

Estimating the Minimum Size of the North Korean Shadow Economy

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Estimating the relative size of the shadow economy, which is often called an underground economy, is important in any country to make effective economic decisions. In particular, it can be crucial to understanding the economic performance of North Korea, whose official economic sector is rapidly dismantling. This paper tried to estimate the relative size of the North Korean shadow economy and therefore defining the shadow economy as 'all economic activities that are carried on outside the state-controlled economy'. This paper introduced the current status of the North Korean shadow economy as well as some background information behind it. Beginning with rough estimates made by rule of thumb, this paper employs three different methods to estimate the relative size of the North Korean shadow economy as of 1999. First, it tries to sum up individual shadow economic sectors based on various sources. Assuming that there are three supply routes for the shadow economy, this paper estimated each of them and adds them up. According to this method, the shadow economy is accounting for at least 12.2% of GDP. Second, by relying on surveys recently conducted with North Korean refugees, it tried to estimate the shadow economy by examining the differences between

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income and expenditure levels of North Korean households. This method estimates the North Korean shadow economy to be as big as 11.5% of its GDP. Third, assuming that electricity consumption is the single most important physical indicator that can explain the growth of an overall economy, this paper estimated the overall size of the North Korean economy first. After that, it calculated the size of the shadow economy by subtracting the official GDP from the overall GDP. This method can be regarded as the most rigorous method, and it estimated the North Korean shadow economic size as at least 11.5% of its official economic size. Whichever method is employed, we come up with the estimate of the North Korean shadow economic size, which is approximately 12% of its official economic size as of 1999. But, it has to be noted that most of these estimations are based on the assumptions that can estimate the shadow economic size at its minimum level. Therefore, it is very likely that the actual size of the North Korean shadow economy can be slightly larger than these estimations.

I. Introduction

In any country, its economy is composed of official and unofficial sectors. The latter is called a black economy, underground economy, the second economy or the shadow economy. For the sake of convenience and also based on some reasons, which will be stated later, it will be called the 'shadow economy' in this paper. Whatever it might be named, the shadow economy accounts for a vast amount of the overall economic activities in most countries. However, the shadow economy is excluded from the official estimation of GDP largely because it is composed of many illegal activities, and also, partly because it is difficult to correctly estimate the size. In the

market economy, the shadow economy is generally interpreted as an underground economy as most of its activities are non-taxable and illegal. However, in a centrally planned economy (CPE) such as North Korea, it can have a broader meaning. Not only it contains many illegal activities within its official economic system but also it embraces many legal and illegal activities that are taking place outside the official sector. In this regard, it is difficult to understand the overall economic performance of North Korea without correctly appreciating its shadow economic sector.

Generally speaking, measuring the shadow economy can be important due to the following reasons. First, in most of the countries, the shadow economy is accounts for at least 10% of its official economic size.¹⁾ Due to this indispensable size of the shadow economy, the official economy alone can not provide enough information to policy makers who are trying to make effective economic policy decisions. Second, the growing shadow economy can influence the official economy in many ways, which are mostly negative. It can induce transfers of labor and other resources from the official economic sector to the shadow economic sector. Also it can encourage tax-evading behaviors. The negative effects of the shadow economy can hollow out the official economic sector. At the same time, a sizable income earned in the shadow economy will be spent in the official economy, the shadow economy can contribute to the growth of the official economy in positive ways as well.²⁾ Third, unlike the market economy, the shadow economy in a socialist (or a transition) economy can complement the official economy. As a socialist economy tends to become an 'economy of shortage' as Kornai [10] described, the official economy alone can not provide enough goods and services through its ordinary rationing system to its households. Therefore, the existence of a

1) Refer to Table 2 of Schneider and Enste [26], p. 80.

2) Refer to Schneider and Enste [27], p. 9.

shadow economy can complement the official economic sector by providing many necessity goods that are not supplied by the state rationing system. Due to these reasons, correctly estimating the relative size of the shadow economy can be particularly crucial in analyzing the North Korean economy.

This paper is composed of five sections. The following section introduces various definitions of the shadow economy as well as some existing literature on the subject. Section three describes the overall situation of the shadow economy in North Korea, and attempts to estimate the North Korean shadow economy with a rule of thumb. Section four introduces more rigorous estimation methods. Three different methods are employed to estimate the North Korean shadow economic size. Section five is the concluding section that summarizes the findings of this paper along with some policy implications.

II . Definition and Existing Literatures

There are many terms that can stand for the unofficial part of an economy. It can be called an informal economy, black economy, second economy, hidden economy, unobserved economy, criminal economy, illegal economy, underground economy or shadow economy. In this paper, it will be called the 'shadow economy' due to the following reasons. Many terms such as black economy and underground economy implicitly stand for the illegal economic sector of a market economy. However, the shadow economy of North Korea includes not only the illegal economic activities but also many legally acknowledged economic activities. Also, while the 'second economy' was first stated by Karol [5] to describe the non-state sector's economic activities of

Russia, the usage of this term is avoided in this paper because it can be confused with the 'secondary economy' of North Korea which stands for the military economy.³⁾

Under a market economy, shadow economy is generally defined as all economic activities that would generally be taxable were they reported to the tax authorities.⁴⁾ Or, more generally, many previous studies in this field used the definition of 'all economic activities that contribute to the officially calculated gross national product but are currently unregistered'.⁵⁾ This broad definition can contain legal and illegal activities, which are both market and non-market based.

However, under a CPE like North Korea, slightly modified definition has to be used. As a CPE does neither collect tax nor calculate an official GDP, the above stated definition of shadow economy would not be appropriate. Therefore, different versions of the definition were made by previous researchers. For example, Grossman [3] said shadow economic activity can be categorized into the following two groups; economic activities that pursue private interests, and all productive and transactional activities that are illegal under a CPE. More broadly, Los [16] defined the 'second economy' as all areas of economic activity, which are officially viewed as being inconsistent with the ideologically sanctioned dominant model of economic organization.

In estimating the relative size of the shadow economy of North Korea, the following definitions were used by the existing literature. Kim, Yeon-Chul [8] defined it as the combination of private economic activities and illegal

3) In general, the North Korean economy is composed of the following four sectors: the first economy, which is managed by the cabinet, the secondary economy of the military, the third economy of the labor party and the fourth underground economy. Refer to "The Second Civilian and Government Economic Information Exchange Council", KOTRA [11].

4) Refer to Schneider and Enste [27], p. 2.

5) For the existing literatures that used this definition, refer to Schneider and Enste [26], p. 78.

economic activities within the CPE. Also, Seo [28] defined it as all economic activities that were carried out outside the official socialist economy, and estimated that it could account for as large as 40% of the total North Korean economy. More narrowly, Kim, Young-Yoon [9] defined it as legal economic activities that pursue private interest. Without losing much generality, the shadow economy of North Korea in this paper will be defined as 'all economic activities that are carried out outside the state-controlled economy'. By using this definition, not only private economic activities and illegal economic activities within the CPE are included, but also some legal economic activities outside the control of the state can be included in our estimation.

There have been several efforts to estimate the relative size of the North Korean shadow economy. Kim, Young-Yoon [9] measured the discrepancy between income and expenditure levels of North Korean households based on the survey he conducted, and estimated that the North Korean shadow economy was approximately 5% of its official GDP as of 1995. Also, a similar estimation method was adopted by Kim, Yeon-Chul [8]. More recently, Nam and Moon [20] estimated the overall consumption level of North Korean households by measuring the total amount of transactions made in peasant markets, and concluded that the North Korean shadow economy can be as large as \$3.4 billion as of 1999. This can be approximately 22% of the North Korean GNI (gross national income) estimated by the Bank of Korea. Similar methodology was employed by Pak [24] in estimating the consumption level of North Korean households, and he concluded that the North Korean households' consumption expenditures in the private sector can be as large as 3.6% of its GDP estimated by the Bank of Korea as of 2000. However, estimating the relative size of the private economic sector and estimating that of the shadow economy can be two different things. Generally speaking, the shadow economy in North Korea tends to have a broader meaning than the private economic

sector as it has to contain all the illegal, hidden and non-monetary transactions.

Due to the lack of reliable data and also due to some limitations of the estimation models, the existing literature have several shortcomings in estimating the North Korean shadow economic size. First, as it is stated above, those who tried to measure the size of the private economic sector only can end up underestimating the size of North Korean shadow economy. Furthermore, some studies such as Pak [24] excluded non-monetary transactions and productions such as barter trade and self-consumption, and thus, they underestimated the relative size of the North Korean shadow economy. Second, when the estimation method is based solely on survey, it cannot produce a reliable result due to the absence of a large and reliable sample size. Finally, most of the existing studies including Nam and Moon [20] and Pak [24] are using the estimate of the North Korean GDP made by the Bank of Korea as the official North Korean GDP. However, the Bank of Korea is using the South Korean price levels in estimating the North Korean GDP. This can be problematic as there can exist big differences between South Korea and North Korea in terms of their price structures due to different industrial structures.

In order to avoid these problems, this paper tried to adopt as many methods as possible to estimate the North Korean shadow economic size. In particular, in order to avoid the problem that incurs when the Bank of Korea's estimation of North Korean GDP is used as the official North Korean GDP, the physical indicator method that uses the growth rate of electricity consumption is tried in this paper. By using the estimation method that relies on the electricity consumption level, we can also capture the non-monetary transaction aspect of the North Korean shadow economy.

III. NK Shadow Economy : Its Current Status and Rough Guesses

The reasons behind the growth of a shadow economy can be diverse. In a market economy, according to Schneider and Enste [27], the shadow economy arises due to tax burden, social security burden, regulations and restricted labor market. In addition to these conventional causes of shadow economy, a socialist economy like North Korea has one more important cause, which is 'economy of shortage'. It is a well-known fact that the official rationing system of North Korea began to collapse since the early 1990s, and it is no longer functioning properly. In particular, many ordinary North Korean households can not purchase goods and services in state stores at state prices. As a result, most of North Korean households rely on the peasant market in purchasing agricultural products and basic necessities. For example, Nam and Moon [20] and Ministry of Unification [17] estimated that 60% of agricultural products and 70% of light-industry goods are purchased in the peasant market.

We can make rough guesses of the North Korean shadow economy's size by relying on a rule of thumb. One way is to review existing literature about the other transition economies. With this regard, one important source can be the European Bank of Reconstruction and Development (EBRD). For example, EBRD [2] has estimated the relative size of the private sector economy for transition economies such as CIS (commonwealth independent states) and Eastern European countries. According to this estimation, the newly emerged private sector was accounting for 37.5% and 22.7% of the official GDPs in Eastern Europe and CIS countries respectively as of 1995.⁶⁾ However, as it is

6) Refer to Chart 4.6 of EBRD [2].

stated already, the definition of the shadow economy can be different from that of private sector economy. In a country such as North Korea, where the shadow economy contains not only the private economic sector but also many illegal and self-sufficient activities, the shadow economy can have much broader meaning than the private sector economy. The difference between the private economic sector and the shadow economic sector is well viewed in the estimation made by EBRD [2]. In Eastern European countries, where a large part of private sector economy is legalized, the shadow economy was accounting for only 18% of the official GDP as of 1995. According to the same study, however, the shadow economy was accounting for roughly 45% of the official GDP in CIS countries. Another source we can rely on would be Schneider and Enste [26].⁷⁾ According to them, the average share of the shadow economy out of official GDP was 35.3% for selected CIS countries and 20.9% for selected Central and Eastern European countries, as of 1994~1995. Generally speaking, countries in the CIS are experiencing more chaotic transition experiences, where the old state control system is rapidly dismantled while the new market system is not functioning properly yet. In this regard, the Eastern European countries' case would be more relevant to North Korea in estimating shadow economy, as North Korea has not initiated transition reform yet and the state control is still largely in place. Taking the Eastern European countries as a reference, we can roughly guess that the North Korean shadow economy would be about 20% of its official GDP level based on the two existing samples of literature mentioned above.

7) Refer to Table 5 of Schneider and Enste [26].

IV. Three Estimation Methods

There are several methods to estimate the size of the shadow economy. Schneider and Enste [26] have categorized them into two broad approaches: the direct microeconomic approach that uses surveys and samples and indirect approaches. Indirect approaches use various macroeconomic indicators such as the discrepancy between expenditure and income levels, the discrepancy between official and actual labor forces, transaction amounts and GDP, currency demand function, and physical inputs such as electricity consumption. Out of these various methodologies, this paper employs three basic methods. First, after figuring out the supply sides of the North Korean shadow economy, this paper will add up individual parts of the shadow economy. Second, by relying on a survey conducted through North Korean refugees, the size of the shadow economy will be measured by calculating the discrepancy between income and expenditure levels. Last, more rigorously, the growth of the shadow economy will be estimated by using electricity consumption level.

For the first and the second methods, the North Korean GNI estimated by the Bank of Korea are used as the official North Korean GDP. However, in the third method, the growth rates of North Korean GDP estimated by Bank of Korea are used in the estimation. Also, the first and the second methods rely on a survey conducted in 2000. This survey is based on interviews with 42 North Korea refugees.

1. Summation of Individual Shadow Economies

Like any other economy, the shadow economy can be divided into supply

side and demand side. As these two sides have to be equal to each other, measuring one side alone can be good enough to estimate the overall size of the shadow economy. In this paper, the supply side will be measured by adding up individual supply sides of the shadow economy. There can be three routes that goods and services are supplied into the North Korean shadow economy. First, North Korean households produce agricultural products and domestic handcrafts unofficially, and supply them into the shadow economy. Second, agricultural and manufacturing goods traded along the Korea-China border are supplied. Third, considerable amounts of official productions are embezzled, and transacted in the shadow economy.

First, let us estimate the value of the private agricultural and handcraft productions supplied by North Korean households. According to the survey we have conducted, approximately 60% of households owned private kitchen plots with the average size of 220 pyong.⁸⁾ Also, the labor productivity in this private kitchen plot was almost three times higher than that in the official state farm.⁹⁾ The survey results coincide with the previous witness made by a North Korean agricultural expert.¹⁰⁾ Also, it was estimated that roughly 60% of North Korean households were engaging in private farming activities according to Noh and Yeon [21], which coincides with our survey result as well. Based on this survey result, we can estimate that about 3.2 million households are producing private agricultural grains with annual production amounts of 525 kg per household on average. It means that the total amount of private grain production can be 1.73 million tons, which is \$159 million

8) 1 pyoung = 3.3m²

9) When the labor productivity was measured with respect to corn production, 3.3kg/pyoung was produced in the private kitchen plots vis-à-vis the official state farm production of 1.18 kg/pyoung. Official production data was recited from KREI [12].

10) Recited from Rhee, Min-Bock, "South-North Korean Agricultural Cooperation Towards the New Millenium", presented at The Symposium for North Korea Agriculture, The Daesan Foundation for Rural Culture and Society, Seoul, Korea, 1999.

worth according to international corn prices.¹¹⁾ In addition to this private farming, there are household handcraft productions. According to Nam and Moon [20], this was estimated to be roughly \$100 million a year. Adding these two numbers, we come up with \$259 million for private agricultural and handcraft productions as of 1999.

Second, let us estimate the value of goods smuggled into the North Korean shadow economy from North Korea-China border trade. Even though Lee, Jong-Seok [14] estimated that it could be as large as \$300 million as of 1995, it was thought to have declined as the border trade volume diminished after the mid-1990s. Based on the on-the-spot surveys, Oh, Seung-Yeal [22] estimated that approximately 30% of the official North Korea-China trade would be underground trade. If we apply this ratio to the official trade data between North Korea and China, the value of smuggled goods through the border trade with China would be \$111 million in 1999.

Third, let us estimate the size of embezzlement from the official sector. According to the survey, many refugees provided anecdotal evidences of the wide spread practices of embezzlement in the cooperative farms and state-run factories where they were working. Even though many of them denied their personal involvement of this wrongdoing practices, most of those responded to our survey said that approximately 20% to 40% of official productions were embezzled in various working places. In order to estimate the size of embezzlement in a conservative manner, we assume that 20% of agricultural productions and 10% of manufacturing and non-service sectors' productions are embezzled each year from the official sector.¹²⁾ This would give us the

11) In 1999, international corn price was \$92.1 per ton.

12) Generally speaking, those who responded to the survey agreed that the embezzlement problem is more severe in the agricultural sector than the manufacturing sector. Based upon this witness, we assumed that the minimum ratio of embezzlement would be 20% in the agricultural sector and 10% in the manufacturing and non-service sectors. Non-service sectors are composed of electricity, gas, water and construction sectors.

minimum amount of embezzlement according to our survey result. Applying these ratios to the North Korea's industrial structure estimated by the Bank of Korea, we come up with the total amount of embezzlement. This was \$1.56 billion in 1999.¹³⁾

Adding up all three components of supply routes to the shadow economy, we come up with \$1.93 billion in 1999, which is 12.24% of the North Korean GNI estimated by Bank of Korea. As this estimation is based on the minimum level of embezzlement activities in state sectors, it is very likely that the actual size of the North Korean shadow economy can be slightly larger than this estimation.

2. Measuring the Differences between Income and Expenditure Levels

Now, let us estimate the North Korean shadow economy by measuring the difference between households' income level and the expenditure level. Once again, in the absence of official data about income and expenditure levels, we have relied on the survey we have conducted. First, the official wage level of North Korean households was measured. In our survey, the average level of the official wage they received from the North Korean government was merely 118 won per month. On the contrary, the average monthly living expense was 3,980 won. Without any legal and official means to fill the gap between the living expense and the official wage, we assume that ordinary households have

13) According to the estimation made by Bank of Korea [1], the industrial structure of North Korea and its GNI are the followings:

| Year | GNI (\$ bn) | Industrial Structure (%) | | | |
|------|----------------|----------------------------|-----------------------------|------------------------------------|---------|
| | | Agriculture and Fishery | Mining and Manufacturing | Construction and Infrastructure | Service |
| 1999 | 15.8 | 31.4 | 25.6 | 10.6 | 32.4 |

to rely on their earnings made in the shadow economic sector to fill this gap. Also, for the moment, let us assume that approximately 15% of the North Korean population would not engage in shadow economic activities such as doing private businesses in peasant markets. They would include the ruling elite of the North Korean society and the military of North Korea, who are presumed to enjoy priorities in receiving rations and accessing to state stores over ordinary households. With these assumptions, we can estimate that approximately 4.6 million households in North Korea are earning approximately 3,860 won worth of income from the shadow economic sector in order to sustain their daily living. Therefore, we can estimate that approximately 213.6 billion won worth of income are earned annually in the shadow economy of North Korea as of 1999. Applying the underground exchange rate of North Korea, which is roughly 200 won per dollar, we come up with \$1.07 billion worth of shadow economic sector's earning as of 1999, which is equivalent to roughly 6.8% of the North Korean GNI estimated by the Bank of Korea.

However, this estimation can severely underestimate the North Korean shadow economy's size. First, the above estimation assumes that ordinary households of North Korea do not save at all, which can be a rather unrealistic assumption. If we assume that ordinary North Korean households save 10% of their total income, for example, they have to earn 4,300 won per month instead of 3,860 won per month from the shadow economy. In that way, ordinary households can save roughly 440 won every month, which is about 10% of their total monthly income. Even though it can be doubtful whether the North Korean households would save any substantial amount of their incomes, the existence of the underground curb market as studied by Pak [24] and several anecdotal stories from the North Korean refugees verify that there exists a certain amount of savings made by North Korean households. In

particular, Park [23] verified that North Korean households are hoarding a certain amount of foreign currency in case for emergencies, which can be viewed as a saving.¹⁴⁾ Therefore, in order to have a more realistic assumption, we need to estimate the saving ratio of North Korean households. However, without any reliable data about the saving ratio of North Korea, we will just assume several different cases of saving ratios for our calculations.

Another reason for possible underestimation is because of the assumption that 15% of the North Korean population, which is composed of the leading elites and the military, do not engage in shadow economic activities. Maybe, it is true that they do not engage in private business activities in peasant markets as they enjoy priority in receiving state rationing services. But, it is rather absurd to assume that they would live on their official wages only. Instead, it is very likely that they engage in illegal economic activities inside and outside the CPE such as giving and receiving bribes, embezzlement, smuggling and various forms of self-sufficient production activities. As most of the expenditures for these activities have to be financed through the shadow economy, excluding these activities from the calculation of the shadow economy can end up being seriously underestimated. Therefore, in order to have a more realistic calculation, we have to estimate how much income of the 15% ruling population would generate from shadow economy. Even though there is no official data for this estimation, it would be a safe guess that their expenditure for living and saving would be at least three times higher than that of ordinary households. For example, in South Korea, the richest 10% households spent about four times more than the poorest 10% households in the late 1970s. Also, according to Table 15 of Pak [24], there exists a wide range of consumption expenditure levels among North Korean households.

14) As of 2000, it was estimated that the total amount of foreign currencies held by North Korean households are \$964.1 million, which is roughly 6% of the North Korean GDP.

〈Table 1〉 Monthly Incomes and Expenses of North Korean Households

(unit: NK won)

| | Official Income (A) | Living Expenses (B) | Saving Expenses ($C=s[A+D]$)* | | | Incomes to be Generated from Shadow Economy ($D=B+C-A$) | | |
|--|---------------------------|---------------------------|------------------------------------|-------|-------|---|--------|--------|
| | | | I | II | III | I | II | III |
| Ordinary Households (85% of population) | 120 | 3,980 | 0 | 440 | 940 | 3,860 | 4,280 | 4,800 |
| Ruling Elites and the Military (15% of population) | 300** | 11,940 | 0 | 1,320 | 2,985 | 11,640 | 12,960 | 14,625 |

Note: * 's' is saving ratio. ($s=0\%$ in Case I, 10% in case II, and 20% in case III.)

** Average official income for the ruling elites such as party cadres, government bureaucrats and enterprise managers. Refer to Ministry of Unification, *Understanding North Korea*, 1999, p. 211, and Table 5 of Kim, Byung-Roh, "Inequality Structure of the North Korean Society and Its Political and Social Implication," research paper, Korea Institute for National Unification, 1998.

Therefore, it would be reasonable to assume that the 15% ruling population of North Korea would spend at least three times more than the ordinary North Korean households. As the official wage they earn from the North Korean government can cover only a fraction of these expenditures, most of their expenditures have to be financed through the shadow economic activities. Based on these more practical assumptions, the monthly income and expenditure structures of North Korean households are estimated in 〈Table 1〉.

The above table contains three cases of saving ratios. In each case, the saving ratio is assumed to be 0%, 10% and 20% respectively. When the total number of North Korean households is 5.43 million, we assume that 85% of them are ordinary households and 15% of them are the ruling elites. With the assumption that the ruling elite would spend three times more in their living expenses, we come up with estimated monthly income levels each household

has to generate out of shadow economy under different scenarios of saving ratios. When the market exchange rate of 200 won per dollar is applied, the ordinary households as a whole have to generate \$1.07 billion under the first case of no saving, \$1.18 billion under the second case of 10% saving ratio, and \$1.33 billion under the third case of 20% saving ratio as of 1999. Also, the ruling elite and the military households have to generate \$0.57 billion, \$0.63 billion, and \$0.71 billion annually under each case of saving ratios. Therefore, as a whole country, the total estimated amount of income generated from the shadow economy would be \$1.74 billion, \$1.81 billion and \$2.04 billion under three different scenarios of saving ratios as of 1999. Out of the three different cases of saving ratios, probably the second case with the saving ratio of 10% would be the most likely scenario. In that case, the total income to be generated from the shadow economy would be \$1.81 billion, which is approximately 11.5% of the North Korean GNI estimated by the Bank of Korea as of 1999.

3. Physical Indicator Method (PIM) That Uses Electricity Consumption

Estimating the shadow economy's share of the overall economy in transition economies using the electricity consumption level was tried by Kaufmann and Kaliberda [6]. They assumed that electricity consumption was the single best physical indicator of overall economic activity, and also assumed that elasticity of electricity consumption with respect to GDP was usually close to one. With these assumptions, the difference between the growth of official GDP and the growth of electricity consumption was deemed to attribute to the growth of the shadow economy. This method can be criticized when the relation between electricity consumption and economic activity changes over time as industrial

structure changes. However, in an economy like North Korea, whose industrial structure has not gone through any major changes during the last few decades, this criticism would be baseless. Also, one can criticize the effectiveness of this method when a large part of the shadow economic activities are carried out without using electricity. However, as it is estimated in section IV.1, more than 80% of the North Korean shadow economic activities are taking place as a form of embezzlement from the official state sectors such as state farm and factories. As the production activities in these places are naturally related to electricity consumption, we can assume that the shadow economic activity of North Korea is closely related to electricity consumption as in any other economy.

In calculating the share of the shadow economy in transition economies, Kaufmann and Kaliberda [6] categorized transition economies of former Soviet Union and European countries into three different groups; 1) energy-efficient economies with elasticity of electricity consumption with respect to output of 0.9, 2) energy neutral economies with unitary elasticity, and 3) energy-inefficient economies with elasticity of electricity consumption with respect to output of 1.15. With these assumptions, Kaufmann and Kaliberda [6] set 1989 as the base year, and measured the relative shares of the shadow economy and official economy afterward. 1989 was picked up as the base year as that was the last year in most transition economies when the old CPE system was functioning.

Following the methodology developed by Kaufmann and Kaliberda [6], let us estimate the relative share of the North Korean shadow economy. First, we have to pick up a base year for this estimation. In this case, 1990 was picked up as the base year. Until 1990, the old CPE system was still functioning relatively well in North Korea with the overall economic activities including industrial production and export peaked. However, after the collapse of the

Soviet Union and Eastern European countries, the North Korean economy began to experience negative growth since 1991. Having 1990 as the base year, let us now estimate the shares of the official and shadow economies of North Korea with the following assumptions.

First, let us assume that the share of the shadow economy in 1990, the base year, in North Korea was 15%, while the official economy's share was 85%. Originally, in Kaufmann and Kaliberda [6]'s estimation, they assumed that the base year's share of the shadow economy in European transition economies would be 12% of the overall economy. However, a more recent study such as Schneider and Enste [26] estimated that the average share of the shadow economy in European transition economies during the period of 1989~1990 would be 15% of the overall economy.¹⁵⁾ Even though there exists a wide range of differences for these economies, let us take the average value cited by Schneider and Enste [26] and assume that 15% of the overall economic activities were carried out by the shadow economic sector in North Korea in 1990. Second, among the three scenarios of electricity/GDP elasticity, we assume that North Korea's output elasticity of electricity consumption would be 1.15, which means that electricity consumption elasticity of output would be 0.87. It is a well-known fact that the North Korean industrial structure has been built in the way that uses energy inefficiently.¹⁶⁾ Therefore, it would be more realistic to assume that North Korea fell in the group of energy-inefficient countries, which has a low elasticity of output with respect to electricity consumption, than to assume that North Korea has unitary electricity/GDP elasticity. In estimation, we have used North Korea's electricity

15) Refer to Table 5 of Schneider and Enste [26]. According to this table, the average size of the shadow economy in European transition economies was 17~18% of the official economy, which means that the shadow economy is accounting for roughly 15% of the overall economic activities.

16) Refer to LG Economic Research Institute [15].

generation figures estimated by the Bank of Korea every year instead of electricity consumption figures. Third, as the growth rate of the official North Korean GDP is unavailable, this paper used the North Korea's growth rates estimated by the Bank of Korea as proxies for the official growth rates. Even though the Bank of Korea's estimation of North Korea's absolute GDP level might have been distorted due to the reasons stated above, the estimation of North Korea's growth rates can be more reliable as the Bank of Korea has estimated them in a consistent manner over many years.

With these three assumptions, the relative size of the North Korea's shadow economy can be estimated according to the following equations.

$$Y(t) = Y_O(t) + Y_S(t) \quad (1)$$

Where Y is the size of the overall economy, Y_O is the size of the official economy and Y_S is the size of the shadow economy.

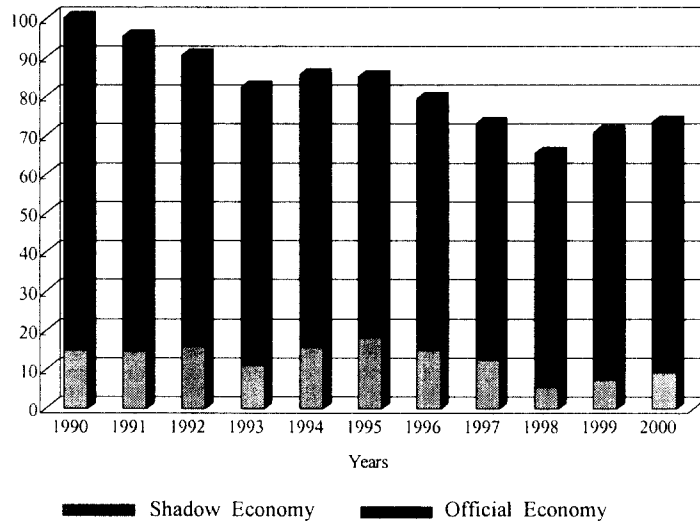
$$Y_S(t) = [1 + \varepsilon G_E(t)]Y(t-1) [1 + G_O(t)]Y_O(t-1) \quad (2)$$

Where ' ε ' is elasticity of output with respect to electricity consumption, G_E is the growth rate of electricity consumption, and G_O is the growth rate of official GDP.

According to the three assumptions we have made, can be 0.87 in our estimation. Using these assumptions and equations, the relative share of the North Korean official and shadow economies are estimated, and are depicted in the following <Figure 1>.

According to the above <Figure 1>, the North Korean shadow economy has generally increased until the mid-1990s, and it reached to its peak in 1995 when it was accounting for roughly 21% of the overall economic activities,

<Figure 1> Share of the North Korean Official and Shadow Economies: Case 1
 With official GDP growth rates estimated by Bank of Korea
 (In 1990, shadow economy=15 and official economy=85)



which was about 27% of the official economic sector. However, as the official economy's growth vis-à-vis the overall economy's growth has slowly recovered afterward, the relative share of the shadow economy has been shrunk since then. More specifically, as of 1999, the shadow economy is accounting for 10.3% of the overall economy, which is 11.5% of the official economy. Also, as of 2000, the shadow economy is accounting for roughly 12.6% of the overall economic size. That is to say, it is accounting for roughly 14.4% of the official economy. However, this estimation bears a risk of potentially overestimating the official economic sector, and thus underestimating the shadow economic size. As it is stated in the third assumption, this estimation has used the North Korean growth rates measured by the Bank of Korea as proxies for the growth rates of the official North Korean GDP. Even though the Bank of Korea's estimation for the North Korean growth rates are more reliable data than its estimation for the North Korean GDP, it can still cause

a problem when it is used as a proxy for the official GDP growth rates. As the Bank of Korea's estimation can contain some economic activities of the North Korean shadow economy, it is possible that its growth rate estimation can outweigh the actual growth rate of the North Korea's official sector. Therefore, the above estimation may have overestimated the official sector's growth, and thus underestimated the relative share of the shadow economy to a certain degree.

This estimation method of PIM can be the most rigorous and unbiased estimation for the North Korean shadow economy. Most of the previous studies have used the Bank of Korea's estimation of North Korea's GDP in estimating the shadow economy of North Korea. However, compared to these previous works, the PIM estimation adopted in this paper has used North Korea's growth rate figures, which are deemed to be more reliable than the GDP figures.

V. Conclusion and Implications

In the previous section, we tried to estimate the relative size of the North Korean shadow economy as of 1999 by relying on three different methods. According to the first method, which added up individual supply routes of the shadow economy, its size was estimated to be 12.24% of the North Korea GNI estimated by the Bank of Korea. Also, the second method, which calculated it by measuring the difference between the official income level and de facto expenditure level of the North Korean households, yielded a result of 11.5%. While, the first and second methods have used the North Korean GNI estimated by Bank of Korea as the reference in the estimation, the third

method has relied on the growth rates of electricity consumption and the North Korean economic growth rates. According to this more rigorous method, the relative size of the North Korean shadow economy was estimated to be 11.5% of its official economic sector. Whichever method we adopt in the end, all three estimation methods gave us approximately 12% as the final figure for the relative size of the North Korean shadow economy.

However, all of these three estimations are based on several assumptions, some of which have to be studied further in the future. Also, these assumptions give us the minimum estimation of the North Korean shadow economic size. For example, we have assumed that the embezzlement ratio in the manufacturing sector would be only 10% in the first method of estimation. Also, we assumed that the ruling elite of North Korea would spend only three times more than the ordinary households in the second method of estimation. In the third method of estimation, the growth rate of the official North Korean GDP, which has been estimated by the Bank of Korea, might be overly estimated, and it would underestimate the shadow economic size. Due to these reasons, we have to conclude that the estimated figures of this paper are the minimum level of the North Korean shadow economic size. Therefore, as a conclusion, it is safe to say that the relative size of the North Korean shadow economy is at least 12% of its official economic sector as of 1999.

Upon measuring the relative size of the North Korean shadow economy, we have to figure out its implication for policy makers. In order to do that, we need to know the effect of the shadow economy on the official and overall economic activities. Normally, its effect on the overall economy can be negative in most of the market economies. For example, it can reduce tax income and thus impair government's ability to provide services and much needed infrastructures. Also, it can divert resources from the official sector to the shadow sector, and, as a result, it can crowd out the official production as

it was analyzed by Murphy, Schleifer and Vishny [18]. Also, the growing shadow economic sector can deteriorate income distribution of a nation as it was studied by Rosser, Rosser and Ahmed [25]. At the same time, however, the shadow economy can affect the official economy in many positive ways. A lion's share of income earned in the shadow sector can be spent in the official sector again, and it also can complement the official sector. Like any other economy, both positive and negative effects of the shadow economy would exist in North Korea. However, at the current stage of the North Korean economy, it can do more good than harm. Basically, the North Korean shadow economy has emerged due to the needs of complementing the official economic sector. To many North Korean households, the existence of the North Korean shadow economy is a matter of survival. Due to this reason, the policy of the North Korean authority toward the shadow economy has been 'benign neglect' so far. It neither encouraged nor depressed the shadow economic sector since the mid-1990s. In many cases, they had to acknowledge these economic activities, and had to legalize some of them.

However, its adverse effects can grow further as time goes by and can eventually outweigh the positive effects. In particular, the growing shadow economic activity can crowd out the official economic activities severely, and it can eventually harm the North Korean economy. More concretely, the wide-spread practices of embezzlement can severely jeopardize the productive capacity of the official state sector. Also, as more transactions are made in the shadow economic sector illegally, it can distort the price mechanism of North Korea not to mention that it can deteriorate the income distribution further. In order to avoid these problems, legalization of non-criminal shadow economic activities has to be made. Also, deregulating many state monopoly activities such as trade would be helpful in correcting the much distorted price system in peasant markets.

Another important policy implication of the North Korean shadow economy can be its exposure to the external economies. In North Korea, a large share of the shadow economy is fuelled by the external economies. For example, hard currencies are provided through remittance from the pro-North Korea Korean Japanese, illegal and covert sales of missiles and bribes from foreign businessmen to the North Korean authorities. Also, basic necessity goods are provided through border trade with China and international aids including those from South Korea. The existence of a relatively large size of the shadow economy in North Korea, which is vulnerable to external factors, can imply that the outside world can influence the North Korean economy in many ways. If this influence is well managed and coordinated, the outside world will be able to affect or even maneuver the North Korean economy in many positive and desirable ways.

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