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North Korea's GDP: Features and issues

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Dialogue on the North Korea Economy

May 2021



North Korea's GDP: Features and Issues

—

Byung-Yeon Kim

Dialogue on the North Korea Economy

North Korea's GDP: Features and Issues

The basis for studying the North Korean economy is to gain an understanding of the size of the overall economy and the trends within it. However, owing to the fact that North Korea does not release data on its GDP and GNI, the task has fallen on the shoulders of outside researchers and such institutions as the Bank of Korea (BOK). Still, with such a lack of official data, the estimates produced have been subject to much controversy, and the question of accuracy and propriety remains unanswered.

Against this backdrop, we at the KDI Office of North Korean Economic Studies invited Dr. Kim, Byung-Yeon, an economics professor at Seoul National University and one of the most prominent experts in this area, for an interview.

Dialogue on the North Korea Economy

Date and Venue

Namhakdang, Friday, June 12, 2020

Interviewer

Lee, Suk (Senior Fellow at KDI)

Interviewee

Kim, Byung-Yeon
(Economics Professor at Seoul National University)

KDI's *Dialogue on the North Korean Economy* is a monthly series that features interviews with the foremost experts on North Korea. The first publication was released in March 2021 in connection with the *KDI Review of the North Korean Economy*. Each edition tackles a different facet of the North Korean economy, and offers valuable insight into prominent issues and aspects.

The views and opinions expressed by the contributors are their own, and do not reflect the official views and position of KDI.

- KDI Review of the North Korean Economy Board of Editors

Estimating North Korea's GDP Prior to the 1990s

For this issue, we are privileged to have Dr. Kim, Byung-Yeon, economics professor at Seoul National University, with us to talk about an important economic aggregate of North Korea, the GDP. Dr. Kim is a leading expert on the North Korean economy and GDP, and as such, I am certain that we will be able to learn a lot from today.

Lee, Suk Q.

Since 1990, the Bank of Korea (BOK) has periodically released its growth rate estimates for the North Korean economy in cooperation with other South Korean government agencies. As an important source of information on the status of the North Korean economy, these figures are widely used by researchers, and hold considerable sway over estimations on economic growth. For the sake of convenience, let us divide the period into pre-1990 and post-1990. But first, I would like to ask you about concepts of an economic aggregate in a socialist country. North Korea adopted the socialist economic system, and as far as we know, the terms used in such an economy differ from those used in a market economy, for example, GDP and GNI. This contrast would have been much more marked before 1990. So, in relation, could you tell us about the indicators used in socialist economies and the differences with those used in market economies. Also, how would we interpret them?



Kim, Byung-Yeon

GDP is the fundamental on which evaluations of a country's economic conditions are based. However, estimates on North Korea's GDP and GDP growth rate have been the subject of endless controversy due to the lack of statistical data in particular, and also due to the different approaches used by researchers.

In terms of the concepts for economic aggregates, Marx believed that, in principle, services do not create value-added. This notion laid the foundation for the use of 'net material product (NMP)' instead of GDP in socialist economies. It was understood that value-added could only be generated through the input of labor and subsequent production of materials. Hence, buying goods at a low price and selling it at a higher price as is customary in distribution was not deemed to be creation of value. Rather, it was ruled as an act to self-profit, and was punishable on the grounds of speculation.

Thus, NMP can be understood to be GDP minus the value-added created in the service industry. According to CIA estimates, the Soviet Union's GDP was 25% higher than its NMP. That difference of 25% is the value-added generated through services. The same is true for North Korea where education, distribution, and financing are considered non-value-added sectors. Having said that, we have not even seen data on its NMP for a long time.

You are absolutely right. North Korea has released rough estimates of its NMP a few times in the past, but it has hardly been regular. In regard to the 25% difference, while we can estimate and understand it as you have explained, there is still a lot of confusion. So, are there any other ways to estimate GDP without official data from North Korea. That is, in addition to converting the economic aggregate of socialist economies into GDP, are there ways to measure the GDP of economies like North Korea using other indicators?

North Korea released relatively detailed statistics in the 1950s, but stopped publishing official data from the 1960s. Japanese scholars, Goto and Niwa, tried to estimate North Korea's GDP using a method similar to the NMP-based method applied by the CIA to estimate the Soviet's GDP (Goto, 1990; Niwa and Goto, 1989). However, while this worked until 1960, the lack of data made this endeavor no longer feasible. In addition, because there was significantly less data for North Korea than the Soviet Union, various assumptions had been made in the estimation of GDP, making the accuracy of the estimates somewhat suspect.

Even though we cannot directly assess North Korea's GDP, there are other alternatives. One is to use real indicators which are related to GDP. For example, researchers studying the income of periods for which statistical data are mostly unavailable, such as ancient or medieval times, use people's height as a proxy for per capita income. Specifically, it is assumed that in-



come is closely tied to calorie intake, and as such, the higher the calorie intake, the taller a person would be. But, caution is required here. We need to differentiate between flow and stock. For instance, while a person's height is a stock variable that is measured at a particular point in time, GDP is a flow variable. Therefore, using height, it would be difficult to estimate per capita income that changes annually.

Real indicators include production indicators such as cement and steel output, and nutrition indicators such as daily calorie intake. And while we can also use health indicators, such as infant mortality and life expectancy, to estimate per capita GDP, there are limitations as health indicators which also possess properties of a stock variable. When there is no available data on the GDP of a certain country, the real indicator method will first examine the relationship between the real indicators

and GDP of other countries, and subsequently use this relationship to make estimations for GDP of the country under investigation. Specifically, after the standard parameters are obtained using data from other countries, estimates for the GDP-a dependent variable-are computed by multiplying these with the amount of indicators (cement and steel output, nutrition, health, etc.) for a data-lacking country.¹ Another real indicator that is commonly used is night lights. In this case, we evaluate the relationship between the night lights and per capita income of other countries, and then apply this relationship to a country that has data for night lights but not for per capita income to obtain the latter.²

However, because there is considerably less data for North Korea than for the Soviet Union and other socialist states, the problem is much more serious. If the availability of official data for the Soviet Union

¹ Kim, Byung-Yeon and Suk Lee (2006), and Chun, Hong-Tack (1992) estimated the GNI of North Korea through the real indicator method.

² Kim, Kyoochul (2017) analyzed the level of and trends in the well-being of North Korea by using data on night lights.

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If the availability of official data for the Soviet Union is 100, then, I believe, that for North Korea was only 10 up to the early 1960s, and not even 5 thereafter.
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is 100, then, I believe, that for North Korea was only 10 up to the early 1960s, and not even 5 thereafter. Therefore, the CIA method does not work for North Korea. Instead, researchers more often use the short-cut method. Using real indicators can be considered as one of the short-cut method.

Although not a real indicator, North Korea's figures on budget and settlement of accounts is the only official data that is regularly released by the regime. Some scholars assume that there is a constant and stable relationship between budget and GDP, and use these data to estimate

national income. In the case of the Soviet Union, government expenditure was as much as 60-65% of GDP. This high share of government expenditure in GDP is because public finance was used to finance most investments in enterprises in socialist economies. If we assume that the ratio of government expenditure to GDP has been stable in North Korea, one could think that the changes in government expenditure could be used to estimate GDP. However, data on the budget are a nominal variable that includes changes in prices, and thus, this short-cut method would mismeasure or overestimate GDP by confusing the rate of change in the nominal variable with the real economic growth rate. Although, in principle, there should be no inflation in a socialist economy, even the official data from the Soviet Union show an inflation rate of 1% per annum. If the informal sector is included in the estimation, overall inflation would be higher. Moreover, the Soviet government included its central bank loans in the budget income. All of this could be the same in North Korea. Therefore, we have to bear in mind that considering the rate of change in the budget to be the equivalent to GDP growth could be extremely problematic.

Because there is such a shortage of data on the North Korean economy, researchers sometimes produce implausible figures based on some of the assumptions they make. In one case, using the above method of equating the rate of change in fiscal expenditure with GDP growth, it was reported that North Korea posted an annual economic growth rate of 20-30% until the 1990s.

Recent discussions on the North Korean growth rate also show potential for such errors. In a recent paper, the author assessed the economic conditions of North Korea to be reasonable after believing that the 4.2% growth in the 2020 budget plan released in April was the economic growth rate. But, as I pointed out earlier, the budget and settlement of accounts is a nominal variable, and in the Soviet's case, it included its central bank loans in the budget income. There is no guarantee that North Korea is any different. And, unless specific items of the budget account are clearly stated, doubt will only escalate.

Whether it be using budgetary growth or other nominal variables, or using other data to estimate inflation and deducting it from the budgetary growth rate, it seems to me that there have been diverse and risky attempts made to measure North Korea's GDP; although not always accurate. Given that, I would like to ask you a more realistic question. How should we view the actual trends in North Korea's GDP and growth rate? Could you elaborate on your research and explain how these trends have changed since the 1990s?

I think one of the most important studies on the long-term growth of the North Korean economy is that of Kim Byung-Yeon, Kim Suk-Jin, and Lee Keun (2007).³ The study was published in the *Jour-*



nal of Comparative Economics, and estimates North Korea's economic growth in 1954-1989. To prevent the growth rates from being distorted by the aforementioned problem of prices, the authors used a methodology that weight averages the output growth rate by industry (agriculture, mining and manufacturing, and services). Specifically, the hidden inflation, which was estimated using the data from the Soviet Union, was deducted to obtain the output growth rate for the mining and manufacturing industry. This adjustment was made because, in a socialist economy, the hidden inflation is included in the industrial growth rate, which could, in turn, lead to an overestimation of the overall growth

³ Kim, Byung-Yeon (2014) and Kim (2011) discussed the estimation of North Korea's economic growth rate in more detail.

rate. This approach applies both the CIA's method and data. That is, the discrepancies between the Soviet's official growth rate and the CIA's estimate for GDP growth were equated to be the differences in inflation, and such discrepancies were deducted from the output growth rate of North Korea's mining and manufacturing industry. In addition, the industrial ratio from North Korea's report to the UN in 1992 was used to calculate the weighted value of each industry. The structure of each industry was assumed to be the same in 1989 as in 1992, and a reverse estimation was done consecutively until 1954.

Simply put, the authors used data on output rather than figures including price changes in accordance with the CIA method, and deducted the hidden inflation from the growth rate, which includes price changes, to obtain this data. Maddison also used output data to estimate China's eco-

nomical growth rate (Maddison, 1995; 1998). This is because, as noted in many studies, there is a high level of uncertainty when it comes to the reliability of China's official growth statistics. Maddison subdivided China's industries, and used the output growth rate and weighted value of each industry to assess the economic growth rate. He found that the official growth rate had been overestimated. The method used by Maddison is a form of the short-cut method while our's (Kim, Byung-Yeon, Kim, Suk-Jin, and Lee, Keun) is a combination of the CIA method and Maddison's

I would like to elaborate on the CIA method.⁴ Estimating the GDP of a socialist economy requires (1) obtaining output data, (2) obtaining price data, and (3) resolving the exchange rate problem to denominate the national income in dollars. However, in terms of output data, even the CIA used the Soviet's official statistics



⁴ The CIA method is explained in more detail by Kim Byung-Yeon (2008).

while making its own estimations for the price data. This is because prices reflect the scarcity value in a market economy while they are arbitrarily set by the government in a socialist economy, and as such, it is difficult to accurately estimate the Soviet's GDP with the official prices. As for the exchange rate, the agency resolved the issue by estimating the GDP value of the Soviet Union and the United States using the purchasing power parity (PPP) approach, both in ruble and dollars terms, and by obtaining the geometric mean of these two estimates. But in North Korea's case, obtaining the output data in itself represents a challenge; which is why the short-cut method is so often used.

From the studies published so far, I see that the short-cut method is the most favored means for many researchers to obtain North Korea's economic growth rate for before the 1990s. So, what about the subsequent economic growth trends?

Initially, growth rates were high, but they have declined gradually. This is a typical pattern of socialist economies such as the Soviet Union and others in Eastern Europe. However, there is a difference. For North Korea, it exhibited a much sharper decline in its growth rate compared to other socialist states from the early 1960s, just as socialism was taking root. In 1954-1989, the average annual growth rate of GDP

posted 4.4% while that of per capita GDP marked 1.9%. Still, it should be noted that even these figure may have been slightly overestimated. This is because, although the hidden inflation was deducted for the mining and manufacturing industry, it was not adjusted for the agricultural industry owing to the lack of data.

These findings indicate that South Korea's per capita GDP already exceeded that of North Korea in 1968. The common notion, however, is that this reversal took place in the 1970s. It also suggests that even the UN's data can be misleading which reveals that the overtake happened in 1974. According to the data, the per capita GDP of North and South Korea were \$480 and \$416, respectively, in 1973, and \$518 and \$575 in 1974.⁵

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⁵ <https://unstats.un.org/unsd/snaama/> (accessed on August 8, 2020).

Led by Bruce Cumings, numerous studies believe that South Korea pulled ahead of North Korea in the mid-1970s. However, UN statistics are usually based on data from its member states. Therefore, if there is fault with North Korea's statistics, there is also fault with the UN's.

The long-held belief that North Korea was affluent until the mid-1970s is a myth, and the time has come to discard such fallacies. As I said earlier, our (*Kim et al.*) estimates show that the tables had already

turned on the Peninsula at the end of the 1960s. Thereafter, North Korea's growth rate contracted even further.

According to recent BOK data, North Korea's average annual growth rate in 1956-1989 was 4.7% (Jo, Se-Hyung and Minjung Kim, 2020). This represents only a 0.3%p difference with our estimates. Although different methodologies were used, similar patterns and result were drawn, leading me to conclude that this reinforces the reliability of our results.

Table 1 | Comparison of the Estimates for North Korea's Economic Growth Rate in 1954-1989 by study¹⁾

(unit: %)

Year	DPRK Official Data	ROK Ministry of Unification	Institute of North Korean Studies	Hwang, Eui-Gak	Jo, Dong Ho	Yoon, Seok-Bum	Kim, Byung-Yeon, Suk-Jin Kim and Keun Lee ³⁾	Jo, Se-Hyung and Minjung Kim
	(NMP)	(GNP)	(GNP)	(GNP)	(GNP)	(GNP)	(GNP)	(GDP)
1953-1956	30.1	-	-	-	-	-	9.3 ⁴⁾	-
1956-1960	21.0	-	-	32.3	-	-		13.6
1960-1965	9.9	-	9.4	11.4	-	-	3.3	4.2
1965-1970	5.4		7.4	12.8	10.2		3.3	4.0
1970-1975	14.2 ²⁾	-	6.1	25.0	10.1	8.5	4.6	3.9
1975-1980	4.0 ²⁾	-	5.3	9.2	10.2	-2.0	2.2	2.0
1980-1985	8.8 ²⁾	3.6	-	7.2	8.5	-1.5	4	2.5
1985-1990	-	1.4	-	2.4	5.1	-	2.7	2.4
Avg. growth rate in 1954-1989	12.0	-	-	-	-	-	4.4	4.7

Note: 1) The author recited and edited figures from Kim et al.(2007) and Jo, Se-Hyung and Minjung Kim (2020).

2) Figures are average annualized growth rates estimated for 1971-1975, 1974-1980, and 1978-1984, respectively.

3) Kim et al. (2007) estimated North Korea's economic growth rate using the weighted average for the output growth rate of the agricultural industry, mining industry, and service industry calculated based on their share of the gross national income and by deducting the hidden inflation. The output growth rate of the mining industry was drawn from the official statistics released by North Korea (1954-1989); that of the agricultural industry from the same official statistics (1954-1960) and data from the South Korean government (Ministry of Unification and the Ministry of Agriculture and Forestry, 1961-1989) and; that of the service industry was assumed to be the same as the weighted average of the output growth rate for the two other industries.

4) The figure represents an estimate for 1954-1960.

Source: Central Statistical Office of DPRK (1961); Lee (1972; 2000); Ministry of Unification (1996, etc.); Institute of North Korean Studies (1983; 1994); Jo, Dong Ho (1992); Yoon, Seok-Bum (1983); Hwang, Eui-Gak (1992); Kim et al.(2007); Jo, Se-Hyung and Minjung Kim (2020).

I have learned a lot from your detailed explanation of the efforts made to estimate North Korea's GDP before the 1990s. Now let's move on to the 1990s. Since 1990, the BOK has released a yearly report on North Korea's GNI growth in collaboration with relevant South Korean organizations, and makes estimations on GDP and economic aggregates. The BOK's estimation of North Korea's GDP is not only used in Korea but overseas as basic data on the growth rates and trends of the North Korean economy. Could you explain how these estimates are produced, and their objectives, features, and limitations?

The main objective of the BOK's estimates is to compare the GDP of the two Koreas⁶ For this, BOK uses South Korea's national accounts system together with North Korea's output data. If I roughly summarize this method, after compiling output data through a variety of means, it is multiplied by South Korea's prices then South Korea's value-added. In other words, the BOK's method is based on North Korea's output times South Korea's prices times South Korea's value-added.

Data on North Korea's output are used, but they have not been released directly by the North Korean authorities but estimated by relevant South Korean institutions. Generally, a country's GDP is estimated using data on output, prices, and value-added. Meanwhile, the BOK's estimates use South Korea's prices and value-added. As such, we get North Korea's GDP es-

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timates in South Korean won. The BOK adds a note in its releases to avoid many misunderstandings which states that its estimates differ from conventional GDPs and using them for direct comparison is not recommended.

Until the early 2010s, BOK estimates on North Korea's GDP were denominated in US dollars. However, this is no longer feasible as it is difficult to determine an exchange rate appropriate for North Korea. It would be easy to think that, because the BOK's estimates are represented in the South Korean won, the ROK won-US dollar rate could be used to make the conversions. However, this has a serious pitfall. The lower a country is in terms

⁶ For more discussions on the BOK method, refer to Kim (2017) and Kim, Suk-jin (2017).

of economic development, the bigger the gap is between the market exchange rate and PPP-based exchange rate; we call this the discount rate. If we ignore the discount rate and use the ROK won-US dollar exchange rate, North Korea's GDP calculated based on the market exchange rate would be overestimated. Hardly anyone would believe that North Korea's dollar-denominated per capita income was higher than that of Vietnam. However, the BOK had North Korea's per capita income pegged at \$1,108 in 2006 while Vietnam's was only \$720 in the same year.

Currently, the BOK only releases its estimates on North Korea's GDP in South Korean won. However, there are still institutions and experts who apply the ROK won-US dollar exchange rate to obtain and present North Korea's GDP in US dollars. This practice ignores the wide gap in economic strength between North and South Korea, and overestimates the former's national income. The difference between the market and PPP-based exchange rates is approximately 30% for South Korea while it is between 50% and 70% for underdeveloped economies.

Another issue with BOK estimates is that there is almost no direct consideration of the informal economy. Some criticize that the BOK's estimates do not reflect the market segment although it accounts for a growing share of the North Korean economy. This criticism is warranted, and efforts should be made to take the informal sector into account. If there are no significant changes in the size of the informal sector, the impact of excluding it on the estimated annual growth rate will be limited. However,

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er, the impact on the level of national income could be considerable. For example, a significant share of the value-added created in the informal sector was omitted from the CIA's GDP estimates for the Soviet Union. According to my own research, CIA estimates would increase 6.8% (Kim, 2003) if the value-added generated by the informal sector is included. In other words, just by excluding the value-added of the informal sector, the CIA underestimated the Soviet's GDP by 6.8%. The problem is, the share of the Soviet Union's informal sector is smaller than that of North Korea, and there was no rapid growth trend. Thus, the risk of growth figures becoming structurally distorted through the omission of the informal sector is low. However, in the case of North Korea, because drastic changes in the size of the informal sector are more likely, we need to take the

potential problem of distortion more seriously.

While attempting to reevaluate the BOK's GDP estimates for North Korea in relation to the informal sector, a question arises over the possibility of distortion in the figures for before and after the mid-1990s when the informal sector began to grow sharply. It is also possible that, during the period after the inception of Kim Jong-un until the effectuation of the UN sanctions, informal activities appear to have expanded. I have roughly measured the contribution of the informal sector to North Korea's national income using the results of a survey on North Korean defectors (Kim, Byung-Yeon, 2019). When we compare the participation rate of North Korean defectors in the informal sector during Kim Jong-il's era and that of Kim Jong-un, we find a 10%p increase from the

former to the latter. When North Korea's GDP is estimated based on this new figure, there is a yearly maximum increase of 1±α%p in BOK estimates. This implies that the BOK's estimates on North Korea's economic growth during the Kim Jong-un era have been underestimated by that much on a yearly basis. Given this, it seems more plausible that North Korea's economic growth rate under Kim Jong-un and before UN sanctions was not in the 1% range as estimated by the BOK, but between 2 to 3% at maximum. The reason why this is the maximum bound is because the growth rate of informal-sector activities was assumed to be that of the overall service industry. The service industry is made up of different sectors that include education and banking, and the growth rates of each sector were considered to have risen by as much as the growth in the participa-



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tion rate of informal activities. On the other hand, upon entering 2017, North Korea's informal sector would have been adversely affected by the implementation of UN sanctions. Nevertheless, this was not directly reflected in the BOK estimates for 2017-2019, suggesting that there may have been some overestimation. We must always be wary of potential estimation errors when an event of significance to informal economic activities is not considered in the estimations for economic growth. As such, how changes in activities at markets should be taken into account in estimating North Korea's GDP remain an important task for the BOK.

The last problem with the BOK's GDP estimates is related to the use of South Korea's prices and value-added. Due to the lack of cases in other countries, the issue of potential bias has yet to be prop-

erly researched. But, the estimation methods used in the study of Kim Byung-Yeon, Kim Suk-Jin and Lee Keun, and my 2017 study, which is updated for the period after 1990, employ output data so has little relevance to South Korea's prices and value-added (Kim, 2017; Kim, Kim, and Lee, 2007). Comparing the BOK estimates from the 1990s and the estimates presented in my studies will help to verify the existence of bias when South Korean prices and value-added are used. Overall, the trends seen in these two sets of estimates are similar, but variances in my estimates tend to be larger. For example, the BOK assessed that North Korea's GDP contracted 30% in 1997 from 1989, but I estimated 40%. For the subsequent period, my study finds the recovery period to be faster. In regard to this, further analysis will be needed to make a comparison with cases in which

the value-added of a country that has a similar economic structure to North Korea has been used, or to examine biases arising from using South Korea's value-added. I understand that Dr. Kim Kyoochul at KDI has been working on this subject.

You have made some crucial points. As you have stated, there are two issues with BOK estimates. The first is the matter of output, and the second is prices and value-added. The use of South Korea's prices and value-added has been a source of contention as doubts continue over just how realistically they reflect the conditions in North Korea. Meanwhile, in terms of output, even if it is assumed that the data obtained through prices is accurate, the informal sector has not been included in the calculations. As this is a very important point, I would like to ask you another question. What if, owing to the COVID-19 crisis, all market activities are suspended in North Korea and the formal sector regains vitality? Will the growth of the informal sector still be faster than that of the formal sector? It would not be problematic if the growth rates of the two sectors were the same, but if the growth of informal sector is higher, the BOK method—which excludes the informal sector—is likely to underestimate the overall economic growth rate. On the contrary, what would happen if the growth rate of the informal sector was favored? Would there be an underestimation or overestimation? I ask this for clarity because, although the BOK's estimates are currently superior to all others, there is still



the problem of the 1%p you mentioned earlier.

That is a key aspect, but it is difficult to explain due to the complicated relationship between the different variables. From a general point of view, it is extraordinary that the growth of the informal sector surpasses that of the formal sector. Typically, the informal sector lacks legal protection, and financial clout. There is also the matter of the participants. For example, in South America, low-educated, low-skilled workers constitute the majority of the workforce. This means that the labor input of the informal sector is weaker than that of the formal sector. As a result, growth rates in the informal sector is lower than that in the formal one.

The relationship between the informal

sector and the formal one differs across countries. For example, the two sectors can independently coexist as in South America. Alternatively, the informal sector can negatively affect the formal sector as is well illustrated by the Soviet Union in the 1980s. One of the reasons is that raw materials bound for the formal sector are often siphoned off to the informal sector. Accordingly, as the former contracts and the latter grows, a negative relationship can form between the growth rates of the two. It is also possible that the formal sector benefits from the marketization in the informal sector, and a virtuous cycle is created. For instance, state-owned enterprises can sell their final products in the markets and use the profit to buy more raw materials needed for production. As it can be seen, the relationship between the formal and informal sectors is not always fixed.

Given that the BOK method only uses the formal sector, gaining an accurate reading of not only GDP size but also growth will be difficult in the event of sudden changes in the size of the informal sector or in its relationship with the formal sector. Also, there is the risk of over- and underestimating the overall growth rate if the growth of the two sectors widely differ. This is something that we should be continue to focus on.

Other Estimates on North Korea's GDP and Growth Rate

I am curious as to whether there are other types of data besides the BOK's. Could you tell about the difference between the estimates presented in your study and those officially released by North Koreans? What is your opinion on this? Additionally, if there are other useful estimates, please tell us about them also.

Both the UN and BOK release data on North Korea's national income. The UN reported that, in 2018, North Korea posted a per capita income of \$688. But, accord-

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ing to my estimation, it stood at \$770 in 2014. While my estimates tend to be higher than the UN's, there is no information on how it obtained this other than the belief that it receives data from member states.

North Korea is known to also make direct announcements through numerous channels which report that national income stood at \$1,013 in 2013 and \$1,053 in 2014. These figures are similar to the BOK's estimates obtained by multiplying North Korea's ROK won-denominated per capita income by the South Korean exchange rate.⁷ The figure for 2013, in particular, coincides with the 2015 per capita income estimated by Hyundai Research Institute.⁸ Given these similarities, I suspect-although I am not certain-that North Korea refers to South Korea's data.

It has also been declared that North Korea has continued to grow even after UN sanctions were implemented in 2016. One North Korean economist maintains that the economy grew 3.7% in 2017, and per capita income was at \$1,214.⁹ He did not, however, comment on the method he used. From what I have heard, while the output data compiled from various firms and organizations, the international prices were multiplied to the output data due to various problems over prices. Still, it a method that raises considerable doubt. Another source claims to have seen a change in the international prices of major goods; pos-

sibly determining that the growth rate increased in line with the increase in the price of major items such as coal. But, while mineral prices fell in 2013-2014, the regime nevertheless reported that the North Korean economy grew 4.5% during the period. So, I doubt the reliability of these figures.

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reliability of these
figures.”

7 The BOK estimated the per capita GNI of North Korea at 1.388 million won (in South Korean won). This figure is equivalent to 1.263 million won if the South Korean won-US dollar exchange rate for 2014 (1 USD = 1,099 KRW) is applied.

8 Hyundai Research Institute estimated the nominal GNI of North Korea for 2015 at US\$1,013 by using the relationship between the infant mortality rate and per capita income, and by considering the crop yields ([http://hri.co.kr/upload/publication/2016928161319\[1\].pdf](http://hri.co.kr/upload/publication/2016928161319[1].pdf)).

9 https://www.japantimes.co.jp/news/2018/10/13/asia-pacific/north-koreas-economy-grew-3-7-2017-pyongyang-professor-estimates/#.Xjz0_cgzaUk (accessed on August 8, 2020).

Macroeconomic Trends Seen Through North Korea's GDP

So, according to all of the aforementioned estimates, what have the macroeconomic trends been like in North Korea since the 1990s?

When we value the BOK's figures for 1989 at 100 and look at the GDP trends, we find an overall, slightly U-shaped curve. The line continued to decline from 1990 before bottoming out in 1997-1998, and rebounding thereafter. With 1989 set at 100, North Korea's GDP in the mid- to late 1990s would have fallen to roughly 70. My study shows that this was 60, and the recovery pace was faster (than the BOK estimate). As I mentioned earlier, the difference derives from whether or not the estimates use South Korean prices and value-added. The informal sector was excluded from both estimates, and both agree that North Korea has been unable to fully return to the 1989 level.

Given that the current nutritional status of North Koreans seems to be at a similar level to the mid-1980s, concerns have been raised over the fact that the recovery in GDP cannot be so slow, because, as some have pointed out, the growth of the informal sector surpassed that of the formal sector; a fact that is missing from BOK figures. The BOK assesses that North Korea's current per capita GDP is at the 1994-1995 level, and my own estimations produced similar results. Even if the informal sector was considered, thereby accelerating

the overall pace of recovery, my estimate would still be around the early 1990s level, which would roughly complete a U-shaped curve. Some could argue that, not only has North Korea already achieved such a level of GDP, it has surpassed the 1990 level. Serving as the rationale behind this are the numerous newly-built buildings and more variety of goods in the markets. Of course, these changes require further examination. But what is visible to the eye is only a small fraction of the overall GDP which consists of both tangible and intangible components. To the layman, tangible components include consumer goods, services, and buildings, among others are ev-

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income.”

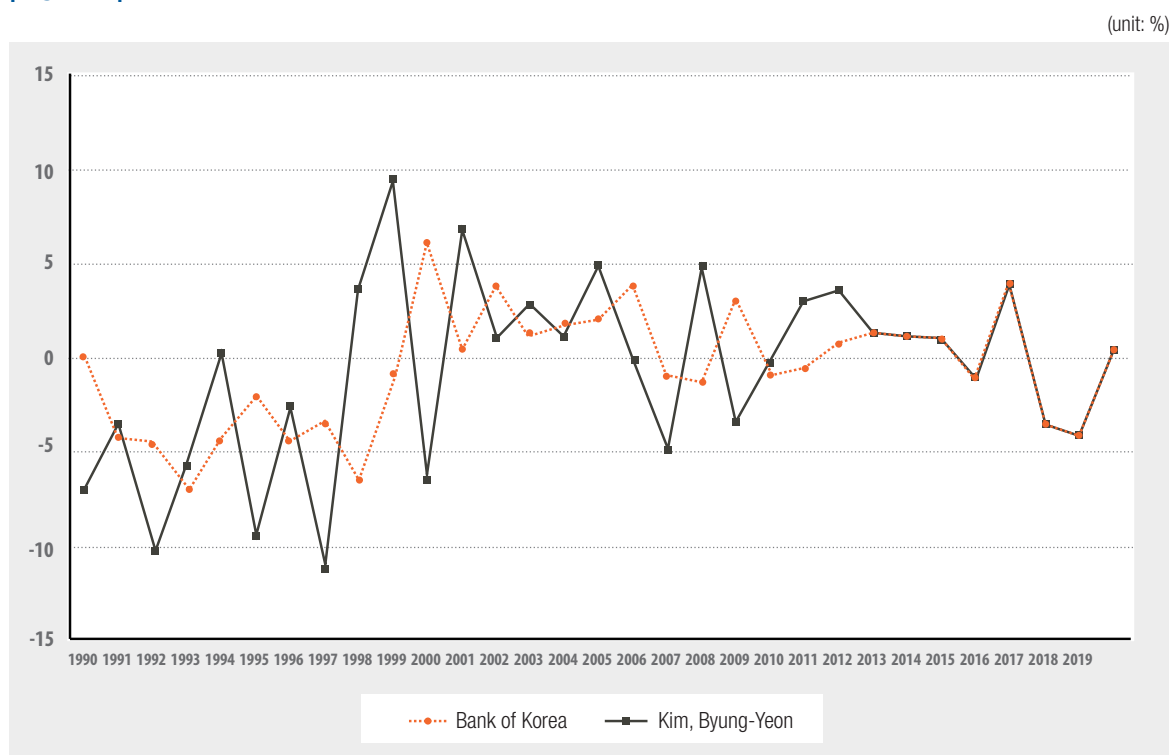
everything for GDP. However, when foreign trade and markets expand, the GDP composition tends to shift towards consumer goods and services, and nutritional status improves even with the same per capita income. This is why there is confusion between an increase in the share of tangible components and overall growth.

Firstly, let's deal with how trade and/or marketization can change the share of GDP from the heavy industry to the light and consumer goods industry. For the Soviet Union, GDP continued to fall throughout the early to mid-1990s, and a U-shaped recovery was only achieved in around 2006-2007. Barring brief rebounds between, the whole cycle took about 16 years. I lived in Moscow in the 1990s. I remember the overall quality of life improv-

ing, with new buildings rising, and more imports and other goods in the markets. This illustrates the changes in GDP composition from heavy to light industry including consumer goods. For example, instead of making tanks, investments were redirected to the light industry, increasing the supply of consumer goods. When the informal sector is invigorated, GDP composition leans towards areas that have market demand. This could also happen in North Korea. As a result, people can mistake a change in GDP composition for GDP growth as they can actually see the changes being made.

We also need to look at the changes in trade. In the 1970s-1980s, the level of openness in North Korea's trade was considerable as was the trade-to-GDP ratio, and

Figure 1 | Trends in North Korea's Economic Growth Rate from the 1990s



Source: By author based on the Bank of Korea Economic Statistics System, Statistics on North Korea's GDP (<http://ecos.bok.or.kr/>, accessed on June 6, 2020) and Kim (2017), Table 2.6 Estimates of Annual Growth Rates and GDP per Capita of North Korea, 1990-2013.

the volume of trade with former socialist states such as the Soviet Union reached \$5 billion. From a long-term perspective, we are able to see that the high level of trade compared to the national income declined sharply in the 1990s before rebounding in the 2000s. Upon entering the 2010s, the ratio continued to rise with the level of trade openness nearing that of the 1980s until sanctions were enforced. Thus, it can be determined that the size of the North Korean economy nearing the end of the 1980s was almost the same as the present level.

Lastly, our study, which empirically analyzes the relationship between BOK estimates and the variables that affect growth, found a systematic relationship between these variables (Kim, 2011). The BOK estimates have a negative (-) relationship with the fiscal burden and imports from China while they have a positive (+) relationship with exports to China, South Korean aid, and inter-Korean integration index. If the BOK's estimates were indeed seriously flawed, such systematically significant results would not be possible.

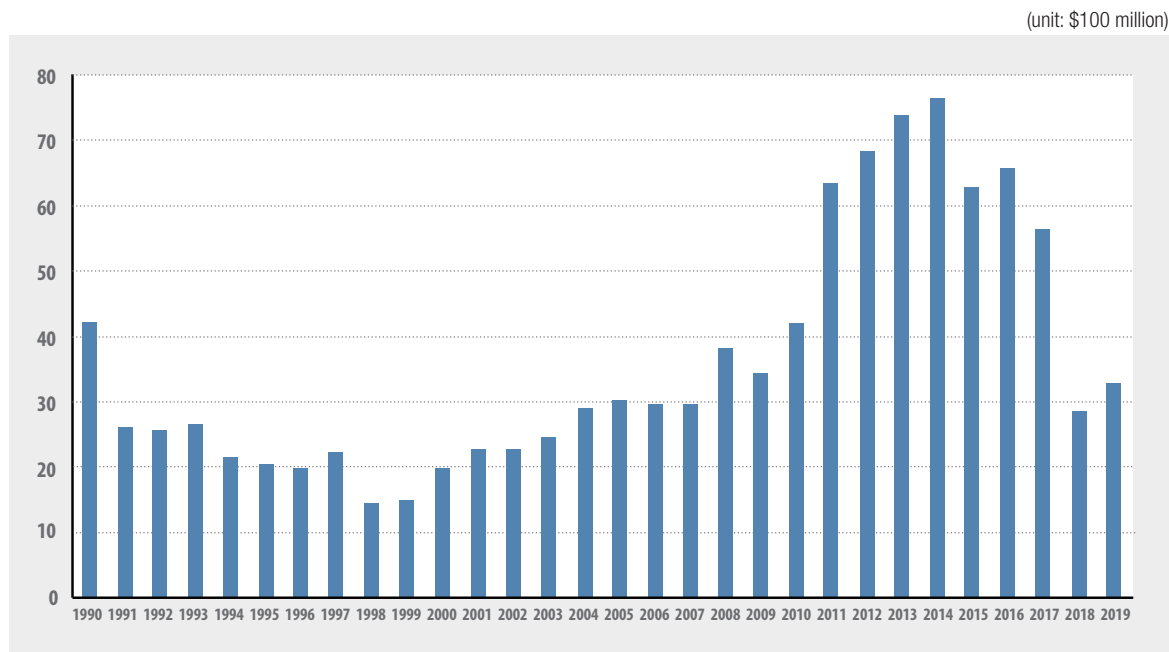
There are those who argue that the North Korean economy has continued to grow a yearly average of 7% under Kim Jong-un, which is certainly unconvincing. Although there were growth factors on the market side, there were none on the trade side. With mineral prices rising until 2013, North Korea's total trade peaked in 2014-2015 but contracted thereafter, offsetting any effects trade growth had on improving economic conditions. North Korea raked in a considerable amount of foreign currency from mineral exports in 2010-2012; during which time both mineral prices and

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total exports rose. We can assume that the foreign currency earned during this period had a lagged effect, and as such, was reflected in Kim Jong-un's era. Accordingly, the fact that the North Korean economy grew fast under Kim Jong-un is an optical illusion, and possibly, the result of a time lag.

| Figure 2 | North Korea's Total Trade Since the 1990s

Source: KOSIS North Korea Statistics (<https://kosis.kr/bukhan/>, accessed on October 6, 2020); KOTRA *North Korean Foreign Trade Trends* (accessed on October 6, 2020).

You have given us new and fascinating insight. From your account, we know that North Korea's GDP and growth rate began to shrink from the early-1990s before reaching a trough at around 1997-1998, and rebounding thereafter. Currently, it is almost at previous levels. You also touched upon an important point that the currently seemingly better economic conditions are not an indication of higher growth or GDP. This was supported by the Soviet Union's case, which witnessed—during its transition—considerable progress being made in some areas of its economy thanks to the changes in GDP composition despite the continued fall in GDP. There were two additional key points. One is that, when we examine the correlation between BOK data and the variables related to growth, there is a systematic relationship. The other is that, even if we assume that the

markets in North Korea—one of the two major growth factors (the other is trade)—have continued to grow, mineral trade is on a downward trend after peaking in 2012-2013. Thus, it is unreasonable, as you have said, to conclude that North Korea's economic growth rate has drastically grown during Kim Jong-un's era. That brings us to the future. So, how do you see North Korea's macroeconomic trends changing?

After hitting bottom in 1997-1998, the two positive elements that helped North Korea achieve a U-shaped growth are foreign trade and the market. Still, as you know, from 2020, trade has been weak and market activities have been sluggish due to the COVID-19 crisis. As such, North Korea's economic growth rate, which has already been constrained by UN sanctions,

will likely tumble during 2020.

As long as the sanctions remain in place, it is difficult to believe that North Korea will grow at a yearly average of over 3%. If sanctions continue at the current level, the maximum that can be achieved in terms of economic growth is 1-2%, and this is only if weather conditions are favorable enough to produce good crop. Unless these special conditions are met, there is hardly anything that North Korea can do. If the sanctions are eased substantially, the economy may be able to grow 4%, albeit temporarily. For an economy to continue growing by more than 4% a year, it must launch serious economic reforms and opening-up. The argument that the North Korean economy has continued to grow at

a yearly 7% without reform and opening up is highly implausible.

If North Korea reforms and opens up, and economic integration is achieved on the Peninsula, the capital and technologies of not just South Korea but the rest of the world will flow into the North. If this happens, a yearly average growth rate of over 10% is possible. This is the best-case scenario for North Korea. If North Korea chooses not to open and reform, but denuclearizes to have sanctions lifted, the markets and trade will expand, and average annual growth will likely mark about 3%. But, like I said, under the current conditions, a 1-2% growth is the maximum. Worse still, if the COVID-19 crisis continues to negatively affect trade and the markets, North Korea's economic growth rate for 2020 is projected to be less than -5%.

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Before wrapping up, as someone who has been studying the North Korean economy, could you share a few words for those who want to study this field or use data on North Korea's GDP?

In terms of estimating GDP, the real indicator method-which I have explained in detail-has many limitations. Firstly, it is difficult to find the yearly trends in growth. This can be tackled by using data on night lights. For this, we must identify and utilize indicators that reflect the trends in night lights, and study the regional discrepancies. More research is also needed to examine the relationship between GDP and dif-

ferent variables. Some of the question we can ask are: what is behind the fall/rise in GDP?; what are the regional differences?; have the many markets in a certain region helped it to grow rapidly?; is it owed to an increase in trade?; is the growth based on an increase in the sale of mineral products produced in that region?; or, is it owed to the on-the-ground leadership of the leader supreme (although there is very little chance of this)? To make an argument, an economist must compile reliable data, and rigorously assess them. Indeed, merely speculating without any data is not the hallmark of serious economist, and experts on the North Korean economy are, by no means, an exception.

Today, we gained valuable insight into the ways in which we can view North Korea's GDP and growth rate as well as into the new types of available data and perspectives on them. You have shown us the exemplar of how we should approach North Korea as economists, which is both intricate and thoughtful. Thank you again for your compelling and in-depth accounts, and for taking the time to be with us today.



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