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North Korea's trade and the integration of Northeast Asia ☆

Kiril Tochkov

Department of Economics, Texas Christian University, Box 298510, Fort Worth, TX 76129, USA

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ABSTRACT

In addition to being one of the most isolated countries in the world, North Korea has been the target of sanctions and trade restrictions in recent years. This paper examines the trade patterns of North Korea with its 19 major trading partners over the period 1989–2016. Moreover, the paper quantifies the trade barriers between North Korea and the rest of the world by estimating border effects in a gravity model framework. The findings indicate that North Korea's trade with developed countries has been declining for almost two decades, while trade with emerging economies has been intensifying. Over the last decade, trade with almost all countries has collapsed with the exception of China. The regression results imply that despite being the second largest trading partner, South Korea faces the highest trade barriers with North Korea, after controlling for distance, contiguity, and economic size. Emerging economies recorded the lowest trade hurdles, while developed countries witnessed a dramatic rise in border effects since the early 2000s. China's trade costs vis-à-vis North Korea are higher than for the rest of the world but remained relatively stable over the past two decades.

1. Introduction

North Korea is an exception in East Asia. Some countries in the region, like South Korea and Taiwan, initiated industrialization efforts in the 1960s and adopted export-oriented strategies that transformed them into wealthy, developed countries in a matter of less than three decades. Other countries, like China and Vietnam, also proved successful in implementing market reforms and becoming manufacturing hubs on a global scale, despite the fact that they are governed by Communist parties. Even countries like Russia and Mongolia, which rely heavily on the exports of natural resources, recorded episodes of rapid economic growth that lifted the living standards of their populations. In contrast, North Korea has remained a poor, isolated country that struggles to feed its population. Despite indications that informal markets are tolerated by the authorities and that the private economy has expanded in recent years, there is no doubt that North Korea's economy lags behind its neighbors in most aspects of economic and human development.

Various reasons are responsible for this situation, including political, ideological, military, institutional, historic, and economic factors. This paper focuses on one such factor, namely the lack of economic interactions with the rest of the world. Trade and openness have been a key feature of the growth strategies of emerging economies around the world, and in East Asia in particular. By comparison, North Korea has remained extremely isolated. This is, in part, a deliberate strategy of the ruling regime to prevent foreign influences from eroding its power. At the same time, the development of nuclear weapons and the constant threats to regional stability have earned North Korea a spot on the list of countries subject to trade sanctions. A third reason is its geographical location. To the south, the country adjoins one of the most fortified and impenetrable borders in the world. To the north, North Korea borders two of the largest and most powerful countries in the world that are not particularly interested in trading with it. Last but not least, North Korea has relatively little to offer to the rest of the world, except for natural resources (e.g., coal, minerals, and seafood), textiles, and a cheap but disciplined labor force that toils on construction sites around the globe.

This paper examines the trade flows of North Korea and analyzes their patterns with respect to changes over time and across trading partners. Moreover, the paper investigates the barriers to trade between North Korea and the rest of the world. These barriers are quantified using a gravity model and their evolution over time is explored. The resulting border effects measure the cost of goods crossing the border between North Korea and its trading partners and include tariffs as well as non-tariff barriers. This approach is valuable because it allows us to study the effects of shifts in domestic policies within North Korea as well as changes in the global attitudes towards the North Korean regime.

Despite the growing attention to the economic situation in the country over the past decade, the empirical literature on North Korean trade in English remains relatively meager. A number of studies focus on the relationship between China and its smaller neighbor. In general, China's trade with North Korea is driven by geopolitical considerations rather than economic necessity, while for North Korea this trade relationship represents a lifeline (Lee and Grey, 2016). Haggard et al. (2012) use survey data from 300 Chinese enterprises doing business in or with North Korea and find that the lack of proper institutions limits the scope of

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E-mail address: k.tochkov@tcu.edu

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trade and investment in the country. In the face of great risks stemming from a predatory and corrupt North Korean state, Chinese enterprises are shown to engage in bribery, keep the size of their business small, and focus on trade rather than direct investment.

Jung (2016) examines the trade between China and North Korea in the context of sanctions after 2006 and finds that the decrease in trade between the two Korean states was compensated by an increase in trade between China and North Korea. As a result, the effectiveness of sanctions, particularly those implemented by the South, was diluted. In a similar vein, Lee and Grey (2017) show that financial sanctions against North Korea lead to an increase in evasive techniques and informal channels but have little effect on cross-border trade with China.

A second group of papers direct their attention to the North-South integration. Haggard and Noland (2012) use survey data from 250 South Korean firms engaged in North Korea to show that the risks of doing business in the North are mitigated by the South Korean government via subsidies and preferential policies. In other words, the lack of an adequate institutional development in North Korea that deters foreign investment is compensated for by South Korean government schemes, which have broader objectives than simply facilitating the generation of economic profits. In fact, the goods produced by South Korean firms in North Korea create legal problems when exported to third countries due to WTO regulations and have required the special attention of the South Korean government when negotiating free-trade agreements (Park, 2016). Nevertheless, trade fosters regional integration, which is key to the gradual opening of North Korea towards its neighbors in Northeast Asia, and can thus be seen as the first step on the long way to the unification of the two Koreas (Park, 2012).

A third group of papers is dedicated to the effects of trade on growth. An early study by Lim (1997) shows that North Korea's comparative advantage depends on whether the country trades with communist nations or with the rest of the world. North Korea exhibits a comparative advantage in raw materials and animal products and a disadvantage in machinery. But the disadvantage in capital-intensive goods appears only in trade with non-communist countries. Furthermore, the increasing isolation seems to have had a negative effect on economic development. Jin (2003) argues that the decline in North Korean growth after 1974 was likely due to its decreasing openness as measured by the share of imports in GNP. Similarly, Lee (2005) calculates that international trade, and inter-Korean trade in particular, were the main drivers of economic growth in North Korea over the period 1999–2003.

This paper differs from existing research by using a gravity model to study the barriers to trade between North Korea and the rest of the world. Inter-Korean trade serves as a benchmark for evaluating these border effects.

The paper is structured as follows. The next section presents the regression model used in the empirical investigation. Section 3 discusses the data, while Section 4 explores the trade patterns and reports the estimates of the border effects. Section 5 summarizes the findings and offers policy recommendations.

2. Methodology

Anderson and van Wincoop (2003) provide the theoretical basis for the gravity framework used in this paper. They use a two-country trade model assuming that each country is specialized in the production of a single good and that consumer preferences are identical, homothetic, and approximated by a constant elasticity of substitution (CES) utility function. Under certain assumptions (e.g., market clearance, symmetrical trade costs), the model yields the following expression for the exports of country i to country j:

$$x_{ij} = \frac{y_i y_j}{y^W}\left(\frac{t_{ij}}{P_i P_j}\right)^{1-\sigma} \tag{1}$$

where y denotes the country's nominal income, y^W is the world income, t denotes the bilateral trade costs, P is the price index, and σ is the elasticity of substitution. Eq. (1) indicates that bilateral trade is determined by the size of each economy, trade costs, and price levels. The price levels, labelled as multilateral trade resistance terms by Anderson and van Wincoop (2003), are more broadly interpreted as the average trade barriers that each country faces with all their trading partners.

After linearizing Eq. (1) and decomposing trade costs into several components, the gravity equation takes the form of:

$$\begin{aligned}\ln x_{ij} = {} & \ln\left(y_i y_j\right) - \ln y^W + (1-\sigma)\ln b\left(1-\delta_{ij}\right) + (1-\sigma)\rho \ln d_{ij} \\ & + (1-\sigma)\tau_{ij} - (1-\sigma)\ln P_i - (1-\sigma)\ln P_j\end{aligned} \tag{2}$$

where b is defined as the border effect, δ_{ij} is a dummy variable that takes the value of one for intranational trade, and zero otherwise, d is bilateral distance, and τ_{ij} includes all remaining trade costs besides border effects and distance.

The regression model derived from Eq. (2) and used in the empirical investigation is given by:

$$\begin{aligned}\ln\left(\frac{x_{ijt}}{y_{it}y_{jt}}\right) = {} & \beta_0 + \alpha_i + \eta_t + \beta_1 \ln d_{ij} + \beta_2 CONT_{ij} + \beta_3(NK \times CHN) \\ & + \beta_4(NK \times DEV) + \beta_5(NK \times EMER) + \varepsilon_{ijt}\end{aligned} \tag{3}$$

The dependent variable is the log of size-adjusted trade, while the control variables are the log of distance and contiguity (CONT). The main variables of interest are the three border effects that define North Korea's trade with China (CHN), with developed countries (DEV), and emerging economies (EMER). Each of these is specified as a dummy variable that takes the value of 1 for trade between North Korea and one of these (groups of) countries, and zero otherwise. Eq. (3) takes into account factors that vary across countries but not across time via exporter fixed effects (α_i). Similarly, factors that vary across time but not across countries are controlled for by including time-fixed effects (η_t).

3. Data

Data on bilateral trade flows over the period 1989–2016 are collected from the IMF's *Direction of Trade Statistics (DOTS)* database. Since North Korea does not publish trade statistics, the values reported by North Korea's trading partners are used instead. Data on trade between North and South Korea is obtained from South Korea's Ministry of Unification. The trading partners of North Korea include South Korea, China, a group of developed countries (Canada, Australia, Japan, the European Union's (EU) 28 member states, Hong Kong, Macao, and Switzerland), and a group of emerging economies (Russia, India, Brazil, Pakistan, South Africa, Saudi Arabia, Malaysia, Indonesia, Singapore, and Thailand). The EU is treated as a single entity. Geographical distances are based on the great-circle distance between the capital cities of the trading partners. Data on GDP was taken from the United Nations Statistics Division. Trade between North and South Korea is used as a benchmark for the estimation of border effects.

4. Results

4.1. North Korea's trade patterns

North Korea's trade with the 19 countries in the sample represents on average around 91% of its imports and 84% of its exports over the entire sample period. Table 1 shows the trade flows between North Korea and its trading partners for the period 1989–2016 and two subperiods of equal length.

The trade statistics show China to be by far the largest trading partner of North Korea, exporting and importing more than all other countries in the sample taken together. The second largest trading partner is South Korea with amounts that are about half of China's for North Korean exports and a third for imports. Among developed countries, Japan and the EU are the major destinations for North Korean exports and are

Table 1
North Korea's average annual trade flows (in millions of current US dollars).

	1989–2016		1989–2002		2003–2016	
	Exports	Imports	Exports	Imports	Exports	Imports
Australia	4.53	7.05	2.29	12.84	6.77	1.25
	(4.97)	(17.63)	(3.00)	(23.79)	(5.62)	(2.73)
Canada	0.51	9.33	0.96	7.58	0.09	11.09
	(1.91)	(11.92)	(2.74)	(13.90)	(0.03)	(9.76)
Japan	152.74	139.38	266.65	256.86	38.83	21.90
	(128.44)	(203.44)	(42.36)	(234.59)	(67.24)	(34.60)
Hong Kong	18.30	42.55	32.49	68.90	4.11	16.19
	(16.70)	(37.74)	(11.62)	(35.69)	(3.26)	(13.71)
Macao	1.69	0.04	3.37	0.05	0.01	0.02
	(5.41)	(0.06)	(7.39)	(0.07)	(0.03)	(0.05)
EU-28	113.94	164.18	133.68	217.12	94.19	111.23
	(53.45)	(86.27)	(33.24)	(36.96)	(63.16)	(89.75)
Singapore	4.73	50.08	7.79	49.01	1.66	51.15
	(9.85)	(25.53)	(13.29)	(23.77)	(2.20)	(28.04)
Switzerland	0.97	4.69	0.93	5.57	1.01	3.80
	(0.65)	(2.37)	(0.28)	(2.71)	(0.90)	(1.63)
Developed economies	297.38	417.29	448.09	617.93	146.67	216.64
	(175.22)	(290.22)	(61.93)	(259.55)	(104.91)	(144.40)
Brazil	53.84	63.19	30.97	60.33	76.71	66.06
	(50.06)	(64.06)	(41.71)	(62.52)	(48.36)	(67.80)
China	822.12	1348.75	133.54	465.91	1510.70	2231.60
	(1011.48)	(1173.05)	(83.03)	(85.95)	(1047.26)	(1082.49)
India	69.61	164.32	32.98	62.75	106.25	258.64
	(85.63)	(202.71)	(27.77)	(59.65)	(107.56)	(242.89)
Indonesia	13.95	7.46	16.83	10.20	11.06	4.72
	(15.78)	(8.20)	(14.90)	(10.28)	(16.64)	(4.24)
Malaysia	3.06	4.65	5.50	1.82	0.62	7.49
	(4.63)	(5.69)	(5.58)	(2.36)	(0.82)	(6.66)
Pakistan	12.21	1.21	0.42	1.29	23.99	1.13
	(16.43)	(1.43)	(0.51)	(0.81)	(16.17)	(1.89)
Russia	27.06	103.47	42.33	97.36	11.79	109.58
	(64.69)	(104.32)	(90.15)	(138.12)	(7.86)	(58.69)
Saudi Arabia	28.09	2.79	34.47	5.56	21.70	0.01
	(18.96)	(4.97)	(20.85)	(5.89)	(14.97)	(0.01)
South Africa	1.50	28.20	0.67	1.82	2.32	54.58
	(1.45)	(56.13)	(1.08)	(3.36)	(1.32)	(70.94)
Thailand	24.34	77.97	12.84	48.20	35.84	107.74
	(28.24)	(76.78)	(13.07)	(60.67)	(34.65)	(81.57)
Emerging economies	1055.77	1796.15	310.55	750.75	1801.00	2841.56
	(1034.06)	(1256.66)	(104.81)	(230.40)	(1006.80)	(934.29)
South Korea	449.86	444.78	147.59	124.06	752.13	765.50
	(413.87)	(397.26)	(72.09)	(128.83)	(392.13)	(299.37)

Note: Trade flows measured in millions of current US dollars. Reported numbers are averages with standard deviation in parenthesis.

also the largest importers as well. However, there is an important difference. Japan's trade with North Korea ceased completely in 2010, while EU's trade has declined, causing it to overtake Japan as North Korea's main trading partner among developed countries over the period 2003–2016. In contrast to the declining trade with developed countries, North Korea's interactions with South Korea increased substantially over the early 2000s. As Table 1 shows, average annual exports and imports almost quintupled from the first subperiod. This can be explained by the continuation of the Sunshine Policy and the creation of the Kaesong Industrial Zone in the early 2000s.

While Western countries scaled back their trade with North Korea, emerging economies seem to have picked up the slack. In fact, there is a substantial increase in trade with some countries, like India and Thailand. China is again at the top with exports to North Korea quintupling and imports increasing more than 10 times on average.

Figs. 1 and 2 reveal more detailed patterns. North Korean exports to developed countries have been declining since the mid-1990s and by 2016 they virtually ceased. Exports to emerging economies have had the opposite trend, but after peaking in 2006 they have been declining as well. South Korea's absorption of goods from the North has surged since the start of the Sunshine Policy in the late 1990s. However, the trend was reversed in 2007, with the exception of a one-time surge in 2015. China is the only country that has experienced sustained increases in imports from North Korea since the early 2000s. In fact, North Korean exports to China quadrupled between 2008 and 2013.

North Korean imports (Fig. 2) follow a very similar pattern, except that the decline sets in later than for exports.

4.2. North Korea's border effects

The estimated coefficients of the regression model in Eq. (3) are presented in Table 2. The first column reports the estimates for China and the rest of the world, while in the second column the latter is divided into developed and emerging economies. The coefficients for distance and contiguity have the expected sign, suggesting that longer distances have an adverse effect on trade, while shared borders promote the exchange of goods. To facilitate the interpretation, the estimates of the border effects are converted to ad-valorem tariff equivalents using two different levels for the elasticity of substitution (5 and 10) common in the literature.

The positive sign of the coefficients indicates that North Korea's trade with China and the groups of emerging and developed countries

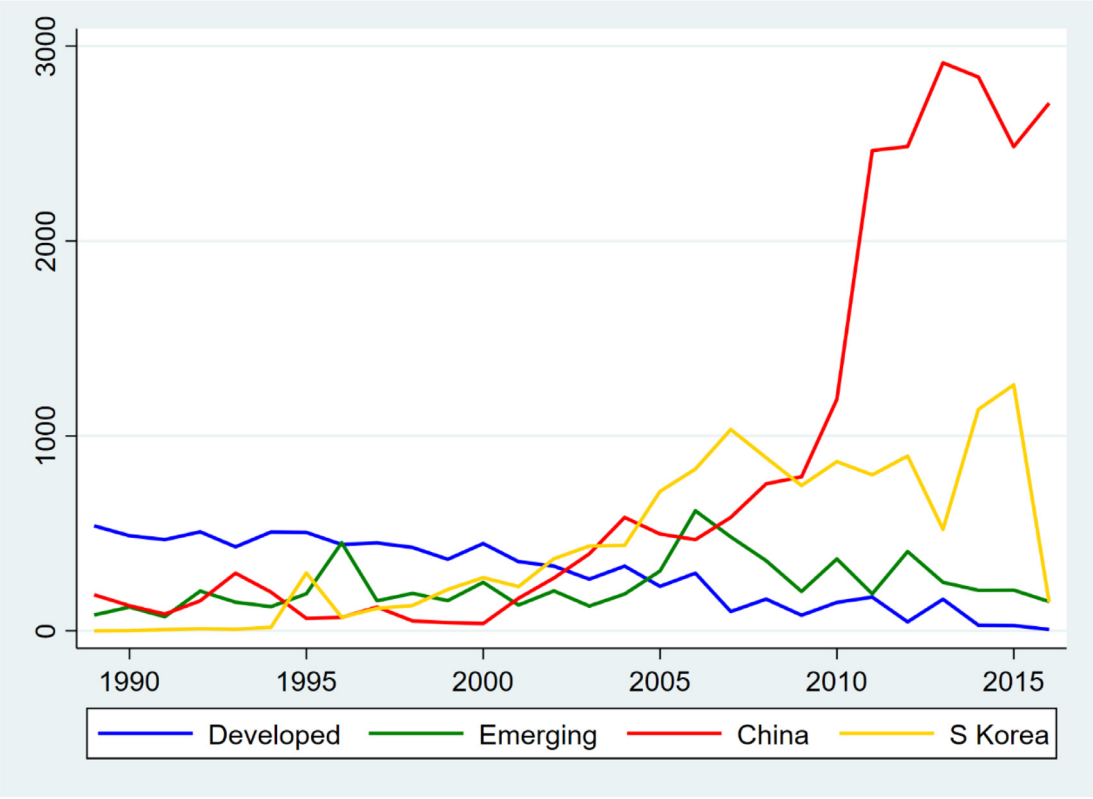

Fig. 1. North Korea's exports (in millions of current US dollars).

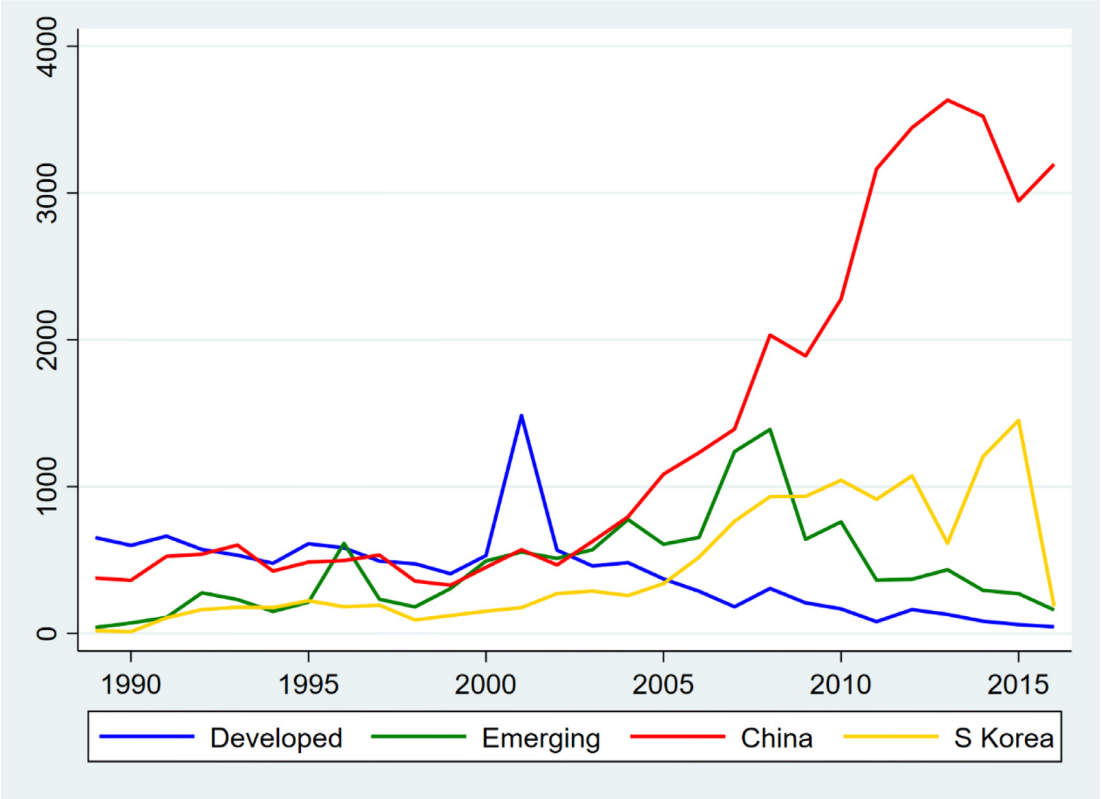

Fig. 2. North Korea's imports (in millions of current US dollars).

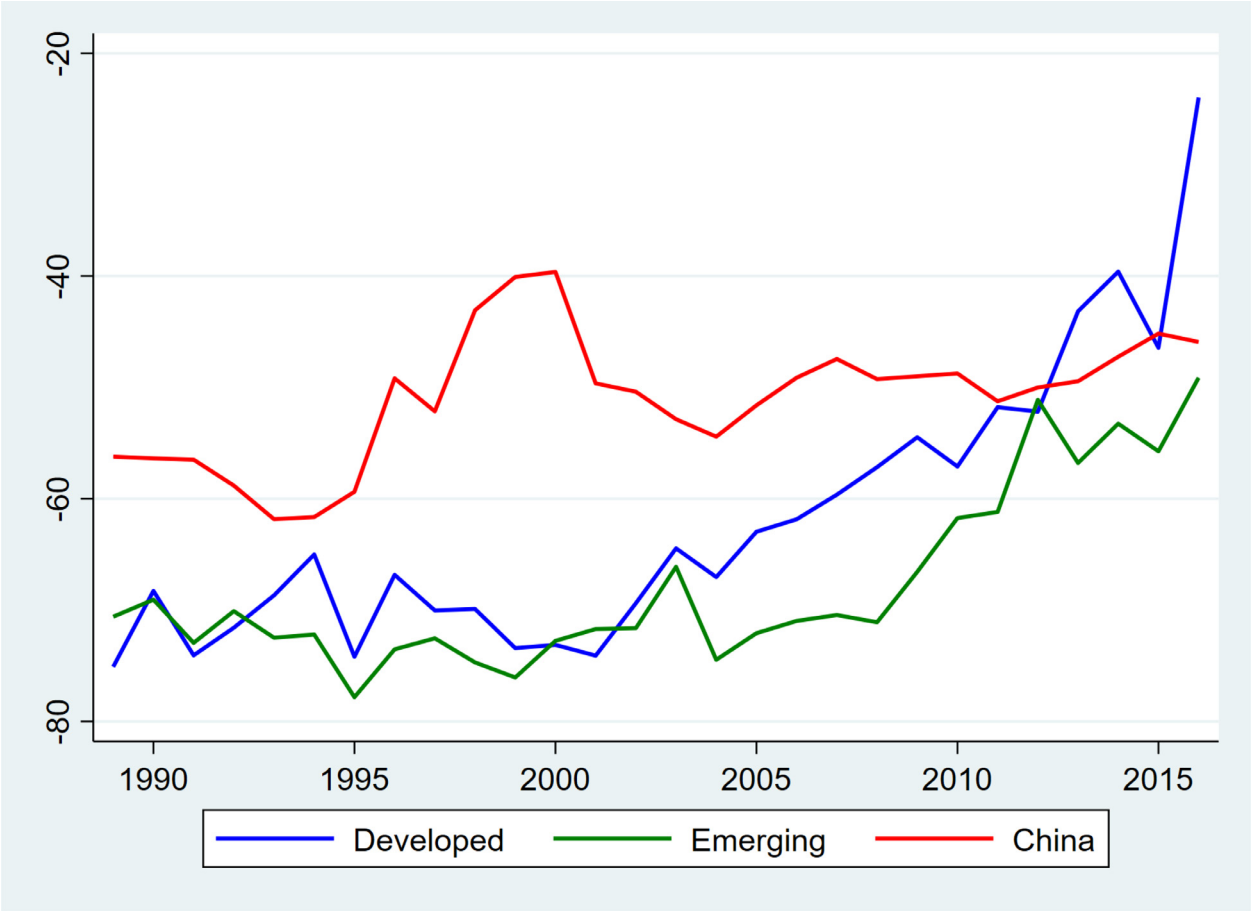

Fig. 3. North Korea's ad-valorem tariff equivalent of border effects (in%)
Note: The tariff equivalents are calculated using the estimates of the model with time-varying coefficients assuming an elasticity of substitution of 5.

is higher than its trade with South Korea, which is used as benchmark. Accordingly, the tariff equivalents have negative signs and thus can be interpreted as subsidies or lower tariffs relative to the trade between North and South Korea. China's negative tariff equivalent is 50–52%, compared to 67% for the rest of the world. Increasing the elasticity of substitution decreases the magnitude of the border effects but does not change the overall results. Developed countries and emerging economies face lower barriers to trade with North Korea than China but the difference between them is not significant. These findings suggest that once the effects of distance, contiguity, and economic size are controlled for, South Korea faces major hurdles in its trade relations with the North, so that other countries around the globe seem to be better integrated with North Korea. This makes sense given that the two Korean states are separated by one of the most hostile borders in the world and political tensions often lead to suspension of trade.

The fact that China faces higher border costs than developed or emerging economies indicates that given China's size and proximity, there is a much larger potential for trade with North Korea. The explanation might be that China trades with North Korea for reasons unrelated to economic benefits. While Chinese border regions in the Northeast rely heavily on trade with North Korea, China is overall much more involved in trade with South Korea, with which it has a free-trade agreement. Geopolitical factors are the main driver for trade with North Korea, while China has also been trying to comply with international sanctions against the North in recent years.

The sample period spans almost 30 year, making it very likely that the border effects have changed over time. To explore this aspect further, we estimate the model in Eq. (3) allowing the coefficients for the border effects to vary across time. The aggregated results in the third column of Table 2 show that the estimates are robust when compared to those in the second column. The variation of the negative ad-valorem tariff equivalents over the sample period is visualized in Fig. 3.

China appears to have experienced a major surge in border costs from the mid-1990s to the early 2000s when North Korea suffered an economic collapse that led to famine. Trade barriers declined in the early 2000s and remained relatively stable for the remainder of the sample period. Developed countries enjoyed fewer impediments to trade than China but since 2001 tariff equivalents started rising and experienced steep surges in later years. This trend was certainly shaped by the increasing confrontation between North Korea and Western countries and the ensuing economic and financial sanctions in the wake of the 2006 nuclear test conducted by the communist government. In fact, after 2012 developed countries were facing higher trade costs with North Korea than China. Emerging economies have also witnessed a deterioration in border effects since the mid-2000s, although the magnitude was not as drastic as in the case of developed economies and the levels remained lower than China's.

Lastly, it is worth mentioning that the increase in border effects since the 2000s might be partly due to the expansion of trade between North and South Korea thanks to the opening of the Kaesong Industrial Zone. Since South Korea's trade with the North serves as a benchmark, it is possible that even if the border effects would remain constant in absolute terms for the rest of the world, they would deteriorate relative to the shifting benchmark.

Table 2
Border effects of North Korea, 1989–2016.

	(1)			(2)		(3)	
$NK \times CHN$	2.76***	σ=5	−49.8	2.89***	−51.5	2.88***	−51.3
	(0.52)	σ=10	−26.4	(0.51)	−27.5	(0.52)	−27.4
$NK \times ROW$	4.38***	σ=5	−66.6				
	(0.76)	σ=10	−38.5				
$NK \times DEV$				4.14***	−64.5	4.05***	−63.7
				(0.76)	−36.9	(0.90)	−36.2
$NK \times EMER$				4.69***	−69.4	4.64***	−68.7
				(0.74)	−40.6	(0.90)	−40.3
ln($Distance$)							
	−1.38***			−1.47***		−1.46***	
	(0.18)			(0.17)		(0.169)	
$Contiguity$	2.25***			1.99***		1.98***	
	(0.19)			(0.23)		(0.238)	
$Constant$							
	−26.04***			−25.35***		−25.95***	
	(1.12)			(1.11)		(0.971)	
Obs.	986			986		986	
R^2	0.60			0.60		0.62	

Note: Robust standard errors are in parentheses. The tariff equivalent of the border effects (in%) is shown for two levels of the elasticity of substitution (σ). Models (3) uses time-varying coefficients and the border effect estimates and their standard errors are thus averages across all years. * $p<.10$; ** $p<.05$; *** $p<.01$.

5. Conclusion

This paper examines the trade of North Korea with the rest of world over the period 1989–2016. In particular, it studies the patterns of trade flows between North Korea and its major trading partners among developed and emerging economies. Furthermore, the paper quantifies the trade barriers of North Korea by employing a gravity model with border effects. This is an important topic given the recent tightening of economic sanctions against North Korea and questions regarding their effectiveness.

The results indicate that China and South Korea are the main trading partners of North Korea and account for a larger share of trade than all other major countries taken together. Developed countries, and especially the EU and Japan, maintained intense trade relations in the 1990s, but since the 2000s trade has declined to a point where it has almost ceased. This trend has been countered by emerging economies which saw their share of trade with North Korea increase substantially since the early 2000s. In recent years, however, this trade has slumped as well. China is the only country that has experienced sustained, and at times steep, increases in the trade volumes with North Korea. This process is likely to be driven by geopolitical factors rather than economic benefits, at least for China's national economy.

The estimation of the border effects provides supporting evidence for the aforementioned patterns. After controlling for the effects of distance, contiguity, and economic size, South Korea is found to face the highest barriers to trade among the four major groups of countries. Compared to South Korea, the other three groups experienced lower border costs reflected in negative ad-valorem tariff equivalents. Emerging economies are shown to be the ones facing the lowest frictions in trade with North Korea. One possible explanation is that in the face of declining trade with the West due to sanctions, North Korea was willing to reduce non-tariff trade barriers, while emerging economies felt less bound to participate in economic sanctions or chose to flout them. Developed economies recorded border costs that are slightly higher than those for emerging economies, while China faced the highest border costs, which were still lower relative to intra-Korean trade. This appears to confirm the previous result that China is not particularly interested in deeper trade relations with North Korea, and vice versa.

Furthermore, the findings indicate that border effects experienced dramatic changes over time. The trade barriers with China increased in the late 1990s but have been relatively stable since the mid-2000s. By contrast, developed countries have been facing rapidly rising trade costs with North Korea, which coincides with the deterioration in the relationship and the imposition of economic sanctions. In fact, if this tendency continues, developed countries will soon face the same border effects as South Korea. Emerging economies have also recorded higher trade costs since the late 2000s but the rise has been less pronounced than for developed countries.

Overall, the results point to a dire trade situation for North Korea in an environment of declining trade volumes and tightening sanctions. Although China has been increasing its trade relations, the results indicate that border effects have actually increased relative to those with South Korea. One limitation of the present paper is that it fails to account for trade flows that are not recorded in the official statistics. There are indications that North Korea attempts to break the tightening grip of the sanctions by trading via illicit channels.

In conclusion, it is worth mentioning that as long as border effects between North and South Korea remain higher than with other countries, economic integration between the two Korean states, or political unification for that matter, will remain a distant dream.

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