From a Disaster to a Miracle: Suggestions for North Korea

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Utilizing a model of income and population growth specialized to a dual-class (master-slave) economy, we show that the lack of ownership for the majority of people may have been the main culprit why North Korea has remained stagnant in the past. The slave-workers, for whom ownership (and freedom) is denied, end up with a subsistent level of income. However, the masters, who own not only property but also slaves, end up with a big income.

When the slave-workers are liberated to become property owning free people, their income will increase far above the subsistent level. However, the former master-owners' income will shrink sharply. Knowing this fact, masters have strong incentives to maintain the slavery and slaves have equally strong incentives to overturn it.

If a binding commitment can be made, under which the masters free the slaves and the freed slaves give back portions of their increased income to their former masters, a smooth transition to a free economy can be engineered.

Keywords: North Korean economy, Ownership, Escape from Malthusian trap.

JEL Classification: O10, P50

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I. Introduction

This study attempts to discover what North Korea can do to revive its economy with particular attention to three salient facts. First, the per capita income of North Korea grew from approximately $750 to around $1,514 from 1953 to 2014.[1] North Korea is as poor as it was before.[2] Second, its population grew from approximately 10 million in 1953 to nearly 25 million at present. North Korea has succeeded in feeding a growing population. Third, income disparity exists between a small class of affluent people and the majority of poor people.[3]

The average income of North Korea has remained virtually stagnant in the face of the doubling up of the population over the last 60 years. This fact suggests that it may have been a Malthusian subsistence economy, in which income stagnation and population growth can coexist.

A single class Malthusian model cannot explain the existing elite class of North Koreans who live more affluently than others do. By contrast, a dual-class Malthusian model can easily explain the phenomenon. In an economy in which a small number of property owners (*i.e.* masters) force a large number of property-less workers (*i.e.* slaves) to work for the former, masters can live affluently.

Solutions for a dual-class economy, which we analyze in the first part of this study, indicate that workers barely subsist, whereas owners live prosperously. Numerical exercises performed with the proposed model show that the long-term stationary state income of a worker is $630 and that of an owner is $6,300. A master can be ten times wealthier than a slave is.

What would happen if slaves become free? How would things change when everyone becomes an egalitarian owner? Our model shows that the long-term stationary per capita income would go up to $2,100.

[1] Both are in 2014 PPP US dollars. They are calculated using Maddison's and Bank of Korea's estimates of North Korea's PPP income level. See Maddison (2001) and the Bank of Korea (2015).

[2] Income data compiled by World Bank indicate that North Korea belongs to a group of extremely poor countries.

[3] The majority of North Koreans barely subsist, whereas a small group of citizens in Pyongyang, the capital city of North Korea, lives affluently. See Breitbart (2015) and Independent (2016).

That is, if the slavery were abolished, the average income of the former slaves would increase from $630 to $2,100. By contrast, the income of the former masters decreases sharply from $6,300 to $2,100; a master must sacrifice two-thirds of his former income.

A master would not willingly forego such privilege. Nevertheless, inducing masters to free their slaves is possible (*e.g.* with "bribery"). Transferring a portion of the increased income of former slaves to their former masters can be such a scheme. Former slaves can have larger income even after transfers.

However, this kind of transfer cum slave liberation scheme may not work in reality. Slaves who are freed may not uphold their promises. They may even try to punish former masters. With this knowledge, masters will not free the slaves unless they become convinced that the freed slaves will abide by their commitment. A mechanism is needed to ensure that slaves are freed and that the freed slaves will not only forgive the former masters but also give them sufficient compensation. Nobody seems to know what this mechanism is, which possibly explains why North Koreans are stuck with dictatorial masters.

We organize the paper as follows. In Section II, we propose and solve a slavery model. The goal is to derive closed-form solutions with which we may enhance our understanding of North Korea. Then, in Section III, we undertake numerical exercises with solutions derived in Section II. The exercises provide us with vivid pictures of how the proposed model would behave in real situations. In Section IV, we attempt to understand the North Korean economy in light of the analyses made in Sections II and III. We also suggest what North Korea can do to revive its economy and engineer unceasing economic growth. Finally, in Section V, we conclude the study.

II. Slave Economy: An Adaptation of Lucas' Models

This section studies slave economy models, which are adaptations of Lucas' 2002 paper. We consider two models: i) land only model and ii) land plus physical capital model. Once we derive solutions to the slave economy models, we compare them with the solutions of Lucas' one class models.

A. Brief Introduction of Lucas' 2002 Model

Utilizing an infinitely living dynastic model, in which parents decide how much to consume, save, and invest and how many hours to work and children to raise, Lucas (2002) studies how human beings may have escaped from the Malthusian stagnation.

His model without human capital accumulation is Malthusian in that human beings never experience persistent growth. Parents love to raise children, that is, a child is a normal good; therefore, parents bear many children whenever circumstances allow. New resource discovery, physical capital accumulation, and technological progresses do not make average people rich. Such changes only increase the number of children and population. This phenomenon is the famous Malthusian trap.[4]

Malthus states that the only way to escape from this trap is to reduce the number of children. As a case in point, the prolonged economic growth since the first Industrial Revolution is invariably coupled with a fall in population growth rates. Why had parents decided to have few children even when they were experiencing phenomenal income growth?[5] Lucas (2002) provides a key insight: As human capital became the most important source for value creation, parents wanted and needed to invest in their children as well as their own human capital. However, human capital accumulation requires time input, and the value of parents' time increase rapidly with their income.[6] Therefore, raising children became increasingly expensive. Parents chose to have few but good children when they discovered the value of human capital. Raising good children worked as an engine of growth. This notion pertains to the famous quantity–quality trade-off explained in Becker and Lewis (1974).

Lucas (2002) utilizes the Becker–Lewis quantity-quality trade-off model of children to demonstrate that human capital accumulation is the ultimate source for persistent economic growth and eventual decline in population growth rates of nations. Lucas (2002) endogenously

[4] Income increases temporarily, but this increase disappears as the number of children increases.

[5] Population initially grew rapidly with the Industrial Revolution, but population growth rates of rich countries eventually declined as their income grew further.

[6] The material cost rises as well, reinforcing the shift toward quality.

determines income and population growth rates. Other growth models either explain income growth with exogenously given population growth rates or explain population growth rates without explaining how income grows persistently.

In this study, we borrow Lucas' models that are included in the first half of his paper (*i.e.* models without human capital accumulation) and attempt to understand stagnant economy, such as North Korea.[7]

The model we study is a simple variation of Lucas' model. We use the same functional forms and notations whenever possible. The only difference is the introduction of classes: *Masters and slaves*. The former owns everything and let the latter work for them. The slaves live with whatever income the masters give them. With the given income, a slave determines how much to consume and how many children to raise. The children also become slaves in time. With this knowledge, a master provides a slave with an income sufficient to raise the desirable number of children (from a master's viewpoint). In Lucas' basic model, the land per worker is the only state variable, whereas the number of slave becomes another state variable in this study.

B. Slave Economy Models

a) Land and Slaves

Consider an economy in which a population of N lives on land L. Assume that population N consists of N_l owners and N_w slaves. The owners own land L and slaves N_w equally. Let $x = L/N_l$ and $s = N_w/N_l$ be the land and slaves per owner, respectively. Each owner lets slaves work on his land to produce an output as follows:

$$y = Ax^{\alpha}s^{1-\alpha}, \tag{1}$$

where y denotes the production per owner, A stands for the level of productivity and technology of the overall economy, and s is the number of slaves per owner.

Out of the output, the owner pays y_w to each slave and uses the remaining $y - y_w s$ for his own consumption c_l and child-rearing cost $k_l n_l$. k_l is the cost of raising a child of an owner, and n_l is the number of

[7] The implications of Lucas' human capital growth models for North Korea are mentioned only on a conjectural basis.

an owner's offspring. The owner's budget constraint is given as follows:

$$c_l + k_l\, n_l = A\, x^{\alpha}\, s^{1-\alpha} - y_w s. \tag{2}$$

The owner's preference is as follows:

$$u_t = W[c_l,\, n_l,\, u_{t+1}] = c_l^{1-\beta} n_l^{\eta} (u_{t+1})^{\beta}. \tag{3}$$

In (3), W [ ] is assumed a well-behaved utility function of an owner of generation t. u_t stands for the utility for an owner of generation t, and u_{t+1} is the utility of his child. In principle, we can utilize a general functional form for the dynasty utility function W [ ]. In what follows, we utilize the specific functional form given after the second equality sign of Equation (3), in which parameter β is a weight given to a child's utility, and η indicates how much an owner cares for his children. The latter indicates that having children directly makes the owner happy. η is assumed larger than β.

The owner, taking x and s as state variables, maximizes Equation (3) subject to Equation (2). His choice variables are c_l, n_l, and y_w. Let $v(x, s)$ denote the "value" of the owner as a function of the state variables. An owner then solves the following:

$$v(x, s) = \text{Max}\;\; W[Ax^{\alpha}s^{1-\alpha} - y_w s - k_l n_l,\, n_l,\, v(x', s')]. \tag{4}$$

Here, $v(x', s')$ is the value of the owner's child who begins a life with $x' = x/n_l$ and $s' = s[n_w/n_l]$, where n_w denotes the number of children of a slave.

The income or compensation y_w given to a slave would be used by a slave as follows:

$$c_w + k_w n_w = y_w. \tag{5}$$

Here, c_w, n_w, and k_w are the consumption, number of children, and child rearing cost of a slave, respectively. The slave's preference is assumed the same as that of an owner, which is given as follows:

$$u(w)_t = W[c_w,\, n_w,\, u(w)_{t+1}] = c_w^{1-\beta} n_w^{\eta} (u(w)_{t+1})^{\beta} \tag{6}$$

In Equation (5), a slave's income y_w is set by an owner and thus

beyond the control of the slave. This fact also implies that a slave cannot do anything to affect his children's income.

With the given income y_w, a slave maximizes the utility Equation (6) subject to the budget constraint Equation (5). The slave's problem is identical to that of a hunter-gatherer in Lucas' model (2002). A steady state solution to the problem is as follows:

$$c_w = \frac{1-\beta}{\eta} k_w, \tag{7}$$

$$n_w = \frac{\eta}{1-\beta+\eta} \frac{y_w}{k_w}. \tag{8}$$

Notice that the number of a slave's children n_w is a function of a slave's income y_w. The owner's state variable s evolves as $s' = s[n_w/n_l]$; therefore, n_w enters into his value function. An owner considers Equation (8) when he determines y_w.

The owner's steady state solution for the choice variables is as follows:

$$c_l = \frac{1}{\eta-\beta} k_l, \tag{9}$$

$$y_l = \frac{1-\beta+\eta}{\eta-\beta} k_l, \tag{10}$$

$$y_w = \frac{1-\beta+\eta}{\eta} k_w, \tag{11}$$

$$n_l = 1. \tag{12}$$

The steady state values of an owner's state variables x and s are as follow:

$$x = \left(\frac{1-\beta+\eta}{A}\right)^{\frac{1}{\alpha}} \left[\frac{1}{\eta(1-\alpha)\beta}\right]^{\frac{1-\alpha}{\alpha}} \left(\frac{1}{\eta-\beta}\right)\left(\frac{1}{1-\alpha+\alpha\beta}\right) k_l k_w^{\frac{1-\alpha}{\alpha}}, \tag{13}$$

$$s = \left(\frac{\eta}{\eta - \beta} \right) \left[\frac{(1-\alpha)\beta}{1-(1-\alpha)\beta} \right] \frac{k_l}{k_w}. \tag{14}$$

The steady state number of owners and slaves and the steady state per capita income $\bar{y}$ of the slave economy are as follows:

$$N_l = \frac{L}{x}, \quad N_w = sN_l, \tag{15}$$

$$\bar{y} = \frac{sy_w + y_l}{1+s}. \tag{16}$$

Finally, the steady state number of a slave's children n_w is 1 when y_w is set as is given in Equation (11).

b) Land, Physical Capital, and Slaves

Suppose that physical capital stock is included for production in addition to land and workers. The physical capital stock Z is owned only by the owners. Let $z = Z/N_l$ be the physical capital stock per owner. When physical capital is added, the production function changes into the following:

$$y = Ax^{\alpha} z^{\upsilon} s^{1-\alpha-\upsilon}. \tag{17}$$

A revised budget constraint for an owner is given as follows:

$$c_l + [k_l + z']n_l = Ax^{\alpha} z^{\upsilon} s^{1-\alpha-\upsilon} + z - y_w s. \tag{18}$$

In Equation (18), we assume 0% depreciation of z.[8] The owner's value function is now $v(x, z, s)$, and state variables evolve as $x' = x/n_l$ and $s' = s[n_w/n_l]$. The state variable z' is directly "chosen" by the current generation owner.[9]

The solutions for this problem are as follows:

[8] This assumption is only for convenience.

[9] With 0% depreciation and assumed malleability of z, making an investment is equivalent to directly choosing z'.

$$c_w = \frac{1-\beta}{\eta} k_w, \tag{19}$$

$$y_w = \frac{1-\beta+\eta}{\eta} k_w, \tag{20}$$

$$n_w = 1, \tag{21}$$

$$c_l = \frac{1}{\eta-\beta} k_l, \tag{22}$$

$$y_l = \frac{1-\beta+\eta}{\eta-\beta} \frac{1-(1-\alpha-\upsilon)\beta}{1-(1-\alpha)\beta} k_l, \tag{23}$$

$$n_l = 1, \tag{24}$$

$$z = \beta\upsilon y = \frac{1-\beta+\eta}{\eta-\beta} \frac{\beta\upsilon}{1-(1-\alpha)\beta} k_l, \tag{25}$$

$$y = \frac{1-\beta+\eta}{\eta-\beta} \frac{1}{1-(1-\alpha)\beta} k_l, \tag{26}$$

$$s = \frac{\eta}{\eta-\beta} \frac{(1-\alpha-\upsilon)\beta}{1-(1-\alpha)\beta} \frac{k_l}{k_w}, \tag{27}$$

$$\bar{y} = \frac{y}{1+s}. \tag{28}$$

In Equations (25) and (26), y denotes the output per owner, which is divided between the owner's own income y_l and the worker's income sy_w. The owner determines a slave's income as is given in Equation (20). A slave then chooses his consumption as given in Equation (19) and decides to have one child.

Workers' consumption and income are the same as the case with no physical capital. Adding physical capital does not change anything for workers. They remain poor. Solutions are slightly different for owners. The owners' consumption is the same as before, but their income increases. The increased income is now used for capital accumulation.[10]

[10] Consumption and income net of capital accumulation of the owner do

Another difference is that the number of slaves decreases with the introduction of physical capital. The "need" for slaves becomes weak when owners replace slaves with machines.

C. Lucas' Solutions for Stagnant Economy

Lucas (2002) provides a series of solutions for a dynastic model, in which a member of current generation decides how much to produce, consume, and invest and how many children to raise. When deciding, he considers how his choice affects the utility of the future generation, that is, the utility of his child enters into his own utility. Among the series of solutions Lucas provides, we consider the following three because they are directly relevant to the objective of our study.

a) Hunter-Gatherers[11]

The steady state solutions in a hunter-gatherer economy are as follows:

$$c_m = \frac{1-\beta}{\eta} k_m, \tag{29}$$

$$y_m = \frac{1-\beta+\eta}{\eta} k_m, \tag{30}$$

$$x_m = \left(\frac{1-\beta+\eta}{\eta} \frac{k_m}{A} \right)^{\frac{1}{\alpha}}, \tag{31}$$

$$N_m = \left(\frac{\eta}{1-\beta+\eta} \frac{A}{k_m} \right)^{\frac{1}{\alpha}} L. \tag{32}$$

In the above equations, the subscript m stands for Malthus because the solutions are those for a Malthusian economy.

not change with the introduction of physical capital in our model owing to the specificity of utility and production functions.

[11] Lucas calls the primitive Malthusian economy a hunter-gatherer economy. People live on whatever they hunt and gather in nature.

b) Egalitarian Ownership of Land

When land is equally distributed such that each hunter-gatherer becomes an owner, his steady state solutions becomes as follows:

$$c_e = \frac{1-\beta+\alpha\beta}{\eta-\alpha\beta}\, k_e, \tag{33}$$

$$y_e = \frac{1-\beta+\eta}{\eta-\alpha\beta}\, k_e, \tag{34}$$

$$x_e = \left(\frac{1-\beta+\eta}{\eta-\alpha\beta}\,\frac{k_e}{A}\right)^{\frac{1}{\alpha}}, \tag{35}$$

$$N_e = \left(\frac{\eta-\alpha\beta}{1-\beta+\eta}\,\frac{A}{k_e}\right)^{\frac{1}{\alpha}} L. \tag{36}$$

Here, the subscript *e* stands for "egalitarian" because the solutions are those for an egalitarian land owning economy.

c) Egalitarian Ownership of Land and Capital

When physical capital and land are equally owned by everyone in a land-physical capital economy, the steady state solutions are given as follows:

$$c_{ez} = \frac{1-(1-\alpha-\upsilon)\beta}{\eta-(\alpha+\upsilon)\beta}\, k_{ez}, \tag{37}$$

$$y_{ez} = \frac{1-\beta+\eta}{\eta-(\alpha+\upsilon)\beta}\, k_{ez}, \tag{38}$$

$$x_{ez} = \left(\frac{1-\beta+\eta}{\eta-(\alpha+\upsilon)\beta}\, k_{ez}\right)^{\frac{1-\upsilon}{\alpha}} \left(\frac{1}{A}\right)^{\frac{1}{\alpha}} \left(\frac{1-\beta}{\beta\upsilon}\right)^{\frac{\upsilon}{\alpha}}, \tag{39}$$

$$N_{ez} = \frac{L}{x_{ez}}. \tag{40}$$

Here, the subscript *ez* stands for egalitarian (land and) physical capital ownership because the solutions are for an economy in which everyone owns an equal share of land and physical capital.

D. Comparison

When workers become owners of land and/or physical capital stock, their income substantially increases from what they obtain as slaves. With the increased income, worker-owners can also consume more than what they had when they were slaves. Having ownership pays off. The increase in income and consumption is unrelated to the usual incentive effect. The steady state income and consumption increase not because the slaves exert more efforts when they become owners but because they can now make choices that can benefit themselves and their children.

III. Numerical Exercises

This section performs simple-minded numerical exercises to see how the five solutions compare. The five solutions are for i) hunter-gatherer economy, ii) land only slave economy, iii) land and physical capital slave economy, iv) egalitarian land ownership economy, and v) egalitarian land and physical capital ownership economy.

A. Assumed Parameter Values Explained

Table 1 contains outcomes of numerical exercises, where the assumed parameter values are given in the second row. The assumed parameter values are all "arbitrary." They are taken only for exhibition purposes. A justification for them is provided.

For a primitive economy, we assume that land and workers are equally important as factors of production, and this is reflected in the parameter value of 1/2 for α. For a slave economy, slaves become more important than land, and this is captured as a small value 1/10 for α for the slave economy, in which a slave contributes 90% toward production. When physical capital is added to the production process, its contribution is assumed 40%. Lands contribute 10%, but slaves' contributions decline from 90% to 50%.

We assume that people's own consumption contributes four times more to their welfare than their children's wellbeing. Moreover, people's

TABLE 1
SUMMARY OF NUMERICAL EXERCISES

		Land-voluntary labor economy	Land-slave labor economy (A)	Land-physical capital-slave labor economy (B)	Egalitarian land ownership economy	Egalitarian land-capital ownership economy
Parameter values		α =0.50, η = 0.25, β = 0.20, k_m = \$150	α = 0.10, η = 0.25, β = 0.20, k_w = \$150, k_l = \$300	Same as left, except for υ = 0.40	Same as (A) except for now k_e = \$300	Same as (B) except for now k_{ez} = \$300
Consumption	Workers	\$480	\$480	\$480	\$1,800	\$1,800
	Owners	-	\$6,000	\$6,000	\$1,800	\$1,800
Income	Workers	\$630	\$630	\$630	\$2,100	\$2,283
	Owners	-	\$6,300	\$6,915	\$2,100	\$2,283
Number of slaves		-	2.1951	1.2195	0	0
Investment		0	0	\$615	0	\$183
Average income		\$630	\$2,405	\$3,462	\$2,100	\$2,283

own consumption contributes more than three times their welfare than the number of children contributes. These are the meanings of β = 0.20 and η = 0.25 (η, which is bigger than β, is needed to obtain meaningful solutions.

Other important assumptions are about child rearing costs. We assume \$150 for a slave's child and \$300 for an owner's child. We take \$150 to make the subsistent income \$630 when other parameters take the assumed values. The \$300 for an owner's child is arbitrary. We assume that slave-masters spend twice as much on their own children than slaves spend on theirs.

B. Outcomes of the Numerical Exercises

With the assumed parameter values, a hunter-gatherer's income and consumption are \$630 and \$480, respectively. They are the Malthusian

subsistent income and consumption, respectively. People subsist with a per capita income of $630. The hunter-gatherer continues to raise one child and spend $150.

When the society is run by owners who let the workers work on their lands, the income and consumption of the former are $6,300 and $6,000, respectively. By contrast, the income and consumption of workers are $630 and $480. Workers remain as poor as when they were hunter-gatherers.

The worker's economic lot does not change even when physical capital is added. The owner's consumption also does not change. However, his own income (economy-wide per capita output minus compensation for slaves) increases from $6,300 to $6,915. The $615 difference (an 8% investment ratio) is used for capital accumulation.

When the slavery is abolished and everyone in the society equally owns properties, income and consumption change respectively to $2,100 and $1,800 for the land only economy and to $2,283 and $1,800 for the land and physical capital economy. These egalitarian ownership solutions are better than the solutions for worker-slaves under a slavery system. However, the former owner's consumption decreases from $6,000 to $1,800 in both cases. Abolishing the slavery system is disastrous for owners.

These numerical exercises show that a person who has no property ownership ends up with a small income. A person who owns nothing is a de facto slave. He has to accept whatever compensation nature or the owner offers.[12] By contrast, owners live affluently in a class economy. For example, in our numerical exercises, an owner earns 10 times more than a worker. Introducing physical capital into the model does not change the economic status of a worker: He remains poor. However, an owner's income substantially increases when physical capital is added to the land only economy.

When slavery is abolished and an egalitarian land redistribution is accomplished, former slave-workers become owners. The new owners experience sizable increases in income and consumption. The income and consumption of new owners increase further when an egalitarian ownership of the physical capital is established.

[12] Lucas (2002) shows that the conclusion does not change even when a worker is paid a competitively determined wage.

However, the economic lots of the "original" owners can greatly deteriorate. For example, in our exercises, the original owner's consumption shrinks to $1,800 from the $6,000 that they have enjoyed as slave masters.

IV. North Korea Can Vitalize Its Economy[13]

The solutions we obtain in Section II and the results of the numerical exercises performed in Section III suggest that North Korea's average income can multiply if the authorities allow ordinary citizens to own properties. For example, in the numerical exercises, the income of an ordinary citizen increases to $1,370–$2,283 from $630. This increase is 2.2–3.6 times which, spanned over 20 years, implies 3.9–6.4% annual growth rates of the average income.

Giving ownership is only the first step.[14] The second step is to allow the markets to proliferate, in which citizens freely undertake whatever activities that make them happy. People will do their best when they are free and when they face fierce market competition. When people do their best, the economy cannot but prosper.

If North Korea wants to steadily raise its citizens' income, unceasing growth must be engineered in the "factors" of production whose marginal products do not diminish. Persistent growths in human capital and technology are good candidates. Either of these should make the per capita income grow steadily.

Opening the economy to the outside world will bring many benefits. An open economy can utilize newer, better, and cheaper factors of production; consume newer, better, and cheaper goods and services; employ newer, better, and cheaper workers with newer and better human capital contents; utilize newer, better, and cheaper technologies; and apply newer and better ideas and knowledge. A newly opened economy can also enjoy the economies of scale, and the enhanced competition with "outsiders" makes citizens efficient and competitive.

[13] See Moland (1997), Jeong (2013), Kim, and Song (2008), and Chun (1999) for related discussions.

[14] The remainder of the section is not based on the models we study in this paper. They reflect the vast literature on economic growth and development.

V. Concluding remarks

Utilizing a dynastic model of income and population growth specialized to a dual-class (master-slave) economy, we show that the lack of ownership for the majority of people may have been the main culprit why North Korea has remained stagnant. When workers, to whom ownership was denied, gain ownership and freedom, their income can grow several times.

Our exercises suggest then that, in a dual economy, masters have strong incentives to maintain the slavery, but slaves have equally strong incentives to overturn the system. Throughout most of human history, masters had upper hands. But slaves quickly gained power since the first Industrial Revolution occurred. In consequence the slavery has now disappeared in most parts of the world.

North Korean authorities seem to know that liberalization and opening up are important for prosperity. But they also know that those measures are very risky. Perhaps they can learn from the experiences of countries that have achieved economic "miracles" by economic reforms and opening up. For instance, China has been growing miraculously ever since she made economic reforms and opened up the country some 30 years ago. China's rapid growth has been achieved without bloodshed.

How far and well North Korea may emulate what China has been doing in the last 30 years are limited. The circumstances that China faced in the 70s or 80s are different from what North Korea currently faces. North Korea is not a "big" country, and its power is concentrated to a few. Thus, we should be careful in drawing lessons from China's experiences.

An important element that is missing in our discussions is the fact that maintaining the current system is not cost free. It takes resources to keep citizens docile. Maintaining the current system would be increasingly costly when information about the outside world, especially information about how well her next-door neighbors live, spreads into North Korea.

Can the authorities utilize the resources being used for maintaining the current system for better purposes? Workers can be given a higher income than the subsistent level, which may keep them contented. In this way, resources used for "unproductive" activities, such as resorting to force to keep the regime, could be used for "productive" activities,

such as the increased compensation of the workers. However, a worker-slave who receives an income that is higher than the subsistent level will use the increased income to raise more children. He and his children would end up as poor as they were before, which illustrates the famous Malthusian trap.

Property-less workers can escape from the Malthusian trap if they are given ownership. If giving them a full ownership is difficult, the authorities may consider gradual or partial privatization. Even with partial ownerships, workers will utilize the newly acquired properties wisely and produce more than what they have produced when they were property-less. The authorities may grant additional property ownership to workers when they become convinced that granting a partial ownership brings not only larger income but also make workers contented. In this way, everyone may eventually become a full owner. In the gradual process of privatization and liberalization, the authorities may feel confident that opening up the economy would enhance their interests.

Interesting development occurs in North Korea. Many people have decided to take control of their lives and do what their self-interests dictate. They are new breeds of farmers, merchants, and factory operators. Numerous markets have appeared. An extensive network of merchants is developing. Equipped with mobile phones, they exchange goods, information, and credits. It would be wise for the North Korean authorities to accommodate this new development.[15]

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