Draft: not for citation etc 18/2/97
Comments/suggestions very welcome

Project Title:
North Korea: How Much Reform and Whose Characteristics?

THE NORTH KOREAN ECONOMY: COLLAPSE, STASIS OR REFORM?

Heather Smith
Research School of Pacific and Asian studies
Australian National University
email: heather.smith@anu.edu.au

ABSTRACT

NORTH KOREA: HOW MUCH REFORM AND WHOSE CHARACTERISTICS?
Heather Smith

This paper is the first of a three part project on economic reform on the Korean Peninsula. In this first paper, I focus on the question which has been subject to considerable recent debate, namely whether collapse of North Korea is imminent. In accessing this question the paper discusses the three structural bottlenecks now thought to be severely constraining the North Korean economy following a series of external shocks in the late 1980s, food shortages, energy constraints and a limited capacity to earn foreign exchange. Much speculation has focused on the deterioration in the food economy and that a prolongation of current food shortages will see North Korea collapse. One contribution of this paper lies in its attempt to analyze North Korean agricultural production and food consumption patterns using data made available by North Korea to the United Nations Food and Agricultural Organization. Several anomalies are found between this data and recent World Food Program assessments of food conditions and estimates of nutritional requirements which suggest caution in drawing a too deterministic link between current food shortages and collapse. The paper then discusses the role of international and regional players in prolonging North Korea's economic survival. In particular, the terms under which North Korea signed onto the 1994 Agreed Framework, a return to favorable trading terms with China, and North Korea's attempts aimed at expanding economic ties with the international community, could sustain North Korea at subsistence levels for the next 5 years at least. If collapse is not imminent in the short to medium term, then the policy implications that emerge from such a scenario are clear: that the international community will need to continue to pursue a policy approach of managing tension reduction and the integration of North Korea into the international community. Whether the North Korea regime will embrace fundamental reforms needed to ensure longer term survival remains difficult to judge. In the final section of the paper, several reasons are advanced as to why the window of opportunity for North Korea to embrace reform is now greater than at any time in the past.

Project Outline

There is no professional consensus on the future of North Korea. Opinions differ over the time path and the modality by which the Korean peninsular will reunify, and whether in fact reunification will take place. Three probable scenarios as to how events may unfold on the Korean peninsular are typically discussed—collapse, stasis or gradual reform.

The first scenario sees North Korean collapse and absorption by South Korea, German style. A collapse of North Korea could come about in a variety of ways. One is by force, although few analysts see Korean unification coming as a result of war. Nonetheless, given North Korea's reliance upon personalized rule, and the schizophrenic qualities of North Korea's foreign policy, a resort to force, cannot be totally ruled out. Another way would see collapse by implosion. Those who see internal collapse as imminent point to such features as the North's economic decline, the food crisis, the delay over Kim Jong-il's official succession to power and the increased numbers of defections, as an indication that political control is breaking down. Further prolongation of the current situation, it is argued, will create unrest among the North Korean population and elite levels of society, leading to dissatisfaction with Kim Jong Il's leadership and the possibility of a regime transition, if not collapse of the state (USIP 1996:6).

A second scenario sees North Korea 'muddling through' with minimal economic changes, with the regime searching for low risk ways to deal with current difficulties but keeping the bulk of the population insulated from foreign influence, and preserving the Leninist system (Scalapino 1995:xvi). The prospects for substantial economic reform are seen as remote, given the instabilities that may result from such efforts. Although such a scenario would seem a dubious strategy in light of the North's current economic difficulties, others citing the contemporary experience of countries as diverse as Cuba, Iraq and Zaire to survive with minimalist reform, have urged caution in attempting to a draw a too stronger link between economic hardship and political collapse (Noland 1997).

A third scenario sees the current system remaining stable under the leadership of Kim Jong Il at least within the short term, possibly 2-3 years, and then embarking on gradual

economic reform. As Scalapino (1995: xvi) has discussed, such a scenario would bear close relationship to the evolution of certain East Asian economies, namely, that of moving to authoritarian pluralism, a period of cautious 'coming out' and encouraging a gradual role for the market, albeit under strong state guidance along with enhanced interaction with the market economies in the region. In order to encourage the North to pursue such a path, the North Korean leadership, it is argued, should be presented with concrete opportunities to choose economic opening and the development of new political relationships with the outside world in the belief that those contacts, if properly managed, might support momentum toward reform and facilitate the reduction of tensions between North and South Korea (USIP 1996).

Over a much longer time frame, two scenarios are then seen as being possible. First, in the course of adjusting to economic reform, North Korea will be unable to avoid outside influence, which will weaken the North's ideological base centered on the 'juche' doctrine of self-reliance. Unable to avoid political change, North Korea would collapse and Korean unification will subsequently result. An alternative scenario would see reunification as an indefinite event, with instead a peaceful coexistence and partial economic rapproachment of the two Koreas lasting over a long period of time, possibly well after the first decade into the next century. This scenario is based on the probable difficulty in reaching an agreement on political unification between the North and South because of their long history of mutual distrust, as well as the differences of their two systems and the intentions of the surrounding powers to maintain the status quo on the Korean peninsular.

This objectives of this project are three fold: to assess current conditions and the prospects for economic reform in North Korea, to discuss the modalities of reform North Korea could pursue, and to assess the impact of the above scenarios on the South Korean economy. The first paper focuses on the question which has been subject to considerable debate, namely whether economic collapse of North Korea is imminent. In assessing this question the paper focuses on the three structural bottlenecks now thought to be severely constraining the North Korea's economy following a series of external shocks in the late 1980s — food shortages, energy constraints and a limited capacity to earn foreign exchange. While it is clear the North Korean economy is now under severe stress, that conditions have deterioration to the

extent to translate into political collapse in the short to medium term would seem unlikely. The support for this assessment rests on a discussion of three features: first, an historical analysis of North Korean agricultural production and food consumption patterns which would caution against a viewing of current food shortages as the catalyst for collapse; second, the role of other Northeast Asian economies, especially China, in ensuring the North's economic survival; and thirdly, North Korea's increasing willingness to pursue international economic linkages. If, as the paper argues, collapse is not imminent, then the policy implications that emerge from such a scenario are clear: that the international community will need to continue to pursue a policy approach of managing tension reduction and the integration of North Korea into the international community.

Drawing on the growing body of literature and practical experience of the transforming economies of the former Soviet Union, Central and Eastern Europe and East Asia, the second part of the project discusses modalities of reform North Korea could pursue if it were to embrace more substantive economic reform. If Korean unification were to come about through political collapse, most analysts predict that the transforming of the North Korean economy will require full scale 'big bang' reform. But if collapse, while conceivable, is by no means inevitable, then North Korea's continuing survival suggests that it may need to be dealt with on its own terms (USIP 1996). To this end, the reform experience of other East Asian economies, notably China and Vietnam may serve as an example for future transformation of the North Korean economy. Moreover, the economic and political interactive processes of the Northeast Asian region itself are also likely to provide much of the substance and influence in shaping the path North Korea pursues. The second paper, by examining the sectoral and institutional structure of the North Korean economy, proposes a series of restructuring steps North Korea could pursue in a gradual transition from a centrally planned command economy to a socialist market economy.

The third paper, undertaken in collaboration with Warwick McKibbin, attempts to empirically model the macroeconomic impact on the South Korean economy of the two polar scenarios of Korean unification—collapse, and survival leading to partial rapprochement. Key assumptions for partial economic rapproachment are the gradual opening of the economy to the

world, and in particular to South Korea, involving the transfer of capital, management, know-how, and technology from South Korea to the North. If the transformation of the North Korea economy under partial rapproachment were successful, there would be no compelling reason, as far as North Korea was concerned, for complete economic or political integration with South Korea (Cho and Kim 1995). On the other hand, the alternative scenario of economic collapse would see the North absorbed by the South with much of the financial burden of integration borne almost exclusively by South Korea. Different scenarios for Korean reunification, the pace and economic costs have been widely proposed and discussed following German unification. To the author's knowledge there has been as yet no attempt to empirically model the sectoral impact of these alternate scenarios on the South Korean economy. A key policy focus of the paper is then to assess the economic readiness or capacity of South Korea to finance unification. Whether the inter-Korean economic relationship can proceed in the manner envisaged at least in principle by South Korea, will depend on the reforming efforts of and flexible policy responses by the South as much as it relies on internal changes in North Korea.

THE NORTH KOREAN ECONOMY: COLLAPSE, STASIS OR REFORM?[1]

"All the economic miracles of the postwar world are put in the shade by these achievements" (Joan Robinson after visiting the North Korea in 1964)

There are conflicting views amongst analysts over the severity and persistence of the economic deterioration of the North Korean economy and, in turn, what this implies for longer term stability of the Korean peninsular. To some, the series of macroeconomic shocks that North Korea has experienced since the late 1980s has increased the likelihood of political instability in North Korea and decreased the likelihood of either gradual economic or political reform (Foster-Carter 1994, Noland 1995). Others, citing the historical resilience of North Korea to deal with economic hardship and recent moves to seek greater economic engagement with the international community, urge a more cautious approach to question of survivability (Scalapino 1995).

These diverging assessments are largely the result of the paucity of information which prevents the North Korean economy from being analyzed along ordinary methodological lines. North Korea ranks as one of the most secretive countries in the world, even by communist standards. Any analysis of current economic conditions and predictions as to the future direction of the North Korea economy must therefore be tempered by the knowledge that there are considerable gaps in the information available from which to draw conclusions with any degree of certainty.

Much of the recent speculation surrounding the future of the North Korean economy has focused on the deteriorating in the food economy and that a prolongation of the current food shortages will see the North Korean economy collapse. In current discussions of North Korea, the term 'economic collapse' has been applied quite loosely. One incontestible indication of a

[1] I would like to thank The Brookings Institution for hosting me as a guest scholar for the first stage of this project. In preparing this paper I have benefited in particular from discussions with Gordon Flake of the Korea Economic Institute, and from discussions with Nicholas Eberstadt of the American Enterprise Institute and John H. Dyck of the United States Department of Agriculture. I also gratefully acknowledge the financial support of the Department of Economics, Research School of Pacific and Asian Studies at the Australian National University for the funding of fieldwork to China, Japan, the Republic of Korea and the DPRK in July 1996, and the many interviewees in these countries for sharing their time.

certain kind of 'economic collapse', is as Eberstadt (1997:39) has defined, 'a hunger crisis precipitated by a breakdown of the national system (construing that system broadly)'. In the North Korean context, the presumption is that the food crisis will worsen to the point where the regime loses support from the military and/or the general populace resulting in regime transition or collapse of the state.

One contribution of this paper lies in its attempt to analysis North Korean agricultural production and food consumption patterns using data made available by North Korea to the Food and Agricultural Organization. In doing so, several anomalies are found between this data and recent FAO/WFP assessments of food conditions and estimates of nutritional requirements which would suggest caution in drawing a deterministic link between current food shortages and economic collapse.

A second contribution of the paper lies in highlighting the role of the international community and regional players in prolonging North Korea's economic survival. In particular, the terms under which North Korea signed on to the 1994 Agreed Framework, a return to favorable trading terms with China, and North Korea's (albeit halting) attempts aimed at expanding economic ties with the international community, may have increased the probability that North Korea has the capacity to ride out current economic difficulties. Motivated in part by the possible flows of refugees in the advent of economic collapse, several reports emerged in July 1996 that China, in it's current Six-Year Plan, had budgeted for a revival of its concessionary pricing practice or 'friendship price system' with North Korea.[2] From 1996 until the year 2000, China will reportedly provide North Korea with 500,000 tons of grain, 1.3 million tons of crude oil and 2.5 million tons of coal. Under this extraordinarily favorable arrangement, half of the commodities are to be provided free, with the other half being offered at a concessional rate equivalent to one third of international prices. These measures, by giving North Korea a 4-5 year breathing space could permit its agricultural sector to recover from successive poor harvests and see the regime adopt

[2] These reports which emerged in the Japanese, Chinese and Korean press have not been officially acknowledged by the Chinese authorities. Although these reports were verified to the author in discussions with South Korean diplomates, further research is required before they can be confirmed. While a return to favorable trading terms seems credible in light of recent grain imports to North Korea, other aspects of the deal would be at odds, for example, with China's own demands for energy, its increasing important economic relations with South Korea, and other reports suggesting China, at least by 1994, had become more cost conscious in its relationship with North Korea (Eberstadt 1995b).

the more wide ranging domestic reforms which will be necessary to ensure longer term economic survival. Whether substantial economic reform will be embraced by the regime remains impossible to judge. Nonetheless, as the final section of the paper discusses, the window of opportunity for North Korea to undertake bolder reform measures is probably greater now than at any time in the past.

The paper is structured as follows. Section II provides a brief discussion of the economic development and recent performance of the North Korean economy. Section III discusses the data limitations and caveats necessary in any attempt to analyze the North Korean economy.[3] Sections IV-VI focus on the three structural features endemic to the question of North Korea's economic survival — the agricultural sector, the energy sector, and the prospects of North Korea to earn foreign exchange. The final section discusses the future options available to the North Korean regime.

II ECONOMIC STRUCTURE AND CONDITIONS

North Korea's economic system is perhaps the most highly centralized and rigidly controlled system in the world today. Whereas other centrally planned economies were already engaging in economic reform efforts by the late 1970s, North Korea has adhered to a rigid central planning model, one that has become increasingly distorted. Since 1956, North Korea has managed its economy according to the ideology of 'juche' or self-reliance, in effect an economic strategy synonymous with the inward-oriented economics of an autarkic state. As in other centrally planned economies, equality of distribution is the ultimate goal and the central planning authority exercises full control over mobilization and distribution of all resources. In practice, this has meant a development strategy focusing on developing a heavy industrial sector, the use of 20-25 per cent of GNP for military purposes (Namkoong and Yoo 1994), the collectivization of agriculture and the strict regulation in the distribution of necessities to the populace, and heavy financial waste in such

[3] Several authors have covered the economic performance and structure of the North Korean economy in great detail. See for example Cho and Kim (eds 1995), Hwang (1993), and Eberstadt (1995a). For a historical analysis of the structure of the North Korea economy see Chung (1974) and Kim (1979). For a comprehensive review of the recent decline of the North Korea economy see Noland (1995) and Flake (1995b).

areas as the unproductive 'monument construction' industry.[4]

However, although the North Korean economy is directed according to precepts officially extolling extreme national self-reliance, its economic development seems to have been largely shaped by international events (Eberstadt 1995a:17). North Korea's decision to build up its military capabilities during the 1960s is said to have been precipitated by a variety of factors, including the institution of a miliary government in the South, the deterioration of North Korean-Soviet relations, the Cuban missile crisis, and unexpected shortfalls of aid around the time of the Sino-Soviet rift (Eberstadt 1995a; Park 1995:188). This chain of events caused North Korea to have serious doubts about the utility of its alliances with China and the Soviet Union and about its long term security position (Levin 1982). North Korea's response during the 1960s was to enhance its military potential at the expense of economic development of other sectors. Official budget figures seem to bear this out, with reported defense expenditure doubling between 1966 and 1967, and nearly tripled between 1967 and 1971. For the years 1967 through 1971, defense was reported to account for over 30 per cent of the national budget-up from a reported 2.5 per cent in 1961 (Eberstadt 1995a:18).

As in other centrally planned economies that have employed strategies of extensive development centered on heavy industry, the initial results were encouraging. North Korean economic development up until the 1970s was notable for its fast rate of industrialization. According to the South Korean government's National Unification Board (NUB) figures cited in Namkoong (1994:8), North Korea registered an annual average growth rate of 10.4 per cent during the period 1971-75. But despite this impressive growth, the efficiency problems of an economy without a price mechanism for resource allocation have became increasingly evident over time. Average economic growth was estimated to have fallen to 3.7 per cent from 1981-85 and to 1.4 per cent from 1986-90. Although the current economic situation of North Korea is hard to assess due to the lack of reliable data, a variety of indicators suggest a steady deterioration of economic conditions since the late 1980s following a series of negative macroeconomic shocks. According

[4] According to one estimate, over the period 1980-95 North Korea spent US$36 billion on 60 construction projects. Of this, US$10 billion was used for 'showpiece' or 'monument' structures, US$8 billion into production facilities and US$19 billion into infrastructure (Naewoe Press 1996b:22).

to the Bank of Korea, North Korea has just experienced its sixth year of negative economic growth, with the economy estimated to have contracted by 30 per cent since 1990.

In the early 1970s, perhaps in recognition of the industrial imbalance already emerging under inward-oriented policies, the regime made great efforts to expand access to foreign capital and technology. North Korea began importing capital equipment from Western industrialized countries (including Japan) with the intention of paying creditors off from resultant production. Average annual imports from Western industrialized nations increased by 90 per cent from 1970 to 1974, with imports from OECD economies in 1974 accounting for over half of total imports (Yeon 1986:182). Ultimately, the external environment as well as internal structural problems defeated the plan by making repayments difficult. The first oil shock in 1973, along with falling prices for raw materials such as nonferrous metals on the world market in the 1970s, on which the North mainly relied for foreign exchange, saw a marked deterioration in its commodity terms of trade. North Korea's managerial capacity to put imported Western equipment to use, and its government inexperience with the workings of international financial markets in which it was operating may also have made repayments difficult. As imports were mostly financed by foreign loans denominated in hard currencies, repayments did not proceed on schedule and by 1976 North Korea was formally in default on a large portion of its borrowings. North Korea's credit rating collapsed and imports from Western countries contracted sharply (Eberstadt 1995a:21). North Korea has repeatedly defaulted on its loans and obligations since then. By 1995, total foreign debt amounted to over US$10 billion, over 50 per cent of its GNP, with almost three-quarters of this owed to OECD countries. The effect has been to close off access to further imports of Western technology and capital, which remain vital for its economy recovery, and to the option of importing raw materials for value added processing and re-export.

Since the early stages of its economic development, North Korea has made development of heavy industry a top priority. Like other centrally planned economies, North Korea's industry policy is based on the belief that an economy cannot grow without the foundation of heavy industry, which is crucial in creating the basic materials vital to the development of all other industrial products (Koo and Jo 1995:26). This view is manifested in Kim Il Sung's statement that 'heavy industry is the foundation for national economic development, and the development of light

industry and agriculture cannot be achieved without its development.'[5] While heavy industry did lead to the country to rapid economic growth in the 1950s and 1960s, the result was an serious industrial balance, as evidenced by the emergence of a chronic shortage of consumer goods.

In 1984, the North Korean regime launched the 'The August Third Consumer Goods Program' as one attempt aimed at addressing the industrial imbalance. The purpose of the program was to mobilize underutilized labor and unused 'waste' materials in the production of simple consumer goods. The program emphasized the role of local government and established direct sales stores where locally produced goods were sold directly to consumers, bypassing centralized production quotas and procurement (Choi 1990:80-85). Since the North Korean economy had previously experienced no local autonomy and had been tightly controlled by the central government, the August Third Program was seen by some observers as big step in the direction of decentralization (Koo 1992:196-97). Others argue that consumer goods production drive 'was never meant to foster local autonomy', given that the emphasis on local industry was followed by the creation of a new organization to strengthen central control (Kim 1994:5). However, as Noland (1995:15) has pointed out, the success of the campaign should be judged not so much in its actual accomplishment, but by whether it represented the beginning of more ambitious reforms. That the production drive did not appear to lead to a loosening of the distribution mechanism, would seem to make it difficult to judge the program a success.

In addition to the limited decentralization of decision making, North Korea has at various times attempted to introduced material incentives into economic activities (Koo and Jo 1995: 29-30). An incentive system for enterprises, the 'independent accounting system' was introduced in 1973 and applied to all national enterprises and factories. Under the system, each enterprise was allowed to keep surplus revenue after meeting various expenses and to distribute the profits to workers according to their contribution. The system was extended in 1980 to include small-scale regional factories, and in 1984 to include organizations and enterprises in the 'unproductive sector' (services sector).[6] Efforts were also undertaken to increase material incentives at the

---

[5] Kim quoted in *Complete Encyclopedia* (1982:294).

[6] North Korea defines the 'unproductive sector' as that which does not produce material wealth, such as education, science, arts, health care, and commerce.

group level, with benefits such as medical facilities as well as public nurseries (North Korea Research Center 1983:993-1056). Still, material incentives and decentralization in the decision-making process should not be interpreted as a signal that the North Korean economic system by the mid-1980s was in transition towards a market economy. All enterprises remained state-owned, with firms given very limited scope, since the quota and production factors are unilaterally given by the central planning authority.

Since the mid-1980s though there have been some signs of change in economic policy through the announcements of further plans to foster light industries, and the adoption of a foreign investment law. The expansion of international trade was set as one of the regimes major policy goals in the 1980s, along with the Joint Venture Law in 1984, to attract badly needed foreign investment. While the joint venture law apparently imitated the law which China had enacted in 1979,[7] its success was limited because the regime failed to undertake the overall reforms needed to attract foreign investment. Plans to foster light industries also appear to have largely failed, with the ratio of heavy industrial production as a share of total production increasing continuously from the 1960s. By 1990, the share of heavy industry production had risen to around 70 per cent, higher than the South's ratio of 60 per cent (Koo and Jo 1995:26-7).[8]

Table 1 reports North Korea's GNP distribution by sectors as estimated by the Bank of Korea. Taken at face value,[9] North Korea's economic structure would seem to be closer to pre-reform China than pre-reform Eastern Europe with North Korea's production structure in 1994 similar to China's production structure in 1979. But whereas China's pre-reform workforce was mainly agricultural, by the late 1980s, North Korea's labor force distribution appears to more closely resemble that of Eastern European economies, with the labor force roughly two-thirds nonagricultural (Table 2).

---

[7] There were however important differences between the two laws. The North Korean law permitted overseas residents to be potential partners in joint venture projects, whereas the Chinese law contained no such provision. The North Korean law allowed a wide range of joint ventures projects, including construction, transportation, science, technology, and tourism, while the Chinese law was more restrictive (Kim 1994:7).

[8] Heavy industry in North Korea is defined as the whole body of industries that produce all the means of production and includes the electric power industry, coal industry, forestry as well as traditional heavy industries such as machinery, metals and chemicals.

[9] As discussed in the next section, the Bank of Korea's estimates are likely to be subject to considerable estimation biases.

The North's economy is widely recognized as having suffered a severe downturn from 1989 following a series of external shocks. The most severe blow was the sharp decline in key energy inputs of oil and coking coal following the fall of the Soviet Union. The former Soviet Union, which had provided oil to North Korea at a 'fraternal' price, requested in 1990 that North Korea pay the standard international price and that it pay in US dollars or Deutsche marks rather than in barter trade. Prior to this, trade conducted on barter terms had enabled North Korea to obtain critical energy supplies while avoiding balance of payment difficulties. As North Korea lacked the hard currency needed to meet these terms, the level of its imports from the former Soviet Union dropped sharply with total trade volume between North Korea and the former Soviet Union falling from US$3.2 billion in 1990 to US$360 million in 1991. Unable to obtain sufficient supplies of oil and coking coal essential to its industry, North Korea's industrial output has since slumped. The operational capacity of most industries has fallen dramatically, with some estimates suggesting that a number of industries presently function at between 30 and 50 per cent of capacity, whilst others have ceased operations entirely.

From 1987, the former Soviet Union ceased providing economic aid, although it has received debt payments from North Korea. Beginning in 1993, China also requested that trade be paid for in cash rather than through barter, although a substantial share of trade between North Korea has continued on a barter basis (Kim 1995).

In December 1993, the government admitted to the failure of its economic policy for the first time in its history, declaring that the Third Seven Year Plan 1987-93 ended in under fulfillment. But as indicated below, the reason given for the poor economic outcome was the collapse of socialist economies rather than domestic systemic failure.

> 'The grave situation in which socialism has suffered a setback and capitalism has been revived in some countries' is creating 'grave difficulties for our [socialist] revolution and imposing heavy tasks on it... The crises facing us now is unprecedented in its gravity and severity' (*Pyongyang Times*, 27 February 1993).

The years 1994-96 were set as a period of adjustment, with the regime declaring it would concentrate on improving living standards by pursuing policies giving priority to the agriculture, light industry and external trade. The regime has concentrated most of its available

resources in attracting investment into the Rajin-Sonbong free trade economic zone located in the remote northeast of the country, even though this alone will be not be sufficient to address the North's systemic economic problems.

In recent years, North Korea's problems have further manifested themselves in falling productivity and output in the agricultural sector as domestic production has fallen appreciably. The decline in agriculture can however, be traced from the late 1980s when economic contraction and trade disruption severely impacted on North Korea's capacity to import the inputs essential to its agricultural sector. In May 1995, the government requested emergency supplies of rice from the international community. Successive years of flooding in August 1995 and July 1996 have set back agriculture and significantly compounded underlying food production problems.

The need for domestic economic reform is now substantial. North Korea is suffering from an acute shortage of capital and raw materials. The imbalance among industries caused by policies that had given top priority to energy-intensive heavy industries since the early stages of economic development have become a serious obstacle to further growth. However, its inability to repay foreign debts accumulated in the 1970s continue to make it difficult for North Korea to attract the foreign capital and technology necessary for industrial restructuring and development. Falling exports and a widening trade deficit, together mean that the country has very little foreign exchange to make purchases from international markets and has had to resort to bartering for food and other essential imports. In the absence of substantial investment and recovery in the medium to long term, the economy faces recurrent food supply difficulties as its ability to maintain domestic production, and its capacity to import food commercially remain highly constrained (FAO/WFP 1996c). Clearly then the North Korean economy is under severe economic stress. Whether though current conditions have deterioration has reached crisis proportions is difficult to assess due to the scarcity of reliable information (Noland 1995:5).

III NORTH KOREAN STATISTICS

Relatively little can be stated with certainty about North Korean statistics. In attempting to quantify North Korea's economic performance, one must not only cope with the theoretical issues that have dogged such estimates for the USSR and communist Europe, but also with the fact that

these countries made available vastly more information about their economies than has North Korea (Eberstadt 1995a:4). This absence of reliable statistical information means that indirect estimates have to be extensively employed.

North Korea ceased publishing regular statistics in 1965. Much of the statistical information provided when statistical yearbooks were produced for the years 1946-65 is in index form, with these numbers generally been unaccompanied by vital information such as the base year, price or quantity weights, treatment of new products, definitions of terms and groupings and sampling methods. While statistics in absolute or physical terms such as the output of major industrial and agricultural commodities seem to be far more accurate and reliable than those in index numbers, there are ambiguities because of vague or unexplained definitions and aggregations methods with classifications seldom accompanied by notes defining them (Chung 1974). Very little information is available on North Korean prices even for individual items, and nothing like a price index or deflator series for output apparently has ever been released.

Those statistics that have been made available by the North Korean regime since 1965 are often discontinuous and fragmentary, with questions surround the reliability of statistics that are published under the auspices of North Korean government. The greatest potential source for statistical inflation arises from the possibility of cheating and errors at the microlevel reporting by individual enterprises and collective farms. In North Korea, economic performance and rewards for individual workers, peasants and managers are fundamentally based on the fulfillment of planned quotas as reflected by the predominance of a piece-rate wage system and bonuses. In such a system there is a built-in tendency to exaggerate output figures. Economy-wide exhortations and mass movements also compound the problem of statistical padding. For example, unusually large production claims appear to have been made around 1958-59 in the wake of the Chollima Movement which was inspired by and patterned after the Chinese Great Leap Forward.

But as Chung (1974:169-78) points out, suppression of selected data need not imply that North Korea is either sporadic in the collection, compilation, and utilization of economic data. He argues that there seems no evidence that North Korea uses a double bookkeeping system, that data selected for publication for external or domestic consumption does not differ from records circulated among the inner circles of the State Planning Commission, the main government body

charged with implementation and collection of economic statistics. Generally speaking, omission and delay, rather than deliberate falsification appears to be the regime's way of concealing any unfavorable development within the economy. For example, if the output of a certain series declines, the production figures for the series tend to be omitted to conceal current failure and instead, emphasis is placed on the series in which output has again shown gains. For example, output figures on only a handful of products were made public in 1964, 1965 and 1970 while there is a complete lack of information on physical data on production from the mid to late 1960s. This blackout of data started from 1966, a year in which gross industrial output declined by 3 per cent for the first time since 1945. Information published for 1970 came in the form of Kim Il-Sung's address to the Fifth Congress of the Workers' Party in November of that year. With the recent economic deterioration North Korea has failed to announce a budget for 1995 and again for 1996.

Since gaining membership in the United Nations (UN), North Korea has been providing data to UN related agencies. Studies applying this data suggest that the data North Korea has released to the UN may not, generally speaking, be erroneous or inflated. Eberstadt and Banister (1992), in their ground breaking study in analyzing the North's demographic, labor and social trends using figures released by North Korea to the United Nations Population Fund in 1989, concluded that the data appear reported as collected, without any serious alterations or falsification.[10]

National income

As in other centrally planned economies, North Korea's national accounts are based on the accounting concept of net material product (NMP), giving rise to the usual problems of upward bias attributable to the double counting problem, namely the practice of counting inter-enterprise production more than once in the valuation of output and services, and to problems associated with excluding 'nonproductive' or 'nonmaterial' services (such as administration, transport, education and health) and depreciation from the measure of aggregate output and income. In the case of North Korea, the paucity of data compounds the problem of measurement since North Korea

[10] While the data reveal several shortcomings and peculiarities in presentation (such as the removal of the military population from the total national count after 1970), the author's conclude that the problems with North Korea's demographic data appear to be similar to those observed in non-Communist, less developed countries.

has never published a figure for net material product.

Several attempts have been made to estimate the North's GNP and GNP per capita.[11] Research institutes such as the United States Central Intelligence Agency (USCIA), Stockholm International Peace Research Institute (SIPRI), and International Institute for Strategic Studies (IISS) in London, have undertaken estimates from time to time, although the USCIA and SIPRI no longer estimate North Korean GNP due to a lack of basic data (Chun 1992).[12] Estimates by the National Unification Board (NUB)/Bank of Korea (BOK) remain the only regular set of time series data produced on the North Korean economy and are the most widely cited indicators used to assess the North's economic performance.

The NUB reportedly estimates North Korean GNP by scaling up from estimated net material product (NMP) to GNP, using three methods. The first is based on the intermittent per capita income figures the North has announced. In the second method, NMP is calculated independently by aggregating up estimated income accruing to various economic units such as government, state enterprises, workers etc. The third method is to estimate NMP on the basis of estimates undertaken by the USSR Academy of Social Sciences up to 1969, which were published in 1971. These three estimates are compared with the increase rate of the North Korean budget and sectoral growth rates, which in the past have been the only regular statistics released by North Korea. Depreciation and value added from the 'nonmaterial' service sector are then added to obtain an estimate of North Korean GNP[13] (Chun 1992).

The Bank of Korea estimates North Korean output by using data on physical output and applying South Korean value-added weights. Physical output indicators are in turn generated by South Korea's National Security Agency which remain confidential. On the basis of this comparison, the NUB and BOK select one of these estimates as the final figure for North Korean GNP. As is readily acknowledged by the South Korean agencies, there are considerable deficiencies in

---

[11] See Hwang (1993) and also Noland (1995) for a survey of these studies.

[12] Although little information is provided as to how these various institutions arrive at their estimates, most seem to have calculated North Korean per capita GNP from the figures intermittently released by North Korea. Differences in the estimates also vary according to whether the 'official' or trade exchange rate is used to convert to a common currency (Hwang 1993).

[13] The rate of depreciation is 3.7 per cent of GNP and value added in nonmaterial service 6.8 per cent of GNP. This rate of depreciation is almost certainly too low, being based an announcement by North Korea that depreciation in 1957 accounted for 3.7 per cent of total production costs.

their methodologies employed to estimate North Korean output. The secrecy surrounding the construction of these estimates makes it even more difficult for outsiders to determine the scale of estimation bias (Oh 1995). Nonetheless, as Noland (1995) has discussed, these estimates are probably best regarded as coming with very large standard errors.

In spite of the limitations surrounding these estimates, there are other diverse indications that point to a consistent reading that South Korea did not catch up with, much less surpass, North Korea's per capita income until the 1970s. By the mid-1980s, depending on the source one chooses, North Korea's per capita income was anything from roughly parity with South Korea (Hwang 1993) to less than two-fifths of the South's level. By the end of the 1980s, per capita output in South Korea was clearly higher than in North Korea, although by exactly how much higher is difficult to tell (Eberstadt 1995a:12-13). According to the Bank of Korea's estimates, by 1995, South Korea's GNP was 20 times that of the North Korea's ($22 billion), with the South's GNP per capita 11 times greater than that of the North's ($957).

North Korea has periodically made public, formally or informally, information regarding its per capita income. In 1989, North Korean officials disclosed a number of US$2,580.[14] If the trade exchange rate[15] in that year is applied, instead of the official rate that the North uses to calculate its national income in US dollars, the figure is $1,205.[16] Several researchers have also attempted to estimate North Korean income indirectly using the physical indicators approach. The physical indicators method is often used to obtain a regression relationship between a set of physical economic and per capita dollar GNP indicators for countries where neither GNP or a

---

[14] As Eberstadt (1995a:12) has discussed, the release of this figure was quite significant. In the past, North Korea has occasionally released dollar-denominated figures for per capita national income. While their accuracy was questionable, they had always been higher than the dollar-denominated, exchange-rate-based estimates of GNP per capita for South Korea. That tradition was broken in 1989. In releasing the figure of $2,580 in May 1990, after South Korea had reported it's estimate for 1989 of $4968, North Korean authorities seemed not only to be placing a measure of per capita output in their country at about half (52 per cent) of South Korea's level, but to be indicating that they themselves knew what they were doing and what they were implying.

[15] North Korea has maintained a multiple exchange rate system since the early 1960s. The official or basic rate, which is most likely highly overvalued, is the rate North Korea uses to convert it's national income into US dollar income. How North Korea determines the official rate is unknown, although it appears to be determined and adjusted to reflect changes in price of the dollar in terms of the ruble. The trade exchange rate or commercial rate is the rate applied to international transactions. A third, non-commercial or non-trade rate, is the rate applied to tourists and to remittances by foreigners for purposes other than foreign trade. In recent years it has been almost equivalent to the trade exchange rate (Kim 1995; Hwang 1993).

[16] More recently, Kim Jong-U, chairman of the North Korean Committee of Promotion of External Economic Cooperation (CPEEC) announced at a conference in Washington DC in 1996 a figure of US$900.

meaningful dollar exchange rate is available. The statistical relationship obtained from other countries is applied to socialist countries' physical indicators to estimate dollar GNP.

Although the physical indicators method requires only a modest amount of data and avoids the dollar conversion problem, this method also has its shortcomings. GNP estimates may have an upward or downward bias depending on the nature of the economic system in sample countries and the country whose GNP is to be estimated. This may be so for several reasons. Firstly, because each estimate provided by each indicator is given equal weight, some indicators are over represented and others are under represented. Secondly, differences among countries in the quality of products used as physical indicators are not taken into account. The result may be an upward bias in the estimate, especially if the reference countries are high income market economies. Third, North Korea, like other centrally planned economies, is inherently inefficient in its use of intermediate inputs such as steel and electricity consumption. Estimating a relationship between per capita GNP and intermediate inputs sampled from market economies, and applying the estimated relationship to North Korean physical indicators, is therefore likely to overestimate per capita GNP.

Using the physical indicators approach, Jeong (1993) estimates North Korean per capita income for 1990 of $1181; Chun (1992) puts the figure at $1269, while Noland reports GNP per capita for 1990 of $2284, which is about one quarter that of South Korea. These results though are not directly comparable. Noland uses purchasing power corrected data, whereas as Jeong and Chun report in current prices, and as a consequence obtain downwardly biased estimates. On the other hand, unlike Chun's sample which comprises only socialist economies, Noland's sample includes industrialized economies which will upwardly bias the estimate for the reasons outlined above.

The interest in these GNP per income estimates are by no means academic. Apart from being indiscriminately used to assess the state of the North Korean economy, the expected per capita income gap between the two Koreas has formed the basis for analysis seeking to predict the cost (defined as the amount of investment required to equalize per capita GNP of the North with that of the South) or investment needs of reunification. Depending on the target year for unification, these estimates have ranged from $200 billion to $1.2 trillion dollars. Taking per capita income

estimates for 1990 for example, the ratio of South Korea to North Korea per capita income ranged from 5.4 (Hwang 1993) using the North Korean trade exchange rate) to 2.5 from the same source using the official exchange rate, with Noland estimating per capita income estimate, seemingly more credible using an adjusted purchasing power parity, implying a ratio of 3.6.

Figure 1 (and appendix Table 1) show select estimates of North Korea's per capita GNP. Based on these estimates, North Korea's per capita income in 1990 was anywhere between US$900-US$2300, placing it in the ranks of a lower to middle income developing economy with a per capita income similar to the Philippines, Vietnam, or some of the middle-income provinces of China. The series of negative shocks since then would have more than likely reduced North Korean output and per capita income. But as Noland (1995:22-23) points out, while economic conditions may have deteriorated, national income and personal welfare may diverge quite sharply. It is unlikely that services (such as housing and education) which are underestimated and are not amenable to physical measurement declined as much as industrial output. Such considerations would appear to caution against interpreting negative growth rates as indices of hardship or political discontent (Noland 1995:23). Moreover, there are, as Eberstadt (1997:14-22) has discussed, several contemporary examples of states coping with significant economic dislocation in response to external shocks. Five years of steep economic decline in Cuba or Iraq does not yet seem to have brought these ruling powers to the point of political crisis. Between 1990-95, Iraq's per capita output is estimated to have fallen by half. In 1993, Cuba's GNP was only half as large as it had been in 1989, following a severe trade shock, which on USCIA estimates, saw the value of Cuba's total trade fall by 70 per cent between 1989 and 1994 (Eberstadt 1997:22).[17]

Socio-economic indicators reported in Table 3 are also suggestive of North Korea having higher standard of living than implied by output indicators. Although travelers reports (including my own) are merely impressionistic, North Korea does not strike one as being a third world country. While there is an evident disparity between life in Pyongyang and life in the rural areas, for the most part this disparity is not discernibly more exaggerated that the disparity between rural and urban life in most East Asian countries (Flake 1995a). And while North's

[17] Like that of North Korea, the success of these regime's in quelling potentially destabilizing pressures can be credited to their state system's carefully developed capabilities for social control (Eberstadt 1997:22.)

performance is usually compared with the South, it is also important to keep in context that South Korea has not only been credited with the most rapid rates of economic growth in the developing world over the past four decades, but is more populous as well. 'Even if its rate of material advance has been slower than South Korea's over past generation, North Korea's pace of progress may still have been quite rapid by international standards' (Eberstadt 1995a:13).

Trade

One area where relatively reliable data is available is on North Korea's trade patterns given that official trade statistics can be checked by trade returns of partner countries. But even these figures are likely to be understated because it excludes the considerable border trade along the North Korean/China border and the presumably significant amount of trade between the North and countries like Libya, Iran, Iraq and Syria, believed to be in the form of arms sales for oil. The amount of such trade, however, remains complete conjecture.

After increasing fairly rapidly in the 1970s, North Korea's trade slowed in the 1980s, and since 1989 has shown a continuous decline following the breakup of the former Soviet Union, at the time the North's major trading partner. Exports increased fairly rapidly from US$0.2 billion in 1965, equivalent to South Korean exports that year, to approximately US$1.6 billion in 1980, an average annual growth rate of 14.5 per cent, but much lower than South Korea's annual export growth of 35 per cent (Figure 2). During the same period imports grew by an average annual rate of 31 per cent, and by an annual rate of 12 per cent between 1980-92. After peaking at US$5.2 billion in 1988, North Korea's total trade has contracted by over 50 per cent to about US$2 billion in 1995.[18] As Figure 2 shows, North Korea has been running a perennial trade deficit since the late 1960s. The fundamental factor behind North Korea's falling trade is the weak competitiveness of its products, and a severe shortage of foreign currency to buy raw materials and parts necessary for producing or processing goods to be sold on the foreign market.

When measured by the ratio of exports to GNP, North Korea is now much less open than Eastern Europe, and is almost as closed as pre-reform China (Table 4). In the past, however,

[18] This figure does not include inter-Korean trade which is considered by the South Korean authorities to be 'domestic' trade. In 1995 inter-Korean trade total US$287 million.

international trade has in fact played a fairly important role in North Korea's economy, despite the officially extolled doctrine of national self-reliance. As Eberstadt (1995a:21) has noted, North Korea in the mid-1960s would have looked more open than a number of other contemporary communist economies; moreover it would have been an economy in the process of becoming more open, insofar as its pace of export growth exceeded reported growth of national income. North Korea's trade dependency ratio (as measured by the ratio of exports and imports to GNP) displayed a general trend of increase from 15 to 25 per cent between 1965-88, but by 1995 had declined to 9 percent.

Government budget

Of the limited data available, the government budget is the only official data that, at least until recently, had been regularly released by North Korea. Based on this data, North Korea's government sector is probably by far the largest in the world. By 1990, the portion of government expenditure in GNP was 72 per cent, compared to 51 per cent in Russia in 1991 and 34 per cent in China in 1978, and 64 per cent in Hungary in 1989 (Park 1995:114). The role and size of government expanded rapidly from the early 1960s, reflecting the greater role of central planning and the growth of industry and urban centers. Since 1975, North Korean statistics report a progressive slowdown in the rate of growth of government expenditure. The annual growth rate of government expenditure during 1986-90 was only 5.4 per cent, compared with 13.7 per cent during 1970-75 (Table 5), suggesting financial mobilization in the government sector has been severely limited by deteriorating economic conditions (Park 1995:114). Table 5 also shows that the composition of government spending has changed little in terms of the ranking of functions over the past three decades. Expenditure on economic development remains by far the largest component (60-70 per cent), followed by social and cultural outlays, military spending and administrative expenditure. It is generally believed that a large portion of the military expenditure is hidden under the heading of economic development in the form of industrial investment.[19]

[19] Estimates of the military's share of output greatly vary. North Korean official estimates for 1991 put the military's share of output at 9 per cent, while the NUB and IISS estimate the military's share as being considerably higher, at 22 per cent and 27 per cent respectively.

Central government revenue is raised primarily from transactions revenue which are collected from state enterprises and cooperatives on the production or sale of consumer goods. The revenue structure relies heavily on the enterprises sector, much more so than in other centrally planned economies. By 1974, for example, the share of revenue from state enterprises accounted for 98 per cent of all revenue, compared to 50 per cent in 1953 (Park 1995:122-24).

IV THE AGRICULTURAL SECTOR

North Korea does not have a natural comparative advantage in agriculture. As a predominantly mountainous country, its natural conditions are not suited to achieving food self-sufficiency. Upon partition of the Korean peninsular along the 38th parallel in 1945, the North retained one-third of the population and slightly less than half of the arable land (Table 6).[20] Table 7 shows the similarities between the agricultural structure of North and South Korea. Like that of the South, only some 20 per cent or 2.12 million hectares of land in North Korea is arable. Of the arable land available, some 1.4-1.6 million hectares is suitable for grain and cereal production, with approximately 80 per cent of the land requiring irrigation. While the share of the population employed in agriculture in South Korea began to fall rapidly from the mid-1970s following rapid urbanization and industrialization, the decline of agricultural employment in North Korea has been relatively slow, from 40 per cent to 25 per cent between 1960-90 (Eberstadt and Bannister 1992).[21]

Rice and maize are the two main crops grown and consumed in the North Korea. Much of the rice production is concentrated in the Southwest of the country where the climate is more conducive to rice production, with maize grown mainly in the northern half of the country. It is estimated that the Southwest of the country produces roughly 60 per cent of the country's food grain with the remainder coming principally from the northwest. While the share of planted rice acreage has remained relatively stable over the past three decades at between 30-40 per cent of

---

[20] Per capita output appears to have been significantly higher in the northern portion of the peninsular than in the southern half. In 1940, by one set of estimates, per capita 'commodity product' (value added in agriculture and industry alone) was almost 70 per cent higher in the provinces from which North Korea was composed than in the southern provinces (Eberstadt 1995a).

[21] Official North Korean figures reported to the FAO put the share of the labor force in agriculture by 1990 much higher, at 34 per cent.

total acreage, that of maize has increased from 10 per cent in the early 1960s to more than 40 per cent by the late 1980s. The increased dominance of maize in agricultural production over time reflects an intensive program to replace miscellaneous cereals with corn.

Following a typical communist pattern, North Korean agriculture has passed through two cycles of change—land reform in 1946 and collectivization during 1954-58—affecting the organization and management of agricultural production and the structure of land ownership and utilization. Between 1954-58, some one million farm households were transformed into collectivized farms, most designated as cooperative farms, and a small number of them named state farms.[22] Cooperative farms remain the most dominant form of farm organization where everything including land, farm facilities, and implements are owned collectively and members are paid incomes in shares of what they produce (Lee 1995). Ownership of small garden plots and the raising of farm animals has been permitted both for consumption at home and sale at the peasant market since 1966 (Robinson 1965). The size of the permitted area for private cultivation is limited to 30-50 pyong (10-17 m^2), depending on the family size; for a soldier's family the limit is reportedly 100 pyong (Hoon, 1996). A small portion of farm products produced on private plots of collective farms are allowed for free marketing in the rural fairs that open once every 10 days (Moon 1995), although with the current food crisis farmers are reportedly allowed to sell an increasing range of produce on the open market.

Because they represent a state form of socialist ownership, the influence of state farms on the development of cooperative farms in terms of agricultural managerial and farming practices, is significant (Moon 1995:81). The incomes of state farms are not linked to the amount of output they produce; the entire output is turned over to the state, and workers are paid fixed wages set by the state like workers in industrial enterprises. In the case of collective farms, renumeration for individual farm members is paid on the basis of the number of workday points accumulated for a given period of time, with the degree of loyalty to the party also taken into

[22] Land redistribution saw the mean farm size reduced in half from 2.4 chongbo to an average 1.4 chongbo per farm household. One chongbo equals 2.45 acres or approximately 1 hectare.

account (Chung 1974).[23] Theoretically this system conforms to the principle of higher renumeration for better work and better results. Under such a system it is almost impossible for individual workers to anticipate the amount of reward they are to be paid because each share depends not only on an individual's accumulated workday points but also on those of other members. Consequently, there could be a considerable difference in actual value of a workday point among different cooperative farms, and this may vary from one year to another. A minimum guaranteed payment system is also adopted for both state and cooperative farms. The purpose of this system is to guarantee minimum subsistence in case of crop failure due to adverse weather conditions.

Fulfilling the government set target is the basic tenet of life for collective farm workers. Since income and status depend considerably on achieving targets determined by higher units, there is a tendency for the lower levels of administration and farm managers to embellish positive achievements in reporting to superiors. But there is also an incentive for farm managers to endeavor to obtain lower planned targets so as to make it easier to over fulfill the plan, because over fulfillment means bonuses.

Decisions concerning the output mix, allocation of inputs and their prices, planting and harvesting dates, the distribution and prices of farm product, are made on the basis of specific central government directives (Moon 1995). Food distribution is also controlled by government authorities. According to the FAO/WFP (1996a), out of a population of 22 million, some 13.5 million or 62 per cent of the population are eligible to receive subsidized food rations through the public distribution system throughout the year. In addition, some 3 million workers and dependents on state farms are entitled to subsidized ratios for 6 months of the year. This leaves a population of roughly 5 million on collective farms, who receive no subsidized rations and are dependant on a quota from the harvest for their annual food needs.

The amount of rations varies depending on the age and the kind of labor engaged. The first claim is given to the military, police, government, party employees, and workers in critical

[23] Under this system, a subteam is assigned a specific number of workday points for performing a planned task on an allotted area of land. Depending on whether the subteam over fulfills or under fulfills the planned target, the workday points are adjusted upward or downward. Once the workday points are earned by the subteam as a group are determined, they are divided among individual members according to their contribution. The planned assignments as regards yields are based on average indicators achieved over the previous 3-5 years, with consideration given to improvements in farming technology (Moon 1995:84-85).

industries such as mining and heavy industry. According to unofficial reports, the standard per capita ration for the general population in the past was 0.7 kg per day (256 kg/yr), but the actual amount of ration by the early 1990s had been cut to 0.55 kg (201 kg/yr) with a mixture of half-and-half non-rice cereals, mainly corn (Choi and Chun 1992). Rationing is not limited to staple food grain. Other farm products as meat, eggs, fruits and vegetables are also distributed through the rationing system. Food grains are rationed on a basic formula which until recently had not changed greatly since 1965. The daily rations of grain were 100 grams for children up to one year of age, 200 grams for up to two years, 300 grams for preschoolers and the elderly, 400 grams for middle schoolers, 600 grams for college students and workers, and 700 grams for government officers. Since children and other dependents constitute a significant proportion of the population, the average ratio per person would be less than 600 grams per day (Lee 1994).

From 1960 and until his death in 1994, agriculture was directed personally by Kim Il Sung. The basic system underlying North Korean agricultural management is believed to have been cultivated from Kim Il Sung's personal visits to sites in North Korea whereby Kim is said to have provided 'on the spot guidance' of farm management techniques and on how to solve administrative and managerial problems. The result was the emergence of the mass mobilization technique known as Chongsanri method, named after the cooperative farm Kim visited. The essence of the Chongsanri method lies in its 'mass line policy', a system that emphasizes communal cooperation as well as political conditioning of the masses (Koo and Jo 1995:33). The more significant articulation of the mobilization strategy is set out in Kim's so-called 'Rural Thesis', where as Lee (1994:514) has described, 'Kim Il Sung put forth the task of increasing food production and developing rural areas in the lofty ideological terms of preparing for the transition to communism by eliminating the differences between town and country and between the peasants and the working class'. In practice, the task entailed carrying out the so-called 'three revolutions'—ideological, technological and cultural. Technological revolution in irrigation, electrification, mechanization and chemicalization, in particular, constituted the means by which Kim Il Sung believed North Korea would attain self-sufficiency in food production (Lee 1994).

One of the long term measures called for by Kim in the early 1970s was the development of new strains of rice and maize which would be resistant to the cold, short in growth periods and

high yielding. North Korea appears to have had some success, especially in developing high yielding rice hybrids. Advances in developing improved varieties, along with refinements in certain scientific practices from 1974, provided important elements for generating steady increases in grain production after 1977. This has been confirmed objectively by scientists of the International Rice Research Institute (IRRI) in the Philippines who visited North Korea in 1985 reported that the higher yielding variety was planted to 60 per cent of the rice acreage in the country, with the highest yield obtained in the cooperative farms being 9.2 tons per hectare (Lee 1994). The IRRI scientists also reported a maize hybrid was being planted in the cooperative farms, yielding on some collective farms up to 9 tones per hectare.

The goals of rapid chemicalization also appear to have been achieved during the 1970s, with chemical fertilization increasing rapidly from 1973-77. In 1963, the amount of chemical fertilizer applied to each hectare of cultivated land had reached 300 kg, rising to 500 kg per hectare by 1970. By the end of the Six-Year Plan (1972-77), the fertilizer plan of achieving production of 3 million tons and applying an average of 1,000 kg/ha of chemical fertilizers to each hectare of cultivated land had been achieved.[24] The basic irrigation system was also in place by 1970, largely in response to the North climatic conditions whereby the dry spring necessitates irrigation and the heavy rainfall in the summer results in flooding. The total land under irrigation is believed to be around 1 million hectares (0.7 paddy rice and 0.3 other field crops), with the further potential for some 300,000 hectares to be irrigated.

The North Korean agricultural system is therefore perhaps more developed that is widely perceived, with impressive accomplishments having been posted in irrigation, rural electrification and infrastructure. In fact as Eberstadt (1995a) has pointed out, a capacity for sophisticated calculation and adept management, in fact, would seem to be suggested by what (al least until recently) did not occur in North Korea. The experience of other communist states in East Asia was that the transition to collectivized agriculture was followed by economic crisis and by famine.

---

[24] The FAO has estimated that the average quantity of fertilizer applied to cereal crops in 1989 was still approximately 1,000 kg/ha in 1989. By 1994 this had dropped to 500 kg/ha following the decline of imports of essential chemicals and other inputs. Nonetheless, this was still above the average per hectare application of fertilizers in South Korea of 440 kg/ha (KREI 1996).

Despite these impressive achievements, once food conditions improved in the mid-1970s, the government apparently gave a relatively lower priority to grain production and eased its push for further farm mechanization and chemicalization (Lee 1994). High yielding varieties require sufficient amounts of fertilizers, and North Korean agriculture failed to receive crucial support in the form of sustained progress in chemical fertilization and farm mechanization. For an economy geared for self-sufficiency, North Korea has never developed domestic sources of potassium and has thus remained dependent on the availability of foreign exchange for its imports.

Grain supply and demand

Recent estimates by Lee (1994) of North Korean grain supply and demand suggest considerable excesses of grain production over controlled consumption were experienced up to 1987. Food conditions reached a balance in 1988, and then slipped into a deficit in 1989. After 1989, the public distribution system came under strain due to a combination of factors, the most devastating of which was the disruption of trade with China and the former Soviet Union. The loss of socialist trading partners severely affected farm operations by reducing imports of petroleum, fertilizers and machinery spare parts needed in agricultural chemical plants. The drop of petroleum imports from the former Soviet Union was dramatic, from 506,000 tons in 1989 to 30,000 tons in 1992 (Lee 1994:544). But the adverse consequences of these factors extended beyond the supply of agricultural inputs. The resulting decreases in power supply, electrified railway service, and the availability of key industrial parts would have also depressed farm operations. In 1994, China ceased to provide grain to the North Korea on concessionary terms which in the period 1992-1995 were estimated as between 700 000 to 1 million tons annually (Naewoe Press?). As this quantum of imports represented a substantial proportion of cereal requirement in the North Korea, cessation had a devastating impact on the grain supply.

Initially North Korea was able to cope with the shortfall by importing grain on a barter system or by exporting good-quality rice in exchange for cheaper grain and by public campaigns advising the consumption of 'two meals a day'. At the beginning of the 1990s, the FAO/WFP (1995) reports that North Korea was holding some 4 million tons in food grain stocks, although there is really no way to accurately determine the amount of stock North Korea has carried over in the

past.[25] In an attempt to adhere to its obligations under the rationing system, the government in the years thereafter drew heavily on the stockpile, to make up the shortfall from domestic production. The decline in the North's capacity to earn foreign exchange since the early 1990s, has meant the regime has been unable to replenish stocks through imports and the volume of stock has continually declined and is now thought to be at neglible levels, with grain demand estimated as exceeding supply by more than 1 million tons by 1992. Estimates by South Korea's Rural Development Administration (RDA) in collaboration with the National Unification Board (NUB) suggest net shortages of grain by 1993 and 1994 at 2.2 million tons and 1.7 million tons, respectively (Table 8). Food grain shortages worsened in 1995 with North Korea approaching the international community for rice aid, even before the heavy flooding in August 1995.[26] In July 1996, the country was affected by floods for the second year in succession, though the severity was not comparable to that of the previous year.

With the recent deterioration in agricultural sector, there have emerged considerable differences in the assessments of international humanitarian relief agencies, of South Korean governmental agencies, in the reports of defectors, and in individual travelers impressions,[27] as to the severity of the food crisis and the capacity of North Korea to cope with these difficulties. These differences have centered on the amount of grain stockpile North Korea was storing, the extent to which grain aid was being diverted to the military, and the extent and seriousness of the crop damage as reported by North Korea. Table 9 reports the estimates of grain supply and

---

[25] According to one North Korean defector who reportedly worked for the Food Department in the Ministry of the People's Armed Forces, North Korea has some 248 grain stockpile complexes, whose combined storage capacity is estimated to be 1.42 million tons. Some 73 grain warehouses were reported to have been constructed for the military since 1987, 60 of which were said to have been completed at the time when relief food grain began arriving in the second half of 1995. Most of the storage facilities are believed to be concentrated in the grain producing regions of North and South Pyongan, located in the southwest of the country, and in South and North Hamgyong, located in the northeast of the country (Naewoe Press 1996a:19).

[26] The floods in July 1995, which came at a critical time in the crop cycle, were up to three to five times above normal for the July-August period, during which the country usually receives some 60 to 65 per cent of its annual precipitation. Following the 1995 floods, the FAO/WFP mission estimated that some 107,000 hectares of rice and 95,000 hectares of maize were lost. Some 300,000 tons of maize and rice were also estimated to have been lost following the July 1996 floods. Overall, flood damage over the past two years may have reduced arable land by around 10 per cent, to an estimated 1.44 million hectares (USDA 1997).

[27] There are those for example who believe North Korea's losses from the floods and reports that North Korea is on the brink of 'wide-scale famine' to be greatly exaggerated. One report, undertaken for the UN on behalf of the Save the Children Fund in July 1996 concluded that North Korea showed no signs of the widespread malnutrition or symptoms of famine reported by other agencies (The Guardian, June 1996:15).

demand, as reported by North Korea, and the NUB/RDA for the production year from November 1995/October 1996, as well as subsequent FAO/WFP mission estimates for 1996/97. According to North Korean estimates, in 1995, demand for grain exceeded production by 3.88 million tons. However, the consensus among observers at the time was that grain demand reported by North Korea, which is obtained by assuming normal food rationing, was far greater than the actual quantity of consumption under the reduced food rationing system (Chun 1996). In September 1996, the FAO/WFP estimated total grain demand would exceed production by nearly 1.5 million tons, with 1.0 million tons being met by commercial imports, bartered cereal imports or foreign aid, leaving an absolute shortfall in 1995/96 of 0.5 million tones. The FAO/WFP (1996c) estimated that prior to harvest, individual daily food rations for large sections of the population had fallen to 200-300 grams. NUB/RDA estimates, undertaking much earlier in the 1996, were roughly in between those of the RDA and FAO/WFP.

Though grain production in 1996 was estimated as being slightly higher than 1995 at 4.3 million tons of cereals (including milled rice) the amount available for consumption is estimated as being considerably less. This is based on FAO/WFP estimates that a substantial amount of the corn harvest (50 per cent) was consumed as fresh cobs in August/September 1996, to supplement declining rations, and that the entire potato crop had already been consumed. Imports of some 2.3 million tons would be needed to meet minimum daily rations of 500 grams through 1997 (FAO/WFP 1996c).

The variation among the estimates can be attributed to various factors—the stage of the crop cycle at which estimates are made, differing methodologies used to estimate North Korea's grain production, as well as differences in grain coverage. The South Korean agricultural institutions estimate North Korean grain production by cultivating the North's grain seeds near the border Demilitarized Zone and on farms in Northeast China where such variables such as the total acreage under cultivation, irrigation facility, weather conditions, quantity of fertilizer etc are monitored. In the past, North Korea has reported its agricultural production data to the UN FAO, but with the recent deterioration in the agricultural sector, North Korea has not provided data since 1993. Agricultural data after 1992 has been estimated by the FAO itself, with grain production and consumption estimates for 1995/96 and 1996/97 based on FAO/WFP mission reports of

area lost and expected yields of rice and maize following access by humanitarian relief agencies in the wake of the floods in August 1995 and again in July 1996. These estimates in turn are based on discussion with North Korean agricultural officials, selected field visits, and analysis of such areas as river deltas where the principle effects of the floods were felt. All of these methods are imperfect to say the least, but because of limited access and information provided by the North Korean authorities to the international relief agencies, they remain the primary source through which the international community has received information from which to assess the state of the food problem in North Korea.

To date the FAO data has not been analyzed to determine its reliability and accuracy, largely because the data has always been assumed to be inflated, and because there has existed no benchmark from which to determine its reliability. South Korean agricultural agencies also typically ignore the FAO data because North Korea reports grain production figures as unhulled whereas in South Korea the amounts of hulled grains are used when calculating grain production figures, although this can easily be adjusted for. However, Lee's (1994) comprehensive study in constructing estimates of North Korean demand and supply of grain now provides a benchmark from which to at least compare the FAO data against. If the data reported to the FAO can be taken as a reasonable estimate of trends in agricultural production, it would provide a consistent series with which to analyze North Korean food grain production and consumption patterns. It would also be useful to compare these trends with South Korea, the country that most closely resembles North Korea in terms of arable land, composition of grain production and dietary similarities.

Drawing on both production figures cited by Kim Il Sung in speeches, announced results of mobilization programs, and recently released internal documents of discussions between Kim Il Sung and agricultural officials, Lee constructs estimates of North Korea's supply and demand of grain as discounted for inflated reporting with minimal consumption levels which North Koreans have historically been accustomed to.[28] After a long period of information blackout on grain production figures, Kim Il Sung in 1975 announced grain output of 7 million tons in 1974, followed

[28] The following is a summary of Lee (1994:530-49).

by figures for the next 7 years.[29] Lee identifies two sources of exaggeration in grain production announcements: measuring the output weight of harvested rice unhusked in contrast to the international practice of weighing hulled rice; and padding the weight of the output. Lee adjusts for the latter but not the former given his purpose is to estimate production changes over time in terms of the North's own standard of measurement. Based on a case study of the reporting behavior of a collective farm in southwest of the country, total padding of grain production is estimated at one-fifth or 21 per cent of the reported yield. This padding was in fact uncovered by Kim Il Sung during discussions with agricultural officials as to why actual output turned out to be less than the estimate he publicly announced.[30] While the case study is not likely to be typical of all cooperative farms, for the lack of better alternative, Lee employs this rule of thumb to discount announced production figures over the period 1974-84 where the pressure to inflate remained high throughout mobilization campaigns. Table 10 contains Lee's estimates of grain demand and supply along with estimates of per capita grain consumption.[31]

Due to the blackout on information announcements after 1984, Lee's estimates of grain production involve far greater guess work and are thus less reliable. During the period 1984-88, before external conditions turned sharply adverse, it is difficult to find internal factors pertaining to grain production undergoing favorable changes. One favorable development was the

---

[29] Grain production for 1973 is estimated on the assumption that output had increased slightly faster that the growth rate in population since 1966. The output estimate for 1966 is derived by tracing back the information contained in closed planning meetings between Kim Il Sung and agricultural officials in 1967, 1968 and 1974 (see Lee 1994:532-535).

[30] The case study is based on the reporting behavior of a collective farm in North Pyongan Province in 1974, which in reporting to county authorities prior to harvest estimated its per-hectare rice production would be 7350 kg. The county authorities then pressured the farm to increase its per-hectare yield, on the basis that its production figures were much lower than other farms' production figures. The farm measured the 'best' rice field again, raising the estimate to 8200 kg. However, after threshing production was only 6800 kg. This allowed two layers of over reporting, a 9 per cent in excess of yield (the original yield that county officials said was too low) and a second layer, the re-estimated report submitted under pressure containing an additional exaggeration of 12 per cent in relation to the actual yield. Thus, discounting the announced production figure in 1974 of 7 million tons (with 5 million tons available for human consumption), it becomes 5.79 million tons, giving a daily ration of 850 grams (310 kg) in terms of unhusked rice and other grains per person. The rate of rice milling loss figured by Kim Il Sung in planning discussions is 20 per cent. Assuming a milling loss of 20 per cent for other grains gives a daily ration of 650 grams (237 kg) in unhulled grains, close to the average ratio per person of less than 600 grams per day. A second method employed by Lee is to take account of importing requirements as revealed by Kim Il Sung, in which case per capita grain consumption amounted to 346 kg (as shown in Table 10)..

[31] Although the figure appears somewhat arbitrarily chosen, per capita consumption of grain is also adjusted upward by 4 kg/year to take account of rising grain demand over time other than for population growth, such as increased ratios for the urban residents and privileged classes, and the rising variety of products requiring grain inputs.

completion of the West Sea Barrage in 1986,[32] which pushed the irrigation program forward significantly. However in the absence of accompanying progress in other mobilization programs, Lee estimates grain production as declining in a step function, by 2 per cent in 1985, 0 per cent in 1986, 2 per cent in 1987 and 0 per cent in 1988, with the main variable being the periodic breakdown in the aged fertilizer factories, which seemed to occur every other year between 1978-1984. Following this, the loss of the North's socialist trading partners and its effects on farm operation would have seen annual falls in grain output beginning in 1989 through 1992. For 1993, grain production is estimated as having increased by 2 per cent on reports on a bumper harvest based on an unusual availability of chemical fertilizers.[33] Resources were mobilized on a top-priority basis not only on the renovation of fertilizer factories but also for the transportation of coal and other inputs into those factories.

A second consideration for thinking a two percent rise in 1993 is based on a figure released by Pyongyang in the process of celebrating the 30th anniversary of the Rural Theses. Premier Kang Sung-San in early 1994 stated that grain production between 1963-93 increased 1.9 times, with rice and maize rising 1.8 times and 2.2 times respectively. The 1.9 figure for all that period was very low, indicating a 1993 production figure lower than the announced amounts for 1984, as well as preceding years back to 1975. The output level for 1963 had never been announced; but it was around 3.8 million tons which Pyongyang claimed for 1960 with little to indicate much increase from 1960 to 1963. Taking output in 1963 to be 3.8 million tons the 1.9-fold increase gives rise to a 1993 production of 7.22 million tons, far less than the 10 million tons announced for 1984 and even less than the 7.7 million. tons claimed for 1975 (Lee 1994:548).

Table 11 compares Lee's estimates with those of the RDA/NUB and with the grain production figures North Korea reports to the FAO. The RDA/NUB estimates are considerably lower than both

---

[32] Due to the severe tides on North Korea's western coast, the waters at the mouth of the Taedong river were rendered unusable for agriculture as the tide would carry saltwater up the river. Moreover, in time of flood, the incoming tide greatly worsened the effects of flooding. The barrage effectively dams the entire mouth of the river. When the tide is out, sluices are opened to release the river water. When the tide is in the sluices are closed to keep out the seawater. As a result the water on the river side of the barrage is fresh water and can be incorporated in the irrigation system (Flake 1996c:7?).

[33] Other assessments suggest adverse weather conditions would have seen grain output decline between 1989 and 1993 by an average annual 3 per cent in the case of rice and by 6 per cent in the case of maize. However this estimate from the FAO/WFP (1995) first mission report, assumes maize and rice (paddy) production in 1989 at 8.1 million tons, falling to 6.64 million tons. These estimates seem extraordinarily very high and remain difficult to reconcile with more recent forecasts.

Lee's estimates and those reported to the FAO, reflecting the South's practice of reporting grain production in its milled equivalent and differences in the coverage of grains. Analysts in South Korea typically discount rice tonnage by a milling loss of 26 percent as well as varying milling loss for other grains,[34] while the rate of rice milling loss figured by Kim Il Sung in his planning discussions is 20 per cent (Lee 1994). Paddy rice data reported to the FAO is uniformly discounted 22 per cent in converting rice to its husked equivalent, and by 33 per cent when discounting paddy rice to its milled equivalent.

In order to compare grain production on a consistent basis, column [2] in Table 11 reports Lee's grain estimates with paddy rice having been discounted to its husked equivalent. As the proportion of rice in Lee's estimates of grain production are not known, its share is calculated from the data reported to the FAO, which over the period under study fluctuated between 40-65 per cent. The results in column [5] show Lee's estimates to be a reasonable approximation to the FAO data, and in fact are higher than what North Korea has in the past reported to the FAO. One possible explanation, as implied by Premier Kang's announcement, is that the regime is well aware of the pressure bought to bear on farmers to inflate production figures, and that this is taken into account in its reporting practices.

Assuming that the data reported to the FAO remains a 'reasonable' representation of North Korean food economy, then it now possible to examine North Korean food production and consumption trends. However, before proceeding it is necessary to point out that there are considerable inconsistencies in the FAO rice production series, particularly the FAO's own estimates for 1993 and 1994. The data for much of the following analysis has been sourced from the International Economic Data Bank (IEDB) at the Australian National University which in turn are derived from the FAO Production Yearbooks. Upon checking this data against the FAO series recently released on the Internet, there appears to have been a major revision to the rice production series. The reasons for this revisions were still not clear to the author at the time of preparing this paper, but one could hypothesize the FAO has revised the rice series following its field missions to North Korea. The analysis here employs the earlier series on the basis that it remains reasonably compatible

[34] According to the Korea Rural Economic Institute, the milling loss for barley is 40 per cent and for wheat 28 per cent.

with Lee's study, and with what is known of North Korean agricultural development, and because, as is revealed further in the analysis, the revisions to the series and estimates of rice production for 1993 and 1994 seem wildly inconsistent with recent FAO/WFP mission estimates.

With these caveats in mind, Figure 3 reports cereal production data from 1961-92, with data for 1993-94 based on the FAO's own estimates and data for 1995-96/97 based on FAO/WFP mission estimates. The trend of cereal production seems broadly consistent with what is already know, that cereal production increased during the late 1970s in the wake of the mobilization plans and technological drives, then began to fall off towards the late 1980s, with an increasingly reliance on imports from the early 1990s. After peaking during 1985-89, with a five year average of 5.1 million tons, North Korean cereal production declined significantly during 1990-95/96 to average 4.1 million tons (Figure 4).

Figure 5, in reporting the composition of North Korea's cereal imports, seemingly contradicts one widely held perception, that the North has traditionally imported rice. Until the early 1990s, imports consisted predominately of wheat and in recent years North Korea has been importing maize, suggesting that prior to this the North had largely achieved self sufficiency in rice production, at least in the sense that it has met minimum consumption standards based on food rationing norms. Production shortfalls between 1990-93 were largely offset by grain imports from China, and by rice donations from Japan and South Korea during 1994.

By 1995/96, however, almost 65 per cent of North Korean imports of grain consisted of rice, an unprecedented feature given the past composition of grain imports. Although agricultural conditions were clearly deteriorating prior to the floods of August 1995, it could also be said that the North Korea very quickly learnt the value of foreign aid. During 1995, North Korea received some 1.0 tons of grain imports, 650,000 tons of which was rice. Of this 650,000 tons, 95 per cent was donated rice and hence free or provided on highly concessionary terms. Although 1993 officially marked the advent of hard-currency settlement terms in Chinese-North Korean trade, China's has continued to serve as a de facto concessional supplier of grain. China's provision of 500,000 tons of wheat, corn and rice on concessional and grant terms in 1995/96 (50 per cent of total imports) is suggestive it will continue to be the North's major grain supplier.

Grain production

Despite North Korea's past achievements in agriculture, grain production has only barely kept pace with population growth. Between 1962-88, total grain output increased at an average 2.6 per cent per annum while North Korea's population grew at an average annual rate of 2.4 per cent.[35] Food grain output decreased significantly after 1988, falling by an average 1.6 per cent between 1989-91, and by an average 9.2 per cent between 1993-94 (Figure 6). However these averages masks considerable falls of production: 3.7 per cent in 1988-89, -5.9 per cent in 1989-90, and -7.6 per cent in 1991-92 and -15.3 per cent in 1992-93.[36] Figure 7 also shows that the share of food production as a share of total cereal production has remained relatively constant over the past three decades at between 70-75 per cent**.** With little capacity to expand acreage, increases in cereal production have largely come about through the introduction of hybrid rice varieties to replace lower yield varieties.

North Korea appears to have had some success in raising rice yields, with yields increasing steadily from the mid-1970s reflecting intensive use of chemicals, mechanization, irrigation, the use of hybrid and high yielding varieties and crop husbandry (Figure 8a). During the 1980s, rice yields averaged 7.6 tons/hectare (paddy), compared to South Korea's average yields in rice of 6.2 tons/hectare (Figure 8b). However, in the period 1989 to 1993, economic contraction and trade disruption began to affect the sector and yields and production declined noticeably. This underlying decline in agriculture continued into 1994-96, though was further compounded by serious climatic setbacks. Between 1990-96, rice yields have averaged 4.8 tons/hectare, although the ambiguities associated with the FAO data series make it difficult to precisely determine rice yields for 1993-95. For example, based on FAO revision, rice yields for 1993-95 averaged 3.8 tons/hectares. However, the most recent FAO/WFP mission report estimated the average rice yield in 1996 at 4.5 tons/hectare. That rice yields fell by such a large amount between 1993 and 1995 and then rose in 1996 would seem unlikely given what is known about the trend of rice production over

[35] Premier Kang Sung-San acknowledged that grain production had not kept up with population growth in announcing that grain production had increased by 90 per cent between 1963 and 1993, whereas the population rose by 98 per cent during the same period (Lee 1994:550).

[36] The decline in 1992/93 is likely to be exaggerated because of the break in the rice series after 1993.

this period.

Although considerable effort has been directed towards maize production, North Korea appears to have achieved less success in higher yielding maize varieties. During the 1970s, maize yields averaged 3.0 tons/hectare, rising to average 3.7 tons/hectare in the 1980s. Since 1988, yields have averaged 3.4 tons/hectare. North Korea's climatic conditions are not well suited to maize production with periodic cold snaps and the short growing season making production volatile. While the common method of planting maize is to drop seeds directly into the field and cover them, in order to shorten the maturing process and to ensure maximum yields, North Korea employs the incredibly labor-intensive practice of raising maize seedlings first and then transplanting the seedlings by hand when field conditions become warm enough (Dyck 1997).

Over the past four decades, North Korean yields on starchy roots (potatoes and sweet potatoes) and pulses have averaged between 11-14 tons/hectare, much lower than South Korea where yields have risen from 13 tons/hectare in the 1960 to 20 tons/hectare in recent years.

Food consumption patterns

As one of the most important indicators of a nation's well being, food consumption patterns often respond quite sensitively to the changing standards of living. Because consumption quantities of food are relatively homogeneous, they also provide a more reliable and sensitive measure of the standard of living in an economy, especially for developing economies. The composition of food consumption will undergo significant changes, with the quantities of necessity food items stagnating or even declining, and higher-value foodstuffs rising rapidly when a country moves up the ladder from a low-income economy (Ma and Garnaut 1992:7).

Tables 12 and 13 present data on per capita consumption of food and animal products for the period 1961-94 for South and North Korea, while Figure 9 plots per capita grain consumption and per capita income for South and North Korea. The South Korean case presents a familiar East Asian story of rising real income growth accompanied by changing grain consumption patterns. As incomes rise food grain consumption increases less rapidly and consumers demand more wheat and less coarse grains as staple foods. But because demand for animal products and alcohol increases, indirect consumption also tends to rise (OECD 1995). As Figure 9 illustrates, South Korean per capita grain

consumption has increased rapidly since the early 1960s, peaking in the mid-1970s, and has since slowly declined. As incomes have grown, the overall pattern of food consumption has also shifted from carbohydrates to a more diversified diet of animal products, vegetables, fruits, and fats. Consumption of meat, eggs and dairy products roughly began to exceed that of the North from the second half of the 1970s. In particular, consumption of meat has risen sharply, increasing almost six-fold since the early 1960s (Table 12).

In contrast to the South, North Korean per capita grain consumption increased gradually until the late 1980s, and then began to decline in the wake of increased food rationing of recent years, itself a telling statement about the North's growth strategy based on heavy industry and the structures of central planning. By the early 1990s (1990-92), per capita availability of cereal consumption averaged 218 kg**,** which was below the average per capita availability of 227 kg in the 1970s and 250 kg in the 1980s, but above the average 195 kg of the 1960s. The uncertainty surrounding rice estimates after 1993 again makes it difficult to accurately assess cereal consumption. The FAO/WFP (1995) has estimated a per capita availability of food grains of 272 kg in 1993 and 222 kg in 1994, although these estimates most probably include 'other grains' such beans and potatoes. North Korean consumption of non-grain foods such as vegetable oil, fruit and vegetables, milk, eggs, and meat have roughly doubled over the past four decades. But while average per capita consumption of meat increased by around 50 per cent, this is still below the average for developing economies (13 kg).

An alternative way to view the pattern of grain consumption is to examine its product composition. In the case of South Korea, the share of rice has remained relatively constant at around two-thirds of total grain consumption, with that of barley declining dramatically from 33 per cent in 1961 to 1 per cent by 1994 (Figure 10a). The share of wheat in cereal consumption increased rapidly from 6 per cent in 1961 to 16 per cent to 27 per cent by 1994, reflecting the general pattern that more wheat is consumed as incomes rise. In North Korea's case, the share of rice in cereal consumption over the past four decades has fluctuated on average between 50-60 per cent, peaking at 65 per cent in 1979 and 1989-90, while the share of maize has fluctuated between 20-30 per cent (Figure 10b and Table 14a, columns 1 and 2).

It is also interesting to compare North Korea's patterns of grain consumption with recent

FAO/WFP estimates of grain consumption requirements. As mentioned earlier in the paper, FAO/WFP estimates for 1996/97 suggest a substantially larger food grain deficit of 2.3 million tons. In deriving the 1996/97 grain estimate the FAO/WFP assume the following:

- losses of 300,000 tons of grain from the 1996 floods
- minimum consumption requirements of 100 kg/cap of rice and 67 kg/cap of maize per annum
- 50 per cent of the current year's harvest of maize and the bulk of the harvest of potatoes have already been consumed. This assumes 36,500 hectares of potatoes were planted and a total output of potatoes in 1996 of 283,360 tons.
- imports on commercial, concessionary and barter terms of 500,000 tons.[37]

In deriving its estimates, the FAO/WFP also assume grain to typically account for approximately 75 per cent of total caloric intake on an average per capita basis, with the remaining 25 percent from fish, meat, vegetables, fruit, fats and oil etc.[38] Yet based on the food consumption information contained in Table 13 (and summarized in Table 14a), cereals have historically accounted for a much lower share of caloric intake, averaging over the past four decades between 30-45 per cent of total food consumption (Table 14a, column 6). Moreover, when estimating North Korean grain demand, the FAO/WFP typically only concentrate on rice and maize, with rice assuming to constitute some 70 per cent of the cereal intake and maize, 30 per cent. However, as already discussed, the composition of rice and maize in North Korean per capita cereal consumption has always been much less, suggesting that the FAO/WFP has overestimated the proportion of cereals (and in particular the share of rice) in the North Korean diet. In this sense it could be, as some have suggested, that the North Korean population has long suffered from a 'food shortage', in part because the government has always taken a certain amount of grain from everybody's ration, under the pretext of supplying for emergencies (Chun 1996).[39] Figure 11a shows that the

[37] This excludes the 'potential' imports from China of 500,000 tons per year for the next five years.

[38] Although following the 1995 floods the FAO/WFP reported that cereal composition of rations had been revised down to 60 per cent rice and 40 per cent maize.

[39] One recent defector, a former economic professor, reported that North Koreans always received their rice rations from old rice every year except in 1991, when they were given new rice, possibly due to a lack of stockpile.

composition of 'other' grains of pulses (beans) and starchy roots (potatoes and sweet potatoes) have historically been a significant source of protein and carbohydrate in the North Korean diet, and much more so than in South Korea (Figure 11b). In fact, if a wider definition of grain is taken to include starchy roots and pulses, their share in average annual per capita consumption has been similar to that of maize, at between 20-30 per cent (Table 14a, columns 3-5). However, according to the FAO/WFP (1996b), 'potatoes were introduced into the public distribution system for the first time [in 1996] to supplement rations' and that 'potatoes are not considered a staple and are normally utilized for industrial purposes'. Yet, based the FAO's own data series, over the past four decades, 80-90 per cent of pulses production and 60-70 per cent of starchy roots have been utilized for domestic food consumption purposes. It is also difficult to reconcile the FAO/WFP estimate that some 36,500 hectares of potatoes were planted, with a total output of potatoes of 283,360 tons. Table (14b) shows that the area of potatoes planted and production of potatoes has historically been significantly higher. Even allowing for flood damages, the FAO/WFP estimate is incredibly low.

Finally, in estimating North Korean per capita grain consumption needs, the FAO/WFP have assumed per capita yearly consumption of cereals in 1995/96 and 1996/97 of 167 kg (100 kg from rice and 67 kg from maize). However, as Figures 12 and 13 indicate, this is still above the average per capita consumption of rice and maize during the period 1961-71 (153 kg), before North Korea began cultivating higher yielding varieties, also suggesting that North Koreans have historically received lower cereal rations than commonly thought. Again the FAO's revision of the rice series make it difficult to interpret the large drop in per capita rice consumption in 1993 and 1994. In fact, Figure 14 shows why the FAO revised series (1961-94) of per capita rice consumption should be treated with great caution. On these estimates, the FAO/WFP assumption of minimum consumption standards of rice of 100 kg/cap would mean the average per capita consumption of rice in 1995/96 and 1996/97 was higher than at any time since 1968!

Food crisis: a catalyst for collapse?

The above analyses in no way seeks to contradict FAO/WFP reports of serious food shortages in North Korea. That there exist clear 'pre-famine indicators' and that without international food aid

there is a real danger of 'massive malnutrition' would seem impossible to refute on consistency of reporting now emanating from North Korea. It does however seek to draw attention firstly, to the informational and methodological constraints which make it difficult to accurately assess the actual extent and incidence of severe hunger in North Korea; and secondly, the misleading picture presented by concentrating on only a subset of the food balance sheet as a basis for assessing North Korean nutritional needs. On the assumption that data reported by North Korea to the FAO remains a reasonable indicator of food production and consumption patterns, the above analysis would suggest:

- the share of rice and maize in total cereal intake has historically been much lower than the ratio currently assumed by international agencies in assessing North Korean per capita grain consumption, suggesting that the population has historically received lower rations than recent estimates suggest.
- the significance of 'other' grains (pulses and starchy roots) as an alternative source of carbohydrates and proteins in the North Korean diet have been underestimated.
- current FAO/WFP assumptions of 'minimum' consumption standards of rice and maize needed to sustain the population would still appear higher than those of the past.

While in no way discounting the human impact of the current food situation, one could also offer several hypothesis as to why a food crisis of the proportions described by international humanitarian agencies would not represent a threat to the stability of the North Korean regime. First, using average per capita rationing as a indicator of food situation may for the general population may be poor gauge of the true situation, since the disparity between access to food between the privileged and underprivileged and between the urban and rural population is substantial (Choi and Chun 1992). Urban centers, which house the bulk of the North Korean population, are accorded higher consumption standards, as are members of privileged classes in the government and party bureaucracy, the military and the families of workers employed in priority industries. Together this group is likely to encompass a fairly large share of the non-agricultural population. One could therefore speculate that groups expected to suffer

nutritional stress of the food shortfalls of the magnitudes estimated the FAO/WFP would include the rural nonagricultural population and inhabitants of second-or third-tier urban centers without access to such priority professions as military industries or those that generate hard currency (Eberstadt 1997:37). Widely cited reports of a significant part of the population receiving cereal rations of 200 g/day (73 kg/yr) would most likely apply to these groups, and would not necessarily be representative of cereal consumption norms of the bulk of the population.

A second factor is the immobility of the North Korean population. Population movements in North Korea have long been controlled through the household registration system, with the government designating jobs, housing, education, and places to obtain food rations. People require internal passports to travel from one place to another. North Korea's strict control on the rural-urban movement of its people is therefore (geographically) likely to limit the effects of a food shortage**.** One could speculate that the most severely affected areas are also likely to be in remote locations (such as along the China/Korea border where recent defectors have originated from) where the distribution system has broken down, and collective farmers who are independent of the government distribution system and whose activities are limited solely to farming and do not engage in cottage industry or other enterprises. It is precisely this group that has been targeted by the international humanitarian aid community for assistance.

Thirdly, as Nicholas Eberstadt has pointed out, 'the North Korean polity by virtue of its exception ability to control information and contact with the outside world, would also appear exceptionally well-suited to dealing with the economic stresses it now endures. This would appear to make the 'rules of the game' for managing economic decline rather different from those in societies and polities with which outside observers are more familiar' (Eberstadt 1997:38). On the other hand it is precisely this feature that has led international aid experts to be concerned over a 'creeping' or 'silent' famine. Because of the lack of information available from which to assess nutritional stresses, it is not outside the realm of possibility that a famine could be unfolding in North Korea. Some of the most sever famines this century occurred in communist countries in which governments were successfully able to internally restrict the flows of information and people (Noland 1997).

And while there are past examples of communist regimes managing to cope politically with

severe food crisis, even for successive years, there are, as Eberstadt (1997:32-35) has also discussed, major differences between current North Korean food problems and earlier communist food crises. All past severe food shortages in communist economies have taken place in countries that were overwhelmingly rural and agrarian (Mongolia, North Vietnam, Ukraine, China and Cambodia). North Korea is likely to under greater pressure, simply because a greater proportion of the population does not produce its own food so that achieving household-level 'food self-sufficiency' is not an option available to most of the North Korean population. Moreover, the timing of the current North Korean food problems differ dramatically from that of previous communist food crises. In all previous food crises, the big food problems occurred within a decade of establishment of the regime, lending itself to relief through quick policy reversal. However, 'if the North Korean economy is organizationally more complex than were the communist economies beset by severe food shortages in the past, and while these complex linkages are conducive to enhanced productivity, they may also paradoxically make the food problem more difficult to solve if economic planners insist upon cleaving to what they view as a 'low risk' strategy' (Eberstadt 1997:34).

On the other hand, North Korea's acknowledgment of food shortages to the international community, and the willingness of regional players to ensure the North's economic survival would also appear to make this case unique. In the short to medium term China, Japan or South Korea could sustain North Korea economically if political conditions warranted. Japan has surplus stocks of rice and is in a position to provide rice aid up to the levels of previous years without any direct government expenditure.[40] China also has grain supplies to easily match past levels of imports. And if reports of a return by China to concessionary trading terms with North Korea turn out to be correct, then China's provision of 500,000 tons per year until the year 2000 would go along way to relieving North Korea's food problems. Under the reportedly favorable terms, 500,000 tons of imports of say half wheat and half rice would entail an outlay at current international prices of

[40] The U.S. Department of Treasury has also approved a license request of 500,000 mt from Cargill Inc to sell wheat and rice on a barter basis.

only US$27 million dollars.[41]

Prospects for agricultural reform

Regardless of past agricultural achievements, it is clear the North's system is now laboring under the inherent bottlenecks that come with an extremely centralized system. After years of socialist agriculture, North Korea is back to where it was 30 years ago—in need of significant reorganization of the agrarian incentive structure conducive to raising farm productivity and foreign currency to pay for the food it needs and inputs needed to sustain agricultural functions. In the short to medium term, the most likely course of action would see the regime return to the basics in the North Korean sense, that is reactivation of the relatively neglected programs of physical mobilization, i.e. chemicalization and mechanization. In addition, the 'green revolution' of developing high yielding strains will continue to be pushed. Given the highly advanced state of irrigation, an energetic thrust on these programs, if sustained, could on some assessments, revive grain production to a level sustainable for quite a while given North Korea's modest consumption standards (Lee 1994:551). The regime is also reportedly giving greater priority to agriculture development planning and in view of dwindling crop prospects has initiated several measures to enhance domestic production and access to food (FAO/WFP 1996a).[42]

In the medium to longer term, North Korea is likely to experience recurrent food supply difficulties, given its limited potential to expand domestic food production, and lack of foreign exchange to secure imports. The problems of limited land are compounded by declining soil fertility due to monoculture and intensive farming techniques and climatic conditions which constrain cropping systems and rotations. Moreover, the economic and ecological sustainability

[41] As Dyck (1997:5) points out, North Korea also has the option of interchanging various grains for food use. With limited cash or barter goods for grain imports, the cheapest major grain, maize, is likely to dominate. Assuming proportions of 60 per cent maize, 20 per cent wheat, and 20 per cent, at current prices North Korea would need to spend $160 million to obtain 1.2 million tons.

[42] These include a large-scale tideland development project of 300,000 hectares in the western coastal area; an extensive programme undertaken in early 1996 involving a large-scale mobilization of the population to replenish top soil on 320,000 hectares of arable land; the development of microbial fertilizers to reduce dependence on chemical fertilizers; allowing individuals to cultivate crops and vegetables in limited areas around dwellings to increase food availability; and the introduction of a new rice variety Pyongyang 21 (P21), claimed to be more fertilizer responsive than other varieties to reduce dependence on chemical fertilizers. The recommended fertilizers application for P21 will be 200 kg/ha, compared to 500 kg/ha for existing varieties (FAO/WFP 1996a).

of barter trade based on raw materials is questionable beyond the short term (FAO/WFP 1996c). Given this, there would seem only one option for the regime to pursue.

But like most aspects of North Korea, there are conflicting reports as to whether the North will move to reform its agricultural system, or will continue to swim against the tide by attempting to turn all cooperatives farms into state farms. With the deteriorating agricultural in the early 1990s, there were reports emanating from Beijing in 1994 that North Korea had informed China of its intentions to break up its communal system (Lee 1994:510).[43] And while government rhetoric of a 'transition to all-people's ownership in agriculture' was then stepped up in 1994 and 1995 after the death of Kim Il Sung, the North Korean media has been largely silent since the floods of mid 1995 and since official appeals for international food aid (Eberstadt 1997). While difficult to substantiate, it would seem hard to imagine that a return to favorable trading terms with China would not go unaccompanied by conditions or in the very least advice on how to reform the agricultural sector.

V ENERGY CONSTRAINTS

It is clear that the problems in North Korea's agricultural sector are inextricable linked to the country's wider economic problems, particularly the energy shortage and the lack of access to hard currency. Not only does the North Korea lack the petroleum imports necessary to produce fertilizer for its chemical dependant production techniques, but these shortages have also hampered the infrastructure and distribution system vital to agriculture (Flake 1996a:8-9). Agricultural production is constrained by the lack of fuel for irrigation purposes and agricultural machinery. North Korea estimates that 50,000 tons of diesel are needed for agricultural operations, including rehabilitation and operation of the irrigation system (FAO/WFP 1996a). Fertilizer application in North Korea is probably excessive for some crops. On rice, for example, it has been suggested that nitrogen fertilizer application in the North Korea could be reduced by 25 per cent. If so,

[43] As of 1987 the number of cooperative farms was estimated at 3,700 and that of state farms at 220, with the state farm's share of total cultivated land estimated at 20 per cent and accounting for 30 percent of total agricultural output (Moon 1995). Another report suggested almost 3000 cooperative farms, with state run farms accounting for only 10 per cent of cultivated areas (Naewoe Press 1996?), while the most recent report from the FAO/WFP (1996c) puts the number of state and cooperative farms at 1000 and 3000 respectively.

significant reductions in energy use in the energy-intensive ammonia manufacturing industry in North Korea would be possible, as well as minor reductions in the need for tractor fuel for fertilizer application (Von Hippel and Hayes 1995:15). The conversion of the North's irrigation method from a pumping based to a gravity based system would also be energy saving. According to one report, approximately one fourth of the North Korea's total energy output (mostly hydroelectric) is consumed by the irrigation system (Flake 1996c:7?).

Though evidence is largely anecdotal, there are plenty of reports of 'bottlenecks' in the North Korea energy system that are suggestive the energy shortage is seriously impeding the flows of goods and materials. Coal shortages at power plants have reportedly been caused, at least in part, by a lack of iron and steel to maintain the rail system that transports the coal from the mines to the power system. The iron and steel deficiency is, in turn, the result of the lack of coal to fuel metal production, as well as rail transport difficulties in moving ore from the mines to the mills (Hayes 1993c; Von Hippel and Hayes 1995). In part because of resource bottlenecks, the rate of utilization of key energy facilities in the North Korea is reportedly relatively low. If official North Korea electricity figures are correct, the capacity factor for electricity generation facilities (computed at the output of power plants divided by what their output would be if they operated 100 per cent of the time at full power) was on the order of 50 to 60 percent in 1990. If estimates by outsiders are accurate, capacity factors could be in the 30-40 percent range and may be as low as 20-30 per cent (Hayes and Von Hippel 1995).

Coal is the most important source of energy in North Korea, accounting for 82 percent of total supply of primary energy and 75 percent of final consumption. Consumption of coal consumption by use is broken down as: industry and other sectors (final demand) 72.6 per cent, electricity generation 21.1 per cent and other uses (for coking, liquefaction etc) 2.7 per cent. Although North Korea has substantial coal reserves, the varying quantity of its coal and the location of some of its better coal reserves set limits on their utilization. Some of the coals mined in North Korea have ash contents as high as 65 per cent and heating values as low as 1,000 kcal/kg (roughly one-sixth the energy content of high quality coals). Around one-half of the coal reserves in the important Anju mining area (located northwest of Pyongyang) are located under the seabed (Von Hippel and Hayes 1995:4). According to the Bank of Korea estimates, coal production

has fallen 40 per cent since 1990, resulting in the decline of electric power production (Table 15).

The 1994 Agreed Framework and a return to favorable trading terms with China will go a long way to assisting the North Korea in meeting its basic energy needs. The Nuclear Agreement requires the North to give up its existing nuclear program in exchange for a substitute energy program based on light water reactors. Under the agreement, North Korea is to be compensated for the loss of energy production from further operation of its 5 mega-watt reactor and from abandoning the 50 and 200 mega-watt reactors under construction, with the provision of two light water reactor plants with a total generating capacity of approximately 2,000 mega-watts. It will take 8-10 years to complete the construction of light water reactors, which will generate 10 billion kwh annually or around half of the North Korea's current electricity output. In terms of energy production this is an extraordinary good deal for the North (Chun 1996, KEDO 1996). The US$4 billion cost of constructing the reactors is to be met by a consortium of countries, of which South Korea is to provide around 55-60 per cent of the cost and Japan about 20 per cent, with the balance being supplied by other countries.[44]

In the interim period North Korea will be provided with energy alternatives in lieu of energy foregone due in the freezing of its' graphite reactors pending completion of the first light-water reactor unit. This is being provided in the form of annual shipments of 500,000 tons of heavy oil for heating and electricity production for use in a specific power plant. The significance of the amount can be gauged from Table 16 in that it is equivalent to approximately one-third of North Korea's total oil imports in 1992. The oil shipments are to go to the Ungi-gi power plant at Sonbong on the east coast. Ungi-gi power plant can operate at 100 percent capacity with 500,000 tons of heavy oil and if fully operated, will generate 1.6 billion kwh, equal to 7 per cent of the electricity generated in 1994 (Chun 1996). However, since electricity generation needs to rise by 20 per cent just to return to 1990 levels of generation, electricity shortage will continue unless coal production increases substantially.

[44] Under the Agreed Framework, the costs will be repaid by North Korea interest-free over 20 years, inclusive of a three-year grace period, beginning with the completion of each light water reactor plant.

China's provision of energy supplies is also significant. Although China's imports of oil decreased below 1 million tons in 1994 for the first time, this reduction was reportedly the result of a sharp fall in its own domestic production, rather than to a change in policy towards North Korea (Han 1994:246). And while China in 1992 requested that North Korea pay with hard currencies from 1993, it has continued to accept raw materials in exchange. Russia, on the other hand, has insisted on payment in hard currencies which is why the North Korea no longer imports oil from Russia. Since China itself in late 1994 became a net energy importer, and with its own domestic requirements growing, the real resource costs and foreign exchange implications of concessional coal and oil for China's own economy would tend to weaken the case for continuing Chinese subventions for North Korea (Eberstadt 1995b:678). If, however, China is in fact continuing to serve as a concessional supplier, then its provision of 1.3 million tons of oil annually until the year 2000, combined with the 0.5 million tons under the Agreed Framework, would be equivalent to North Korea's total oil imports in 1992. As the provision of oil under the Agreed Framework is free, imports of oil from China on the reported favorable terms, combined with 2.5 million tons of coal would see North Korea meet it basic energy needs for the next five years at an annual foreign exchange outlay of just over $50 million.[45]

Clearly, price reform, diversification of energy sources, and improvement of energy efficiency is urgently required. But many of North Korea's energy problems could initially be addressed through increased international cooperation. At present, North Korea lacks the technology to effectively mine and extract its reserves of coal at more than moderate depths as well as to undertake oil and gas exploration. To this extent, North Korea's major cause of coal shortage and hence energy production lies in it's underdeveloped coal mining technologies (Von Hippel and Hayes 1995).[46] North Korea has been trying to attract joint venture interest in developing its energy reserves and has expressed interest in technical cooperation, but is yet to secure an international partner to aid such an effort. The thawing of political relations with countries processing energy efficient production technologies such as the United States and

---

[45] Recall that under the reported terms China will supply 1.3 million tons of oil and 2.5 million tons of coal, half of which is provided free, the other half at one third of current international prices.

[46] Although Mack (1994) reports oil prospecting has been underway for some time in North Korean waters.

Australia could fairly quickly change the situation. In the meantime China may be a good source of inexpensive and easily adopted technologies that would represent significant improvements over those currently used in North Korea (Von Hippel and Hayes 1995).

VI FOREIGN EXCHANGE SHORTAGE

North Korea's balance of payments position appears weak, although assessing the degree of pressure remains difficult because of the uncertainty surrounding the magnitude of arms trading, illicit activities, and private remittances (Noland 1995:5). Most analysts though tend to agree that the amount of foreign exchange needed to meet North Korea's basic import requirements are in the hundreds of millions of dollars, in which case its current reported difficulties in financing even modest imports of critical commodities are suggestive that the regime does not have appreciable hard currency reserves (Eberstadt 1996).[47]

Apart from export earnings, remittances from Korean residents in Japan (*Chosen Soren* or pro-Pyongyang group of Korean residents) are often considered to be North Korea's most vital source of hard currency. In addition to remittances, other sources include the cash carried by the roughly 5,000 Korean residents in Japan who travel to North Korea each year. Estimates of annual remittances flows vary widely, between $500 to $2 billion. Japan's Public Security Investigation Agency has recently estimated that the Chosen Soren could currently generate a subsidy to Pyongyang of approximately $550 million a year (Eckert 1996). Other carefully constructed estimates however suggest the flows could likely have dwindled to as little as US$100 million annually (Eberstadt 1996). A reduction in these flows would be consistent of anecdotal reports suggesting the Chosen Soren-North Korean relationship is in decline. Disillusionment following the end of the cold war, Japan's economic recession, and declining loyalty among second and third generation members are among the various problems cited as impacting upon the amount of

[47] If, as Erberstadt (1996) has suggested, North Korea were actually receiving the volume of aid from Chosen Soren that many suggest, then its basic import requirements should be easily managed. By international standards, North Korea's prospective import bills for energy and food would not be large. On world markets, for example, 2 million tons of oil would cost roughly $250 million. Two million tons of maize would cost roughly $200 million. North Korea is believed to have been able to cover its oil imports from the Middle East through sales of weapons, gold and contraband. According to the U.S. Arms Control and Disarmament Agency (ACDA), for example, North Korean arms exports totaled $200 million in 1990, $180 million in 1991, and $90 million in 1992.

support North Korea receives from Japan.[48]

The role of China, as the North's other economic lifeline, is likely to be critical. China has consistently attempted to minimize pressure on the North Korean regime. In 1993, North Korea received approximately 72 per cent of its food imports, 75 per cent of its oil, and 88 per cent of its coking coal from China (Flake 1996b:5). If reports of China's return to 'friendship' prices in it's provision of grain, oil and coal turn out to be correct, then under the terms set out, North Korea could meet its minimum import needs for an outlay of less than $100 million.

Although China has filled the gap of lost Soviet imports to some extent, without hard currency, North Korea will remain restricted in maintaining even past levels of output. To this end, foreign investment and increasing exports are now increasingly important because the North sees them as a method of obtaining capital.

In many respects the experiment with which North Korea is placing most of hopes in attracting capital and earning foreign currency for imports, is the Rajin-Sonbong Economic Zone. Established in 1991, the zone forms a 746 sq km triangle from Rajin port in the south to the mouth of the Tumen River to the north. The regime envisages the economic zone as having three basic functions: a international cargo transit center, a export processing center, and a center for tourism.[49] While North Korea could potentially earn appreciable amounts of foreign exchange through each of these developments, the biggest pay off would flow from the transfer of technology and manpower skills upgrading which would follow from the establishment of export processing industries (Cotton 1996).

To date international investor interest remains weak. Since 1993, North Korea is believed to have signed some 20 investment commitments for joint ventures worth US$200 million. Before then, an estimated 116 joint ventures were contracted under the 1984 Joint Venture Law. Nearly 90 per cent of these joint ventures though were reportedly with the Chosen Soren. In an attempt

---

[48] Based on discussions with Japanese academics.

[49] On paper the tax incentives available to foreign enterprises are competitive to those offered elsewhere in East Asia. Foreign enterprises are required to pay a 14 per cent corporate tax rate (with 10 per cent on offer for 'priority investments'). Industrial investments are exempt from corporate tax from 3 years from their first profit making year. Reinvested profits attract a tax rebate of 50 per cent (UNIDO 1996). North Korea has also adopted a series of law and regulations to provide a coherent regulatory framework for the operation of the zone, although many of these laws are yet to be tested.

to foster foreign interest in the zone the North Korean Committee for External Economic Promotion (CPEEC) along with the UNDP and UNIDO organized an investment forum in September 1996. The event concluded with the announcement that new contracts and foreshadowed investments of US$840 million (although only $265 million in contracts were signed). Adding to existing investments of $319 million ($43 realized to date), this carries the total foreign capital planned to flow to the free trade zone to over $1 billion (Cotton 1996:3).

Despite increasing efforts by the regime to promote the Rajin-Sonbong Zone, on most independent assessments, the obstacles to attracting investors are substantial.[50] The biggest stumbling block to the zones development is poor infrastructure. Labor is cheap but it is also more expensive than in other countries that do not carry as much risk. Relative to China, Vietnam and other ASEAN economies, wage rates in the Rajin-Sonbong economic zone are considerably higher. Wages for unskilled workers in Yanbian in China start from US$40 per month. In Hunchun, minimum wages start at US$50 per month and in Rajin-Sonbong at US$80 per month. The other major obstacle is the poor state of South-North relations. If the zone were to move beyond simple transhipping trade it is generally accepted that South Korean *chaebol* (conglomerates) will have to become more involved. Unless South Korean business leads the way, few countries, especially Japan, are unlikely to be interested.

However, in the absence of large-scale participation in the North Korean economy by South Korean, Japanese or US firms, China (and by extension Hong Kong) is emerging as potentially the driving force in the development of the special economic zone, at least in the short run. At is present state of development, the greatest potential for the zone appears to be as a center of regional transhipment trade, driven by the ongoing economic boom in Northeast China and China's lack of access to the Sea of Japan (Noland and Flake 1997).

If the economic zone were to succeed it would act as encouragement to the regime to adopt similar strategies in more desirable locations in terms of infrastructure and proximity, such as Nampo or Shiniju. Nampo, in particular, offers many of the advantages the Rajin-Sonbong Free Trade Zone lacks but because of its proximity to Pyongyang the regime is unlikely to risk it at

---

[50] See for example reports by Noland and Flake (1997) and Cotton (1996).

this stage, with only South Korean firms allowed to invest there to date. Recent reports suggest that North Korea has designated Sinpo the sight for the construction of the two 1,000 megawatt light water reactors as a second special zone, enjoying special tax and wage privileges similar to the Rajin-Sonbong Free Trade Zone.[51] If these reports are correct, then North Korea could be regarded as entering a new phase in its external policy.

Regional economic linkages

Although uncertainty surrounds the likely future direction of the North Korean economy, the economic and political interactive processes of the Northeast Asia subregion itself, and especially China, are likely to provide much of the substance and influence in shaping the path North Korea takes. While the enormous potential for economic cooperation remain suppressed by political barriers, with the collapse of the Soviet Union and the opening of China, many of these barriers have fallen.

By the early 1990s, economic reform and political change in the USSR had not only redirected Russian trade, but also affected Mongolia and North Korea which had been running substantial trade deficits with the USSR until the latter was dissolved. Table 17 shows the rapidly changing trade patterns in Northeast Asia over the past decade. In 1985, the USSR, China and Japan had multilateral trade among themselves, though the amounts were low. South Korea traded only with Japan. North Korea's trade was heavily oriented towards the USSR, though North Korea also traded with China and Japan, but not with South Korea (Pomfret 1995).

Changes in trade flows in the past five years have been dramatic. By 1995, Northeast Asian trade has become more concentrated, in the sense that bilateral trade flows between Japan and South Korea exceeded $50 billion as did those between Japan and China. Bilateral trade between South Korea and China grew from nothing in 1992 to over US$16 billion in 1995, following the establishment of diplomatic relations between the two. Russian trade with Mongolia and North Korea collapsed, while Russian trade with South Korea has since grown.

---

[51] Based on the reported quote of KEDO's (Korean Peninsular Energy Development Organization) executive director, Stephen Bosworth in The Korea Herald, 30/1/97.

While there are discrepancies in North Korean trade figures released by the Korean Trade Promotion Organization (KOTRA), the Japan External Trade Organization (JETRO) and the IMF,[52] these differences remain minor in comparison with the striking changes in its trade patterns of the last 5 years (Flake 1996b). Together China, Russia, Japan and South Korea account for almost 70 per cent of the North's trade. Trade with Russia has slumped while that with Japan and South Korea has become increasingly important. In 1988, the former Soviet Union was responsible for 60 per cent of all imports entering North Korea. By 1995, Russian imports made up less than 10 per cent of the North's total trade. However, Russia is not entirely insignificant, as it remains the North's third largest source of imports. Although bilateral trade with China slipped to US$550 million in 1995, there could conceivably be huge amounts of unaccounted for trade (mostly foodstuffs and consumer goods) along the China/North Korean border, with official statistics ignoring the rapidly growing border trade by individuals. By its nature such trade is hard to document, and existing estimates are guesses based on the number of cross-border crossings. In 1993, these crossings amounted to around a quarter of a million, which on one estimate would add US$40 million (at the then official exchange rate) to China-North Korea trade through Yanbian (Pomfret 1995:6.4). More recent estimates suggest border trade could be as high as US$300 million a year (Naewoe Press 1996?). Hence declining official trade figures with China may be more indicative of declining government control over trade than of declining economic exchange.

Although there is clear potential for inter-Korean economic relations, at present the political environment limits such relations to trade and limited forms of investment. Still, the overall trend has been towards progress, with continued growth of economic ties despite the ongoing political tensions is evidence of the potential for greater cooperation. Inter-Korean trade began to be formally approved by the South Korean government in October 1988. Since then, South-North trade or commodity exchanges has continuously increased, though commodity exchanges have mostly taken place by indirect trade through Hong Kong, Japan, China, or other third countries (Tables 18a and b). Iron and metal exports account for three quarters of South Korea's imports, followed by textiles and agriculture and fishing products. South Korea's exports to the

[52] See Noland (1995) and Eberstadt (1996) for a discussion of these issues.

North are composed predominantly of textiles and chemical products (Tables 18c and d). Processing on commission trade has rapidly increased from 0.1 million in 1992 to be close to US$50 million by 1995. Meanwhile North Korea's exports to the South increased from US$90 million to US$223 million, making South Korea the North's third largest trading partner after Japan and China.

North Korea's establishment of the Rajin-Sonbong economic zone, in being closely linked to the broader Tumen River Area Development Program (TRADP), provides a key opportunity for cooperation between North and South Korea. The Tumen River Economic Delta Area (TREDA) encompasses North Korea's North Hamgyong Province, the Korean-speaking Yanbian Korean Autonomous Prefecture in Jilin Province in China and the southern and central part of Russia's Primorsky Territory. The region takes its name from the Tumen River which borders all three countries. Launched in 1992, the TRADP is a regional project of the United Nations Development Program (UNDP).[53] The five signatory countries, China, North Korea, Russian Federation, Mongolia and the Republic of Korea—are cooperating under international agreements through the Tumen Secretariat, based in Beijing, to integrate their economies more closely, making them more attractive to foreign investment.[54]

On paper the region constitutes a market of enormous size and economic potential. The northeastern provinces of China, far eastern Russia and Mongolia and North Korea are rich in natural resources and skilled labor. South Korea and Japan are richly endowed with intermediate to high level technologies. Japan has an abundance of capital, and, South Korea while not as well endowed with capital, has the capacity to mobilize capital (Young 1995:5.3). While the potential for regional economic dynamism has also been suppressed by the infrastructural bottlenecks, especially transport bottlenecks, the completion of key railway and port projects in Rajin-Sonbong could encourage considerable Russian and Chinese transit trade. By mid-1996, the TREDA had attracted over $300 million in actual foreign investment, 60 per cent coming in the since 1994

[53] The Tumen River Area Development Project dates from a conference in July 1990 in Changchun China, at which China called for a coordinated measures to create a 'Golden Triangle' involving the contiguous areas of China, the USSR and North Korea. See Pomfret (1995), Cotton (1996) and UNDP (1996) for a history of the development of the project.

[54] Efforts are being strengthened by investment promotion activities assisted by the United Nations Industrial Development Organization (UNIDO). These started with an investment promotion programme for the Yanbian Korean Autonomous Prefecture in China in 1995, followed by a similar promotion programme for the Rajin-Sonbong Zone in 1996, funded by the UNIDO, UNDP and the CPE

(UNIDO 1996).

A crucial role is being played by South Korea and China. Before 1990, foreign investment was minimal in the whole area. Since the establishment of diplomatic relations, South Korean investment in the neighboring part of China has played a major role in the rapid development of the Hunchun Border Economic Cooperation Zone, and the same advantages and proximity could draw South Korean business to Rajin in North Korea (Cotton 1996). Yanbian has also attracted some 600 foreign investors since 1988 worth some US$150 million. South Korean investors dominate (42 per cent of the population is Korea) with Hong Kong and Japan also heavy investors (UNIDO 1996). With the collapse of the USSR, the Chinese government has responded by promoting its border areas, including Hunchun in Yanbian prefecture. Hunchun received open city status and a border economic cooperative zone established in 1992 was allowed to offer further investment incentives. The northeast has lagged in China's rapid economic development over the past fifteen years, and especially now that the military threat from the USSR/Russia has subsided, the central government is promoting economic reform and diversification in Jilin and Heilongjiang provinces.

VII PROSPECTS FOR REFORM

Since the mid-1980s North Korea has made some efforts to revitalize it's economy and to develop economic cooperation with capitalist countries. To some these reforms are, at best, a tactical measure. On other interpretations, these opening policies thus far, may be the first step in a learning exercise (Cotton 1996). As Scalapino has said:

> North Korean officials are now acknowledging economic difficulties, and equally important, signaling that they wish to advance the embryonic changes in economic policy now underway ... Progress in these direction is uncertain, being contingent both on North Korea foreign and domestic policies, but a recognition of the need for at least piecemeal economic changes has been signaled (Scalapino 1995:xv).

Whether such measures constitute the beginning of a bigger process is difficult to judge. Piecemeal reforms are unlikely to be adequate and the regime will at some stage have to confront the issue of whether and how to address the economic problems at hand. To this end, the window of opportunity for more substantial reform to be embraced is probably greater now than at any time in the past, for the following reasons:

First, the series of negative macroeconomic shocks since the late 1980s has meant that North Korea has found it almost unavoidable to foster an environment for international cooperation and dialogue. North Korea's participation in the Agreed Framework, and its request for international humanitarian assistance and has actually resulted in creating conditions to improve relations with the internationally community and accordingly, in promoting it to open its doors to the outside world.

North Korea's attempts to attract investment in the Rajin-Sonbong Zone are also evidence of a growing awareness of the necessity of expanding ties with the international community, and when seen in historical context, is a radical departure from the past. This has entailed unprecedented access for foreigners to North Korean territory, exposure of North Koreans to foreign commodities, and the sending of specialists abroad to acquire international market oriented skills and knowledge (Cotton 1996). At the domestic level, the influx of foreign currency and products, and the establishment of illegitimate distribution mechanisms that have arise as a means of dealing with current economic crises have all contributed to the emergence of private networks and exchange, most recognizable in black market activities (Kim 1994). Behind the scenes, North Korean officials have sought international linkages and cooperation in the area of education, energy and agriculture. The need for foreign capital has necessitated increased dialogue and exposure to other dynamic Asia Pacific economies such as Taiwan, Hong Kong and Southeast Asia. Participation in various nongovernmental regional economic forums such as PAFTAD (Pacific Trade and Development Conference Series) will increasingly expose a new generation of Korean officials to the economic reform experiences of other East Asian economies.

Second, Kim Jong-Il will be faced with a need to provide an appropriate background to justify his successorship. If he can demonstrate his ability by overcoming the current economic crisis it would be an effective way to solidify his position. To this end, the North Korean leadership views improved relations with the United States, and the ultimate prize of the limiting of the economic embargo, as the key to solving its economic problems. And even if US firms do not make significant investments upon a lifting of the embargo, North Korea still sees the United States as the key that will unlock investment flows from other countries.

Third, the pragmatic role of China in averting collapse should not be underestimated.

While politically it would probably prefer the status quo, China's strategy has been realistic. North Korea's policy thinking about economic reform and institutional changes has also increasingly come under Chinese influence. China has urged North Korea to follow its lead and seek economic reform with foreign capital and technological expertise. Pyongyang is believed to be impressed by China's external policies, but to the extent it can be judged by outsiders, is yet to be convinced of the virtue of its domestic reforms because of the obvious political risks this would entail. To this end, 'the North Korean leadership may be thought to be standing at a position equivalent to that occupied by the Chinese leadership in 1978-79, though with additional knowledge of the Chinese and Eastern European experiences of reform in mind' (Cotton 1996:12). While there appears no Deng Xiaoping type reformer in sight, there are elements within the regime supportive of reform.

Fourthly, North Korea's official ideology as 'Socialism of Our Own Style' would not by itself exclude the possibility of embracing bolder reform and opening-up of the North Korean economy. North Korea has been far more pragmatic and less rigid in it's adherence to the concept of 'juche' than is often recognized. While the stated policy goal has always been the construction of an independent and self-reliant national economy, what this has meant in practice, however, has undergone considerable change over time. This would suggest that the 'juche' ideology may be more malleable and more amenable to reinterpretation if required. In the early days of North Korea, Kim Il-Sung stated clearly that independence and self-sufficiency were not inconsistent with foreign trade. In 1984, the year of the original law permitting joint ventures, Kim went further to suggest that with a more modernized economy North Korea should diversify trade to include 'processing trade and reselling' and that 'building an independent national economy means laying down solid foundation for the expansion and development of foreign trade' (Cotton 1996:5-6). In recent years agriculture, light industry and trade have been set as priorities. To displace heavy industry from the preeminence that it has enjoyed, and to seek rice aid in the face of past slogans extolling 'rice is communism', represents a reversal of monumental proportions.

There are of course obvious problems with a gradualist scenario of reform. Noland (1995, 1997 forthcoming) and Foster-Carter (1994) have discussed various reasons as to why such a scenario may not be viable from the regimes perspective. Essentially they condense into two. The

economic problems to be resolved are enormous. Successful gradual reform will require substantial resources to cushion adjustment in the industrial sector, and the initial conditions and reforms in China and Vietnam (which freed up surplus labor from the rural sector to move into a non-state sector) may be irreproducible in North Korea (Noland 1995:45). The second is political. Economic liberalization creates obvious political risks for the regime and the economic changes of the sort required may imply political changes that the regime would not countenance. Any meaningful opening and reforms will surely trigger changes in the people's awareness, leading to political pressure on those in power. If the North Korean leaders fail to pass through this process, it is possible that their regime will collapse. Thus while economic opening itself may not be synonymous with collapse of the regime, it is, as Flake has explained,

> the uncontrolled and rapid dissemination of information within North Korea that could severely destabilize the regime. The threat comes not from the information itself, but from the disparity between the newly perceived reality and the official government line. It is the resulting crisis of confidence that could potentially undermine support for the government (Flake 1995a:25).

Nonetheless, it would be possible to construct various models in which the North Korean government could decide to pursue reform without necessitating an internal crisis (Noland 1995). There are, for example, ample precedents in East Asia where military order has been kept as gradual reform has proceeded, including in South Korea (Scalapino 1992).

With the current economic stresses being viewed by the regime and population as having been caused by external factors, rather than by the North Korean system itself or the ineffective leadership of the Pyongyang regime, this may also explain why a collapse of North Korea in the short to medium term is not likely to come at the hands of a popular uprising. One possibility discussed by (Suh 1996) is that a moderate political group may rise to a position of leadership to establish a new government advocating a gradual reform. The worst case scenario would see the military emerge as a ruling group to establish a more dictatorial regime. In this respect, the total collapse of the current North Korean political system can be expected to take place only after one of these new regimes fails to cope with the post Kim Jong-il situation. And if as most reports suggest, Kim Jong-il is in firm control then the mechanism or catalyst through which the current conditions will be translated into collapse remains unclear, at least as far as outside

observers can gauge.

Figure 1: North Korean per capita GNP (US$)

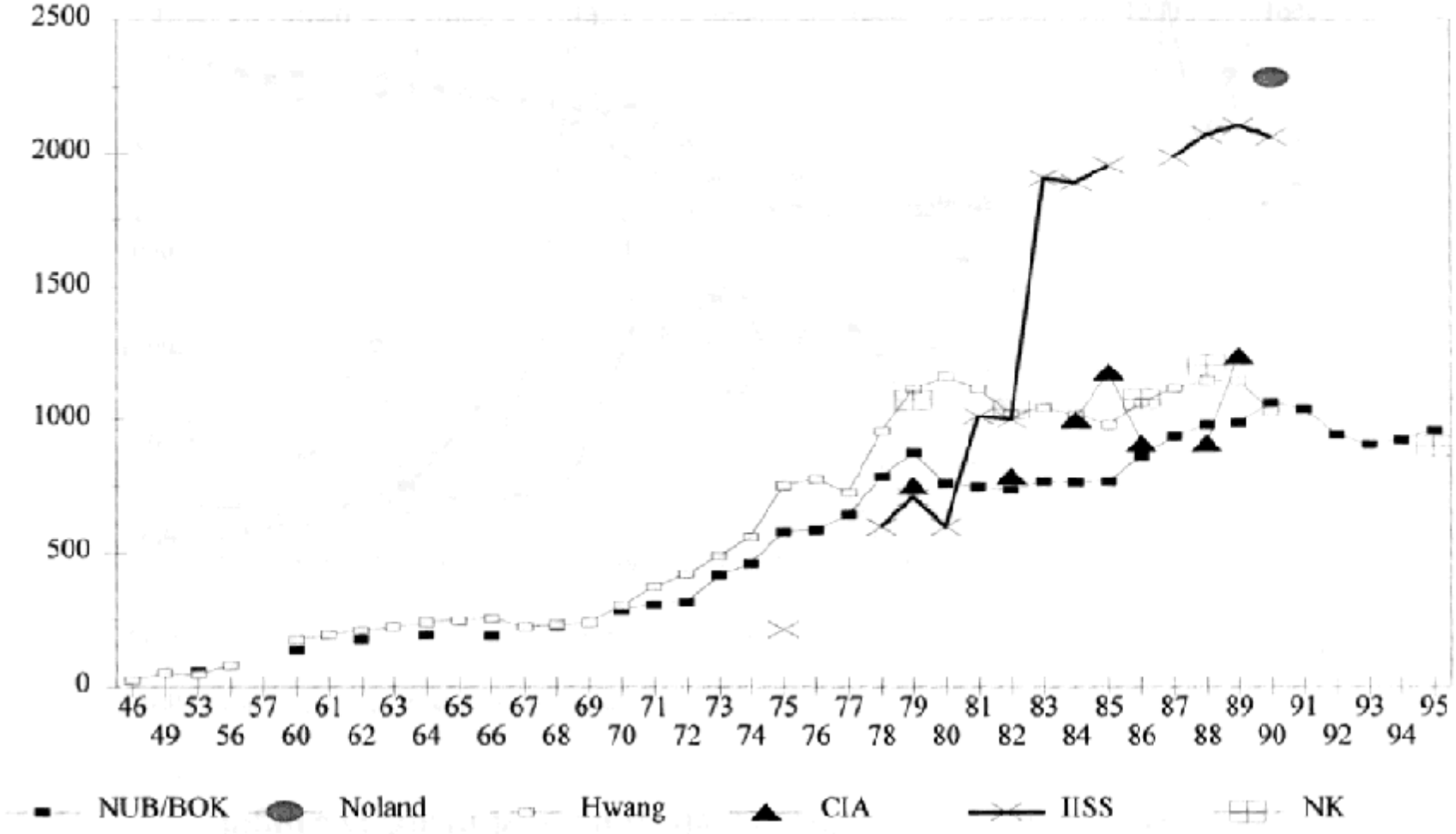


Figure 2: North Korean trade, 1955-95 (US$million, current prices)

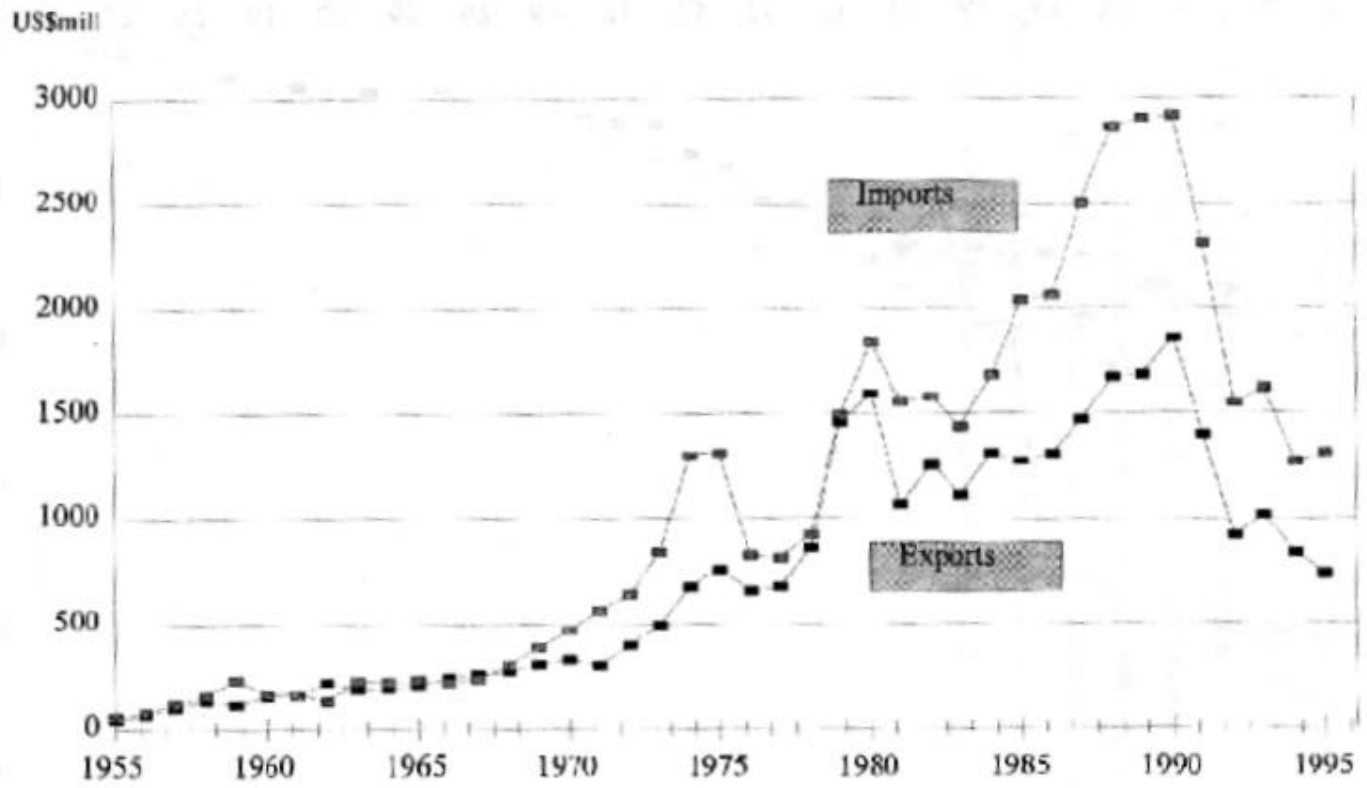
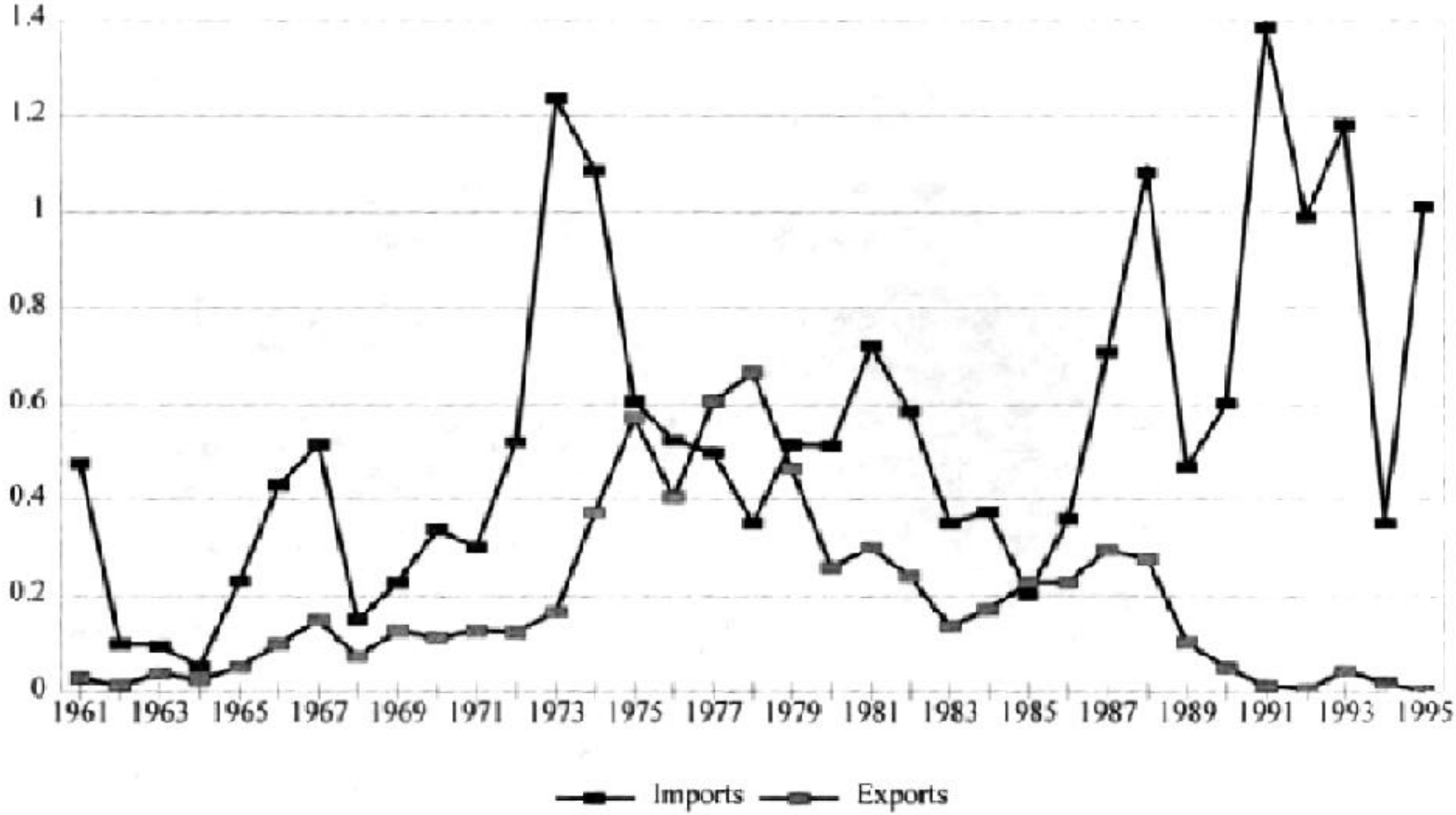
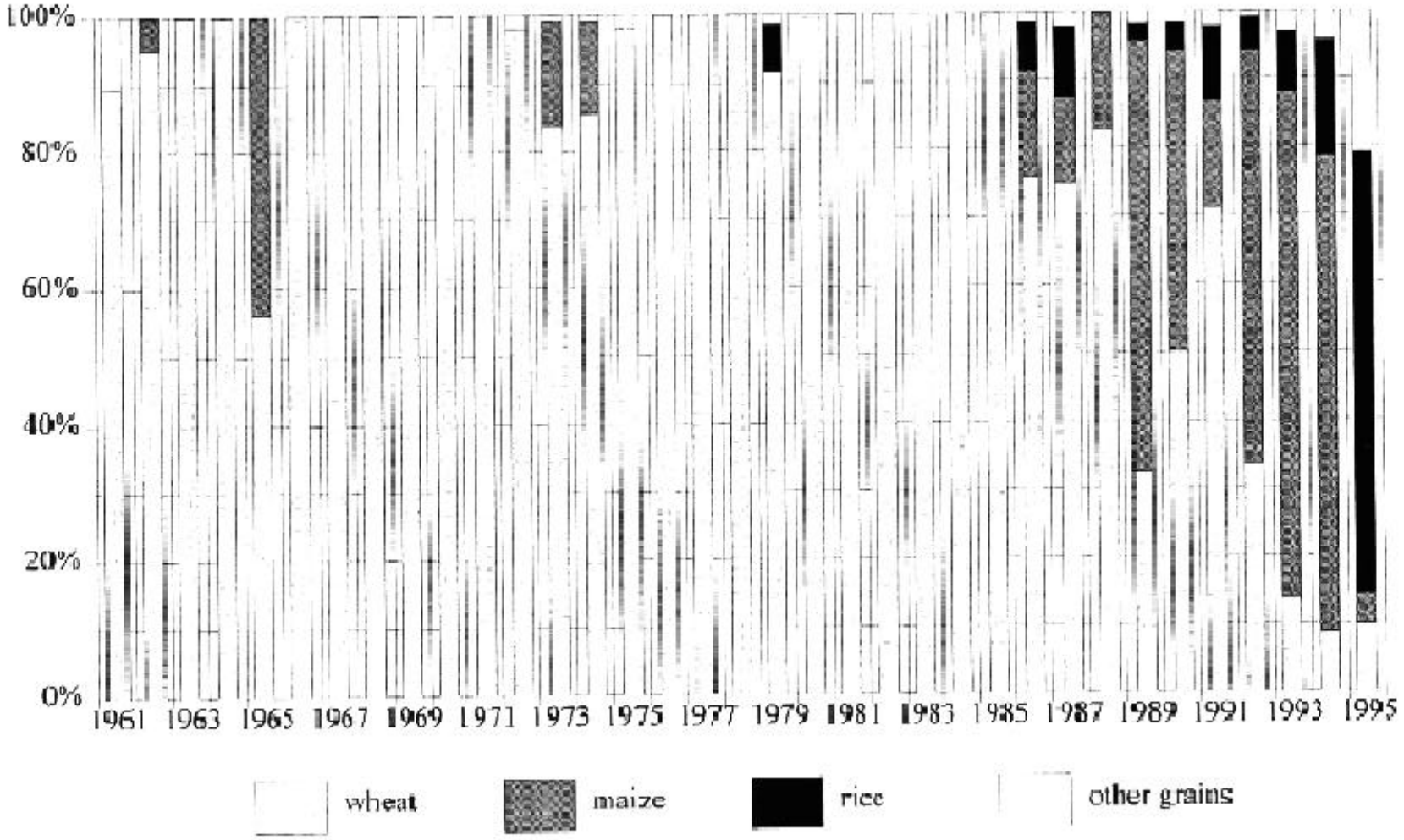


Figure 4: Exports and imports of cereals, North Korea 1961-95 (million tons)



Note: Imports include commercial trade, food aid granted on specific terms, donated quantities, and estimates of unrecorded trade.

Figure 5: Composition of cereal imports, North Korea 1961-95



Notes: 1) Rice is milled equivalent. Totals include 'other cereals' but excludes pulses, starchy roots

2) Other grains include flour of wheat, barley, sorghum, buckwheat

Figure 7: Domestic utilisation (supply) of cereals, North Korea 1962-92

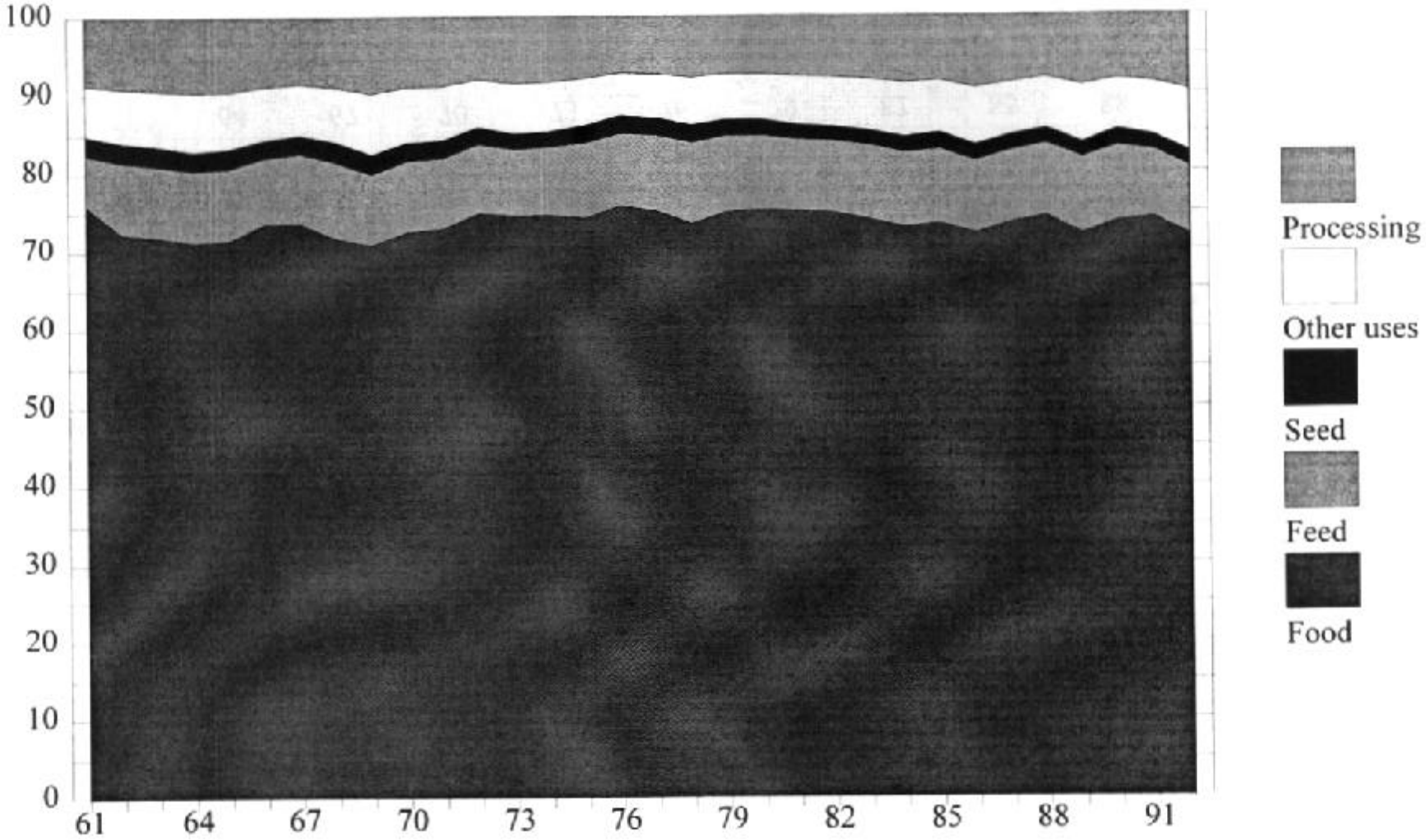
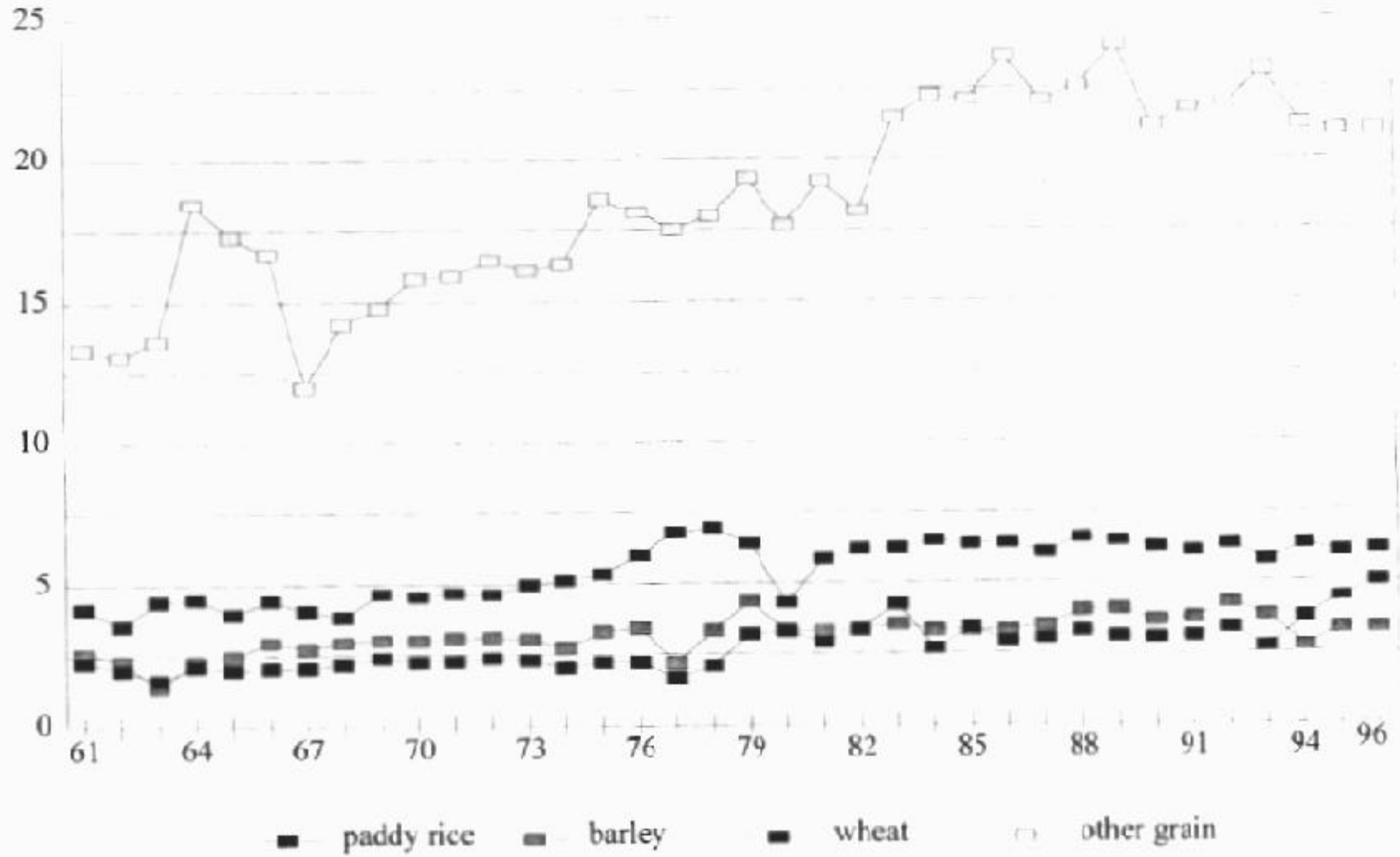


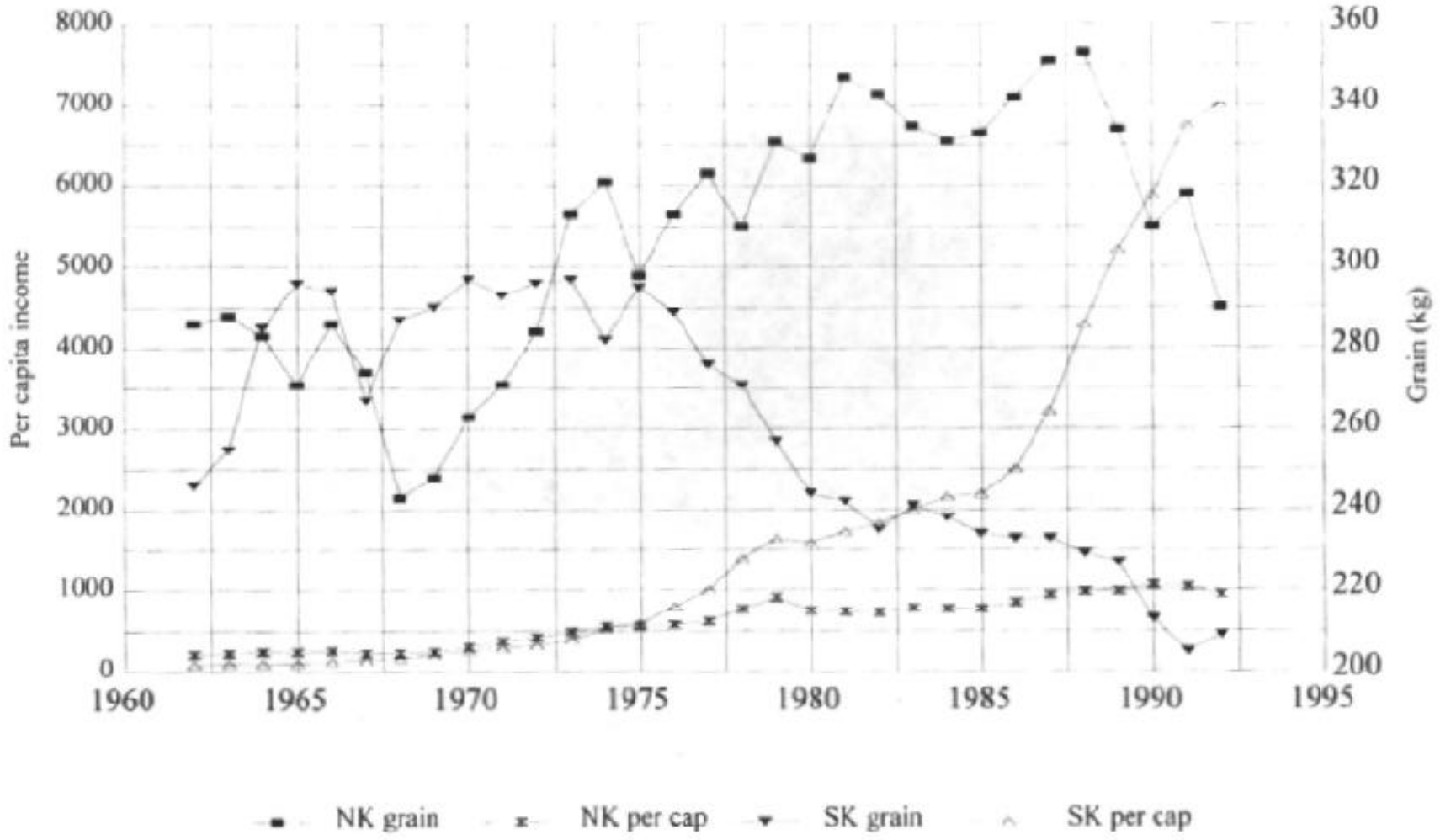
Figure 8(b): Grain yields, South Korea 1961-96 (tons per hectare)



Notes; 'Other grains' includes pulses and starchy roots.

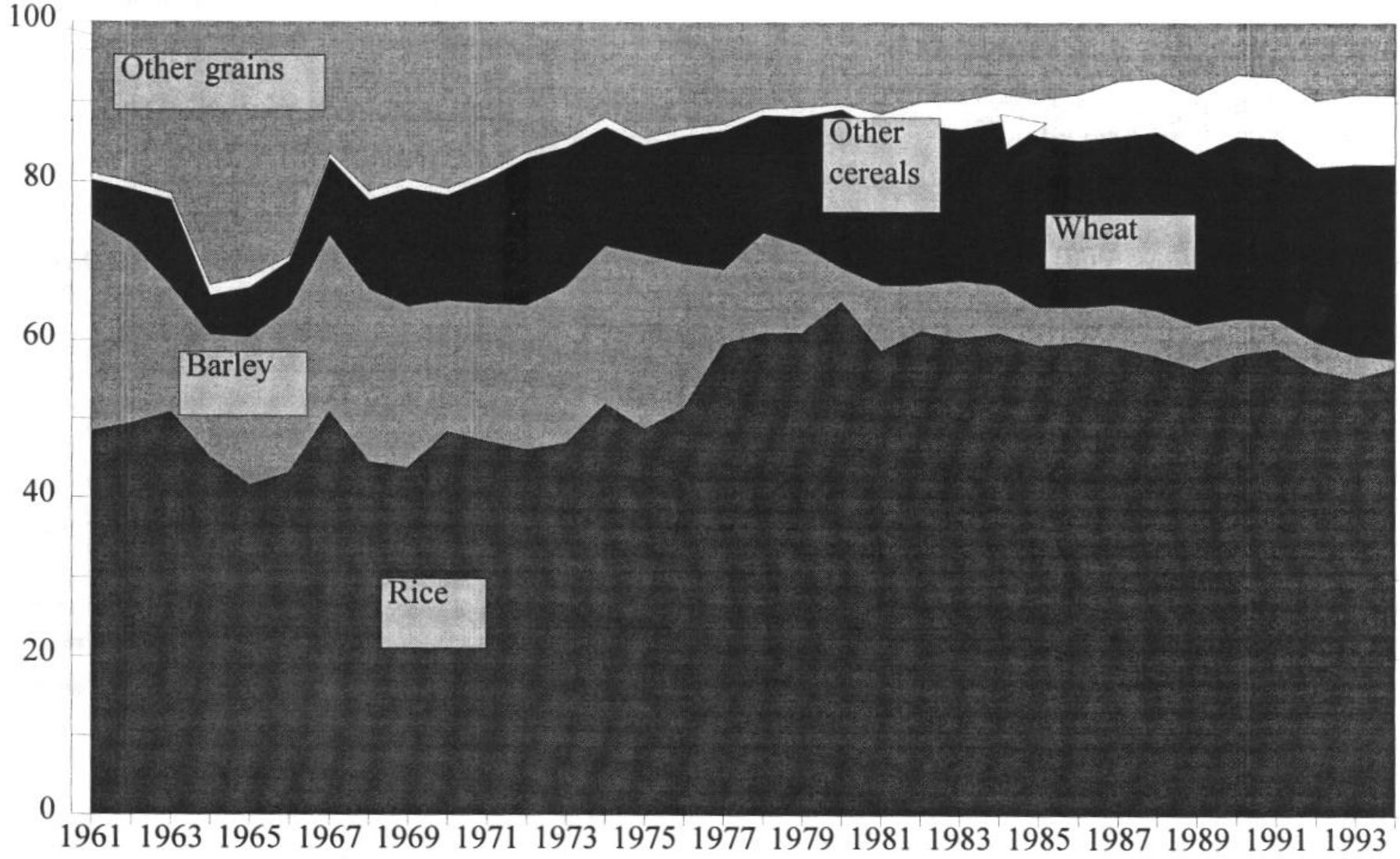
Data for 1995 and 1996 are FAO estimates.

Figure 9: Per capita income and grain consumption, South Korea and North Korea, 1962-92



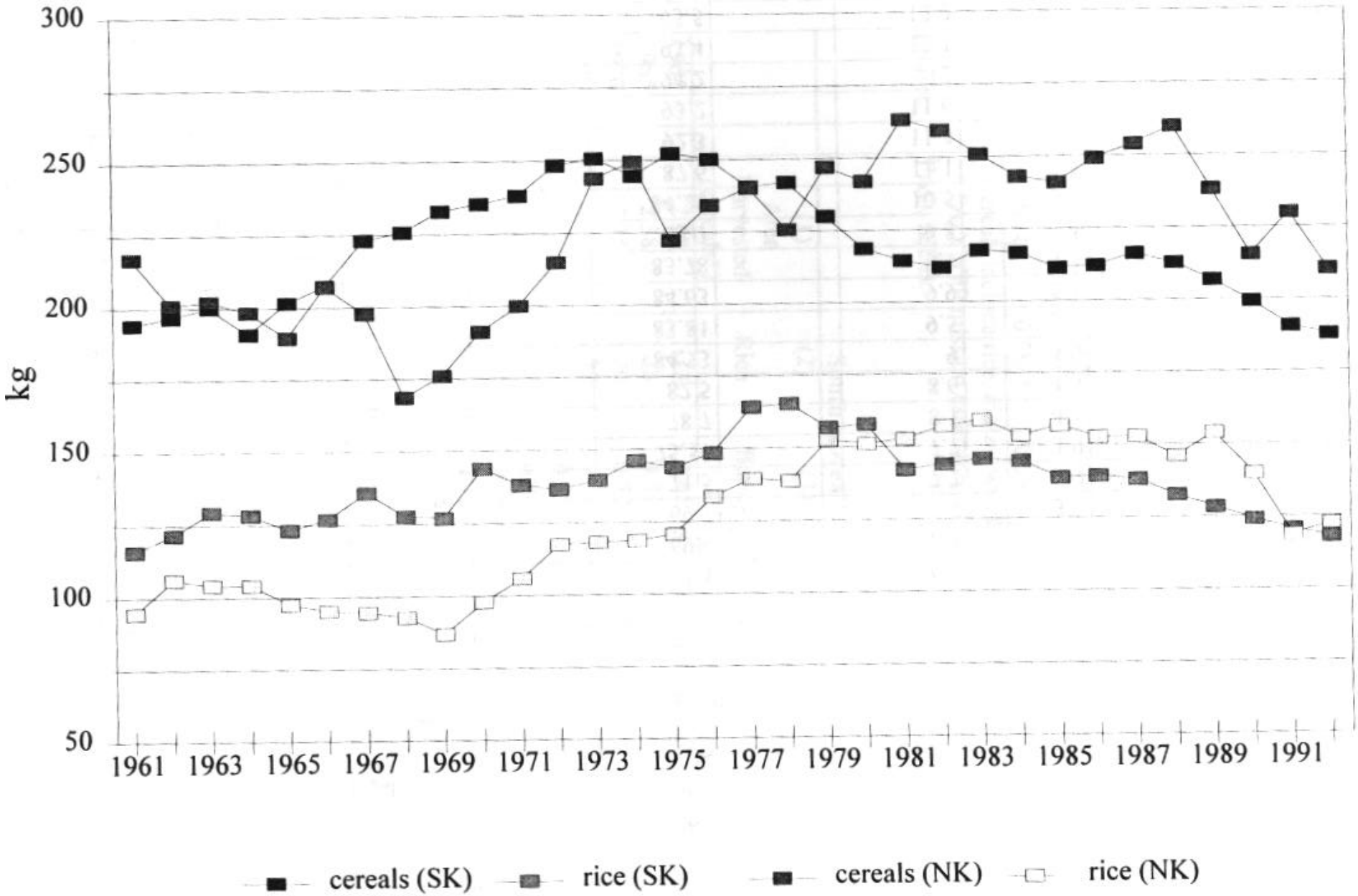
Note: Grain includes rice (husked equivalent), maize, wheat, barley, millet and sorghum, pulses, starchy roots.

Graph 11(b): Composition of food grain consumption, South Korea 1962-94



Note: Other grains includes starchy roots and pulses.

Figure 13: Per capita cereal consumption, North and South Korea 1961-92



Per capita food consumption in North Korea: 1962-92

Annual kilograms per person

	Grain					Pulses,	Vegetables,	Meat	Eggs	Milk	Fish	Edible Oils	Alcohol
		rice	maize	wheat	other	Potatoes	Fruit						
1961						85.6		6.9	3		1.7		19.4
1962						85.19		6.8	3.1		1.8		19.9
1963						86.1		6.7	3.1		1.9		20.4
1964						84.6		6.9	3.5		2		18.9
1965						82		6.7	3.4		2		17.9
1966						78.76		6.7	3.4		2.1		15.8
1967						76.49		6.7	3.4		2.2		12.6
1968						74.2		6.6	3.4		2.3		12.2
1969						71.8		6.6	3.5		3		11.4
1970						72		6.6	3.4		2.4		11.5
1971						71.1		6.8	3.6		2.5		11.8
1972						69.4		6.8	3.7		2.4		11.8
1973						69.1		7	3.9		2.8		13.1
1974						71.5		7.2	3.9		2.7		13
1975						75.57		7.7	3.9		2.5		12.7
1976						78.7		8.1	4.1		2.5		12.5
1977						82.5		8.6	4.4		2.5		12.6
1978						84.73		9	4.9		3		13.3
1979						83.81		9.5	5.2		3.5		13.1
1980						84.63		9.9	5.4		3.7		13.4
1981						83.78		9.9	5.4		3.7		12.3
1982						83.7		9.8	5.4		4.1		12.3
1983						84.25		10.5	5.6		4.3		12.2
1984						87.6		11.1	5.7		4.6		12.6
1985						92.3		11.4	5.8		4.2		12.9
1986						93.2		11.6	6.1		4.9		14.9
1987						94.2		12	6.1		4.8		14.9
1988						93.4		12.1	6.1		4.7		13.6
1989						95.5		12.2	6.1		5		13.3
1990						94.1		12.1	6.2		4.3		13.8
1991						88.5		12.6	6.2		3.7		14.5
1992						80.1		11.7	6.1		4		13.4
1993						76		11.4	5.9		3.8		13.5
1994						69.3		11.2	5.9		3.3		13.2

Table 7: Area harvested (million hectares)

North Korea

	(1) Area harvested (cereals*)	(2) Rice	(3) Maize	(4) Wheat	(5) Pulses, Potatoes	(1) – (5) Total
1961	1.43	0.42	0.53	0.16	0.37	1.80
1965	1.46	0.48	0.54	0.16	0.45	1.91
1970	1.51	0.53	0.57	0.15	0.43	1.94
1975	1.61	0.62	0.67	0.10	0.45	2.06
1980	1.61	0.65	0.69	0.09	0.49	2.10
1985	1.60	0.67	0.69	0.09	0.52	2.12
1990	1.57	0.65	0.68	0.09	0.55	2.12
1992	1.51	0.65	0.64	0.09	0.54	2.05
1994	?					
1996	1.44	0.58**	0.63**	0.08	0.51	1.95

Notes: * Cereals include rice, maize, wheat and other cereals
** FAO/WFP mission estimates

Source: FAO, IEDB.

South Korea

	(1) Area Harvested (cereals*)	(2) Rice	(3) Barley	(4) Wheat	(5) Pulses, Potatoes	(1) + (5) Total
1961	2.07	1.13	0.65	0.08	0.16	2.44
1965	2.38	1.23	0.83	0.09	0.27	2.83
1970	2.15	1.20	0.73	0.10	0.24	2.58
1975	2.05	1.22	0.71	0.04	0.21	2.50
1980	1.65	1.23	0.33	0.03	0.15	2.14
1985	1.51	1.24	0.24	0**	0.11	2.03
1990	1.44	1.24	0.16	0**	0.08	1.99
1992	1.29	1.16	0.10	0**	0.08	1.80
1994		1.10	0.09	0**	0.06	
1996		1.03	0.09	0**	0.06	

Notes: *Cereals includes rice, barley, maize, wheat and other cereals
** Under 10,000 hectares

Source: FAO, IEDB.

Table 11: Food grain production estimates, North Korea 1961-96

	[1] RDA/NUB	[2] FAO1	[3] FAO2	[4] Lee	[5] Lee (adj)	[6]=[5]-[2]
1961	-	-	2.41	-	-	-
1962	-	3.22	2.29	-	-	-
1963	-	3.32	2.37	-	-	-
1964	-	3.34	2.38	-	-	-
1965	-	3.31	2.35	-	-	-
1966	-	3.61	2.65	3.85	3.57	0.04 (-)
1967	-	3.58	2.61	-	-	-
1968	-	3.28	2.31	-	-	-
1969	-	3.46	2.48	-	-	-
1970	-	3.81	2.79	-	-	-
1971	-	4.04	3.00	-	-	-
1972	-	4.34	3.31	-	-	-
1973	-	4.90	3.85	5.01	4.60	0.30 (-)
1974	-	5.14	4.04	5.79	5.31	0.17
1975	-	4.86	3.68	6.36	5.79	0.93
1976	-	5.20	3.96	6.61	6.04	0.84
1977	-	5.44	4.13	7.02	6.40	0.96
1978	-	5.36	3.97	6.52	5.88	0.52
1979	-	5.80	4.42	7.44	6.67	0.87
1980	-	5.85	4.42	7.44	6.67	0.82
1981	-	6.31	4.89	7.35	6.62	0.31
1982	-	6.36	4.93	7.85	7.06	0.70
1983	-	6.29	4.82	7.70	6.89	0.60
1984	-	6.28	4.75	8.26	7.39	1.11
1985	-	6.44	4.79	8.09	7.24	0.80
1986	-	6.73	5.03	8.09	7.27	0.54
1987	-	6.98	5.23	7.93	7.15	0.17
1988	5.21	7.23	5.45	7.93	7.20	0.03
1989	5.48	6.19	5.09	7.77	6.87	0.68
1990	4.86	6.55	4.69	7.54	6.78	0.23
1991	4.42	6.89	5.09	7.31	6.70	0.19
1992	4.26	6.40	4.75	7.09	6.40	0.00
1993	3.88	-	-	7.23	-	-
1994	4.12	-	-	-	-	-
1995	3.45					
1996	3.68					

Notes: [1] RDA/NUB estimates include rice, maize, other cereals, beans and pototoes
[2] FAO1 includes cereals, pulses (beans) and starchy roots (potatoes, sweet potatoes) Rice is husked equivalent.
[3] FAO2 includes cereals (rice,maize, wheat, barley, sorghum, oats and millet)
[4] Lee includes rice (unmilled), maize, wheat, millet, sorghum, barley, potatoes and beans.
[5] Lee (adj) Rice component in Lee is adjusted by estimating the share of rice in the FAO statistics and then discounted by 22 per cent (i.e. the milling loss in converting paddy rice to its husked equivalent).

BIBLIOGRAPHY

APEG (Asia Pacific Economic Group) 1996. *Asia Pacific Profiles 1*996. Canberra: Australian National University.

Bank of Korea. 1990, 1994. 'The Estimation of North Korean GNP', Seoul: Bank of Korea.

Bosworth, Barry P. and Gur Ofer. 1995. *Reforming Planned Economies in and Integrating World Economy*. Washington DC: The Brookings Institution.

Central Intelligence Agency, 1990, 1995. *Handbook of Economic Statistics*. Washington DC: CIA.

Cho, Lee-Jay Cho and Yoon Hyung Kim. 1995. (eds) *Economic Systems in South and North Korea*. Seoul: Korea Development Institute.

Choi, In-Duck. 1990. 'Our District Party Committee's Political Organization Works for the Increased Production of People's Consumer Goods Through a Mass Movement', *Geunloja*, January.

Choi, Hak-Nam and Man-Soo Chun. 1992. 'Agricultural economy of Choson [North Korea]', paper presented at the Seminar on East Asian Studies, 1-3 July 1992, Changchun, China.

Chun, Hong Tack. 1992. 'Estimating North Korean GNP by physical indicators method', *KDI Working Paper No. 9201*, Seoul: Korea Development Institute.

Chun, Hong Tack, 1995. 'Rapprochement model for economic integration', in Lee-Jay Cho and Yoon Hyung Kim (eds) *Economic Systems in South and North Korea*. Seoul: Korea Development Institute.

Chun, Hong-Tack. 1996. 'Economic conditions in North Korea and prospects for reform', *KDI Working Paper No. 9603*, Korea Development Institute, Seoul.

Chung, Joseph S. 1974. *The North Korean Economy*. Stanford: Hoover Institution Press.

Complete Encyclopedia. 1982-83. Pyongyang: Scientific Encyclopedia Press.

Cotton, James. 1996. 'The Ranjin-Sonbong Free Trade Zone experiment: North Korea in pursuit of nee international linkages' paper presented at the Australian National University, November.

Dyck, John H. 1997. 'Korean agriculture in the 1990s and beyond' paper presented at the conference on Food and Security on the Korean Peninsular, University of Maryland, College Park, 18 February.

Eberstadt, Nicholas. 1995a. *Korea Approaches Reunification.* Armonk NY: ME Sharpe.

Eberstadt, Nicholas. 1995b. 'China's trade with the DPRK, 1990-1994', *Korea and World Affairs*, Winter 665-685.

Eberstadt, Nicholas. 1996. 'Financial transfers from Japan to North Korea', *Asian Survey,* 36:5 523-542.

Eberstadt, Nicholas 1997. 'The DPRK as an economy under multiple severe stress', manuscript.

Eberstadt, Nicholas and Judith Bannister. 1992. *The Population of North Korea*. Berkeley, CA: Institute of East Asian Studies.

Eckert, Paul 1996. 'North Korea's pachinko well drying up in Japan', *The Korea Times*. July 3.

FAO (Food and Agricultural Organization). various years. *FAO Production Yearbook*, Geneva: United Nations.

FAO/WFP, 1995. 'FAO/WFP crop and food supply assessment mission to the Democratic People's Republic of Korea', *Special Report.* 22 December.

FAO/WFP, 1996a. 'Special alert No. 267 Democratic People's Republic of Korea', 13 May.

FAO/WFP, 1996b. 'Special alert No. 270 Democratic People's Republic of Korea', 6 September.

FAO/WFP, 1996c. FAO/WFP crop and food supply assessment mission to the Democratic People's Republic of Korea' *Special Report.* 6 December.

Flake, L. Gordon 1995a. 'Observations from Pyongyang'. DPRK Trip Report Addendum. Washington DC: Korea Economic Institute of America, July 31, memo.

Flake, L. Gordon. 1995b. 'International economic linkages of North Korea', paper presented at the Symposium on North Korea and Prospects for Korean Unification, University of California, San Diego, La Jolla Ca, 25-27 May.

Flake, L. Gordon. 1995c (Check with author)?

Flake, L. Gordon 1996a. 'Personal observations on current conditions in the DPRK', Washington DC: Korea Economic Institute of America, June, memo.

Flake, L. Gordon 1996b. 'The globalization of the North Korean economy and the role of South Korean large enterprises', paper presented at The 6th International Symposium on The Globalization of the North Korean Economy, Seoul. August 20.

Foster-Carter, Aidan. 1994. 'North Korea after Kim Il-Sung: controlled collapse?', *Research Report,* London: Economist Intelligence Unit.

Han, Yong-Sup. 1994. 'China's leverages over North Korea', *Korea and World Affairs*, Summer 223-249.

Hayes, Peter, 1993. *Should the United States Supply Light Water Reactors to Pyongyang?*, Nautilus Institute, Berkeley, California, USA.

Hoon, Shim Jae. 1996. 'Darkness at noon', *Far Eastern Economic Review*, October 10 26-36.

Hwang, Eui-Gak. 1993. *The Korean Economies.* Clarendon Press, Oxford.

Jeong, Kap-Yeong. 1993. 'Comparing the North Korean level of economic development by principal components analysis', in Young Sun Lee (ed) *North Korea's Reality and Unification.* Seoul: Center for East and West Studies, Yonsei University. (in Korean)

KEDO, 1996 *Korean Peninsular Energy Development Organization Annual Report.* New York.

Kim, Youn-Soo (ed.) 1979. *The Economy of the Korean Democratic People's Republic 1945-1977.* Kiel: German Korea-Studies Group.

Kim, Kwang Suk 1995. 'Foreign exchange and trade regimes' in Lee-Jay Cho and Yoon Hyung Kim (eds) *Economic Systems in South and North Korea.* Seoul: Korea Development Institute.

Kim Sung Chull, 1994. *Is North Korea Following the Chinese Model of Reform and Opening?* East Asia Institute, Columbia University (December).

Koo, Bon Ho. 1992. *Political Economy of Self-Reliance: Juche and Economic Development in North Korea, 1961-1990.* Seoul: Research Center for Peace and Unification of Korea.

Koo, Bon Ho and Dongho Jo. 1995. 'Comparative analysis of the North and South Korean economies', in Lee-Jay Cho and Yoon Hyung Kim (eds) *Economic Systems in South and North Korea.* Seoul: Korea Development Institute.

KREI (Korea Rural Economic Institute). 1996. *Korean Agriculture 1996*. Seoul: Ministry of Agriculture, Forestry and Fisheries.

Lee, Hy-Sang. 1994. 'Supply and demand for grains in North Korea', *Korea and World Affairs*. Fall 509-552.

Levin, Norman D. 1982. 'Management and decision-making in the North Korean economy', Rand N-1805/I-NA. Santa Monica, CA: Rand Corporation.

Ma Guonan and Ross Garnaut. 1992. 'How rich is China' Department of Economic and National Center for Development Studies Working Papers in Trade and Development 4.

Mack, Andrew. 1995. 'Nuclear end-game on the Korean Peninsular', in M. Van Leeuwen (ed.), *The Future of the International Nuclear Non-Proliferation Regime*. Netherlands: Kluwer.

Mason, Edward., Mahn Je Kim, Dwight H. Perkins, Kwang Suk Kim, and David C. Cole. 1980. *The Economic and Social Modernization of the Republic of Korea*. Cambridge: Harvard University Press.

Moon, Pal-Yong 1995. 'Rural economic system', in Lee-Jay Cho and Yoon Hyung Kim (eds) *Economic Systems in South and North Korea* .Korea Development Institute, Seoul.

Moon Young Huh and Young Tai Jeung. 1994. 'External policies and relation' in Tae Hwan Ok and Hong Yung Lee (eds) *Prospects for Change in North Korea*, Korea Research Monograph No. 19. Institute of East Asian Studies, University of California, Berkeley, and Research Institute for National Unification, Seoul.

Naewoe Press. 1996a. 'North Korea army building more grain warehouses', *Vantage Point*, 19:5 19-20.

Naewoe Press. 1996b. 'Excess spending on political programs ruining the economy', *Vantage Point*, 19:10 21-22.

Namkoong, Young and Ho-Yeol Yoo, 1994. 'North Korea's Economic System', in Tae Hwan Ok and Hong Yung Lee (eds) *Prospects for Change in North Korea*. Korea Research Monograph No. 19. Institute of East Asian Studies, University of California, Berkeley, and Research Institute for National Unification, Seoul.

Namkoong, Young. 1994. 'Assessment of the North Korean economy: status and prospects', in *US-Korean Relations at a Time of Change*, Seoul: Research Institute for National Unification.

National Unification Board (NUB), various years. 'Economic Indicators of North and South Korea, Seoul.

Noland, Marcus. 1995. 'The North Korean economy', *Working Paper Series No. 5*, Washington DC: Institute for International Economics.

Noland, Marcus. 1997 (forthcoming) 'Stumbling towards the apocalypse?: the economic prospects of North Korea', *Foreign Affairs*.?

Noland, Marcus and L. Gordon Flake. 1997 (forthcoming) 'Prospects for North Korea's Ranjin-Sonbong Free Economic and Trade Zone' in *Korea's Economy*?

North Korean Research Center. 1983. *General Survey of North Korea*. Pyongyang: North Korea Research Center.

OECD, 1995. *The Chinese Grain and Oilseed Sectors*. Paris: OECD.

Oh, Seung-yul. 1993. 'Economic reform in North Korea: is China's reform model relevant to North Korea?' *The Korean Journal of National Unification*, 2 127-151.

Oh, Seung-Yul. 1995. 'Shortages in the North Korean economy', *The Korean Journal of National Unification*, 4 105-131.

Park, Chong Kee. 1995. 'Fiscal system', in Lee-Jay Cho and Yoon Hyung Kim (eds) *Economic Systems in South and North Korea*. Seoul: Korea Development Institute.

Pomfret, Richard. 1995. 'Regional economic cooperation in Northeast Asia: The Tumen River project', China and East Asia Trade Policy, *Pacific Economic Papers, No. 249*, Australia Japan Research Center, Canberra.

Robinson, Joan. 1974. 'Korea, 1964: economic miracle', originally published in the *Monthly Review* January 1965, reprinted in *Collected Papers Volume 3*. Oxford: Basil Blackwell.

Scalapino, Robert A. 1992. 'Trends in North-South Relations: an external perspective', *RINU Newsletter* 1:1.

Scalapino, Robert A. 1995. 'Forward' in Nicholas Eberstadt, *Korea Approaches Reunification*. Armonk NY: ME Sharpe.

Suh, Choo Suk. 1996. 'North Korea's political system: its current status and possibility of change', *Vantage Point*, 19:8 30-40.

Shuhachi, Inoue. 1984. *Modern Korea and Kim Jong Il*. Tokyo: Yuzankaku Publishers.

UNDP, 1994. *Human Development Report*. New York: United Nations Development Program.

UNESCO, 1993. *Statistical Yearbook.* Geneva: United Nations Economic, Social, and Cultural Organization.

UNDP, 1996. *Tumen River Economic Development Area Investment Guide*. United Kingdom: Icon.

UNIDO, 1996. *DPR Korea's Tumen River Area.* United Kingdom: Icon.

USDA (United States Department of Agriculture) North Korea Food 1997. Washington DC.

USIP (United States Institute of Peace) 1996. 'A coming crisis on the Korean Peninsular?', *Special Report*. Washington DC: United States Institute of Peace.

Von Hippel, David F. and Peter Hayes 1995. *The Prospects for Energy Efficiency Improvements in the Democratic People's Republic of Korea: Evaluating and exploring the options*, Nautilus Institute for Security and Sustainable Development, Berkeley, California USA.

World Bank. 1991. *World Bank Development Report 1991*. Washington DC: World Bank.

Yeon, Ha-cheong 1995. 'Inter-Korean economic relations', in Lee-Jay Cho and Yoon Hyung Kim (eds) *Economic Systems in South and North Korea.* Seoul: Korea Development Institute.

Young Soogil. 1995. 'Economic integration in Northeast Asia from a Korean perspective', China and East Asia Trade Policy, *Pacific Economic Papers, No. 249,* Australia Japan Research Center, Canberra.