The Cost and Financing of Korean Unification

Yonsei University Young-Sun Lee

1. Introduction

Many people believe that the unification of the Korean Peninsula is fast approaching. However, no consensus exists as to exactly when and how it will take place. Nevertheless, North Korea is certain to change, and in response South Korea needs to guide it in a desirable direction. Numerous scenarios exist on the unification of Korean Peninsula, but even for unification through disintegration of the North, the form of unification and its economic consequences will be contingent on the response from the South.

The economic consequences of Korean unification have been a frequent object of discussion. Lee (1994), Noland et al (1996), and Park (1997) estimated unification costs using different theoretical approaches. In addition, some more estimates have been presented by the media, which were probably calculated using relatively a simple approach. Unfortunately, the diversity and complexity of unification cost estimation generated confusion in understanding and interpreting the estimates. Furthermore, the mere presentations of the seemingly large cost figures without any appropriate explanation have produced a rather passive attitude toward unification on the part of South Korea people.

This paper is intended to estimate the unification cost of Korea with theoretically and empirically acceptable concepts, especially in relation to the different forms of unification. This paper also discusses how much financial burden the South Korea people need to face, and how to finance it.

The paper consists of six sections. Following the introduction, the second section clarifies the concepts of unification cost. Various assumptions and characteristics of unification cost are discussed. In the third section, the cost of German unification is explained. An estimate of German unification cost is calculated using the computable general equilibrium model (CGE), and is compared to the actual cost paid by West German people after the German unification. Section four presents estimates of the costs of Korean unification are calculated by the CGE model for

different scenarios, namely rapid unification and gradual unification. Section five inquires into the feasibility and methods of financing the unification cost. Lastly, section six summarizes the paper's findings.

2. Forms of Unification and Concepts of Unification Cost

The concept of unification cost depends on how the words unification and cost are understood. The form of unification, whether unification is quick or gradual also affects unification cost. We presume that a quick unification or a gradual unification can be an object of our choice. If these two alternatives are not within our choice, it is meaningless to compare them.¹⁾

Some contend that a gradual unification will incur lower costs than quick unification. Gradual unification assumes that North Korea can accomplish economic transformation in the long term and gain economic efficiency, minimizing the resources that the South has to transfer to the North. Those who question such a gradual unification doubt whether the North can effectively carry out such a system transformation. Also, there is a view that gradual transformation will invite interference from the privileged class and hence make it difficult to minimize transformation cost.

Those who favor quick unification over gradual unification hold that the former may incur great initial cost but will result in an efficient economy sooner, thereby resulting in a lower cost in the long run. But those who prefer gradual unification assert that calculating the long-term cost of gradual unification in terms of present value using an appropriate discount rate may lead to a different conclusion. Whether quick unification is politically possible is beyond the scope of this paper. The possibility of quick unification on the Korean Peninsula after the case of Germany still remains uncertain: Seeing East Germany collapse, North Korea became more alert to avoid a similar collapse.

Another important question is whether the South Korean people are willing to accept the large albeit short-term financial burden accompanying a quick unification. In the German case, the economic burden of quick unification produced substantial socio-political complaints despite the remarkable strength of the West German economy, evidenced by a long-term trade surplus. In contrast, South Korea recently faced an economic crisis due to foreign currency shortage and financial difficulties. Whether South Korea, with a foreign debt of 156, 900 million dollars, can deal with the unification cost if unification suddenly occurs is a new question.²⁾ In such circum-

stances, gradual unification may be a better choice politically and economically.

The economic term for unification cost is the income or consumption opportunity we have to sacrifice if unification is chosen. We must first clarify what is precisely meant by 'we'. If 'we' includes South Korean residents only, everything that is sent to the North from the South for unification is a cost. If 'we' is viewed as the residents of a unified Korea, however, goods sent to the North from the South are no longer costs but merely a transfer of resources. From a broad nation-minded perspective, 'we' may be considered as the Korean people or a unified Korea. If South Korean residents have to choose between pursuing unification for peace and prosperity or keeping the status quo, 'we' or the subject of choice is South Korean residents. In this case, a transfer of resources to the North from the South is regarded as the cost of unification.

What costs are in store for South Korean residents in case of unification? Given the present situation where a great economic disparity exists between the two Koreas, unification will inevitably be accompanied by a transfer of resources from the South to the North. If the border between the two Koreas is abolished, a massive migration of North Koreans into South Korea is expected, given the poverty of the North Korean economy. This will lead to great confusion in South Korea and negatively affect the South's living standards. Keeping North Korean residents in the North by providing aid or guaranteeing North Korean residents certain living standards while allowing migration may be an ideal for social stability. In either case, South Korean residents will be required to pay for improving living standards in North Korea.

Unification cost is often defined as the amount of resources South Koreans must spend to bring North Korean living standards up to South Korean levels. Since South Korean residents can spend their resources for other purposes if they do not have to improve living standards in North Korea, it can be said that South Koreans will have to sacrifice for unification and the size of that sacrifice is the unification cost. How much South Koreans sacrifice depends on how close they aim to bridge the gap in living standards of the two Koreas. Completely equalizing per capita GNP in the two Koreas would not only require a long time but would also increase the burden on South Koreans. Therefore, what is often aimed at is to increase North Korean per capita GNP up to about 60% of South Korea's. Such an income gap is possible within one nation and is believed unlikely to result in massive migration.³⁾

〈 Table 1 〉 GDP and Domestic Demand in East Germany versus Transfers from the West
1991-1996

	(billion DM)					
	1991	1992	1993	1994	1995	1996
Gross Domestic Product(GDP)	206.6	265.6	323.2	366.1	398.0	414.2
Net exports	-154.4	-188.0	-192.4	-203.2	—	—
GDP minus net exports (consumption plus investment)	361.0	453.6	515.6	569.3	—	—
Transfers from West Germany	130.0	252.9	198.7	163.6	139.3	140.7
Transfers in percent of consumption plus Investment	36.7	55.8	38.5	28.7	—	—
Transfers in percent of GDP(East)	63.1	95.2	61.5	44.7	35.0	34.0
To compare:						
GDP of West Germany	2647.6	2813.0	2840.5	2962.1	3061.6	3127.3
Transfers in percent of GDP(West)	4.91	8.99	7.0	5.52	4.55	4.50

Source : Boss (1998), Sachverständigenrat (1997/98), own calculations.

3. The German Case

How much did Germany pay for unification? It is not easy to calculate the cost of German unification because we need to hypothesize how the German economy would have performed in the absence of unification. Nevertheless, the German case provides valuable lessons for South Korea. Information on how West Germany dealt with the economic burden of unification will help South Korea prepare for the financial burden of Korean unification.

After unification, Germany transferred approximately 1,000 billion DM from the West to the East between 1991 and 1996. As shown in Table 1, the size of economic aid from West Germany to East Germany amounted to 63% and 95% of East German GDP in 1991 and 1992 respectively. Afterwards, it started to decrease, amounting to 34% in 1996. The economic aid was used for projects like social security, deficit payment, privatization cost, and investment inducement.

About 75% of the financial input into East Germany was spent for consumption purposes such as guaranteeing living standards while less than 25% was spent for investment purposes such as creating jobs and improving competitiveness of the East German economy.⁴⁾ Approximately 50% of total transfer was paid out to households as social welfare expense and 25% took the form of interest payments, public spending, and transfer to the corporate sector.⁵⁾

〈Table 2〉 Investment in East Germany after Unification 1991-1995

(billion DM)

Industry	1991	1992	1993	1994	1995	Total
Agriculture and forestry	0.95	1.10	1.30	1.50	1.80	6.65
Manufacturing	32.45	41.10	45.20	49.20	56.20	221.45
-energy/water						
service,	10.35	14.15	17.00	19.10	22.30	82.90
mining						
-processing ¹⁾	18.50	22.50	23.70	24.60	27.50	116.80
-construction	3.60	4.45	4.50	5.50	6.40	24.45
Trade	4.35	5.30	5.70	6.00	5.80	27.15
Transport, Communication	16.15	22.50	24.90	26.70	28.80	119.05
Service	23.70	34.60	46.90	63.40	78.90	247.50
-house lease	15.90	23.90	31.40	44.90	56.60	172.70
-other services ²⁾	7.80	10.70	15.50	18.50	22.30	74.80
Private Total Investment	77.60	104.60	124.00	146.80	171.50	624.50
Public Total Investment	14.90	23.30	26.50	32.20	35.00	131.90
Total Investment	92.50	127.90	150.50	179.00	206.50	756.40

1) including construction of gas station

2) including banking and insurance

Source : Shin Dong-Chun (1988) p. 27.

There was relatively high expenditure on consumption purposes because the West German social security system, which was characterized by high benefits and very broad coverage, was applied to East Germany in its exact form. In particular, currency exchange with overvalued East German currency resulted in wage increases and diminished exports, leading to a large increase in unemployment and ultimately, large expenditures on social security. Also, since pensions in East Germany were given out according to the same rules as in West Germany, the size of pensions in East Germany more than doubled between 1991 and 1996. The standard pension in East Germany, which was 40.3% of the West German pension before unification, increased to 80% of the West German pension after unification. The federal government had to make up for what was lacking in the East German pension fund with the West German pension fund.⁶⁾ A great rise in East German unemployment after unification called for a huge financial transfusion

〈Table 3〉 Main economic indicators in East Germany after Unification 1991-1996

(West Germany = 100)

	1991	1992	1993	1994	1995	1996
GDP per capita	31.3	38.5	46.2	50.6	52.8	54.4
Investment per capita in equipment	63.6	75.3	99.5	111.7	—	—
Investment per capita in Construction	67.2	100.8	129.1	164.9	180.6	184.5
Housing	44.5	61.3	81.8	115.8	136.8	146.2
Enterprises	89.4	141.5	195.5	233.3	245.3	239.3
Productivity ¹⁾	31.0	43.1	51.6	54.3	55.2	56.8
Relative wage ²⁾	150.7	140.9	131.6	129.8	131.2	130.0

1) GDP per labor (in market price)

2) Non-self employed income per capita/ GDP per labor

Source : DIW, Wochenbericht, 17/97 (April 1997), p. 306.

from West Germany in order to meet East Germany's employment insurance payment.

Table 2 shows that from 1991 to 1995, investment in East Germany reached 756 billion DM, of which 624.5 billion DM, about 83% of the total amount, came from the private sector and 131.9 DM, about 17% of the total amount, came from the public sector. A large part of the investment, about 33%, went to the service industry. A large 70% of the total investment was in housing. Out of the rest, 30% was invested in the manufacturing industry and 17% in transport and communication.

The German experience tells us that two kinds of expenditures were made in the unification process: investments aiming at increasing productivity in East Germany and expenditures to maintain the quality of life for residents in East Germany. All consumption expenditures were made from public sources, while investment expenditures came from both the public and private sectors. Investments from private sources cannot be regarded as public expenditure, since these investments are expected to profit the investors in the future. Therefore it can be said that unification costs consist of consumption costs for crisis management and investment made by public institutions.

Table 3 shows changes in the main economic indicators in East Germany after unification. GDP in East Germany increased from 31.3% of West Germany's in 1991 to 54.4% in 1996. The

relatively rapid economic growth in East Germany is a result of a higher rate of investment per capita in East Germany compared to West Germany. Compared to West Germany, per capita investment in equipment rose from 63.3% of the West's in 1991 to 111.7% in 1994 and investment in construction rose from 67.2% of the West's in 1991 to 184.5% in 1996. These numbers suggest that resources were transferred from West Germany to East Germany at a very rapid rate. But productivity in East Germany did not increase as quickly, reaching only 56.8% of the West German productivity level in 1996.

However, the relative wage cost of East Germany to West Germany, expressed by the ratio of wage income per capita of employed to GDP per labor, decreased from 150.7% in 1991 to 130% in 1996. The decrease was due to the increase of labor productivity in East Germany. But since the level of East German labor productivity is still much lower than that of West Germany, the relative wage cost is significantly higher in East Germany.

Could a faster growth of the East German economy have been possible if investment allocation in East Germany after unification had been more efficient? To answer this question, we calculate the required amount of investment under the assumption that the optimal allocation of investment could have been made in East Germany. Such a calculation can be made using the computable general equilibrium model (CGE model).⁷⁾ This model is based on neo-classical economic theory, which assumes that all markets are perfectly competitive and all production factors including labor and capital are fully employed. The model operates under the assumption that all economic actors regard the market price system as given and try to pursue their goals within their limited constraints. Also, in the initial economic structure all resources are optimally distributed. Of course one may question whether the economic activities of a socialist state like East Germany can be analyzed through a neo-classical model. However, as Lange and Taylor (1998) pointed out, if economic planners were to maximize a society's welfare by allocating resources according to the goals of that particular society it is at least theoretically possible to achieve a 'Pareto optimum' in a socialist state. Of course, lack of information and a rigid bureaucracy make it difficult for the Pareto optimum to be achieved in the real world. However, the results of applying such a model provide us with an ideal picture of an economy.⁸⁾

The minimum investment cost for East Germany to achieve 60% of West Germany's GDP per capita was calculated by using East Germany's 1987 economic data with the CGE model. This was done under the premise that a large amount of East German capital would become valueless

〈 Table 4 〉 Minimum German unification cost and optimal investment in each industrial sector
(investment in billion DM, structure in %)

Industry	Optimal investment		Industrial Structure (Value Added)	Industrial Structure (Products)
	Amount	Structure		
Agriculture, forestry & fishing	80.8	11.96	7.47	8.01
Mining and quarrying	34.6	5.12	6.92	4.91
Light industry	53.3	7.90	10.36	17.08
Chemicals	63.8	9.45	14.06	15.89
Ceramics, stones, clays	25.0	3.70	2.29	2.78
Primary metal products	17.3	2.50	2.80	5.40
Metal products	27.5	4.08	4.35	4.72
Mechanical engineering	28.8	4.27	3.58	4.35
Electronics	33.2	4.91	4.98	4.92
Fine machines	2.5	0.37	0.34	0.31
Transport machines	15.3	2.27	2.20	2.45
Other manufacturing	5.3	0.70	0.80	0.70
Electricity, Gas, Water	21.1	3.13	1.02	2.61
Construction	14.7	2.17	1.06	1.32
Service	252.9	37.31	37.62	24.41
Sum	676.1	100%	100%	100%

after unification, since East German capital differs greatly from West German capital in terms of productivity or other aspects of quality. We estimated the amount of total investment and optimal allocation of investment throughout different industries under the assumption that only 30% of East Germany's capital would be useful after unification.⁹⁾

According to the results shown in Table 4, a total of 676.1 billion DM in 1987 prices must be invested in East Germany for its GDP per capita to reach 60% of West Germany's level. The results also recommended that 37.3% of the total investment be made in the service sector, 12% in agriculture and fishery, 9.5% in the chemical industry and 7.9% in light industry in order to achieve optimal allocation. Considering the industrial structure of East Germany in 1987, this implies that for faster economic growth in East Germany, light industry has to be reduced and the chemical and service industries have to be expanded.

It is very interesting to compare these results with Germany's actual situation after unification.

First of all, the total investment made in East Germany after unification until 1995 was 884.5 billion DM, which was 30.8% more than 676.1 billion DM, the suggested amount of minimum investment.

The reason why East Germany's GDP per capita remains at 52.8% of West Germany's despite this large amount of investment is either because investment in East Germany was not optimally allocated or because the real amount of investment was calculated in current prices. Therefore, if the annual amount of actual investment is converted to 1987 constant prices under an assumed average inflation rate of 2%, the amount of real investment through 1995 adds up to 786.9 billion DM. The discounted investment volume in 1987 prices exceeds the minimum investment calculated by CGE-model. This result shows that the investment had not been optimally allocated.

In short, even though the actual investment made from 1991 to 1995, 786.9 billion DM in 1987 prices, exceeded the required amount of optimal investment to increase East German GDP per capita to 60% of West Germany's by a factor of 1.16, the per capita GDP of East Germany in 1995 was still only 52.8% of West Germany's.

Then how much more actual investment is needed for East Germany's per capita GDP to reach 60% of West Germany's? If we linearly extrapolate the figures estimated above, we find that 1 trillion and 35.4 billion DM should be invested, which is 1.53 times the amount that was estimated by the CGE model. In the actual process of investment, inefficient allocation and management could cause the amount of investment to greatly increase.

It is necessary to point out again that the amount of investment is not entirely public cost. If we apply a 17% rate of public investment to total investment between 1991 and 1995, to the total required investment of 1035 billion DM, the public investment cost would be only 176 billion DM. If we assume that East Germany's GDP per capita becomes 60% of West Germany's in 1999, and West Germany transfers income to East Germany for crisis management until that time, the total crisis management cost would be 1320.7 billion DM. And the total unification cost becomes 1497 billion DM, including crisis management cost and investment cost.

Since Germany was unified through a rapid rather than gradual process, the main fiscal burden of unification was crisis management cost, mainly social security cost. The social security contribution of the German people increased after unification from 16.9% of GDP in 1990 to 20.0% in 1997, while the ratio of tax burden to GDP changed little; 23.6% in 1990 to 22.6% in 1997

〈Table 5〉 Government Expenditures, Taxes, Contributions to Social Security, Balance and Public Sector Debt of Germany and South Korea (in relation to GDP)

Year	Government Expenditures (a)	Taxes	Contributions to social security	Other Revenues	Balance	Public sector debt (b)
West Germany						
1980	49.0	25.9	16.9	3.3	−2.9	31.8
1985	48.0	25.2	17.6	4.0	−1.2	41.7
1990	46.1	23.6	16.9	3.5	−2.1	43.4
Germany						
1991	50.1	24.1	18.0	3.3	−4.5	44.0
1992	51.9	24.5	18.3	3.7	−5.4	48.7
1993	52.7	24.4	18.8	3.7	−5.8	54.6
1994	51.4	24.4	19.3	3.7	−3.9	57.6
1995	50.7	24.2	19.5	3.6	−3.4	58.0
1996	50.0	23.2	19.9	3.4	−3.5	60.4
1997	49.0	22.6	20.0	3.3	−3.1	61.7
South Korea						
1991	10.3	17.8	1.6	3.2	−1.9	13.4
1992	10.9	18.6	1.7	3.7	−0.7	13.5
1993	10.8	18.8	1.7	2.8	0.3	12.4
1994	10.6	19.8	1.9	2.9	0.5	11.4
1995	10.3	20.5	1.8	2.4	0.4	10.2
1996	10.7	21.1	2.0	2.4	−0.3	—

(a) NIPA, including Treuhandanstalt.

(b) At the end of the year

Source : Statistisches Bundesamt (1997a, b) Sachverständigenrat (1996), Boss (1998) and Public Finance Statistics of Korea (1997)

(see Table 5). These facts indicate that the main fiscal burden of German unification was shouldered by the social security contributions of the West German people.

Another remarkable change in financial situation of Germany after unification has been the increase in the public sector debt. Germany's total outstanding public sector debt increased from 1,298 billion DM in 1991 to 2,140 billion DM in 1996, which led the debt-to-GDP ratio to

increase from 44.0% in 1991 to 60.4% in 1996, indicating that the unified Germany increased public debt by as much as 3% of GDP every year in the first five years following unification. Therefore, we can conclude that the two main financial sources for fiscal burden of the German unification were social security contributions and public debt, sharing more or less equal importance.

The issuing of government bonds and social security tax were important means of raising funds for unification: The German government also applied various other measures to finance unification such as government budget cuts, increased taxes for West German residents, borrowing from capital markets, and disposal of national assets.

To evenly distribute the burden of unification costs the German government tried to engage the federal government, state governments and local governments equally. The costs were distributed equally by enacting a law of financial balance among states and the fund was basically raised through issuing government bonds. Also, in order to fairly distribute the costs of unification among the different social classes, the government imposed a surcharge of 7.5% to corporate and income taxes.

4. Estimates of the Cost of Korean Unification

The case of Germany gives us an insight into the cost of Korean unification and how to finance it, although the German model cannot be applied directly to the Korean case since the costs of unification as well as financing methods will depend on the procedure of unification as well as on the economic situation. There are two main scenarios for unification on the Korean peninsula: rapid unification as was the case with Germany, and gradual unification. Depending on the form of unification there are two kinds of unification costs. First there are investment costs to increase North Korea's productivity to match that of South Korea's. There are also crisis management costs in the form of living expenses to prevent massive migration of North Korean residents to South Korea since North Korea's GDP per capita is far lower than South Korea's.

Investment costs will be lower for rapid unification compared to gradual unification, because in the case of rapid unification North Korea's economy will quickly be transformed into a market economy and the price mechanism will enable efficient investment allocation. However, as in the case of Germany the cost for rapid unification mainly consists of crisis management costs. If

the borders between the two countries dissolve and the income gap is not solved quickly North Korean residents are expected to swarm into South Korea. To prevent such massive migration, it is necessary to find a way to secure their lives in North Korea. Although investment will gradually increase North Korean productivity, South Korean residents will have to transfer their income to support North Korea as long as North Korea's GDP per capita remains below 60% of South Korea's. This is assumed to be the minimum level of income for North Korean people to stay in the North.

In the case of gradual unification, there are investment costs and crisis management costs. Gradual unification refers to the unification of North and South Korea's politico-economic system based on the agreement of both countries. This means that North Korea will open and reform its economy gradually with South Korean support until complete economic unification is achieved. Unless integration of the two politico-economic systems is accomplished, borders between the two countries will keep residents from moving freely from one side to the other.

Crisis management costs will be lower with gradual unification. If borders remain and keep residents from migrating, crisis management funds might not be necessary. If these borders are eliminated before North Korea's GDP per capita reaches 60% of South Korea's, crisis management costs will be needed.

Investment costs will be more burdensome with gradual unification. If the process of unification is gradual it means that North Korea's planned economic system will be preserved for a while. Although the effectiveness of investment will increase with the opening and reform of the economy, it is expected that investment activities by the North Korean authorities will tend to be inefficient as long as the economic system is not a market system. That is, in the case of gradual unification, crisis management costs will be low, but investment costs high.

A. Methodology, Assumptions, and Data

Let us now estimate the investment costs and crisis management costs in both cases. First of all, let us assume that the collapse of borders allows South Korean companies to invest in North Korea and North Korean residents to move to South Korea. In this case, how much must be invested in North Korea for North Korea's GDP per capita to reach 60% of South Korea's? To find an answer to this question we will try to apply the CGE model that was used for Germany.

As mentioned in the process of estimating unification costs for Germany, the estimation of

unification costs based on the CGE model involves calculating the minimum resources necessary to increase North Korea's GDP per capita to a certain level, for example, 60% of South Korea's per capita GDP. In this case we follow the neo-classical assumption that the current industrial structure enables the best possible allocation and new investments are fairly allocated by the market. Of course the reality is different. As seen in the case of Germany, actual costs of investment were much higher than estimated through this method. We apply this method since it gives us insight about the minimum cost of unification.

In order to apply this model to North Korea we collected data on North Korea's industrial structure, and created a social accounting matrix for North Korea. To do so we needed access to an input-output table for North Korea and created one based on East German data. The general practice in making input-output tables for North Korea is to use Chinese data, but since North Korea's economic structure is far more dependent on heavy and chemical industry than South Korea or China, its industrial structure can be assumed to have more in common with East Germany's industrial structure before unification.

It is also important to know how much of North Korea's capital stock is usable for actual production. As seen in the German case, most of North Korea's capital stock will become useless with unification. Since most facilities are in bad shape, labor costs are expected to rise after unification, and technological know-how is lacking, it is difficult for most of the capital to be utilized after unification. Therefore we assume, as in the case of Germany, that only 30% of the existing capital stock will be usable. In terms of technology and capital, North Korea is far behind East Germany, so most of North Korea's capital stock is likely to be discarded after unification. However, if North Korea's wages do not increase at the rate of East Germany's, North Korea's low quality capital might not be discarded so quickly.

If unification is achieved under these assumptions and South Korea continues to invest in North Korea until North Korea's GDP per capita reaches 60% of South Korea's and this investment is allocated properly, how much investment has to be transferred to North Korea?

To acquire actual numbers with the CGE model we need to set a base year. Although it is best to use the most recent data, considering the availability of data and the economic situation, 1990 was chosen as the base year. In 1990 the North Korean economy was relatively sound, but with the collapse of the Soviet Bloc the economy started to decline. One may suggest that the costs should be estimated in light of North Korea's current economic situation. Since it is more

〈Table 6〉 The unification cost, optimal allocation of investment and North Korean industrial structure after unification (North Korea's GDP per capita = 0.6 x South Korea's GDP per capita).

Industry	Optimal investment		industrial structure (value added)	Industrial structure (%) (product)
	Amount (billion \$)	%		
Agriculture	14.626	16.50	17.91	16.08
Mining	9.676	10.80	5.40	4.72
Light industry	5.622	6.34	6.97	14.43
Chemicals	9.956	11.23	3.96	6.55
Primary metals	4.682	5.28	2.04	5.02
Metals, machinery	16.322	18.41	13.02	14.95
Other manufacturing	0.666	0.75	0.77	0.72
Electronics, gas, water	3.772	4.25	1.70	2.76
Service	23.427	26.43	48.23	34.78
Total	88.749	100%	100%	100%

important to analyze whether South Korea is capable of financing unification based on the normal economic structure of the two countries, we decided to take 1990 as the base year since in that year, both economies were in relatively normal condition.

The Bank of Korea estimated North Korea's GNP in 1990 to be approximately 23.1 billion dollars. This means that North Korea's GDP per capita was \$1,066. In the same year South Korea's GDP per capita was \$5,693, about five times the North Korea's.

B. Cost of Rapid Unification

In order for North Korea's GDP per capita to reach 60% of South Korea's i.e., \$3,416, the minimum amount of needed investment according to the CGE model is \$88.9 billion. If this investment is well allocated among industries, this amount can be regarded as the lower limit. Table 6 shows the allocation of investment across industries and North Korea's industrial structure in terms of production. Note that not all investments are public expenditures, since a large portion of the investment will come from private sources. In Germany only 17% of total investment came from the public sector, but public investment will probably constitute a much larger portion in Korea since the South Korean economy has a more government-led growth strategy

than the West German economy. If the public sector contributes about 30% of the investment cost, approximately \$26.7 billion will be from public sources.

The CGE model does not take the time factor into consideration. In other words, the CGE model neglects the time it will take for North Korea's GDP per capita to reach 60% of South Korea's and assumes that North Korea will achieve the desired economic growth without any adjustment costs. However, this is not true in reality. Such a large amount of investment cannot be made in a short period of time, and even if it were, productivity is unlikely to increase at once. As seen in the German example it will take about 10 years for East Germany's GDP to reach 60% of West Germany's GDP.

If it takes this long for North Korea to catch up to South Korea, North Koreans will probably want to move to South Korea until the North's GDP per capita increases to 60% of South Korea's. To prevent migration, South Korea has to provide some kind of crisis management cost or adjustment cost. Therefore we assume that South Korea will provide support to North Korea to bridge the economic gap until North Korea's GDP per capita reaches its goal. The amount of the crisis management cost depends on how fast North Korea increases its GDP per capita. The longer this period is, the higher the cost will be. What also needs to be considered is the fact that South Korea's GDP per capita also will increase with time; here we will assume that South Korea's GDP per capita will increase by 6% every year.

The speed of North Korea's economic growth depends on how fast the country opens and reforms its economy in the process of economic integration and as a result establishes an effective market economy. Since this cannot be determined in advance, we will conduct simulations for two scenarios.

In the first scenario we assume that North Korea increases its GDP per capita to 60% of South Korea's level within 5 years. Since North Korea's GDP per capita in the base year is 20% of South Korea's we assume that the gap will decline by 10% every year. The amount of annual investment in crisis management costs, North Korea's economic growth rate, and unification costs are laid out in Table 7.

The total amount of investment when it is optimally allocated is \$145.9 billion and the reason that this figure is much larger than the results shown in Table 6 is because the South Korean economy is expected to grow as well and more investment will be needed to bridge the gap between the North and the South. If public investment represents 30% of the total needed

〈 Table 7 〉 Unification cost of Korea according to scenario 1

(billion \$)

	Investment cost	Public investment cost (A)	Crisis management cost (B)	Unification cost (A + B)	Growth rate of North Korea
1st year	2.0	0.6	52.4	53.0	13.2
2nd year	18.0	5.4	41.6	47.0	59.0
3rd year	28.0	8.4	29.4	37.8	41.3
4th year	40.8	12.2	15.6	27.8	32.5
5th year	57.1	17.1	0	17.1	27.2
Total	145.9	43.7	139	182.7	

Assumption

- (1) Base year = 1990
- (2) South Korean economy grows 6% per year
- (3) North Korean GDP per capita grows to overtake yearly 10% of the income gap to South Korean GDP

amount, \$43.7 billion will be financed from public sources. However, this amount can also be estimated assuming that investment is properly allocated across industries. Even if a market economy is introduced in North Korea after rapid unification, time will be needed for the system to work and it is unlikely that the investments will be allocated efficiently. The figure presented above thus refers to minimum costs and actual expenditures will easily exceed it.

A total of \$139 billion in crisis management costs will be needed to increase North Korea's per capita income to 60% of South Korea's per capita income. As in the case of Germany, social security costs will exceed investment costs by far. The sum of public investment and crisis management costs is \$182.7 billion which is about 60% of South Korea's GNP in 1990. In other words, 12% of South Korea's GNP must be transferred to North Korea every year for five years after unification. If the figure is too large to be covered by income generated each year, the government could issue bonds or borrow from abroad. If bonds are issued and foreign loans are available, South Korea would only have to redistribute a burden of 5-6% of its annual GNP over ten years after unification.

The second scenario is based on the assumption that it will take about 10 years for North Korea's GDP per capita to reach 60% of South Korea's GDP per capita, as occurred in Germany.

〈Table 8〉 Unification cost of Korea according to scenario 2

	Investment cost	Public Investment cost (A)	Crisis management cost (B)	Unification cost (A + B)
1st year	0.4	0.1	52.7	52.8
2nd year	2.6	0.8	55.8	56.6
3rd year	4.0	1.2	58.5	59.7
4th year	6.3	1.9	60.4	62.3
5th year	7.8	2.3	61.1	63.4
6th year	6.5	2.0	60.3	62.3
7th year	10.9	3.3	57.2	60.5
8th year	18.1	5.4	51.0	56.4
9th year	18.5	5.6	40.8	46.4
10th year	21.0	6.3	25.0	31.3
11th year	25.7	7.7	2.0	9.7
Total	121.8	36.6	524.8	561.4

Assumption:

- (1) Base year: 1990
- (2) Yearly growth rate of GDP per capita of South Korea is 6% and that of North Korea is 12%
- (3) South Korea pays investment cost and crisis management cost until North Korea's GDP per capita reaches 60% of South Korea's

In this case the crisis management costs will be considerable, because the income gap between the two regions should be bridged by the rising social security costs for a longer period. Investment costs will not necessarily increase, because the longer the transition takes, the more the facilities that were created with the initial investments will contribute to North Korea's economic growth for a longer period. If there is little time to bridge the income gap, however, a significant amount of capital will be needed right away. As seen in Table 8 the total amount of investment during the 11 years is \$121.8 billion. If we suppose that 30% of the total investment comes from the public sector, public investment will be approximately \$36.6 billion. The crisis management cost to secure the lives of North Korean residents will be about \$524.8 billion. Adding public investment expenditure to this figure, South Korea will spend about \$561.4 billion in public spending to achieve unification within 11 years. The per capita income for South Korea in the last year of this time span will be \$19,354, and \$11,520 for North Korea. This figure tells us that

in this scenario, crisis management costs will be much larger than in the scenario that aims at bridging the income gap in 5 years. This is because the longer the process takes, the larger the costs to bridge the income gap since South Korea's income level will increase with time.

The amount of these costs is similar to the results of the study by Lee (1994), and Noland, Robinson and Scatasta (1996).¹⁰⁾ Unification costs will be much larger in the second scenario and that this gap is due to social welfare costs. The crisis management funds needed to secure the lives of North Koreans include aid for the unemployed, financial support for the elderly, medical insurance, education funds, and financial aid for local governments in North Korea. According to Park (1997), financial aid for the unemployed will be about 70% of the total crisis management costs.¹¹⁾

At this point we need to discuss how such crisis management costs can be minimized. The best way to cut crisis management costs is to bridge the income gap as soon as possible. In order to do so a large amount of investment must be transferred to North Korea. Depending on the will of the government, the volume of public investment may increase within a short period. However, the amount of private investment, which is expected to play a significant role in the unification scenario, is variable depending on the economic situation. Since private investment will be stimulated by a market system, the creation of a proper legal order will be very important. The establishment of social infrastructure will also help invite private investment to the region. Thus we can say that increase in public investment will reduce crisis management costs.

So far we have discussed the unification costs in the case of rapid unification. How will the unification costs in a gradual unification process be different?

C. Cost of Gradual Unification

Gradual unification refers to a state where the borders between North and South remain, preventing a massive migration of North Koreans to the South, and North Korea introduces a market system based on an agreement between the North and the South. South Korea is assumed to continue its financial support only until North Korea's per capita income reaches 60% of South Korea's. Since there will be no massive migration of North Koreans no additional social welfare expenditures will be needed. However, unless North Korea introduces a market system right away, inefficient investment will continue for a long time. Thus investment expenditures will be much larger than in the case of rapid unification. A study of the East European experience

shows that the productivity of investment in socialist states is only 2/3 that of capitalist states.¹²⁾ North Korea's investment efficiency is expected to be even lower than that of East Europe, since it has a much stronger socialist system. If we assume that North Korea's investment efficiency for the period of gradual unification of ten years is half of South Korea's, the total public transfer needed from South Korea will be about 73.2 billion dollars which is significantly larger than the public investment costs of rapid unification.

However, even if investment costs are twice as high as those for rapid unification, the total amount of unification costs will be much smaller for gradual unification since there are no crisis management costs. This is because in rapid unification, crisis management costs exceed investment costs. The question is whether North and South Korea can reach an agreement to pursue gradual unification. If there is no firm belief that North Korea will in the long run embrace democracy and a market economy and also open and reform its economy, it is doubtful whether South Korea will continue its financial support. It is also possible that in the process of pursuing gradual unification sudden changes will lead to rapid unification. In this case the unification costs can be estimated by combining the two cases explained above. In the extreme, a significant portion of transfers from the South to the North may be used for consumption purposes to increase the living standard of North Korea even if a gradual procedure of unification is taken. In this case, the cost of gradual unification will be much higher than the figure estimated with the assumption of no crisis management cost.

5. Financing Unification Cost

How can the fiscal burden of Korean unification be financed? Increasing tax rates, curtailing government expenditure, issuing government bonds in both domestic and foreign markets, inviting foreign capital and selling state-run enterprises in North Korea are some measures to finance the cost of unification.

The tax burden to GDP rate in South Korea rose to 21.1% in 1996 as shown in Table 5 and is likely to climb further with increases in financial demand, especially for social welfare. Even if the current tax burden ratio is still low compared to that of most OECD countries, it would be difficult to raise the tax burden rate by more than 2.0% in order to meet unification cost, since the tax burden ratio is already close to that of Japan, a country with an economic structure and cultural background similar to Korea's. Once peace takes root in the Korean Peninsula as a

result of unification, the size of defense expenditure may be reduced by 1.5% of GNP¹³⁾. Expenditures other than defense could also be spared for unification financing by, say, 0.5% of GDP. Issuing government bonds was regarded as another measure for securing fiscal burden until the 1997 financial crisis broke out in South Korea. Until the crisis, the financial position of the South Korean government was rather sound, with a budget surplus of about 0.4% of GNP from 1993 to 1995, and a deficit of 0.3% in 1996, which was quite low compared to other OECD countries. Also, the outstanding stock of government debt has not been a serious problem in South Korea, the government debt to GNP ratios having decreased from 14.9% in 1990 to 10.2% in 1995, which can be considered as quite low compared to the German case; 45.5% in 1991 and 60.4% in 1996 as shown in Table 5. It was once thought that the South Korean government could increase the public debt by at least 3% of GNP every year for five years, which would make the outstanding public debt ratio to GNP about 25%.

The 1997 financial crisis made the possibility of debt financing very uncertain. At this moment, it is difficult to predict how much foreign debt should be repaid by the government in the future. If we assume that about 50 billion US dollars in addition to the existing foreign debt before the crisis will be paid by the government, the public debt to GNP will soar up to about 30%. Since this ratio is still lower than Germany's in 1991, one might think that there would be room for the government to issue bonds to cover the fiscal burden for unification, raising about 2% of GNP per year, which would make the debt-to-GNP ratio over 40 percent within five years. Again, this ratio is still lower than in the German case, but the rapid increase in the public debt will increase interest rates, which may reduce private investment so that economic growth would slow down, which in turn would make it difficult to mobilize resources for the fiscal burden of unification.

It is also important that revenues from government bonds be used in constructing production-related facilities in North Korea to minimize the effects of financial deficit such as inflation and increased interest rate. It is desirable to avoid a fiscal deficit financed by printing money.

Attracting foreign capital will also contribute to securing unification cost. Foreign capital may be invited to invest in profitable social infrastructure such as communications and electricity. In fact, there is some possibility for foreign capital to be invested in North Korea, but most of it will be on a commercial basis, so that the fiscal burden for public purposes will not be reduced. The government needs to take over most of the public investment in social infrastructure. As we

could see in the German case we can not expect to earn net revenue from selling state-run enterprises, because most of them are old fashioned and obsolete.

In short, increasing the tax rate and curtailing financial expenditures will allow about 4% of yearly GNP to be used for meeting unification costs, which is sufficient for the investment requirement in the case of gradual unification. A gradual unification will have no significant financial difficulties. However, a quick unification will require dependence on government bonds and foreign deficits to meet the high initial cost of crisis management, amounting to over 4% of GNP. In this case, financial difficulties will be an important problem.

6. Concluding Remarks

We have looked at how unification cost varies with the form of unification. We found that quick unification would incur lower investment costs and higher crisis management costs compared to gradual unification. The total unification cost in case of rapid unification is estimated to be about 60% of South Korea's 1990 GNP, a sum that can be transferred to North Korea by sending 5-6% of GNP each year to the North for ten years after unification. If gradual unification is possible, the unification cost will be much lower since the crisis management cost will be much lower.

The estimated cost of unification can be financed through higher taxes, expenditure reduction, and borrowing. However, the question is how to deliver the financial resources temporarily required by unification and how to distribute the burden of unification across generations and income groups. This is a political rather than economic question.

Resource mobilization and distribution of the financial burden will be the most urgent problems in the case of a quick unification while efficient transformation of the North Korean system will be most important in the case of a gradual unification. If system transformation takes a long period of time, the political management of various interest groups will emerge as a hot issue.

Also, unification cost may be controlled through appropriate policy choices. A quick unification requires policies such as minimizing crisis management cost while gradual unification calls for policies that accelerate transformation of the North Korean system, thereby speeding up the realization of unification benefits.

Finally, the author wants to emphasize that the recent economic crisis in South Korea can have an important impact on the course of Korean unification. The South Korean government's dete-

riorated financial position would make gradual unification more financially feasible than quick unification.

Notes

- 1) Here, quick unification means that South Korea can take over North Korea in a very short period of time after political collapse of the North Korean government. Also, gradual unification means that the Korean Peninsula becomes united through an agreement between South and North Korea to create a unified country over a much longer period of time during which the two countries go through political and economic system transformation into a unified one.
- 2) This is a gross figure for the end of 1997. Since Korea's claims on the rest of the world is estimated at about 60,600 million dollars, the net foreign debt of Korea as of the end of 1997 was 96,300 million dollars.
- 3) See Noland (1996), p.3.
- 4) See Boss (1998), Table 2.
- 5) See Boss (1998), Table 2.
- 6) See Boss (1998), Table 2.
- 7) The computable general equilibrium model (CGE model) has been used for calculating unification cost by Noland-Robinson-Scatasta (1996) for the North Korean case, and by Shin (1998) for the German case and the Korean case.
- 8) For more information on the estimation of unification costs by the CGE model refer to research by Dong-Chun Shin of the Institute for Korean Unification Studies: "Economic Cooperation and Unification Costs: A Comparative Analysis between Germany and Korea", February, 1998.
- 9) The assumption that only 30% of the existing capital will be useful after unification is based on Sinn and Sinn's (1992) estimation of capital amount. Gerlinde Sinn and Hans-Werner Sinn (1992), *Jumpstart: the Economic Unification of Germany*, translated by Juli Irving-Lessmann, MIT Press, p.102.
- 10) In the study by Young-Sun Lee (1994) government spending and the reduction of consumption expenditure to balance the per capita income between North and South were considered as unification costs and in the 40 years after 1990 unification costs were estimated at about \$330-\$841 billion. To bridge the income gap South Korea will have to transfer about 6% of its GNP every year for 10 years. Noland, et al (1996) based their study on the assumption that in order for North Korea's per capita income to reach 60% of South Korea's per capita income, North Korea will have to adopt a market economy and will need \$415-\$2242 billion for unification costs depending on the time of unification.
- 11) Park Tae-kyu (1997), "Estimating Unification Costs and Ways to Raise Funds", *Economic Integration*

- Strategies and Unification on the Korean Peninsula (Hong-taek Chun, Young-sun Lee), KDI, p.488.
- 12) This is the result of empirical analysis performed by Gregory and Stuart, who compared the productivity growth between GDR and FRG from 1960 to 1981. See Gregory & Stuart (1985), *Comparative Economic Systems*, 2nd Ed. Houghton Mifflin Company, Boston. p. 528.
- 13) Cho (1997) estimated the normal level of defense expenditure when Korea is in peace from a regression analysis using cross country data, and found that South Korean defense expenditure can be reduced by 1.5% of its GNP.

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