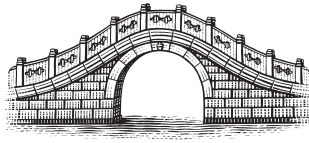


RESEARCH NOTE

The (Non-) Impact of UN Sanctions on North Korea

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On October 9, 2006, North Korea conducted an underground nuclear test, despite warnings by the country's principal economic benefactors, China and South Korea, not to proceed. Before the test, it was widely believed that such an event would have cataclysmic diplomatic ramifications in Asia, possibly even prefiguring war. Indeed, the South Korean stock market dropped on the day of the test but began rising the next day and regained the lost ground the following week. Markets in the rest of Asia were largely unaffected.

Five days later, on October 14, the UN Security Council unanimously adopted Resolution 1718 imposing economic sanctions on North Korea, specifically placing a ban on the exportation of luxury goods and large-scale arms-related goods, technology, and services to North Korea, as well as on the importation of North Korean heavy arms.¹

These developments could have been expected to attenuate North Korea's trade with the rest of the world. The sanctions specifically prohibited the importation and exportation of certain products to North Korea. Tensions over these nuclear developments in North Korea, therefore, might have been expected to raise the risk premium on economic interaction with North Korea, particularly affecting the behavior of foreign private sector entities. Such increased sensitivity to risk could have been motivated either by firms' anticipation of possible additional restrictive actions or by guidance from their home governments, as well as by their own heightened assessments of risks regarding business with North Korean counterparties. The result could have been a reduction in cross-border commerce, even with respect to activities not directly covered by the sanctions.

Whether or not these effects materialized is an important issue: if sanctions are toothless or major powers acquiesce in the face of such provocations, it makes deterring North Korea all the more difficult in future conflicts, as well as establishes an unwelcome precedent for other countries contemplating emulation.

This paper examines the empirical evidence on North Korean trade before and after the nuclear test with its two neighbors and principal trade partners, China and South Korea, which together account for nearly half of the country's merchandise trade.² The article finds that it is virtually impossible to uncover

¹ See "Security Council Condemns Nuclear Test by Democratic People's Republic of Korea, Unanimously Adopting Resolution 1718 (2006)," UN Security Council, Press Release, October 14, 2006  <http://www.un.org/News/Press/docs/2006/sc8853.doc.htm>.

² Stephan Haggard and Marcus Noland, "North Korea's Foreign Economic Relations," *International Relations of the Asia-Pacific* 8, no. 2 (2008): 219–46, table 1.

any statistical evidence that the nuclear test and subsequent sanctions had any impact on North Korean trade. The analysis of the trade data suggests that, for better or worse, North Korea correctly calculated that the penalties for nuclear action, at least in this primary sphere, would be trivial to the point of being undetectable—potentially establishing a very unwelcome precedent with respect both to the country’s future behavior and to the behavior of potential emulators.

The article is organized as follows:

- ≈ pp. 64–66 review the history of sanctions against North Korea
- ≈ pp. 67–74 subject the country’s trade data to screens of escalating rigor: simple visual inspection followed by the estimation of conventional econometric models of trade flows of increasing sophistication
- ≈ pp. 74–77 draw policy inferences

SANCTIONS BACKGROUND

During the 1993–94 nuclear crisis on the Korean Peninsula many key players considered, but did not ultimately pursue, sanctions. Policymakers in the United States, Japan, and South Korea all feared a violent and possibly preemptive North Korean response to the imposition of sanctions (North Korea repeatedly threatened war that would turn Seoul into “a sea of fire”).³ Moreover, there were concerns over the possible ineffectiveness of sanctions, due either to Chinese (and Russian) unwillingness to support sanctions in the Security Council or to the unwillingness of provincial authorities in northeast China to implement a sanctions policy. Nevertheless, the United States, Japan, and South Korea discussed the possibility of pursuing limited sanctions outside the purview of the United Nations in the event that China was unwilling to enforce sanctions, presaging the Proliferation Security Initiative a decade later.⁴

By the time of the July 2006 missile tests, in which North Korea tested short- and long-range missiles, attitudes had hardened considerably. In 2003 China allegedly cut off an oil pipeline to North Korea briefly in response

³ South Korea took some of these threats sufficiently seriously to put its military forces on alert in June 1994. See Leon V. Sigal, *Disarming Strangers: Nuclear Diplomacy with North Korea* (Princeton: Princeton University Press, 1998); and Don Oberdorfer, *The Two Koreas: A Contemporary History* (Reading: Addison-Wesley, 1997).

⁴ Sigal, *Disarming Strangers*.

to North Korean diplomatic recalcitrance.⁵ China also cooperated in the September 2005 investigation into North Korean assets at Banco Delta Asia (BDA) in Macao, one of China's two special administrative regions, and subsequently allegedly froze North Korean accounts in a Chinese bank.⁶

Before the July missile tests, China publicly and privately warned North Korea not to proceed. When North Korea fired the missiles anyway, China (as well as Russia) supported the adoption of UN Resolution 1695, imposing targeted sanctions on missile proliferators. Although China blocked more sweeping proposals from the United States and Japan, one observer characterized the erosion in North Korea's diplomatic support as a "momentous move."⁷ The sanctions were the strongest reprimand of North Korea by the Security Council since 1950 and clearly represented an escalating response on the part of the UN.

When in October 2006 North Korea announced its intention to test a nuclear device, the UN Security Council issued a vague warning that could have been interpreted as alluding to the prospect of tightened sanctions.⁸ One prominent observer predicted that such a test could lead to military action by the United States and possibly South Korea as well.⁹ As in the case of the July 2006 missile tests, China warned of "grave consequences" if North Korea were to proceed.¹⁰

When North Korea once again defied Chinese wishes, Beijing described the act as "flagrant and brazen." China quickly supported more robust sanctions—though as in the case of the July missile tests, a less severe package than what the United States and Japan proposed. Resolution 1718 was passed relatively quickly in six days. The resolution imposed an embargo on exports of heavy weapons, dual-use items, and luxury goods to North Korea, as well as on the importation of heavy weapons systems from North Korea.

⁵ Yoichi Funabashi, *The Peninsula Question: A Chronicle of the Second Korean Nuclear Crisis* (Washington, D.C.: Brookings Institution Press, 2007).

⁶ Suh Bohyuk, "Are North Korea and China Drifting Apart after the Missile Test," Nautilus Institute, Policy Forum Online, no. 06-77A, September 2006 ∼ <http://www.nautilus.org/fora/security/0677Suh.html>.

⁷ Peter Hayes, "Embrace Tiger, Retreat To Mountain, Test Nuke," Policy Forum Online, no. 06-06A, Nautilus Institute, July 2006 ∼ <http://www.nautilus.org/fora/security/06660Hayes.html>.

⁸ Julia Choi and Karin Lee, "North Korea: Economic Sanctions and U.S. Department of Treasury Actions 1955-September 2006," National Committee on North Korea, October 2006.

⁹ Michael A. Levi, "Levi: North Korea Nuclear Test Could Lead to Military Response from U.S.," interview by Bernard Gwertzman, Council on Foreign Relations, October 3, 2006 ∼ http://www.cfr.org/publication/11595/levi.html?breadcrumb=%2Fbios%2F11890%2Fmichael_a_levi%3Fgroupby%3D2%26hide%3D1%26id%3D11890%26filter%3D19.

¹⁰ Joseph Kahn, "North's Test Seen as Failure for Korea Policy China Followed," *New York Times*, October 9, 2006 ∼ <http://www.nytimes.com/2006/10/09/world/asia/09china.html>.

The administration of the sanctions was left to the individual sanctioning countries. Russia, for example, defined luxury goods so narrowly (e.g., fur coats costing more than \$9,637 and watches costing nearly \$2,000) that the bite of the sanctions was questionable.¹¹ Due to Chinese opposition, Article 42 of Chapter VII, which allows the use of military enforcement action, was not included despite U.S. and Japanese support, and Chinese UN ambassador Wang Guangya expressed hesitation over full implementation.¹² Seoul announced that, in addition to the sanctions, South Korea would suspend food and fertilizer aid, though continuing with other economic cooperation projects. North Korean UN ambassador Park Gil-yon called the resolution “gangster-like,” and the Ministry of Foreign Affairs released a statement reiterating that sanctions were an act of war and threatening “a merciless strike” against any state that implemented the UN resolution.¹³

The chair of the UN sanctions committee, Italian ambassador Marcello Spatafora, subsequently advised that 71 countries and the EU had submitted reports on their implementation activities.¹⁴ China’s report was notable in its lack of detail, however, and some countries with past histories of North Korean weapon systems procurement, such as Iran and Ethiopia, did not submit reports.

In sum, despite the apparent reluctance of some countries, the UN adopted increasingly stringent sanctions in the face of repeated North Korean provocations—setting the stage for bolder future action. The widely respected International Crisis Group opined that “should the North test again, the Security Council would likely pass a new resolution with more sweeping sanctions and perhaps language authorizing enforcement by military means.”¹⁵ The implication was that the activities of traders and investors in North Korea would be continually exposed to the vagaries of Pyongyang’s decisionmaking, which for whatever reason has consistently elevated diplomatic over economic goals, as illustrated by the recent interference in the operation of the Kaesong Industrial Complex.

¹¹ Choi and Lee, “North Korea: Economic Sanctions.”

¹² *Ibid.*; and “North Korea’s Nuclear Test: The Fallout,” International Crisis Group, Asia Briefing, no. 56, November 13, 2006.

¹³ “Full Text: North Korea Statement,” *BBC News*, October 17, 2006 ~ <http://news.bbc.co.uk/2/hi/asia-pacific/6058316.stm>.

¹⁴ “Annual Report of the Security Council Committee Established Pursuant to Resolution 1718,” United Nations Security Council, December 31, 2007 ~ <http://www.un.org/sc/committees/1718/annualreports.shtml>.

¹⁵ “North Korea’s Nuclear Test: The Fallout.”

ASSESSING THE IMPACT OF SANCTIONS

It is less clear how much of an impact on commerce the sanctions actually had, however.¹⁶ It goes without saying that South Korea does not export weapons to North Korea, and in recent years China has not reported the export of heavy arms either.¹⁷ Luxury goods are a different story, however. China and South Korea did not publish detailed lists of sanctioned luxury goods, but a number of other countries did. As shown in **Appendix 1** these lists exhibit considerable consistency across countries.

In the absence of a Chinese list of sanctioned luxury goods, this article instead presents **Figure 1**, which reports Chinese exports of luxury goods to North Korea defined in three ways. The first variant (“Australian list—SITC”) takes the Australian list in Appendix 1 and maps the verbal description of the sanctioned luxury products to Standard International Trade Classification (SITC) categories. (Australia was selected for this exercise as a middle power with diplomatic relations with North Korea; Australia’s list also has the virtue of being specified in simple terms facilitating concordance to SITC.) The second variant (“Japanese list”) is based on the 2006 Korea Trade-Investment Promotion Agency (KOTRA) report, which attempted to map the Japanese sanctions list to detailed product categories using the Harmonized System (HS).¹⁸ The third variant (“Australian list—HS”) reconstructs the Australian list using KOTRA’s HS codes, which tend to be more narrowly drawn than the SITC-based categories used to construct the Australian list—SITC.

As can be seen in Figure 1, Chinese exports of luxury goods to North Korea did not fall to zero in 2007 under any variant; indeed, luxury goods exports increased between 2006 and 2007 under all three definitions. Resolution 1718 appears to have had no impact on Chinese behavior.

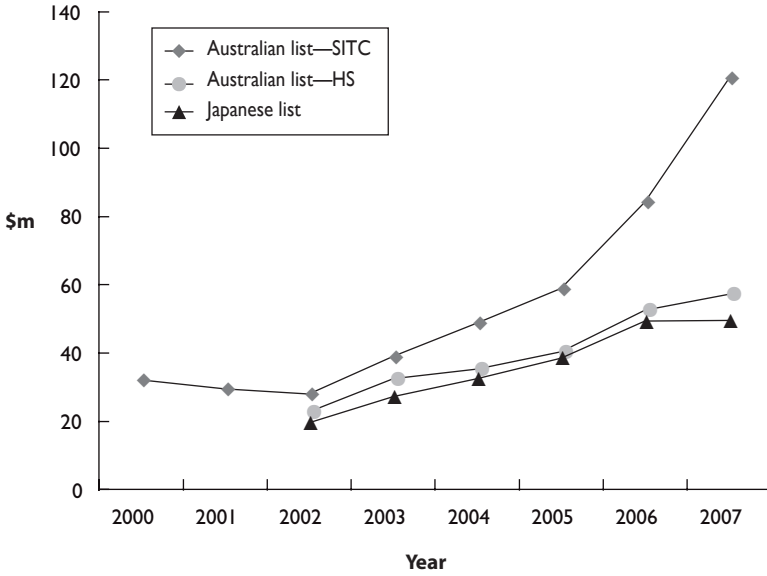
Beyond the direct impact of the sanctions narrowly construed, it is plausible that the ratcheting up of political tensions and the prospect of tightening sanctions, or even military action, should there be future

¹⁶ Data sources are documented in an appendix to this paper available on the Peterson Institute for International Economics website [~ http://www.petersoninstitute.org/publications/wp/wp08-12.pdf](http://www.petersoninstitute.org/publications/wp/wp08-12.pdf).

¹⁷ In 2007, China reported arms and ammunition exports to North Korea of \$20,000, consisting entirely of cartridges for shotguns.

¹⁸ Yeon Geon Kim, “Ilbonui daebuk sachipum suchul geumji jochi mit haedang muyeokaek” [Japanese Luxury Goods Sanctions on North Korea and Its Estimates], Korea Trade-Investment Promotion Agency (KOTRA), Report, December 2006 [~ http://www.globalwindow.org/wps/portal/glw/kcxml/04_Sj9SPykssy0xPLMnMz0vM0Y_QjzKld4w3MgkCSYGywab6kWhCPiEI0SB9b31fj_zcVP0A_YLc0lhyR0dFAHfzKk!/delta/base64xml/L3dJdyEvd0ZnQFzQUMvNEIVRS82X0FfMTMw?1=1&workdist=read&id=2007129](http://www.globalwindow.org/wps/portal/glw/kcxml/04_Sj9SPykssy0xPLMnMz0vM0Y_QjzKld4w3MgkCSYGywab6kWhCPiEI0SB9b31fj_zcVP0A_YLc0lhyR0dFAHfzKk!/delta/base64xml/L3dJdyEvd0ZnQFzQUMvNEIVRS82X0FfMTMw?1=1&workdist=read&id=2007129).

FIGURE 1

Export of Chinese Luxury Goods to the DPRK, 2000–07

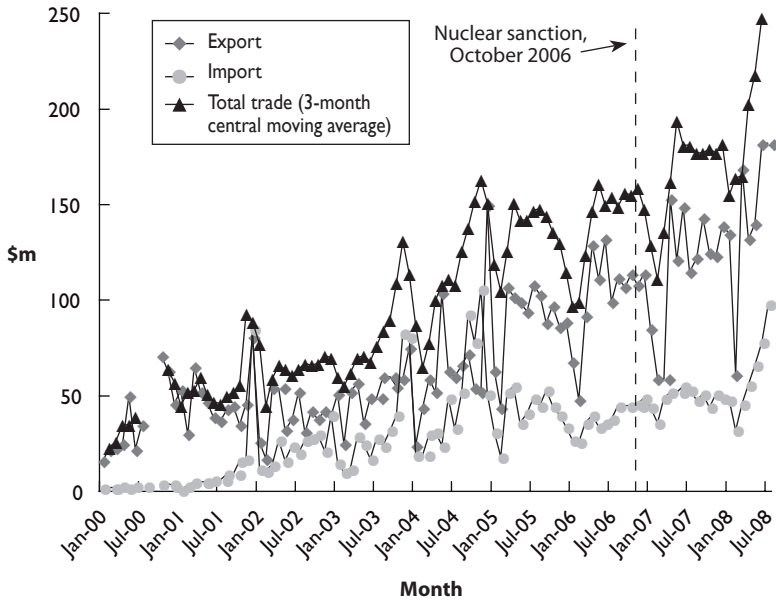
Source: UN Commodity Trade Statistics Database ~ <http://comtrade.un.org/db/default.aspx>.

provocations would drive up the risk premium on exchange with North Korea and deter commerce in areas not directly subject to sanctions. Monthly data on bilateral trade both between North Korea and China and between North and South Korea is shown in **Figure 2** and **Figure 3**, respectively. The data exhibits significant month-to-month volatility and strong seasonal patterns—trade volumes drop off in the winter, possibly due to a slowdown of economic activity or, particularly in the case of China, the impassibility of unpaved roads on the North Korean side of the border. It is not apparent from Figures 2 and 3 that the imposition of sanctions had any impact on trade flows, particularly once the expected winter decline in activity is taken into account.

Figures 2 and 3 also illustrate, however, that North Korea's trade with its main partners was generally on an upward trend. It is possible that statistical models could detect an effect of the imposition of sanctions and the more general increase in political risk that might not be otherwise apparent. Simple models incorporating only a time trend, seasonal dummies, and a dummy variable for the post-nuclear test sanctions period are reported in **Appendix 2**

FIGURE 2

China-North Korea Trade, 2000–08



Source: Customs Administration of the People’s Republic of China, available through the Ministry of Commerce of the People’s Republic of China website, 2008 ~ <http://mofcom.gov.cn>.

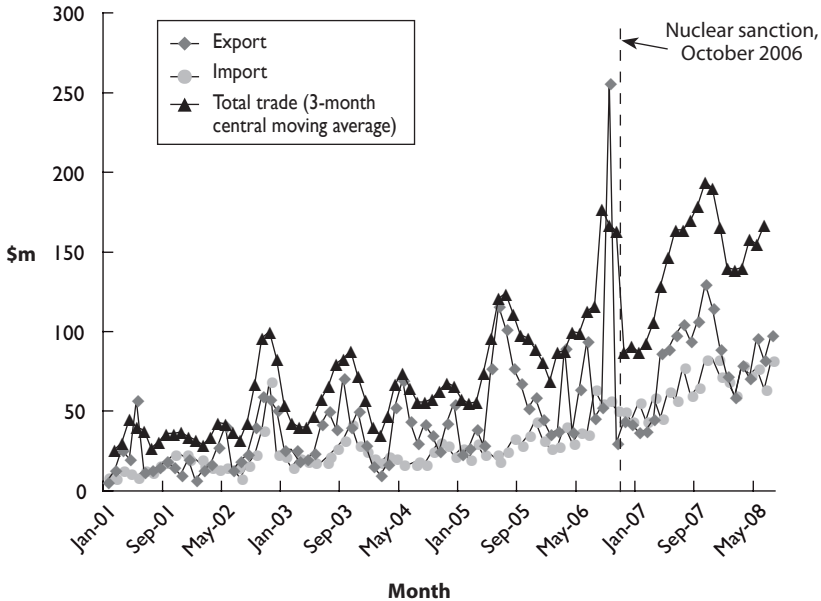
(China) and **Appendix 3** (South Korea).¹⁹ Two variants are reported: the first based on the original monthly trade data, and a second in which the data has been cumulated on a quarterly basis for use in subsequent models where other variables are available only on a quarterly basis. There are positive time trends in all of the regressions and some evidence of seasonality as well. The monthly data appears to show some decline in activity in the winter months.²⁰

In most cases these models detect no significant change in trade flows following the nuclear test and the imposition of UN sanctions (i.e., the null hypothesis of a zero valued coefficient on the test/sanctions dummy could not be rejected), though in regressions presented in Appendix 2.1 (monthly

¹⁹ The equivalent exercise cannot be conducted on the luxury goods data because in contrast to the aggregate data reported in Figures 2 and 3, the disaggregated product-specific data is only available for annual observations.

²⁰ Not surprisingly, given the simplicity of these models, in some of the regressions there is evidence of autocorrelated residuals, which means that the estimated standard errors are likely to be downwardly biased, and as a consequence the reported level of statistical significance is exaggerated. For obvious reasons this is a bigger issue for the regressions on monthly data.

FIGURE 3

South Korea–North Korea Trade, 2001–08

Source: “Monthly North-South Trade Data,” Ministry of Unification of the Republic of South Korea, available through Korean Statistical Information Service, 2008 ~ <http://www.kosis.kr>.

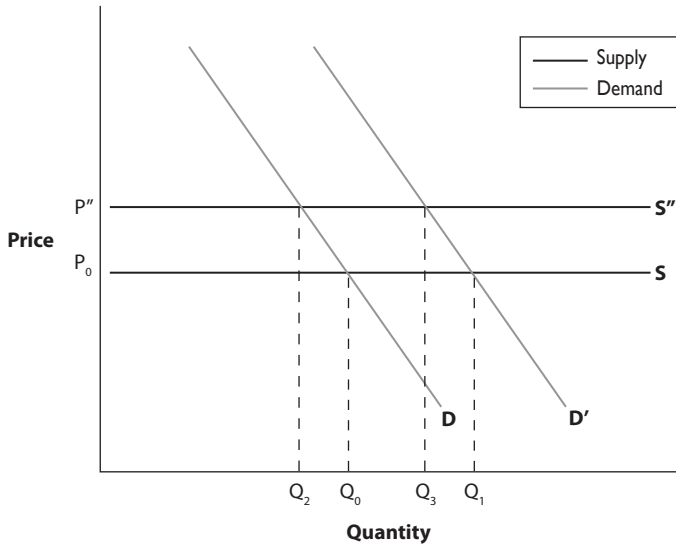
Chinese exports to North Korea), Appendix 3.2, and Appendix 3.4 (South Korean imports from North Korea), the period after the tests is actually associated with larger than expected trade volumes.²¹

A more complete characterization of trade behavior would take the level of economic activity explicitly into account; trade is not only a function of sanctions but also of macroeconomic performance. North Korea can be considered a small country, in that its imports are so small relative to the exports of either of its principal trading partners (less than 0.25% of total exports in both cases) that the country is a price-taker facing a perfectly elastic supply of exports at a parametrically given price (see **Figure 4**). This justifies the use of a single equation reduced form in which observed variations in trade volumes $Q_0 \rightarrow Q_3$ reflect shifts in the demand curve tracing along a horizontal

²¹ In the case of the two regressions on monthly data (Appendix 2.1 and 3.2) this is subject to the caveat regarding autocorrelated residuals and exaggerated statistical significance noted in footnote 20.

FIGURE 4

Small Country Demand for Imports



supply curve (Figure 4, $Q_0 \rightarrow Q_1$), and price variations are solely due to shifts in the supply curve along the demand curve (Figure 4, $Q_0 \rightarrow Q_2$).²²

Appendix 4 and **Appendix 5** report regressions incorporating only the North Korean economic activity term, derived by quarterly interpolations of Bank of Korea annual GDP growth estimates. The inclusion of the activity renders the time trend insignificant and reduces the autocorrelation of the residuals to an acceptable level. The estimated income elasticities are extremely large (i.e., in terms of Figure 4, the shift $Q_0 \rightarrow Q_1$). One possibility is that the impact of omitted variables is being misattributed to the activity term.

There are three obvious possibilities for the fact that changes in North Korean income appear to have a very large impact on the demand for imports.

²² The export case is more complicated: trade with China and South Korea looms sufficiently large in the North Korean economy that China and South Korea presumably face an upward-sloping North Korean supply curve (i.e., the magnitude of their demands is such that external demand shifts actually affect North Korean internal prices). In modeling terms, this possibility implies the need to estimate demand and supply simultaneously, thereby increasing the analytical complexity considerably. Moreover, the UN sanctions were imposed mainly on exports to North Korea rather than on imports from North Korea. Given that there are no qualitative differences in the estimated results for export and import trade, for the sake of brevity in this paper consideration of North Korean exports to China and South Korea is set aside to focus on trade moving in the other direction.

The first is that behavior of North Korean households and importing firms has changed during the sample period, specifically that exposure to new products from China and South Korea has in effect boosted the demand for imports. Something quite similar to this was observed in Eastern Europe, particularly in East Germany in the period following unification, when the sudden enhanced availability of new Western products led to a massive shift in consumer preferences away from domestically produced goods.²³ Thus, an upsurge in North Korean demand for imports may have swamped any impact of sanctions.

A second and related possibility, which also echoes the German experience, is that the development of new institutional channels of trade has greatly reduced transaction costs. This secular decline in transaction costs, possibly together with a shift in consumer preferences, has led to an upsurge in the demand for imports, which in these regressions is captured in the activity term. Such effects may have overridden the impact of sanctions.

The third possibility is that as a high-inflation economy with a fixed nominal exchange rate (E), North Korea is by definition experiencing real exchange rate appreciation. For North Korea, the relative price of imports to locally produced goods is the ratio of foreign prices (P^*) converted to North Korean *won* via an exchange rate to home-goods prices (P), that is P^*E/P . With the nominal rate E unchanged, the movement in the real exchange rate, P^*E/P , would be a function of differential change in the foreign and local price levels, P^* and P respectively. This real appreciation may have driven a growth in the demand for imports and has not been captured in the preceding specifications. The situation is complicated further by the existence of both an official nominal exchange rate and a parallel or black-market rate.

The problem is that we cannot observe P , North Korean prices, directly. Hence one solution would be to use movements in the black-market exchange rate as a proxy for changes in the unobservable domestic price level, P . This is not perfect: in a high-inflation environment, demand for foreign exchange as a relatively liquid “safe haven” investment may outstrip both domestic prices and the prices of imported goods, and as a consequence, movement in the black-market value of the won (which in fact depreciated

²³ Rudiger Dornbusch and Holger C. Wolf, “East German Reconstruction,” in *The Transition in Eastern Europe*, vol. 1, ed. Oliver Jean Blanchard, Kenneth A. Froot, and Jeffrey D. Sachs (Chicago: University of Chicago Press, 1994), 151–90.

continuously over the sample period) may be an upwardly biased measure of inflation.²⁴

In **Appendix 6** the log inverse black-market exchange rate is added to the specifications reported in Appendix 4 and Appendix 5 (i.e., an increase in the value is an appreciation and would be expected to be associated with a larger volume of imports). As can be seen in Appendix 6, this variable is not statistically significant. In terms of Figure 4, this indicates that the changes in trade volumes are driven by the income shift $Q_0 \rightarrow Q_1$ while price effects, $Q_0 \rightarrow Q_2$, are imperceptible.²⁵ It could be that the black-market exchange rate is not a good proxy for the unobservable domestic price level. Another possibility is that trade is occurring contemporaneously both at the official exchange rate as well as at the black-market rate. In such circumstances, real exchange rates calculated using either official or black-market rates will be a noisy proxy for the actual rate imbedded in the trade.

The models reported in Appendixes 4, 5, and 6 assume that all adjustment to variations in activity and prices occur within a single quarter; a large literature examines the issue of non-contemporaneous adjustment of trade to changes in the levels of economic activity and relative prices.²⁶ There are two basic approaches to estimating these relationships. The first approach estimates distributed lags of each explanatory variable directly. The second includes a lagged dependent variable on the right-hand side, imposing the same long-run geometric adjustment pattern on all of the independent variables.

The conventional wisdom is that variations in activity levels feed through to trade flows relatively quickly, whereas the impact of relative price changes takes longer to manifest. In the case at hand, the exchange rate term was never statistically significant either contemporaneously (Appendix 6) or non-contemporaneously (not reported for the sake of parsimony). There is some evidence of lagged adjustment with respect to the income term, but permitting non-contemporaneous adjustment has no significant effect on the nuclear test/sanctions coefficient.

Likewise, North Korea's trade volumes have shown some upward trends. It is possible that these trends in the key trade and income series are so

²⁴ The classic reference is Costantino Bresciani-Turroni, *The Economics of Inflation: A Study of Currency Depreciation in Post-War Germany* (London: George Allen & Unwin, 1937).

²⁵ A reduction in North Korean income, as has occurred in recent years, would be represented by a leftward shift of the demand curve.

²⁶ Morris Goldstein and Mohsin S. Khan, "Income and Price Effects in Foreign Trade," in *Handbook of International Economics*, vol. 2, ed. Ronald W. Jones and Peter B. Kenen (Amsterdam: North-Holland, 1985), 1041–1105.

pronounced that in statistical terms the series are said to be non-stationary, and hence the simple econometric estimates reported in Appendixes 2–6 are biased and inconsistent. Alternative estimates using more advanced time-series techniques do not generate any qualitatively different results, however.²⁷

CONCLUSIONS

Beginning with visual inspection and ending with the most sophisticated time-series models that can be implemented given the weakness of the data, no evidence has been found that UN economic sanctions have had any effect on North Korea's trade in luxury goods with its largest trade partner, China. Nor is there evidence that sanctions have had an indirect effect on North Korea's aggregate trade with its two principal partners, China and South Korea.

From one perspective, the lack of robust results is perhaps unsurprising: the sanctions were limited to exports of military and luxury goods, with the definitions of these products and the administration of the sanctions left to individual UN members. Perhaps some impact could be uncovered by focusing on narrow product categories. Moreover, restricting politically sensitive military and luxury products might have had some impact on regime behavior even if sanctions did not bite at the level of aggregate trade.²⁸ In the case at hand, however, even this modest result is questionable.

Yet sanctions were not the only channel through which the test could have affected trade flows. One would have thought that the test and sanctions would have generally increased the risk premium on all forms of economic engagement with North Korea, but the evidence does not bear this out. Enterprises in China and South Korea appear to have shrugged off the test, much like the financial markets did.

It is possible that the governments of China and South Korea undertook actions to offset or minimize the private risks faced by individual firms and enterprises. This is more plausible in the case of South Korea than

²⁷ These regressions are reported in an extended working paper version of this article available on the Peterson Institute for International Economics website ~ <http://www.petersoninstitute.org/publications/wp/wp08-12.pdf>.

²⁸ See William H. Kaempfer and Anton D. Lowenberg, "The Theory of Economic Sanctions: A Public Choice Approach," *American Economic Review* 78, no. 4 (September 1988): 786–93. Kaempfer and Lowenberg demonstrate that even seemingly mild sanctions can have an impact if they adversely affect key constituencies in the target country. An analytically interesting and potentially important issue is who in China and North Korea captured scarcity rents that may have been generated by the imposition of sanctions.

China. A relatively limited number of South Korean firms engage in trade or investment with North Korea, and they operate through government-controlled programs that could facilitate the socialization of risk. Although the South Korean government did carry through on a threat to curtail humanitarian assistance, Seoul did not impose sanctions on the nominally commercial trade associated with the Kaesong Industrial Complex—a decidedly mixed message that critics of the Roh Moo-hyun government were quick to observe. It is less clear that this explanation is plausible with respect to China: much of China’s economic interaction with North Korea comes through small, largely self-financed, effectively private firms, and it is not at all obvious what policy tools are available to socialize risk in this case. Indeed, survey evidence from other research suggests strongly that Chinese enterprises do not have recourse against losses in their North Korean business.

Even if the sanctions did not impede trade, counterfactually their existence may have deterred North Korea’s partners from relaxing barriers further, in effect blocking trade that would have otherwise developed. It is also possible that the test and the subsequent ratcheting up of political tensions increased the risk premium on trade with North Korea, but that the models are just too crude to capture it. The sample period under the sanctions regime is relatively short, and hence the power of the statistical tests comparing behavior before and after the test may be low. The apparent steady growth in trade throughout the period in question does not, however, suggest a major shift in behavior, regardless of the power of the statistical tests. More plausibly, it may also be the case that South Korean behavior could alter in light of the change in governments in Seoul. Whether the current Lee Myung-bak government would react in a similar fashion to its predecessor is questionable. In some sense these considerations are subject to self-correction: as time goes by, more sanctions-period data will become available, and eventually the sanctions may well be removed, generating additional sample variation for modeling.

These results should also not be interpreted as suggesting that all economic sanctions are useless. In contrast to the UN trade sanctions, evidence suggests that the disruptions to financial flows associated with the

Banco Delta Asia case had economic and possibly political impact. Accounts at BDA were associated with missile proliferation,²⁹ unrecorded gold sales,³⁰ and allegedly Kim Jong-il's political slush fund.³¹ Apart from disrupting these activities, the financial shock led to a fall in the black-market value of the won, put a squeeze on legitimate commerce,³² and reportedly necessitated a scaling back of the festivities associated with Kim Jong-il's birthday. More importantly, accounts of the six-party talks reveal a strong North Korean interest in resolving the BDA issue, and a willingness to make concessions to do so.

Nevertheless, the central message that emerges from this analysis is that the pre-test conventional wisdom that a North Korean nuclear test would resonate dramatically in economic relations appears to have been misguided. Despite diplomatic warnings before the test not to do so, the post-test behavior of public and private sector actors in China and South Korea has been accepting of North Korea's nuclear status. The test and even the imposition of limited sanctions do not appear to have had a perceptible effect on the country's trade relationships with its two principal partners. If such warnings are to be heeded in the future, they must embody credible threats of penalty. In the present case a major problem, of course, appears to be that some of the permanent members of the Security Council, particularly China, displayed reluctance to fully embrace and implement sanctions.

North Korea may have calculated quite correctly that the direct penalties for establishing itself as a nuclear power would be modest indeed. Presumably this experience will condition reactions of North Korean policymakers in the future—making deterrence on this issue and other sources of conflict more difficult. Sanctions that are fecklessly applied may be worse than useless: they could actually encourage other states to pursue undesirable behavior. If trade sanctions are to deter behavior in the future, they must be much more broadly targeted and enthusiastically implemented.

²⁹ Daniel A. Pinkston, "The North Korean Ballistic Missile Program," Strategic Studies Institute of the U.S. Army War College, Monograph, February 2008.

³⁰ Stephan Haggard and Marcus Noland, "North Korea's External Economic Relations," Peterson Institute for International Economics, Working Paper, no. 07-7, August 2007, appendix A ≈ <http://www.petersoninstitute.org/publications/wp/wp07-7.pdf>.

³¹ Stephen Mihm, "No Ordinary Counterfeit," *New York Times Magazine*, July 23, 2006 ≈ <http://www.nytimes.com/2006/07/23/magazine/23counterfeit.html>; and Sheena Chestnut, "Illicit Activity and Proliferation: North Korean Smuggling Networks," *International Security* 32, no. 1 (Summer 2007): 80–111.

³² Nigel Cowie, "US Financial Allegations: What they Mean," Nautilus Institute, Policy Forum Online, no. 06-35A, May 4, 2006 ≈ <http://www.nautilus.org/fora/security/0635Cowie.html>.

One can question whether this was ever in the cards in the case of North Korea. Clearly the UN had ratcheted up its response with each succeeding provocation, and Resolution 1695 established that China and Russia would no longer protect North Korea from sanctions in the Security Council. Yet it was also clear that both countries were less than enthusiastic in support of the policy and would act as a brake on the United States and others. The real question then is not so much why sanctions were ineffective, but why U.S. policymakers chose to go down a path that appears to have offered little likelihood of reaching the desired outcome. ◆

APPENDIX I
Banned Luxury Goods

	United States	European Union	Australia	Canada	Japan
Food items		<ul style="list-style-type: none"> • Caviar and caviar substitutes • Truffles and preparations thereof 	<ul style="list-style-type: none"> • Caviar • Crustaceans (all), e.g., rock lobsters • Abalone • Mollusks and aquatic invertebrates, e.g., oyster in any form 	<ul style="list-style-type: none"> • Gourmet foods and ingredients • Lobster 	<ul style="list-style-type: none"> • Caviar and caviar substitutes prepared from fish eggs • Meat of bovine animals, frozen (beef) • Fish filets, frozen (tuna)
Tobacco	<ul style="list-style-type: none"> • Tobacco and tobacco products 	<ul style="list-style-type: none"> • High-quality cigars and cigarillos 	<ul style="list-style-type: none"> • Tobacco products 	<ul style="list-style-type: none"> • Cigarettes 	<ul style="list-style-type: none"> • Tobacco
Beverages	<ul style="list-style-type: none"> • Alcoholic beverages, including wine, beer, ales, and liquor 	<ul style="list-style-type: none"> • High-quality wines (including sparkling wines), spirits and spirituous beverages 	<ul style="list-style-type: none"> • Wine and spirits (all kinds) 	<ul style="list-style-type: none"> • Alcoholic beverages 	<ul style="list-style-type: none"> • Alcoholic beverages
Cosmetics	<ul style="list-style-type: none"> • Perfumes and toilet waters • Cosmetics, including beauty and make-up 	<ul style="list-style-type: none"> • Luxury perfumes, toilet waters, and cosmetics, including beauty and make-up products 	<ul style="list-style-type: none"> • Perfumes and toilet waters • Cosmetics (all) 	<ul style="list-style-type: none"> • Perfume 	<ul style="list-style-type: none"> • Perfumes and toilet waters • Cosmetics (beauty and make-up)
Apparel	<ul style="list-style-type: none"> • Leather articles • Silk articles • Leather apparel and clothing accessories 	<ul style="list-style-type: none"> • High-quality garments, clothing accessories, and shoes (regardless of material) 		<ul style="list-style-type: none"> • Designer clothing 	
Fur	<ul style="list-style-type: none"> • Fur skins and artificial furs 		<ul style="list-style-type: none"> • Furs 	<ul style="list-style-type: none"> • Furs 	<ul style="list-style-type: none"> • Fur skins and artificial fur products

Appendix 1 (continued)

	United States	European Union	Australia	Canada	Japan
Fashion accessories	<ul style="list-style-type: none"> Leather travel goods, vanity cases, binocular and camera cases, handbags, wallets, silk scarves 		<ul style="list-style-type: none"> Leather travel goods, apparel and clothing accessories 	<ul style="list-style-type: none"> Clothing accessories 	<ul style="list-style-type: none"> Leather bags, clothes, and others
Transportation	<ul style="list-style-type: none"> Automobiles and other motor vehicles to transport people (other than public transport), including station wagons Racing cars, snowmobiles, and motorcycles Personal transportation devices (stand-up motorized scooters) 	<ul style="list-style-type: none"> Luxury vehicles for the transport of persons on earth, air, or sea, as well as their accessories and spare parts 	<ul style="list-style-type: none"> Automobiles and other vehicles to transport people 		<ul style="list-style-type: none"> Motorcars Motorcycles
Aquatic vehicles	<ul style="list-style-type: none"> Yachts and other aquatic recreational vehicles (such as personal watercraft) 		<ul style="list-style-type: none"> Yachts and pleasure craft 		<ul style="list-style-type: none"> Motorboats, yachts, and others
Flooring	<ul style="list-style-type: none"> Rugs and tapestries 	<ul style="list-style-type: none"> Hand-knotted carpets, hand-woven rugs and tapestries 	<ul style="list-style-type: none"> Carpets 		<ul style="list-style-type: none"> Carpets and other textile floor coverings
Jewelry	<ul style="list-style-type: none"> Jewelry with pearls, gems, precious and semi-precious stones (including diamonds, sapphires, rubies, and emeralds) Jewelry of precious metal or of metal clad with precious metal 	<ul style="list-style-type: none"> Pearls, precious and semi-precious stones, articles of pearls, jewelry, gold- or silversmith articles Cutlery of precious metal or plated or clad with precious metal 	<ul style="list-style-type: none"> Jewelry Precious and semi-precious stones (including diamonds and pearls) Silver and gold Precious metals 	<ul style="list-style-type: none"> Jewelry Gems Precious metals 	<ul style="list-style-type: none"> Jewelry Natural or cultured pearls, precious or semi-precious stones Precious metals and metal work

Appendix 1 (continued)

	United States	European Union	Australia	Canada	Japan
Electronic items	<ul style="list-style-type: none"> • Flat-screen, plasma, or LCD panel televisions or other video monitors or receivers (including high-definition televisions); any television larger than 29 inches; DVD players • Personal digital assistants (PDA) • Personal digital music players • Computer laptops 	<ul style="list-style-type: none"> • High-end electronic items for domestic use 	<ul style="list-style-type: none"> • Consumer electronics (televisions, videos, DVD players, PDAs, laptops, MP3 players, and any other relevant exports) 	<ul style="list-style-type: none"> • Televisions • Computers • Other electronic devices 	<ul style="list-style-type: none"> • Televisions • Portable digital automatic data processing machines
Photographic equipment		<ul style="list-style-type: none"> • High-end electrical/electronic or optical apparatus for recording and reproducing sound and images 	<ul style="list-style-type: none"> • Photographic equipment 		<ul style="list-style-type: none"> • Cinematographic cameras and projectors • Apparatus for recording and reproducing sound and images
Watches/Clocks	<ul style="list-style-type: none"> • Wrist, pocket, and other watches with a case of precious metal or of metal clad with precious metal 	<ul style="list-style-type: none"> • Luxury clocks and watches and their parts 	<ul style="list-style-type: none"> • Watches and clocks 	<ul style="list-style-type: none"> • Watches 	<ul style="list-style-type: none"> • Wrist watches and other watches
Works of art	<ul style="list-style-type: none"> • Works of art (including paintings, original sculptures, and statuary), antiques (more than 100 years old) • Collectible items, including rare coins and stamps 	<ul style="list-style-type: none"> • Works of art, collectors' pieces and antiques • Coins and banknotes, not being legal tender 	<ul style="list-style-type: none"> • Works of art (all) 		<ul style="list-style-type: none"> • Works of art, collectors' pieces and antiques

Appendix 1 (continued)

	United States	European Union	Australia	Canada	Japan
Musical instruments	<ul style="list-style-type: none"> • Musical instruments 	<ul style="list-style-type: none"> • High-quality musical instruments 			<ul style="list-style-type: none"> • Musical instruments; parts and accessories of such articles
Sports equipment	<ul style="list-style-type: none"> • Recreational sports equipment 	<ul style="list-style-type: none"> • Articles and equipment for skiing, golf, diving, and water sports 	<ul style="list-style-type: none"> • Sports equipment 	<ul style="list-style-type: none"> • Sporting goods 	
Fountain pens	<ul style="list-style-type: none"> • Fountain pens 		<ul style="list-style-type: none"> • Fountain pens 		<ul style="list-style-type: none"> • Fountain pens
Drinking glasses	<ul style="list-style-type: none"> • Items of lead crystal 	<ul style="list-style-type: none"> • High-quality lead crystal glassware 	<ul style="list-style-type: none"> • Drinking glasses (lead crystal) 		<ul style="list-style-type: none"> • Drinking glasses (lead crystal)
Others	<ul style="list-style-type: none"> • Tableware of porcelain or bone china 	<ul style="list-style-type: none"> • High-quality tableware of porcelain, china, stone- or earthenware, or fine pottery • Purebred horses • Articles and equipment for billiards, automatic bowling, and casino games and games operated by coins or banknotes 	<ul style="list-style-type: none"> • Electronic entertainment or software 	<ul style="list-style-type: none"> • Private aircraft 	

Source: "Charter of the United Nations (Sanctions—Democratic People's Republic of Korea) Luxury Goods List 2006," Australian Department of Foreign Affairs and Trade \approx http://www.dfat.gov.au/un/unsc_sanctions/north-korea_luxury_items_list.html; Kim, "Ibbonui daebuk sachipum suchul geuniji jochi mit haedang myeokkaek"; Bureau of Industry and Security, Department of Commerce, "North Korea: Imposition of New Foreign Policy Controls," *Federal Register* 72, no. 17, January 26, 2007; Government of Canada, "Regulations Implementing the United Nations Resolution on the Democratic People's Republic of Korea," *Canada Gazette* 140, no. 24, November 29, 2006 \approx <http://canadagazette.gc.ca/partII/2006/20061129/html/sor287-e.html>; and UK Department of Trade & Industry, Export Control Organisation, "Sanctions on North Korea—Luxury Goods," \approx <http://www.berr.gov.uk/whatwedo/europeandtrade/strategic-export-control/sanctions-embargoes/by-country/democratic%20people%20republic%20of%20korea/page39588.html>.

APPENDIX 2

*China-North Korea Trade: Nuclear Sanctions,
Seasonal Dummies, and Time Trends*

2.1 Log of Chinese Exports to North Korea		2.2 Log of Chinese Imports from North Korea	
Nuclear sanction	0.33**	Nuclear sanction	-0.09
(Dummy variable)	(0.11)	(Dummy variable)	(0.16)
Logged time trend	0.35*** (0.04)	Logged time trend	0.98*** (0.06)
Month 1	-0.31 (0.17)	Month 1	-0.53* (0.26)
Month 2	-0.58** (0.17)	Month 2	-0.65* (0.26)
Month 3	-0.04 (0.17)	Month 3	-0.33 (0.26)
Month 4	0.07 (0.17)	Month 4	-0.16 (0.26)
Month 5	0.04 (0.17)	Month 5	-0.42 (0.26)
Month 6	-0.06 (0.17)	Month 6	-0.27 (0.26)
Month 7	-0.04 (0.17)	Month 7	-0.29 (0.26)
Month 8	-0.05 (0.18)	Month 8	-0.15 (0.26)
Month 10	-0.02 (0.17)	Month 10	-0.06 (0.26)
Month 11	-0.06 (0.17)	Month 11	0.02 (0.26)
Month 12	0.14 (0.18)	Month 12	0.21 (0.26)
Constant	9.79*** (0.20)	Constant	6.66*** (0.30)
N	93.00	N	93.00
r ²	0.67	r ²	0.81
F	12.18	F	26.29
p	0.00	p	0.00
Durbin-Watson d-statistic	1.238272	Durbin-Watson d-statistic	0.6775941
Durbin's alternative test for autocorrelation, prob > chi ²	0.0008	Durbin's alternative test for autocorrelation, prob > chi ²	0.0000
Breusch-Godfrey LM test for autocorrelation, prob > chi ²	0.0006	Breusch-Godfrey LM test for autocorrelation, prob > chi ²	0.0000

Note: Standard errors in parentheses. Month 9 was omitted. * p<0.05, ** p<0.01, *** p<0.001.

Appendix 2 (continued)

2.3 Log of Chinese Exports to North Korea		2.4 Log of Chinese Imports from North Korea	
Nuclear sanction	0.16	Nuclear sanction	-0.39
(Dummy variable)	(0.18)	(Dummy variable)	(0.29)
Logged time trend	0.47*** (0.07)	Logged time trend	1.21*** (0.12)
Quarter 1	-0.24 (0.16)	Quarter 1	-0.50 (0.26)
Quarter 2	0.05 (0.16)	Quarter 2	-0.31 (0.26)
Quarter 3	-0.16 (0.16)	Quarter 3	-0.37 (0.26)
Constant	10.94*** (0.22)	Constant	8.29*** (0.35)
N	32.00	N	32.00
r ²	0.72	r ²	0.83
F	13.06	F	25.20
p	0.00	p	0.00
Durbin-Watson d-statistic	1.720628	Durbin-Watson d-statistic	1.159076
Durbin's alternative test for autocorrelation, prob > chi ²	0.6032	Durbin's alternative test for autocorrelation, prob > chi ²	0.0801
Breusch-Godfrey LM test for autocorrelation, prob > chi ²	0.5586	Breusch-Godfrey LM test for autocorrelation, prob > chi ²	0.0616

Note: Standard errors in parentheses. Quarter 4 was omitted. * p<0.05, ** p<0.01, *** p<0.001.

APPENDIX 3

*South Korea-North Korea Trade: Nuclear Sanctions,
Seasonal Dummies, and Time Trends*

3.1 Log of South Korean Exports to North Korea		3.2 Log of South Korean Imports from North Korea	
Nuclear sanction	0.23	Nuclear sanction	0.59***
(Dummy variable)	(0.18)	(Dummy variable)	(0.10)
Logged time trend	0.43*** (0.07)	Logged time trend	0.34*** (0.04)
Month 1	-1.02*** (0.27)	Month 1	-0.18 (0.15)
Month 2	-0.93** (0.27)	Month 2	-0.40* (0.15)
Month 3	-0.59* (0.27)	Month 3	-0.14 (0.15)
Month 4	-0.50 (0.27)	Month 4	-0.35* (0.15)
Month 5	-0.03 (0.27)	Month 5	-0.35* (0.15)
Month 6	-0.30 (0.27)	Month 6	-0.36* (0.15)
Month 7	-0.40 (0.27)	Month 7	-0.26 (0.15)
Month 8	-0.38 (0.27)	Month 8	-0.15 (0.15)
Month 10	-0.54 (0.28)	Month 10	0.20 (0.16)
Month 11	-0.45 (0.28)	Month 11	0.16 (0.16)
Month 12	-0.48 (0.28)	Month 12	-0.21 (0.16)
Constant	9.44*** (0.30)	Constant	9.08*** (0.17)
N	80.00	N	80.00
r ²	0.60	r ²	0.78
F	7.68	F	17.54
p	0.00	p	0.00
Durbin-Watson d-statistic	1.196735	Durbin-Watson d-statistic	0.9131134
Durbin's alternative test for autocorrelation, prob > chi ²	0.0005	Durbin's alternative test for autocorrelation, prob > chi ²	0.0000
Breusch-Godfrey LM test for autocorrelation, prob > chi ²	0.0004	Breusch-Godfrey LM test for autocorrelation, prob > chi ²	0.0000

Note: Standard errors in parentheses. Month 9 was omitted. * p<0.05, ** p<0.01, *** p<0.001.

Appendix 3 (continued)

3.3 Log of South Korean Exports to North Korea		3.4 Log of South Korean Imports from North Korea	
Nuclear sanction	0.01	Nuclear sanction	0.48**
(Dummy variable)	(0.25)	(Dummy variable)	(0.15)
Logged time trend	0.48*** (0.10)	Logged time trend	0.37*** (0.06)
Quarter 1	-0.33 (0.22)	Quarter 1	-0.31* (0.13)
Quarter 2	0.29 (0.22)	Quarter 2	-0.42** (0.13)
Quarter 3	0.22 (0.22)	Quarter 3	-0.25 (0.13)
Constant	10.44*** (0.29)	Constant	10.55*** (0.17)
N	27.00	N	27.00
r ²	0.67	r ²	0.82
F	8.48	F	18.78
p	0.00	p	0.00
Durbin-Watson d-statistic	1.787388	Durbin-Watson d-statistic	1.788646
Durbin's alternative test for autocorrelation, prob > chi ²	0.8418	Durbin's alternative test for autocorrelation, prob > chi ²	0.6713
Breusch-Godfrey LM test for autocorrelation, prob > chi ²	0.8168	Breusch-Godfrey LM test for autocorrelation, prob > chi ²	0.6235

Note: Standard errors in parentheses. Quarter 4 was omitted. * p<0.05, ** p<0.01, *** p<0.001.

APPENDIX 4

China-North Korea Trade, Activity Variable Included

Log of Chinese Exports to North Korea	4.1	4.2
Nuclear sanctions	0.21 (0.16)	0.21 (0.16)
Log of North Korean GNI index	9.76** (3.41)	10.16*** (1.27)
Logged time trend	0.02 (0.17)	– –
Quarter 2	0.36* (0.14)	0.37* (0.14)
Quarter 3	0.20 (0.15)	0.20 (0.14)
Quarter 4	0.45** (0.16)	0.45** (0.14)
Constant	-33.89* (15.59)	-35.72*** (5.95)
N	31.00	31.00
r ²	0.80	0.80
F	15.63	19.53
p	0.00	0.00
Durbin-Watson d-statistic	2.17094	2.174953
Durbin's alternative test for autocorrelation, prob > chi ²	0.6252	0.6166
Breusch-Godfrey LM test for autocorrelation, prob > chi ²	0.5726	0.5713

Note: Standard errors in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

APPENDIX 5

South Korea-North Korea Trade, Activity Variable Included

Log of South Korean Exports to North Korea	5.1	5.2
Nuclear sanctions	-0.03 (0.26)	0.00 (0.25)
Log of North Korean GNI index	9.55 (4.97)	12.73*** (2.38)
Logged time trend	0.15 (0.20)	- -
Quarter 2	0.68** (0.20)	0.70** (0.20)
Quarter 3	0.66** (0.22)	0.70** (0.21)
Quarter 4	0.47* (0.22)	0.53* (0.21)
Constant	-33.95 (22.93)	-48.55*** (11.15)
N	26.00	26.00
r ²	0.71	0.70
F	7.87	9.56
p	0.00	0.00
Durbin-Watson d-statistic	2.199694	2.222466
Durbin's alternative test for autocorrelation, prob > chi ²	0.5528	0.5593
Breusch-Godfrey LM test for autocorrelation, prob > chi ²	0.4798	0.4984

Note: Standard errors in parentheses. * p<0.05, ** p<0.01, *** p<0.001.

APPENDIX 6

North Korea Bilateral Trade, Exchange Rate Included

6.1 Log of Chinese Exports to North Korea		6.2 Log of South Korean Exports to North Korea	
Nuclear sanctions	0.22 (0.16)	Nuclear sanctions	-0.08 (0.24)
Log of North Korean GNI index	11.02** (3.61)	Log of North Korean GNI index	1.20 (7.40)
Log inverse exchange rate index (export price proxy)	0.03 (0.13)	Log inverse exchange rate index (export price proxy)	-0.34 (0.21)
Quarter 2	0.37* (0.14)	Quarter 2	0.68** (0.19)
Quarter 3	0.21 (0.14)	Quarter 3	0.65** (0.20)
Quarter 4	0.46** (0.15)	Quarter 4	0.43 (0.21)
Constant	-39.57* (16.16)	Constant	3.44 (33.47)
N	31.00	N	26.00
r ²	0.80	r ²	0.74
F	15.68	F	9.08
p	0.00	p	0.00
Durbin-Watson d-statistic	2.189263	Durbin-Watson d-statistic	2.143525
Durbin's alternative test for autocorrelation, prob > chi ²	0.5850	Durbin's alternative test for autocorrelation, prob > chi ²	0.6886
Breusch-Godfrey LM test for autocorrelation, prob > chi ²	0.5287	Breusch-Godfrey LM test for autocorrelation, prob > chi ²	0.6316

Note: Standard errors in parentheses. * p<0.05, ** p<0.01, *** p<0.001.