

Famine in North Korea Redux?

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Abstract

In the 1990s, 600,000 to 1 million North Koreans, or about 3 to 5 percent of the precrisis population, perished in one of the worst famines of the 20th century. North Korea is once again poised on the brink of famine. Although the renewed provision of aid is likely to avert a disaster on the scale of the 1990s, hunger-related deaths are already occurring and a dynamic has been set in motion that will carry the crisis into 2009. North Korea is a complex humanitarian emergency characterized by highly imperfect information. This paper triangulates quantity and price evidence with direct observation to assess food insecurity in North Korea and its causes. We critique the widely cited UN figures and present original data on grain quantities and prices. These data demonstrate that for the first time since the 1990s famine, the aggregate grain balance has gone into deficit. Prices have also risen steeply. The reemergence of pathologies from the famine era is documented through direct observation. Although exogenous shocks have played a role, foreign and domestic policy choices have been key.

Keywords: Famine, North Korea

JEL codes: Q1, O1, P2

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INTRODUCTION

Imperfect and asymmetric information poses an ongoing challenge to the management of complex humanitarian emergencies. Often for political reasons—including authoritarian rule, breakdown of central authority, or civil conflict—donors face problems assessing the causes and extent of distress in recipient countries. These conditions frustrate the formulation of effective relief strategies.

North Korea is an example. During the 1990s, 600,000 to 1 million North Koreans, or about 3 to 5 percent of the precrisis population, perished in one of the worst famines of the 20th century. The closed nature of the regime made it nearly impossible for the outside world to recognize the onset of food distress and for aid to enter the country in a timely and targeted way.¹ The country is again experiencing signs of severe food shortages, and although more information is available than in the past, it remains imperfect and politicized.

The current cycle of distress can be traced back to late 2005. On the back of improving harvests and generous outside aid, the government attempted to ban the private trade in grain; in doing so, it criminalized the primary mechanism through which most North Korean families obtained food. The regime also sought to revive the state-run public distribution system (PDS) of quantity rationing, in part by confiscating grain in rural areas.² The government also threatened to expel the World Food Programme (WFP), incapacitating the outside world's early warning system.

High politics has also played an important role in recent shortages. More than two-thirds of the grain consumed in North Korea is produced locally (figure 1). Domestic production is highly dependent on fertilizer, however, much of which has been donated by South Korea in recent years. Following missile and nuclear tests in 2006, South Korea suspended fertilizer shipments; predictably, North Korean grain production fell. Food aid also dried up, and with global food prices rising, the regime's capacity to import grain on commercial terms also withered.

These policy-derived shocks were certainly exacerbated by adverse weather, as the country experienced flooding in 2006 and 2007, concentrated in grain-growing regions of the southwest. Yet as this brief narrative suggests, exogenous shocks in the form of both weather and rising world prices must be seen in the context of a wider political economy that involves both foreign and domestic policy choices.

In this paper, we triangulate between three sources of information—grain quantities, prices, and

1 More detailed background can be found in Noland (2000, 2004a, 2004b); Noland, Robinson, and Wang (2001); and Haggard and Noland (2007) and sources cited therein.

2 In August 2005, the government decided to reinstate the PDS as of October 1 and to ban private trading in grain. Implementation was uneven and eventually the government was forced to quietly shelve the policy as PDS sites were not able to meet targets and markets for grain began to reemerge. These developments coincided with reports of the government forcibly extracting food in contravention of the rules determining the disposition of cooperative farm output following the 2005 harvest.

direct observation—to assess the extent of distress and its causes. We begin with a reconstruction of aggregate food balances and show that recently released United Nations estimates of the production shortfall are almost certainly exaggerated. Nonetheless, even after making appropriate adjustments, we find that for the first time since the 1990s famine, the aggregate grain balance has gone into deficit. We show that the decline in aggregate supply predates the floods of 2007 and the onset of rising world food prices in 2007–08.

A central contribution of this paper is to match these aggregate balances with a consideration of the evolution of prices over the last three years. Prices have assumed increased salience due to fundamental changes in the North Korean food economy. The famine era collapse of the PDS encouraged entrepreneurial coping behavior and the emergence of markets. Food security is increasingly a function of household financial status as the PDS has receded in importance and food is increasingly accessed via the market.

Employing an original dataset of more than 600 grain-price observations, we map the path of prices against a number of potential drivers and show that while exogenous shocks, including floods and rising world-market prices, affect prices, reckless policies have played an important role as well. Moreover, some external constraints facing North Korea are themselves endogenous to political choices by the North Korean leadership, including those regarding relations with the WFP, the country's nuclear ambitions, and other foreign policy provocations. The latter are responsible for cuts in South Korean food and fertilizer aid and thus have both directly and indirectly affected available grain supplies.

In combination, these factors suggest a somewhat different approach to the political economy of famine than is visible in the extant literature. Rather than focusing solely on the domestic political determinants of famine, such as authoritarian rule (Sen 1981) or the presence of antifamine political compacts (de Waal 1997), we also need to consider how governments relate to the outside world. In North Korea's case, a foreign policy that emphasized economic autarky and a confrontational foreign policy combined to limit the access to external sources of supply in times of need.

I FOOD BALANCES

The conventional starting point for assessing food needs is a quantity balance sheet.³ Total need consists of requirements for human consumption, seed, feed, industrial uses (including the manufacture of alcohol), and losses and spoilage. Domestic supply consists of production and any drawdown on accumulated stocks. The gap between domestic needs and supply is the uncovered food balance, which

³ This section draws on Haggard and Noland (2008), which provides extensive documentation of the primary source materials.

must be met through commercial imports or aid. Each of these components is uncertain in the North Korean case. Analysts estimate human consumption by imputing per capita consumption or caloric intake (controlling for the heterogeneity of need across demographic groups) and multiplying that estimate by the population. Unfortunately, considerable uncertainty surrounds the size of the North Korean population; the most recent population census data pertain to 1993, that is, before the famine that may have killed a nontrivial share of the population (Eberstadt 2007, chapter 2). It appears that at times during the 1990s the Food and Agriculture Organization and World Food Programme (FAO/WFP) overestimated population (and hence consumption needs), in part because of the ravages of the famine itself.⁴

Moreover, there is also no consensus about the North Korean diet, and differing assumptions regarding caloric needs and nutritional sources can generate significantly different estimates of human needs. Heather Smith's (1998, 57) comprehensive analysis of North Korea's historical consumption patterns of all food categories concludes that "the share of rice and maize in total cereal intake has historically been much lower than assumed by international agencies" and that the cereals consumption figure adopted by the FAO/WFP probably overstated the role of rice and corn in the North Korean diet by approximately 20 percent (figure 1).⁵

Total requirements must also account for seed, livestock feed, industrial uses such as the manufacture of alcohol, and postharvest losses. Seed is a relatively small component, but livestock feed is significant and has exhibited substantial change. The initial 1995 FAO/WFP assessment estimated feed requirements at 1.4 million metric tons (MMT) of cereal, well above Kim, Lee, and Sumner's (1998) estimate of 584,000 metric tons (MT) for a typical year. Subsequent reports (corroborated by eyewitness accounts) described culling of livestock on the order of "30 to 90 percent,"⁶ "more than half,"⁷ and "most,"⁸ and the United Nations Development Programme (UNDP) reported that "livestock and

4 The initial FAO/WFP assessment released in December 1995 implied that the population was just over 22 million. In the November 1997 food balance calculation the FAO/WFP assumed that mid-1998 population would be 23.5 million. As a point of comparison the South Korean government's estimate was 21.9 million. By June 1999, however, it was apparent that famine mortality was of such a magnitude that it was germane to calculations of overall demand. Food balances were subsequently recalculated based on an official North Korean government population estimate of 22.55 million for August 1999, amounting to a downward revision of nearly one million people from the FAO/WFP's previous assumption. The population issue emerged again in 2008, when assessment teams were only able to access areas accounting for less than 20 million people, while the putative population of the country was 24 million.

5 Hazel Smith (2008) provides a counterargument that because of its cold climate, caloric intake needs in North Korea are actually higher than those specified by the UN agencies.

6 FAO/WFP (1996a, 3).

7 FAO/WFP (1996b, 3).

8 FAO/WFP (1997, 2). This report also observes that the extensive culling of livestock should have, at least

poultry populations fell dramatically after the floods.”⁹ As a consequence of these reductions in herd size, the estimated feed requirement was cut to 600,000 MT for the 1996–97 marketing year and 300,000 for the 1997–98 marketing year, where it remained constant for a number of years. Yet in the 2003–04 assessment, the FAO/WFP reported a figure on feed demand provided by the North Korean agriculture ministry of 178,000 MT, despite the fact that the FAO/WFP was reporting that the herds had been substantially restocked. In other words, over the course of a decade, the estimated feed requirement fell by more than 1 MMT—from nearly a quarter of total use to less than 5 percent—despite a reported increase in herd size. We make this observation not to belittle the analysts at the FAO and WFP but to illustrate the magnitude of uncertainty surrounding important components of aggregate demand.

Finally, consider postharvest losses. Early FAO/WFP calculations assumed that these were relatively minor, but they were raised to 12 percent of production for the 1997–98 balance sheet, and 15 percent the following year. By assumption they have remained constant since, despite North Korean government attempts to reduce them. This relative constancy reflects in part political negotiations among the WFP, the FAO, and the North Korean government and is without serious empirical foundation; recent FAO/WFP reports openly acknowledge as much.¹⁰

As a consequence of these various sources of uncertainty, differences among need estimates are extraordinarily large, ranging from a relatively expansive 6.5 MMT (from the [South] Korea Rural Development Administration [KRDA])¹¹ to a highly compressed, minimum human need requirement of roughly 3 MMT (our calculations). Consumption at this highly compressed level would certainly not avoid hunger; food would have to be distributed precisely across the population, an outcome that is both logistically and politically implausible (Haggard and Noland 2007).

How about supply? The biggest single component of supply is domestic production (figure 1). Since production cannot be measured directly, outside observers impute it by combining estimates of planted acreage and yields. Yields pose more challenges than acreage, which can be observed through satellite imagery. The South Korean government estimates yields by operating experimental farms mimicking

temporarily, increased the supply of meat and thereby reduced demands for other foods.

9 The UNDP report goes on to quantify these losses: “Data gathered for the purposes of this study indicate a reduction of 37 percent of cattle, 36 percent for sheep and goats. More importantly, grain eating pig and poultry populations declined by 57 percent and 90 percent, respectively” (UNDP 1998, 16).

10 For example, the Food and Agriculture Organization and World Food Programme states that “the level of postharvest crop loss in DPR Korea has been a contentious issue in recent years, with estimates ranging from 2 percent to as high as 30 percent. Unfortunately, none is based on quantified investigation” (FAO/WFP 2003, 17–18). The following year’s report reads: “The level of post-harvest crop loss in DPR Korea has been a contentious issue in recent years, with estimates ranging from 3 percent to more than 30 percent. Unfortunately, no systematic investigations have been taken to clarify the issue” (FAO/WFP 2004, 15).

11 Park Hyun Min, “Food Provisions Will Be 2.49 Million Tons Short Next Year,” *DailyNK*, December 15, 2007.

North Korean agricultural techniques. The FAO uses selective field sampling to generate estimates of yields, but the organization is also diplomatically constrained to recognize North Korean official data. This is an important constraint insofar as North Korea has tended to understate supply during bad times to maximize assistance. In the spring of 2008, for example, the FAO downwardly revised its estimate of the previous harvest by a whopping 25 percent.¹²

Estimating imports is also challenging. North Korea treats trade data as a state secret, and a number of the country's trade partners—most notably China—are circumspect about revealing their aid commitments. But the magnitude of discrepancies across external sources on imports and aid is smaller than with respect to domestic production. It is possible to track most aid, including the share passing through the WFP. As shown in figure 1, aid has been volatile during recent years, and its shrinkage is an important contributor to the decline in aggregate supply.

Lastly, it is possible that North Korea could be running down accumulated stocks, including stocks reserved for the military. There is disagreement as to the size of these putative stocks and North Korea's management of them, although recent reports have suggested a release of military stocks around the time that prices peaked in early 2008. However, the consensus is that the release of stocks is unlikely to have had a large quantitative impact on the balance sheet although, as we will see, they can have a temporary impact on prices.¹³

Figure 2 reports two alternative estimates of North Korea's uncovered grain needs. One is constructed from FAO/WFP figures. The other adjusts these estimates on the supply side by substituting US Department of Agriculture (USDA) estimates of North Korean production for the FAO estimate and adjusts the demand side to reflect the South Korean government's estimate of the North Korean population and the Heather Smith-adjusted estimates of human consumption.¹⁴

The UN series are not plausible. According to these figures, North Korea has avoided food shortages

12 Other estimates of current grain output range from 4.01 MMT to a low of 2.5 MMT; all assessments point to a sharp decline in output. At the higher end of the production estimates, KRDA shows a decline in total food equivalent of 500,000 MT between the 2006 and 2007 harvests, from 4.48 MMT to 4.01 MMT or 11 percent. The US Department of Agriculture estimates show a more modest decline in output but from a lower starting point: from 3.49 MMT to 3.32 MMT. The FAO revision marks a large reduction not only from the 4 MMT of the previous year but also from the five-year average of 3.7 MMT. Finally, at the low end, Good Friends has cited an estimate of total output of 2.5 MMT but without extensive justification of sources or methods.

13 On the putative size of military stockpiles, see Noland (2000, box 5.2). Pomnyun (2008) and Good Friends (2008) report that the government released military stocks in the spring of 2007, while Lee Sung Jin and Moon Sung Hwee report that military stocks were released in May 2008 at the time when prices were peaking. See Lee Sung Jin, "Military Provisions Released to the Cadres," *Daily NK*, May 6, 2008; and Moon Sung Hwee, "North Korean National Defense Commission Orders Distribution of Wartime Food Reserves to the Army," *Daily NK*, May 27, 2008.

14 Using South Korean government estimates of North Korean output would yield a very similar picture to the one derived from USDA data. These two series track each other closely but are significantly different from the FAO series.

in only one of the last 12 years—2000—and then only barely. If North Korea really experienced the shortfalls depicted in these data, it would have experienced famine. The adjusted figures tell a more plausible story. The very large food deficits during the famine period in the mid-1990s were followed by a modest agricultural recovery and small surpluses. After 2005, however, the combination of declining domestic production and more erratic aid pushed available supply below even adjusted total needs for the first time since the famine. By spring 2008, the wolf really was at the door. A consideration of prices provides additional information both on the extent of distress and some of its causes.

II EVIDENCE FROM PRICES

North Korean authorities impede the collection and dissemination of price data. Nonetheless, increasingly active nongovernmental organizations (NGOs) and the growing availability of cell phones in the Chinese border region have facilitated the monitoring of price trends. These data are assembled primarily from observations reported in Good Friends' publication *North Korea Today*, NKNet's *DailyNK*, and other Korean-language academic and media sources.¹⁵ As with all data on and from North Korea, these series too should be treated with caution. The data are spotty, markets are fragmented, and we have little information on quality differences. It is also likely that the actual collection of the data is endogenous: More effort is placed on collecting and disseminating data during periods of stress or concern about the food situation, both secularly and seasonally (figure 3). As a consequence the series that we have constructed may well exhibit upward bias and greater volatility relative to the "true" price series.¹⁶

A scatter plot of more than 600 observations of corn and rice prices from 19 North Korean cities

15 Good Friends is a Buddhist charity, which has long been involved in refugee and famine relief work in North Korea. It has taken an aggressive line with regard to the magnitude of problems facing North Korea: Based on a network of informants claimed to include North Korean government officials, it asserts that North Korea faces a food shortage of 1.8 MMT and that 200,000 to 300,000 lives could be lost in 2008 due to renewed famine (Pomnyun 2008). (The Good Friends estimate of the food shortage [1.8 MMT] is particularly striking insofar as they estimate that the population of North Korea is only 20 million due to 4 million famine-related deaths in the 1990s.) NKNet, which includes a significant number of North Korean refugees or defectors, has generally taken a more skeptical line, arguing that it is hard to assess the actual magnitude of the shortage and estimating excess mortality on the order of 100 to 1,000 through June 2008, though even NKNet reports disturbing developments, including the exhaustion of rations for some military units (Moon Sung Hwee, "North Korean National Defense Commission Orders Distribution of Wartime Food Reserves to the Army," *DailyNK*, May 27, 2008).

16 One might think of this as a situation where the observed price, p^o , is the sum of the true price (determined by supply and demand fundamentals), p^f , and a random component, e , either measurement error or short-run fluctuations that are orthogonal to q and its determinants $E(e|p^f)=0$, i.e. $p^o=p^f+e$. In the case at hand there are two potential sources of bias. There may be a tendency to disproportionately collect data on observations with big realizations of e (so $E(e)>0$). It may also be the case that there is a similar tendency to disproportionately pick up observations with large positive values of e when p^f is small (so $E(e|p^f)=f(p^f)$ with $f'(p^f)<0$). Both tendencies would upwardly bias both the mean and variance of the observed relative to the true series of prices.

over the period from June 2004 to August 2008 is reported in figure 4. A reasonably consistent time series was constructed for eight cities,¹⁷ interpolating between missing observations, and an index of grain prices was formed with corn and rice each receiving 50 percent weights. This index, along with the FAO index of world grain prices, is reported in figure 5 together with the timing of nine events of potential significance to the trajectory of prices since the fall of 2005 (summarized in table 1). Two of these events are weather related: the floods in July 2006 and August 2007. The remainder, however, are domestic policy actions or developments in the external political and economic environment. In chronological order, we include: the October 2005 ban on private trade in grain and the revival of the PDS; the October 9, 2006 detonation of a nuclear device and the subsequent imposition of UN sanctions on October 14, 2006; the April 2007 tightening of internal trade restrictions¹⁸; the December 2007 imposition of export controls by China in response to rising domestic food prices (which coincided with a North Korean ban on trading activities by younger women); the reported May 14, 2008 release of military stocks and the nearly coincidental May 15, 2008 afternoon announcement (US time) of the provision of US food aid (i.e., May 18, Korea time); and the June 30, 2008 arrival in Nampo of the first shipment of US food aid. The mapping of these events against the timeline of prices provides some suggestive evidence as to the drivers of price movements.

In sifting through these possible influences, it is important to underline some expected seasonality in the data. We expect prices to decline following the fall harvest and to rise in the spring, the traditional “lean season” prior to the summer harvest of potatoes and some secondary grains. The July 2006 floods generate the first noticeable inflection point in the price series, producing a 37 percent increase in prices between July and September 2006. The nuclear weapon test and UN sanctions the following month do not appear to have sufficient impact to reverse the seasonal pattern of postharvest price decline. In the aftermath of the July 2006 missile tests the South Korean government limited food and fertilizer shipments, but these shipments resumed following a breakthrough in the nuclear negotiations in early 2007. Food shipments might be expected to have a relatively immediate effect on prices, but the consequences of the interruption of fertilizer are more indirect; reduced availability and application of fertilizer has delayed effects via the size of the subsequent harvest, which was also affected by the floods.

The data indicate that North Korean grain prices have outstripped either overall inflation or world grain prices, quadrupling between May 2007 and May 2008 alone; although world market prices set a floor under North Korean prices, country-specific effects were clearly at play. Prices declined following the announcement of the resumption of large-scale assistance and the possible release of military stockpiles but did not converge fully to world prices.

With respect to the timing of these increases, it is important to note that prices had already begun

17 They are Chungjin, Haeju, Hamheung, Hoeryong, Onsung, Pyongyang, Sariwon, and Sineuiju.

18 See Haggard, Noland, and Weeks (2008) for details.

to accelerate more rapidly than world market prices before the August 2007 floods hit, possibly reflecting the secular decline in aggregate supply and uncertainty regarding the ultimate resolution of the nuclear issue and the resumption of external support in particular. The rapid increase in prices continued through mid-May 2008, apparently accelerating around April 2008. Although caution is warranted in drawing precise inferences, the high point in prices coincided with a near perfect storm of exogenous and self-inflicted shocks. Externally, world market prices were cresting, but the constraints facing North Korea were political as well as economic. China was also restricting exports of grain and fertilizer in an effort to contain domestic inflation; Beijing, increasingly disaffected with North Korean behavior, was unwilling to play the role of lender of last resort, which it had in the past. The elections in the South had stalemated North–South Korean relations—and aid—but the US promise of assistance had not yet materialized. In both cases, North Korea’s failure to be completely forthcoming in negotiations over the status of its nuclear program played a role.

Internally, the government sought to cope with rising prices by imposing a variety of restrictions on market activity: price controls, restrictions on who could trade in the market, and crackdowns on corruption in cross-border trade (Haggard, Noland, and Weeks 2008). These actions also had the unintended consequence of driving up the risk premium on trade and producing the kind of speculative activity that frequently accompanies pre-famine and famine conditions.

Prices peaked the following month, falling dramatically after the US aid announcement and the rumored release of military stocks, presumably due to sellers’ dumping of inventory in anticipation of significant new supplies coming into the market. The market appeared to overshoot slightly, possibly reflecting both an overestimate of stocks released into the market and a lack of understanding of the regulatory and logistic impediments to the United States quickly delivering large amounts of food aid. These impediments included the requirement that US aid be primarily sourced in the United States and shipped on US-flagged vessels; the failure of the expected Japanese release of rice stocks to materialize; and the implicit links between the provision of aid and progress on the nuclear front, which was slow in coming.

Two other aspects of the price evidence bear mentioning. The first is spatial. There is a high correlation of price movements across provinces and across cities. Figure 6 reports provincial corn prices, again interpolating between observations. (In the interests of brevity, the equivalent chart for rice, which yields quite similar results, is not reported.) Indeed, there appears to be some diminution of crossprovincial price dispersion over time, as measured by the crossprovincial coefficients of variation (figure 7). It is possible that this could be a spurious result, reflecting the relative paucity of observations during the early part of the sample period. But the hypothesis of price equality across major cities cannot generally be rejected for 2008 data, reinforcing the notion that there has been a narrowing of spatial

price dispersion and a possible integration of markets (table 2). As a result, crossprovincial and crosscity patterns of price movement do not reveal any obvious patterns. Provinces bordering China, which might be expected to have better access to imports, do not exhibit uniquely low or stable prices relative to the rest of the country. The Northeast, which was disfavored by the government during the first famine, does not appear unique. And perhaps most interestingly, Pyongyang does not appear immune to trends in prices, a fact that at least suggests generalized distress.

The second observation concerns relative prices. As the real price of rice rises, households shift to less preferred grains such as corn, barley, and millet, and, in the worst case, turn to grasses and foraging of other plant sources for food. Figure 8 shows that the price of corn relative to rice began rising around the time of the 2007 floods, rising again with the tightening of trading activities. The corn-rice price ratio fell with the aid announcement and rumors of military stock releases but then rose again, ultimately increasing more than 75 percent in the index of eight major cities, from 0.34 in mid-August 2007 to a peak of 0.60 in July 2008, the highest value since the series began in 2004, before stabilizing. This rise in the price of corn relative to rice is another sign of intensifying distress.

III DIRECT OBSERVATION

The quantity and price evidence presented thus far can be used to make indirect inferences about distress in North Korea. Obviously, it would be desirable to have direct observation, particularly in the North Korean case where considerable evidence documents the nonuniformity of distress across geographical regions and political-economic classes. Unfortunately, the North Korean government systematically impedes the access of foreign observers, including relief agencies, rendering even their efforts to collect systematic data on conditions suspect (Haggard and Noland 2007). However, the deepening of the North Korean food emergency was accompanied by an intensification of surreptitious activities by South Korean NGOs, most notably Good Friends and NKNet, which have generated anecdotal accounts of conditions in North Korea via networks of informants.

Moreover, we now have access to assessments carried out by the WFP and a consortium of US NGOs in conjunction with the large-scale aid program finalized in 2008 (Anderson and Majarowitz 2008, WFP 2008). The American NGOs evaluated conditions in two provinces in the northwest, North Pyongan and Chagang, while the UN agencies were responsible for evaluating conditions in the rest of the country.

While access was generally better than in the past, it remained constrained and the assessment was therefore not entirely systematic. Assessment teams were not allowed to visit markets. North Korean authorities selected the households and institutions to be visited, were present during the interviews, sometimes objected to or declined to translate certain questions as inappropriate, and would

sometimes interrupt or correct respondents' answers. The teams were unable to conduct any formal anthropomorphic studies as have been carried out in the past and were required to accept official statistical claims at face value.

Nonetheless, the assessments corroborate the quantity and price evidence presented here. PDS rations had been cut from a target of 500 to 600 grams to 150 grams or 700 kilocalories per day over the 2007–08 crop cycle. This rapid decline implies that an increasing share of demand is being met through the market, as confirmed in household interviews; sole reliance on state-administered provisions would otherwise portend massive famine. Increased marketization also underscores the salience of the price increases: Hunger is now driven not only by the collapse of the PDS but also by rapidly increasing real grain prices. The WFP reports that three-quarters of households have reduced their food intake (90 percent in the case of PDS recipient households), and more than half consume only two meals a day, though given the constraints on the assessment process, one cannot know how representative this sample is. On the supply side, both WFP and NGO interviews with local officials indicated that prospects for the upcoming harvest were uncertain due to lack of inputs, including fertilizer, fuel, and electricity; decreased worker capacity or effort; and possible diversion of effort to unregulated plots. Local officials interviewed by the NGO team indicated that cereal stocks would be completely exhausted in 24 of 25 counties visited by the end of June 2008.¹⁹

Apart from corroborating observable macro trends, the assessments also document the re-emergence of pathologies from the famine era. On the demand side, the WFP reports that more than 70 percent of households are collecting wild foods, a 20 percent increase from 2003–05; this finding is consistent with evidence of a shift in demand toward less preferred cereals (and the sharp increase in corn-rice price ratios), which was confirmed in the household interviews. Eighty percent of PDS-dependent households report receiving assistance from relatives or friends compared with 60 percent in 2003–05. These consumption patterns are manifested in interviews with doctors and other informants who revealed modest increases in malnutrition, low birth weight, infant mortality, and decreased work and school attendance.

The WFP also identifies specific socioeconomic groups prone to food insecurity. Consistent with prior historical experience, shortages are not limited to the flood-affected areas but include the cities of the industrial northeast. These findings suggest both the difficulties facing urban residents reliant on market sources of supply and the breakdown of within-country transfers due to rising fuel and transportation

¹⁹ However, the WFP also documents a significant increase in livestock, though the pattern appears complex. The biggest increases are among PDS-dependent households raising goats and rabbits, which subsist on grass, as a coping behavior. There are reports, particularly in the northeast, of herds being culled due to lack of feed. Under conditions of widening inequality, it is quite possible that these coping responses coexist with an increase in livestock production to meet the demands of the well-to-do.

costs and intensified restrictions on market activities.²⁰ Increased vulnerability of the rustbelt industrial proletariat as well as flood-affected farmers, together with a disintegration of the normal transfer process, were precisely the conditions that gave rise to the generalized distress of the 1990s famine (Haggard and Noland 2007).

IV CONCLUSION

This paper has examined three sorts of evidence—grain quantities, prices, and direct observation—concerning the evolution of the North Korean food economy. Three conclusions stand out. In 2008 the aggregate balance between grain requirements and supply slipped into deficit for the first time since the 1990s famine. The decline in aggregate sources of supply is the result not only of exogenous shocks but also of the decline in aid, which in turn reflects diplomatic conflicts between North Korea and the international community. Domestic production has been adversely affected by cuts in the concessional deliveries of fertilizer, fuel, and other inputs, while aid has been directly affected by North Korean foreign policy behavior. Rising global grain prices constitute an adverse development, but their impact has been exacerbated by the reluctance of the government to undertake reforms of the external sector that would permit more robust commercial imports.

Second, prices have risen steeply, and by magnitudes that cannot be explained by either domestic inflation or the increase in world grain prices alone. Bad weather has undoubtedly affected prices, but prices were already on an upward trajectory before the 2007 floods, reflecting a sharp drop in assistance from South Korea and other donors and North Korean policies that disrupted or rendered uncertain the functioning of domestic markets.

Finally, the declining significance of the PDS as a source of food—documented through direct observation—coupled with rising prices suggests a fundamental difference from the 1990s famine. During that episode the incidence of distress was a proximate function of the collapse of the PDS. The current emergency, in which the market plays a more prominent role, is more akin to prefamine situations in market economies where access to food is determined by economic status.

Although hunger-related deaths are occurring, we doubt that the current episode will come close to matching the 1990s famine for two reasons. First, during that episode, famine or prefamine conditions had emerged as early as 1993. But it was not until 1995, with a full-blown famine under way, that the government appealed for help, and it then took nearly six months before aid of any magnitude started

²⁰ “The team found that the seven counties visited try to be as self-reliant as possible in food provision: in fact in three counties they did not receive any commodities from other counties or provinces in 2007” (Anderson and Majarowitz 2008, 8).

to arrive. During the 2005–08 cycle, aid has been vulnerable to political constraints. But the global community has gained access to information such as that presented in this paper and the response to distress has been timelier as a result.

Second, even in its degraded state, the marketization of the North Korean economy has probably reduced vulnerability from what it would have otherwise been. Even with rapidly rising prices, markets—including those fed by cross-border trade in grain with China—are able to ameliorate internal supply constraints to some extent. That said, North Korea has experienced an intensification of long-standing problems of malnutrition and hunger-related deaths. Moreover, the lack of fertilizer and the consequent possibility of a weak fall harvest in 2008, continuing constraints on commercial imports, and the vacillating policy response of the government will carry the emergency into 2009 if not beyond.

Our analysis suggests an important role for political economy in the understanding of food emergencies, but a political economy that encompasses both domestic and foreign policies and the external sector. The long-run solution to North Korea's chronic food insecurity lies in a political settlement of the nuclear issue and reforms that would open and revitalize the industrial economy. These reforms would allow North Korea to export industrial products, earn foreign exchange, and import bulk grains on a commercially sustainable basis, just as its neighbors South Korea, Japan, and China do. The outstanding question is whether such reform can be achieved by the incumbent government, as the Chinese Communist Party was able to do, or whether the foreign and domestic policy commitments of the current regime prohibit the policy innovations that would avert such distress in the future.

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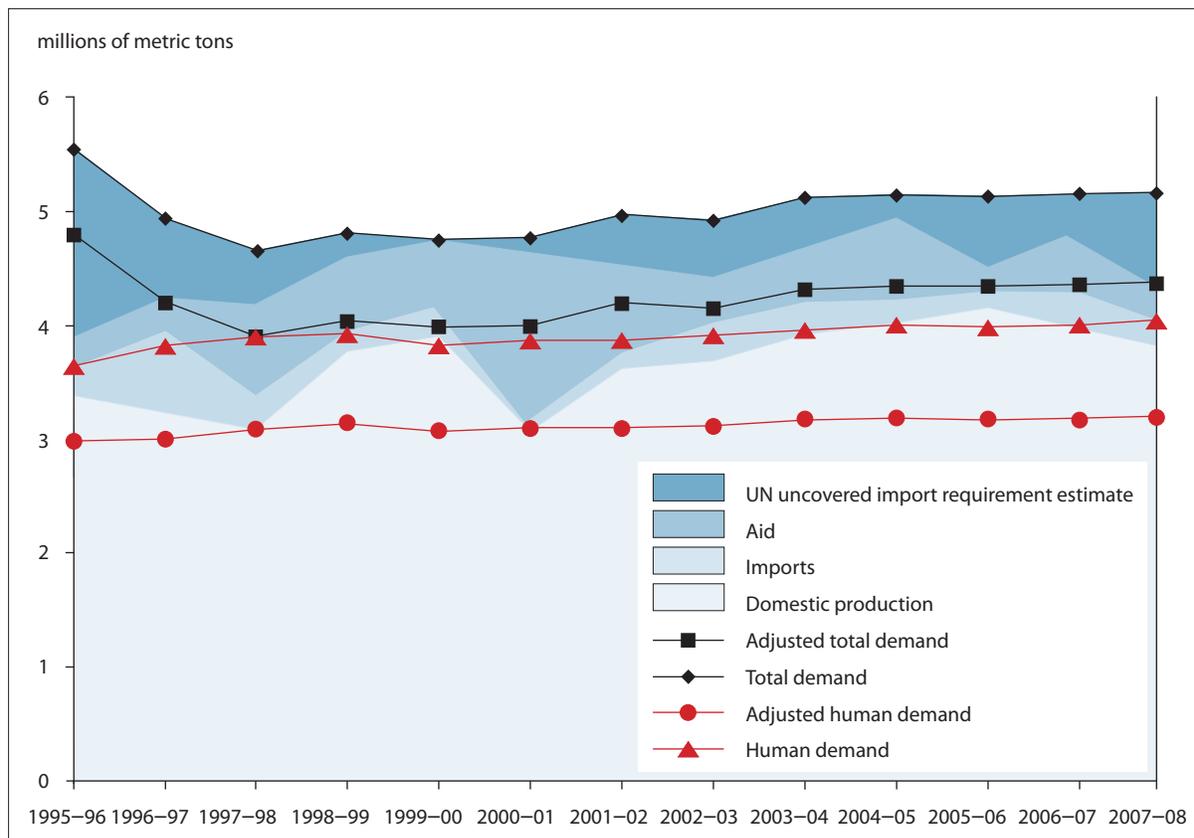
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Figure 1 North Korean food balances, 1995–96 to 2007–08



Sources: **Aid**—UN Food and Agriculture Organization (FAO) data until 2003/04, authors’ calculations thereafter; **imports**—average of FAO, US Department of Agriculture (USDA), and UN Comtrade data; **domestic production**—USDA; **adjusted total demand and adjusted human demand**—authors’ calculations using FAO data; **total demand and human demand**—FAO.

Figure 2 North Korea's uncovered grain needs, 1995-96 to 2007-08

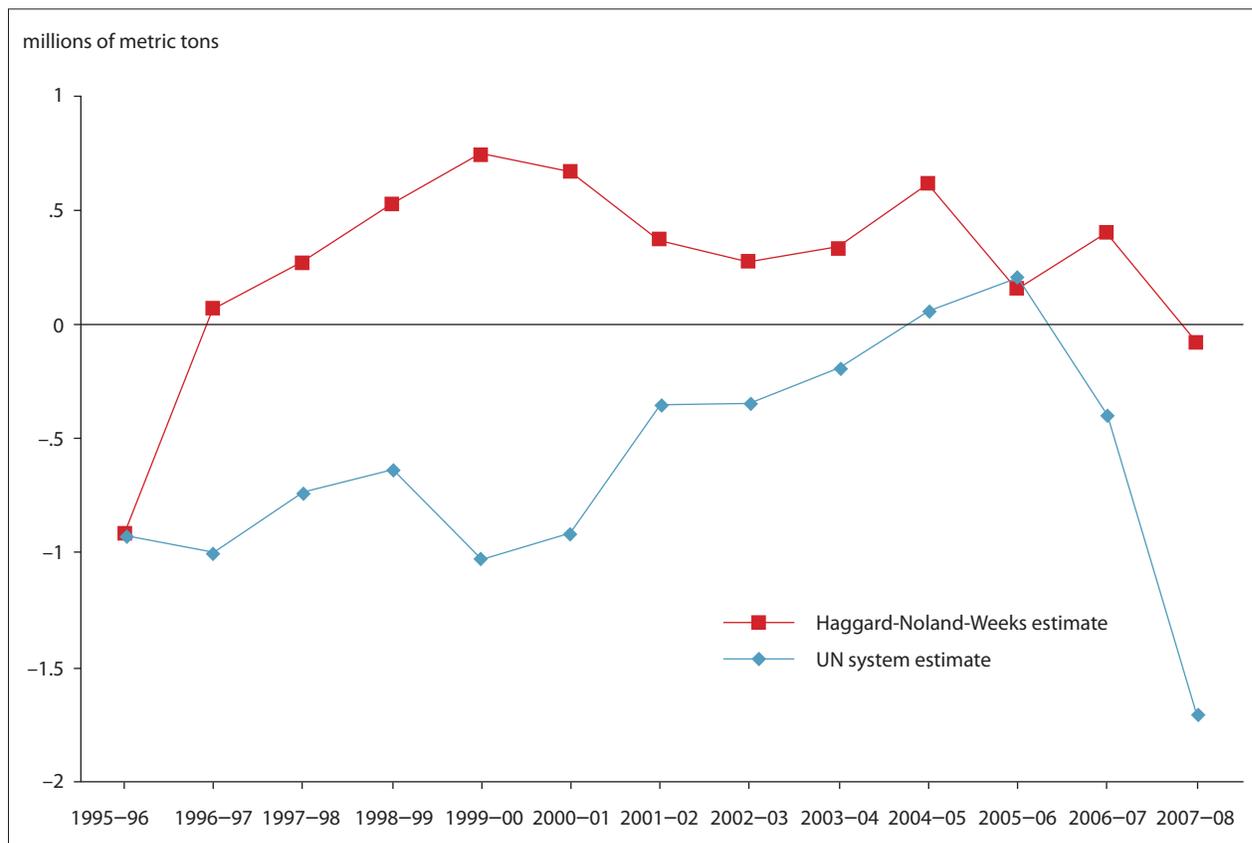


Figure 3 Number of price observations, corn and rice, 2004–08

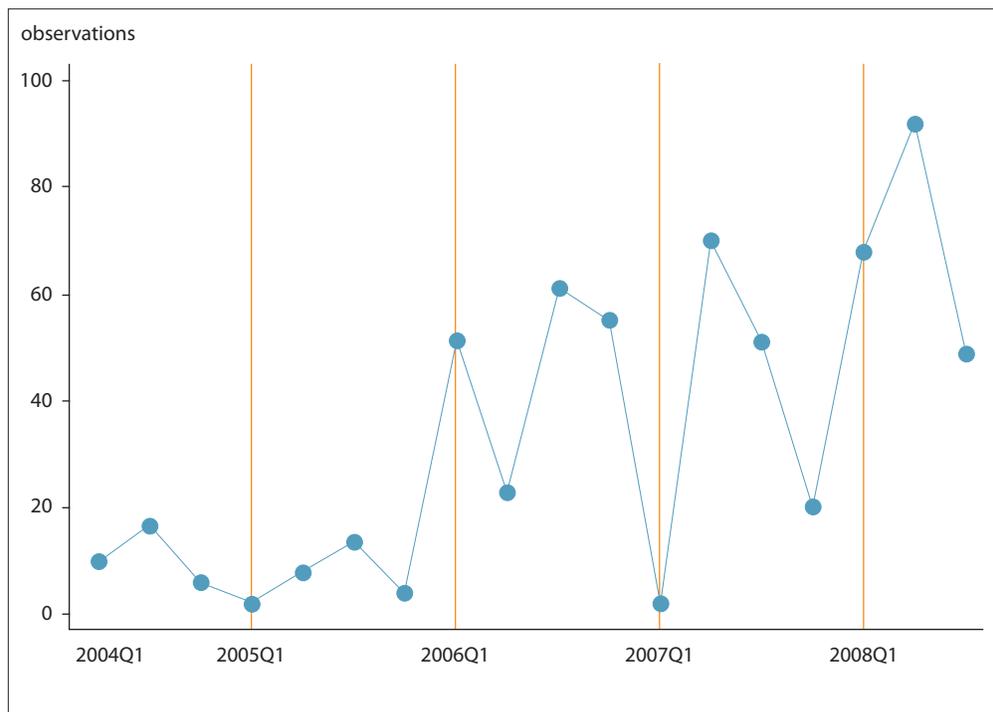


Figure 4 Scatterplot of corn and rice prices, 2004–08

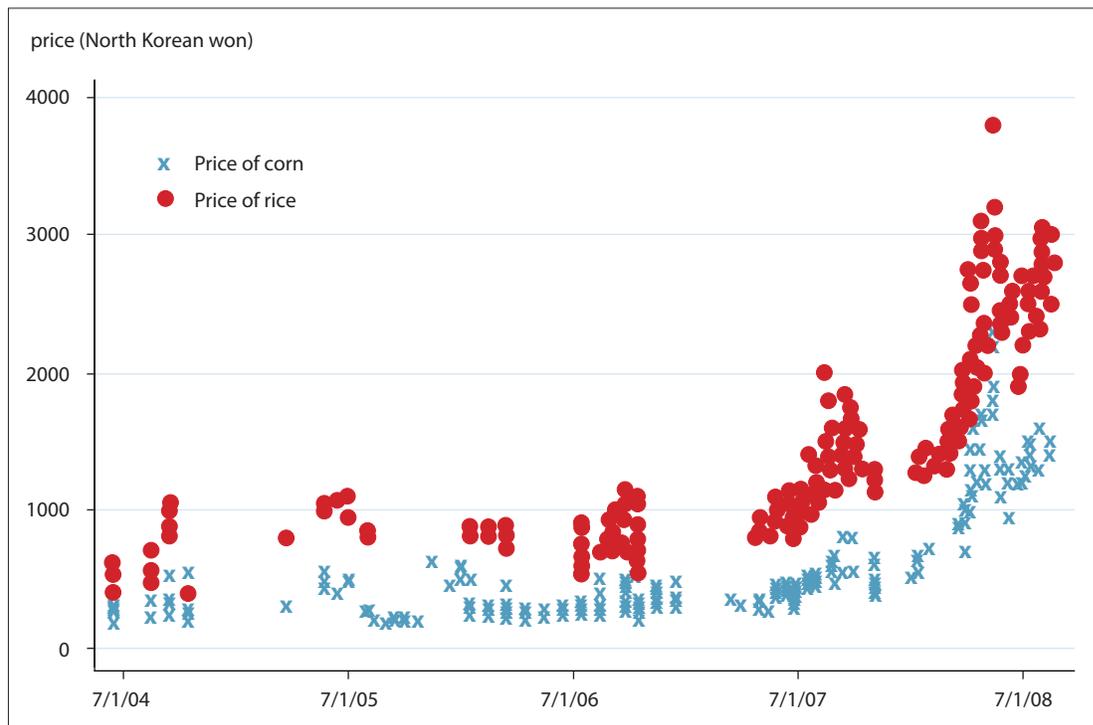


Figure 5 North Korean grain prices

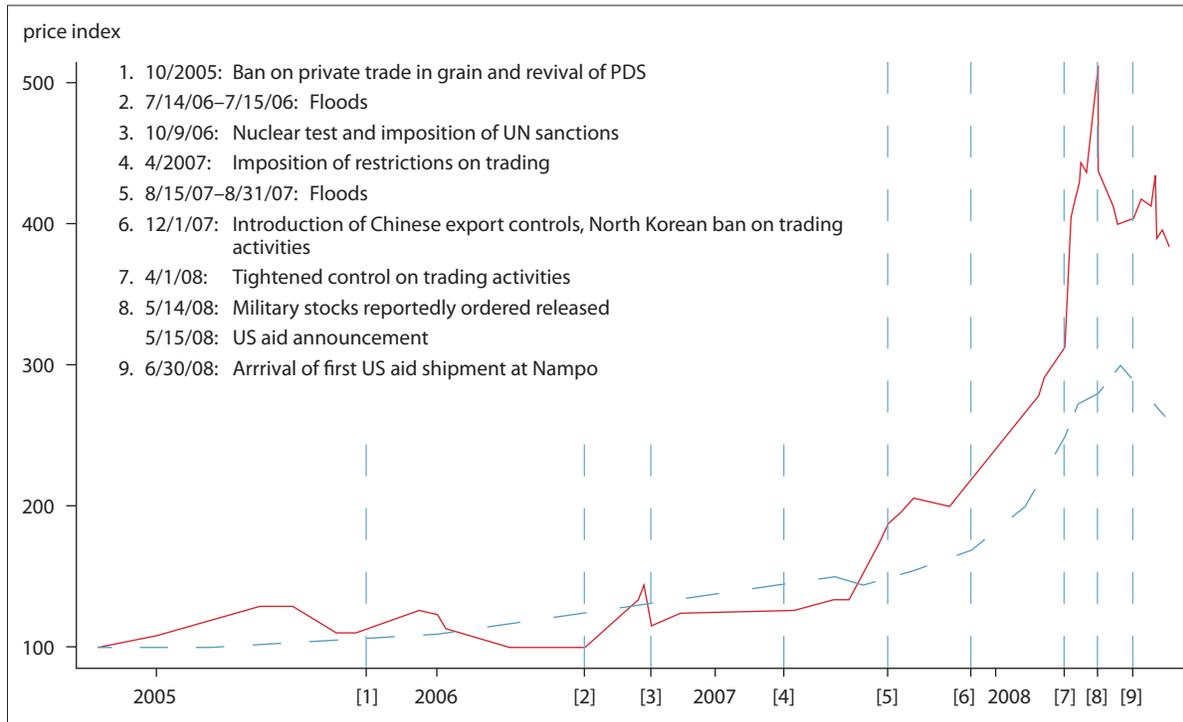


Figure 6 Corn price by province, 2004–08

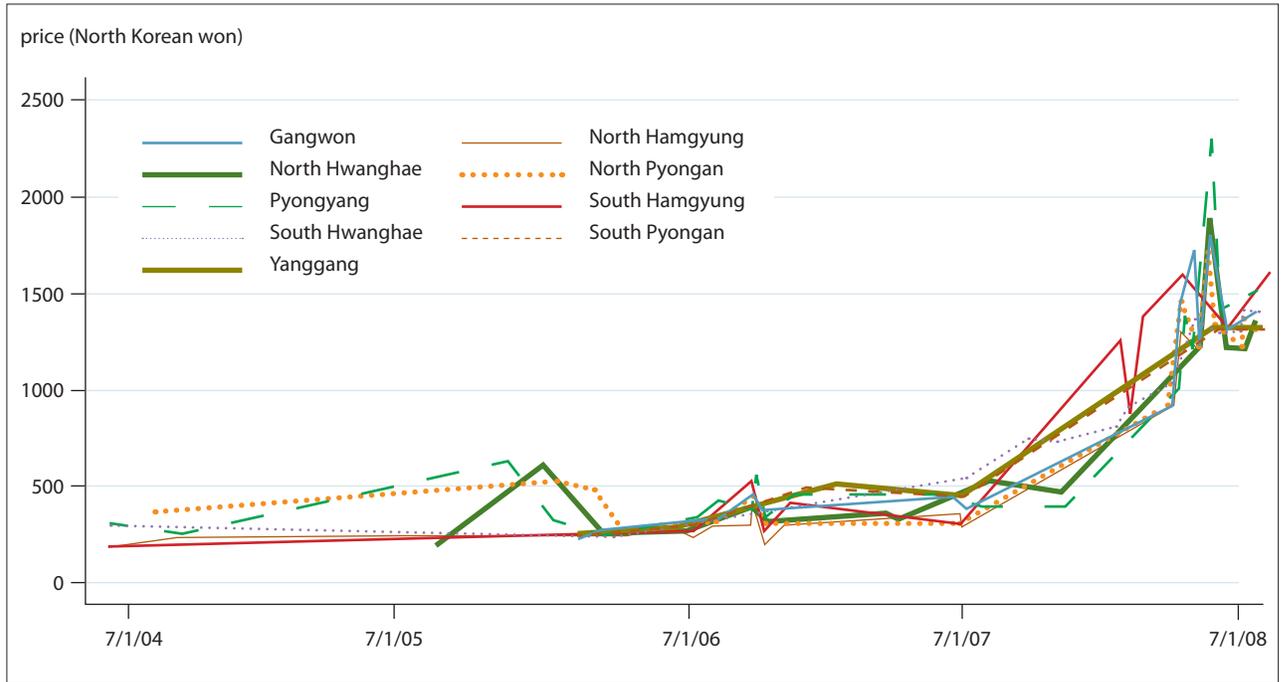


Figure 7 Coefficient of variation of grain prices across provinces, 2004–08

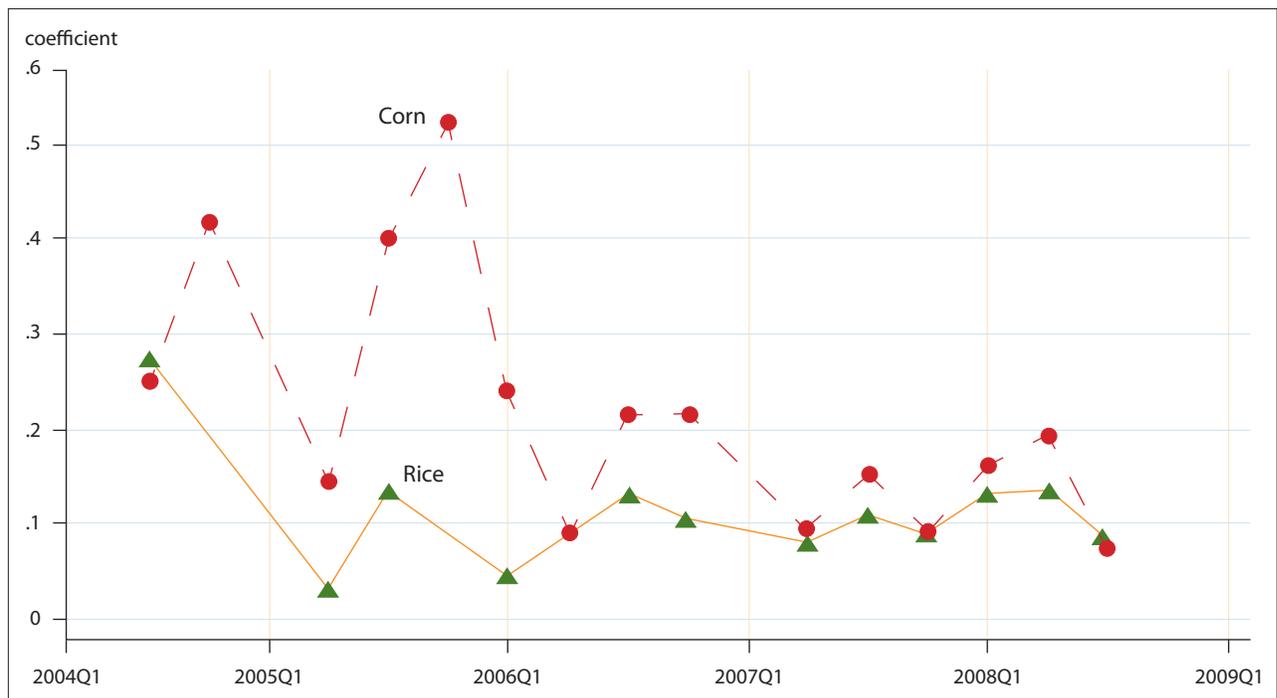
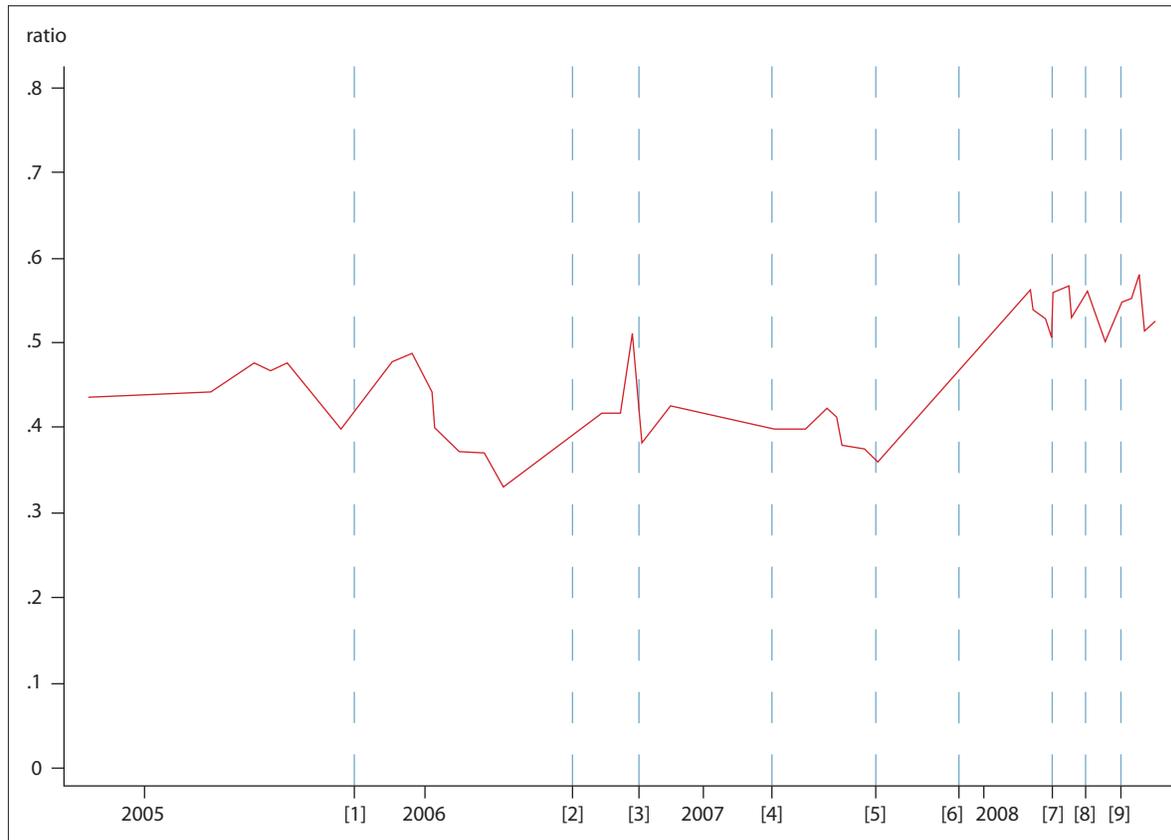


Figure 8 North Korean corn-rice price ratio



1. 10/2005: Ban on private trade in grain and revival of PDS
2. 7/14/06–7/15/06: Floods
3. 10/9/06: Nuclear test and imposition of UN sanctions
4. 4/2007: Imposition of restrictions on trading
5. 8/15/07–8/31/07: Floods
6. 12/1/07: Introduction of Chinese export controls, North Korean ban on trading activities
7. 4/1/08: Tightened control on trading activities
8. 5/14/08: Military stocks reportedly ordered released
5/15/08: US aid announcement
9. 6/30/08: Arrival of first US aid shipment at Nampo

Table 1 Possible price shocks, 2005–08

Date	Event	Anticipated effect on prices
October 1, 2005	Ban on private trade in grain and revival of the public distribution system	+
July 14–15, 2006	Floods	+
October 9–14, 2006	Nuclear test and imposition of UN sanctions	+
April 2007	Imposition of restrictions on trading	+
August 15–31, 2007	Floods	+
December 1, 2007	Chinese export controls and North Korean restrictions on age of women traders in the market	+
April 1, 2008	Tightened control on trading activity	+
May 14–15, 2008	Reported release of military stocks and announcement of US aid package	-
June 30, 2008	Arrival of first US aid shipment at Nampo	-

Table 2 ANOVA (analysis of variance) of corn and rice prices on time periods and regions

First period	January–April 2008
Second period	May–August 2008
Cities included	Hamheung, Pyongyang, Sineuiju, and Wonsan

CORN

Number of observations	33.000
Root MSE (mean squared error)	314.939
R-squared	0.2649
Adj. R-squared	0.0953

Source	F Statistic	P value
Model	1.56	0.1981
Second period	7.21	0.0125
Region	0.74	0.5403
Interaction term of second period and region	0.91	0.4132

RICE

Number of observations	62.000
Root MSE (mean squared error)	472.388
R-squared	0.4185
Adj. R-squared	0.3431

Source	F Statistic	P value
Model	5.55	0.0001
Second period	28.07	0
Region	1.54	0.2157
Interaction term of second period and region	0.45	0.7192
