td>
<td>55.87</td>
</tr>
<tr>
<td>1992</td>
<td>162,863</td>
<td>10,563</td>
<td>173,426</td>
<td>7.59</td>
</tr>
<tr>
<td>1993</td>
<td>178,167</td>
<td>8,425</td>
<td>186,592</td>
<td>4.26</td>
</tr>
<tr>
<td>1994</td>
<td>176,298</td>
<td>18,249</td>
<td>194,547</td>
<td>47.67</td>
</tr>
<tr>
<td>1995</td>
<td>222,855</td>
<td>64,436</td>
<td>287,291</td>
<td>–12.27</td>
</tr>
<tr>
<td>1996</td>
<td>182,400</td>
<td>69,639</td>
<td>252,039</td>
<td>22.34</td>
</tr>
<tr>
<td>1997</td>
<td>193,069</td>
<td>115,270</td>
<td>308,339</td>
<td>–28.02</td>
</tr>
<tr>
<td>1998</td>
<td>92,264</td>
<td>129,679</td>
<td>221,943</td>
<td>50.24</td>
</tr>
<tr>
<td>1999</td>
<td>121,604</td>
<td>211,832</td>
<td>333,437</td>
<td>7.59</td>
</tr>
<tr>
<td>2000</td>
<td>152,373</td>
<td>272,775</td>
<td>425,148</td>
<td>–3.75</td>
</tr>
<tr>
<td>2001</td>
<td>176,170</td>
<td>226,787</td>
<td>402,957</td>
<td>27.50</td>
</tr>
<tr>
<td>2002</td>
<td>271,575</td>
<td>370,155</td>
<td>641,730</td>
<td>–12.27</td>
</tr>
<tr>
<td>2003</td>
<td>289,252</td>
<td>434,965</td>
<td>724,217</td>
<td>22.34</td>
</tr>
<tr>
<td>2004</td>
<td>258,039</td>
<td>439,001</td>
<td>697,040</td>
<td>–3.75</td>
</tr>
<tr>
<td>2005</td>
<td>340,281</td>
<td>715,472</td>
<td>1,055,754</td>
<td>51.46</td>
</tr>
<tr>
<td>2006</td>
<td>519,539</td>
<td>830,200</td>
<td>1,349,739</td>
<td>27.85</td>
</tr>
<tr>
<td>2007</td>
<td>765,346</td>
<td>1,032,550</td>
<td>1,797,896</td>
<td>33.20</td>
</tr>
<tr>
<td>2008</td>
<td>932,250</td>
<td>888,117</td>
<td>1,820,366</td>
<td>1.25</td>
</tr>
<tr>
<td>2009</td>
<td>934,251</td>
<td>744,830</td>
<td>1,679,082</td>
<td>–7.76</td>
</tr>
</tbody>
</table>

Source: KOTRA (various years).

Note: These data for Inter-Korean economic transactions do not use terms such as import and export. Because North Korea is still part of South Korea according to South Korea’s constitution, inter-Korean transactions are not regarded as international trade.
Thus, it is difficult to consider past transactions as international trade. In more recent years, however, commercial transactions are taking a more dominant share of the total inter-Korean transactions. Therefore, in estimating the potential trade volume between the two Koreas, we will regard the current level of inter-Korean economic transactions as the total trade volume between the two Koreas.

**Gravity Model for Trade**

Let us define the gravity model first and introduce previous studies that have used the gravity model in estimating bilateral trade volume between two countries. A gravity model is an empirical model that is widely used in estimating bilateral trade volume with a certain set of explanatory variables. This model is based on the assumption that two countries would trade more if the product of their GDPs (and also GDP per capita) were larger and the distance between the two countries were closer. Therefore, almost all gravity model literature makes use of three explanatory variables: GDP, GDP per capita, and distance. Also, many researchers try to augment this conventional gravity model by adding more...
Table 2: Composition of Inter-Korean Economic Transactions, 1995–2009

<table>
<thead>
<tr>
<th>Year</th>
<th>General trade</th>
<th>Commission-based processing trade</th>
<th>Economic cooperation</th>
<th>Subtotal</th>
<th>Noncommercial transactions</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mt. Kumgang</td>
<td>Kaesong</td>
<td>Others</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>230.4</td>
<td>45.9</td>
<td></td>
<td>276.3</td>
<td>11.0</td>
<td>287.3</td>
</tr>
<tr>
<td>1998</td>
<td>73.0</td>
<td>71.0</td>
<td>37.7</td>
<td>182.5</td>
<td>39.4</td>
<td>221.9</td>
</tr>
<tr>
<td>1999</td>
<td>89.0</td>
<td>100.0</td>
<td>40.7</td>
<td>236.1</td>
<td>97.3</td>
<td>333.4</td>
</tr>
<tr>
<td>2000</td>
<td>110.5</td>
<td>129.2</td>
<td>16.2</td>
<td>273.3</td>
<td>151.8</td>
<td>425.1</td>
</tr>
<tr>
<td>2002</td>
<td>171.8</td>
<td>171.2</td>
<td>11.9</td>
<td>367.9</td>
<td>273.8</td>
<td>641.7</td>
</tr>
<tr>
<td>2004</td>
<td>171.8</td>
<td>176.0</td>
<td>41.8</td>
<td>436.5</td>
<td>260.5</td>
<td>697.0</td>
</tr>
<tr>
<td>2005</td>
<td>209.8</td>
<td>209.7</td>
<td>87.1</td>
<td>689.5</td>
<td>366.2</td>
<td>1,055.8</td>
</tr>
<tr>
<td>2006</td>
<td>304.1</td>
<td>253.0</td>
<td>56.7</td>
<td>928.1</td>
<td>421.7</td>
<td>1,349.7</td>
</tr>
<tr>
<td>2007</td>
<td>461.4</td>
<td>330.0</td>
<td>1,14.8</td>
<td>1,431.2</td>
<td>366.1</td>
<td>1,797.9</td>
</tr>
<tr>
<td>2008</td>
<td>400.1</td>
<td>410.0</td>
<td>840.0</td>
<td>1,712.0</td>
<td>108.0</td>
<td>1,802.0</td>
</tr>
<tr>
<td>2009</td>
<td>256.1</td>
<td>409.7</td>
<td>8.7</td>
<td>1,642.1</td>
<td>36.9</td>
<td>1,679.0</td>
</tr>
</tbody>
</table>

Source: KOTRA (various years).
explanatory variables that represent trade structure, membership in regional trade agreements (RTAs), degree of trade liberalization, and so on.

The gravity model has been studied theoretically by Poyhonen (1963), Bergstrand (1985, 1989), Helpman and Krugman (1985), and Evenett and Keller (2002). Also, the gravity model has been used empirically to predict the natural trade volume between two countries. Numerous studies have made use of multilateral trade data from a group of countries; they include Rose (2004), Faruqee (2004), Frankel and Wei (1995), Filippini and Molini (2003), and Kien (2009). Also, some studies have applied the gravity model in order to examine the natural trade volume of South Korea with its major trading partners; they include Lee Young-sun (1995), Sohn and Yoon (2000), Sohn (2005), Lee Doo-won (2005), and Lee Chong-wha (2010).

Also, there has been some effort to utilize the results of the previous estimations made with the use of the gravity model. For example, Noland (2000, chap. 7) estimated the natural trade shares of North Korea as of 1990 using the gravity model of bilateral trade estimated by Frankel and Wei (1995). According to this study, the largest natural trading partner of North Korea would be South Korea. Kim (2008) estimated the potential trade dependency ratio of North Korea using the gravity model estimated by Broadman (2005). According to this study, the natural trade dependency ratio of North Korea is estimated as 30 percent, when the actual figure was only 17 percent as of 2006.

Let us now establish a gravity model for South Korea’s trade volume in order to estimate the natural trade volume between South Korea and North Korea. In this paper, the dependent variables are export from South Korea to its trading partners (EXPORT) and trade volume (export + import) between South Korea and its trading partners (TV). This paper estimates gravity models using the 2008 trade data of South Korea. The number of observations in this paper is the largest 50 trading partners of South Korea. First, the basic equation of the gravity model is estimated using explanatory variables of GDP of each trading partner, GDP per capita of each trading partner, and distance between South Korea and each trading partner. The results of these basic equations (1-1) and (1-2) are summarized in Table 3.

---

4 According to Noland (2000), South Korea would take 35 percent of North Korea’s trade shares. The next largest natural trading partners would be Japan and China, taking 30 percent and 13 percent trade shares, respectively. As of 1990, the actual trading shares of South Korea, Japan, and China were 10 percent, 21 percent, and 23 percent, respectively.

5 The explanatory variables used in the gravity model estimation of Kim (2008) were population, GDP per capita (measured at purchasing power parity), distance, and dummy variables for East Asia, Latin America, and the Organization for Economic Cooperation and Development.
\[
\text{Ln}[\text{EXPORT}_{\text{Korea, } j}] = C + \alpha_1 \cdot \text{Ln}[\text{GDP}_j] + \alpha_2 \cdot \text{Ln}[\text{GDPPC}_j] + \alpha_3 \cdot \text{Ln}[\text{DST}_{\text{Korea, } j}] + \varepsilon_j \quad (1-1)
\]

\[
\text{Ln}[\text{TV}_{\text{Korea, } j}] = C + \alpha_1 \cdot \text{Ln}[\text{GDP}_j] + \alpha_2 \cdot \text{Ln}[\text{GDPPC}_j] + \alpha_3 \cdot \text{Ln}[\text{DST}_{\text{Korea, } j}] + \varepsilon_j \quad (1-2)
\]

According to Table 3, the coefficient for GDPPC is positive, but its statistical significance is too weak to be considered. This is understandable given the fact that South Korea’s trade volumes with a rich country like the United States and a relatively poor country like China are both large. Therefore, let us remove GDPPC from our explanatory variables in the following equations.

\[
\text{Ln}[\text{EXPORT}_{\text{Korea, } j}] = C + \alpha_1 \cdot \text{Ln}[\text{GDP}_j] + \alpha_2 \cdot \text{Ln}[\text{DST}_{\text{Korea, } j}] + \varepsilon_j \quad (2-1)
\]

\[
\text{Ln}[\text{TV}_{\text{Korea, } j}] = C + \alpha_1 \cdot \text{Ln}[\text{GDP}_j] + \alpha_2 \cdot \text{Ln}[\text{DST}_{\text{Korea, } j}] + \varepsilon_j \quad (2-2)
\]

Let us now augment equations (2-1) and (2-2) by adding two more explanatory variables that are deemed to be important in determining bilateral trade volume between South Korea and its major trading partners. They are dummy variable for RTA and index for trade liberalization (TL). The RTA dummy takes the value of 1 if the country has ratified a free trade agreement (FTA) with Korea or the
country is a member of the Asia-Pacific Economic Cooperation (APEC) as of the end of 2007. The TL index, which is published by the Fraser Institute, measures the degree of freedom to trade internationally, and it ranges from 0 to 10. For example, a country like Myanmar whose trade regime is very much closed to the rest of the world has the TL index of 1.3, when the equivalent figure for a free trade country like Singapore is 9.4. Equation (3) adds RTA, and Equation (4) adds both RTA and TL. We can expect that a country that is a member of an RTA with South Korea would trade more with South Korea. Also, a country whose trade regime is more liberalized would trade more with South Korea. By adding these explanatory variables, we can expect to improve the estimation power of the model. Estimation results of these augmented gravity models are summarized in Table 4.

\[ \ln[\text{EXPORT}_{\text{Korea}, j}] = C + \alpha_1 \cdot \ln[\text{GDP}_j] + \alpha_2 \cdot \ln[\text{DST}_{\text{Korea}, j}] + \alpha_3 \cdot [\text{RTA}_{\text{Korea}, j}] + \varepsilon_j \] (3-1)

\[ \ln[\text{TV}_{\text{Korea}, j}] = C + \alpha_1 \cdot \ln[\text{GDP}_j] + \alpha_2 \cdot \ln[\text{DST}_{\text{Korea}, j}] + \alpha_3 \cdot [\text{RTA}_{\text{Korea}, j}] + \varepsilon_j \] (3-2)

\[ \ln[\text{EXPORT}_{\text{Korea}, j}] = C + \alpha_1 \cdot \ln[\text{GDP}_j] + \alpha_2 \cdot \ln[\text{DST}_{\text{Korea}, j}] + \alpha_3 \cdot [\text{RTA}_{\text{Korea}, j}] + \alpha_4 \cdot [\text{TL}_j] + \varepsilon_j \] (4-1)

\[ \ln[\text{TV}_{\text{Korea}, j}] = C + \alpha_1 \cdot \ln[\text{GDP}_j] + \alpha_2 \cdot \ln[\text{DST}_{\text{Korea}, j}] + \alpha_3 \cdot [\text{RTA}_{\text{Korea}, j}] + \alpha_4 \cdot [\text{TL}_j] + \varepsilon_j \] (4-2)

Table 4 shows that, first, all the signs for coefficients are consistent with theoretical hypotheses, and they are statistically significant. As theoretical hypotheses have predicted, a country with a large GDP, close distance, an RTA membership, and a liberalized trade regime would trade more with South Korea. Second, the estimated coefficients for GDP and distance are robust as we add additional explanatory variables. Also, as we augment the basic model with additional explanatory variables, we have improved the fitness of the estimation with higher value for R^2. As equation (4) has yielded the best estimation result, we will use the result of equation (4) in estimating the natural size of the inter-Korean trade volume.

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6 Refer to Free the World (www.freetheworld.com) for further description of the TL index.
To estimate the natural export or trade volume between the two Koreas using the result of equation (4), we need to figure out corresponding values of North Korea for GDP, distance, RTA dummy, and the TL index. According to the estimation by the Bank of Korea, the North Korean GNI as of 2008 was $24.8 billion. Also, the distance between Seoul and Pyongyang is 128 miles. As North Korea is part of South Korea according to the South Korean constitution, the RTA dummy in equation (4) should take the value of 1. Last, we need to figure out the TL value for North Korea. Because the TL value for North Korea is not published by the Fraser Institute, we need to find a proxy value for the North Korean TL. Thus, the TL values of three countries with political and economic situations similar to North Korea’s are regarded as proxies for North Korea. They are Zimbabwe, Venezuela, and Iran; and their TL values are 2.4, 3.7, 5.0, respectively. In this paper, for the sake of simplicity, TL values of 3, 4, and 5 are used. Therefore, we have estimated the natural export or trade volume between the two Koreas by inserting these figures into equation (4). The result of this estimation is summarized in Table 5.

Table 4: Estimation Results of Augmented Gravity Models

<table>
<thead>
<tr>
<th>Explanatory variable</th>
<th>Expected sign</th>
<th>Equation 2 (basic)</th>
<th>Equation 3</th>
<th>Equation 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Export</td>
<td>Trade volume</td>
<td>Export</td>
</tr>
<tr>
<td>Constant (c)</td>
<td></td>
<td>21.280***</td>
<td>19.233***</td>
<td>19.995***</td>
</tr>
<tr>
<td>Log of GDP (GDP)</td>
<td>+</td>
<td>0.251***</td>
<td>0.360***</td>
<td>0.213***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4.365)</td>
<td>(5.373)</td>
<td>(3.938)</td>
</tr>
<tr>
<td>Log of distance (DST)</td>
<td>–</td>
<td>–0.688***</td>
<td>–0.728***</td>
<td>–0.444***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(–4.350)</td>
<td>(–3.947)</td>
<td>(–2.698)</td>
</tr>
<tr>
<td>RTA dummy (RTA)</td>
<td>+</td>
<td>0.725***</td>
<td>0.853***</td>
<td>0.590***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.153)</td>
<td>(3.194)</td>
<td>(2.722)</td>
</tr>
<tr>
<td>Trade liberalization (TL)</td>
<td>+</td>
<td>0.220**</td>
<td>0.197*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.298)</td>
<td>(1.873)</td>
<td></td>
</tr>
<tr>
<td>No. of observations</td>
<td></td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>R²</td>
<td></td>
<td>0.502</td>
<td>0.540</td>
<td>0.591</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td></td>
<td>0.481</td>
<td>0.520</td>
<td>0.564</td>
</tr>
</tbody>
</table>

Source: Author’s data.

Notes: Numbers in parentheses are t-values for each coefficient. Coefficients with *, **, *** are statistically significant at 90 percent, 95 percent, and 99 percent, respectively.
Table 5: Natural Volume of Inter-Korean Export or Trade Estimated by Equation (4), in millions of dollars

<table>
<thead>
<tr>
<th></th>
<th>Actual (2008)</th>
<th>Estimated potential</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TL=3</td>
</tr>
<tr>
<td>A: Export from South Korea to North Korea (gap between the actual and the potential)</td>
<td>888</td>
<td>6,812 (7.7 times)</td>
</tr>
<tr>
<td>A / North Korea’s GNI</td>
<td>0.036</td>
<td>0.275</td>
</tr>
<tr>
<td>B: Total inter-Korean trade volume (gap between the actual and the potential)</td>
<td>1,820</td>
<td>10,203 (5.6 times)</td>
</tr>
<tr>
<td>B / North Korea’s GNI</td>
<td>0.073</td>
<td>0.411</td>
</tr>
</tbody>
</table>

Source: Author’s data.

As Table 5 shows, the inter-Korean export or trade volume can be substantially increased once North Korea transforms itself into a normal market economy. With regard to South Korea’s exports to North Korea, they can be increased to at least eight times larger than the current level. Furthermore, if North Korea adopts more of a free trade regime, exports can increase to 12 times the current level. With regard to the total inter-Korean trade volume, it can increase anywhere from 5.6 times to 8.3 times the current level. These figures can imply that the relative importance of inter-Korean trade out of the North Korean GNI would be at least 41 percent. This ratio is substantially higher than the current level of 7 percent.

Last, let us compare the results of this paper with the previous literature on this subject. Using explanatory variables such as GDP, GDP per capita, and distance, Lee Young-sun (1995) estimated the potential inter-Korean trade volume as of 1990. Also, Sohn (2005) estimated a gravity model for South Korea using explanatory variables including TCI (trade complementarity index). The results of these previous studies and this paper are summarized in Table 6.

Table 6 shows that there is a wide range of gaps between the actual inter-Korean trade volume and the potential inter-Korean trade volume estimated by each gravity model. Generally speaking, however, we find that this gap has been
narrowed over time. This implies that both sides have gradually exploited the potential of inter-Korean trade over time.

### Table 6: Comparison of Estimation Results for Inter-Korean Trade Volume

<table>
<thead>
<tr>
<th>Name of study</th>
<th>Base year</th>
<th>Explanatory variables</th>
<th>Actual trade volume, in millions of dollars</th>
<th>Estimated trade volume, in millions of dollars (gap between the actual and the estimate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sohn Chan-hyun (2005)</td>
<td>1995</td>
<td>GDP, GDP per capita, distance, TCI APEC (dummy)</td>
<td>287</td>
<td>4,303.9 (15 times)</td>
</tr>
<tr>
<td>This paper</td>
<td>2008</td>
<td>GDP, distance, RTA (dummy) TL index</td>
<td>1,820</td>
<td>10,230–15,126 (5.6–8.3 times)</td>
</tr>
</tbody>
</table>

Source: Author’s data.

Notes: TCI = trade complementarity index; TL = trade liberalization. The estimation by Sohn (2005) is based on the assumption that North Korea’s TCI with South Korea is 0.6 and that North Korea becomes a member of the Asia-Pacific Economic Cooperation (APEC).

**Policy Implications and Conclusions**

Inter-Korean economic cooperation has gradually increased since the late 1980s even though it has been interrupted by noneconomic factors from time to time. It is generally agreed, however, that both sides on the Korean peninsula have not been able to exploit the potential of inter-Korean trade fully yet. Therefore, it has been the aim of this paper to examine the potential trade volume between the South and the North using gravity models. Even though similar efforts have been tried in the past, this paper differs from previous studies in several aspects. First, this paper uses gravity models augmented by additional explanatory variables such as RTA membership and a trade liberalization index. Also, this paper uses the most updated bilateral trade data of South Korea with its major trading partners. Furthermore, this paper compares its estimation result with those of the previous works and tries to find out how the two Koreas have narrowed the gap between the actual trade volume and the potential trade volume.
As a result of empirical tests, this paper concludes that there is still a wide range of gaps between the actual trade volume and the potential trade volume. As of 2008, exports from South Korea to North Korea could be increased by at least 8 to 12 times if North Korea were a normal market economy. Likewise, the total trade volume could be increased 6 to 8 times as well. If this potential were realized, trade with South Korea would take account of 40–60 percent of the North Korean GNI. Also, this potential would be enlarged if North Korea were to adopt a more liberalized trade regime.

When the result of this paper is compared with the results of previous studies, we can see that the gap between the actual trade volume and the potential one has narrowed over time. This is a positive change, which can provide more a optimistic perspective on the future.

A series of strong efforts must be made to fill the gap between the actual trade volume and the potential one. Several suggestions can be made with regard to this concern. First, the North Korean regime needs to liberalize the inter-Korean trading business, which is currently monopolized by a government-run state-owned enterprise. Second, many transaction costs such as logistics costs, communications costs, and customs clearance costs need to be reduced substantially. Third, South Korean firms need to contact and hire North Korean labor more freely so that they can take full advantage of the cheap and relatively well-educated labor force in the North. Fourth, the North Korean infrastructure needs to be improved dramatically. Without proper infrastructure, it is difficult to figure out where the comparative advantage of the North Korean economy lies. Infrastructure can include institutions such as financial institutions that are essential to increased international trade. Only when these market institutions are in place and prices are set by the market will North Korea find out its true comparative advantage. More than anything else, the political interference that has thus far greatly interrupted inter-Korean economic cooperation needs to be abandoned.

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