Online Appendix for

The Vulnerability Effect that Wasn't: Trade Dependence and Entry Bans on China at the Beginning of the COVID-19 Pandemic

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1. TRAVE RESTRICTIONS

Travel restrictions are a broad term that includes entry bans, visa restrictions, flight suspensions, or surveillance and monitoring at ports of entry. Of the various types and dimensions of travel restrictions, the kind of restrictions examined in this study target inbound travelers. For outbound travelers, home country governments can also issue travel warnings and advisories. In addition, although this study is limited to international travel restrictions, the WHO includes both domestic and international travel restrictions in its official protocol as a containment strategy against influenza pandemics (WHO 2007).

It is worth noting some of the differences between this study and past epidemiological research in terms of how they deal with travel restrictions. I note two main differences. First, epidemiological studies conducted before the COVID-19 pandemic rarely examined how policy makers decide on the imposition of travel restrictions as drastic as those seen in 2020. This may be due to the fact that the scale and severity of COVID-19 were simply unprecedented. Second, whereas this study focuses on the explicit travel ban and treats it as a dichotomous variable, previous analyses of travel restrictions included a wide range of measures, which were grouped together without much differentiation between their types and stringency levels. Furthermore, when they differentiate, past epidemiological studies have tended to focus on the least strict measures, such as travel advisories or screening at entry (Cowling et al. 2010).

2. DATA COLLECTION PROCEDURE FOR ENTRY RESTRICTIONS

The cut-off date for the entry restrictions is February 19, 2020. Starting from February 20, governments around the world began to issue entry restrictions to countries other than China. On February 20, the Iraqi government imposed a ban on border-crossings from Iran by foreigners (Barbarani, 2020).

1. Start with *Chinese National Immigration Administration* announcement dated Feb 16, 2020.
https://www.nia.gov.cn/n741440/n741542/c1245203/content.html

2. Cross-check and expand with the data collected by:

(1) Think Global Health, an initiative of the US Council on Foreign Relations (Kiernan and DeVita, 2020) https://www.thinkglobalhealth.org/article/travel-restrictions-china-due-covid-19

(2) COVID-19 Government Response Event Dataset (CoronaNet v. 1.0) https://www.coronanet-project.org/

3. Cross-check with official government statements (e.g. border control or immigration authorities, or tourism agencies) or official state media reports.

4. Consult media reports when official information is limited or unavailable.

5. Also consulted:

Washington Post FactChecker
https://www.washingtonpost.com/politics/2020/04/07/trumps-claim-that-he-imposed-first-china-ban/

6. Other datasets examined but not consulted:

(1) The Assessment Capacities Project (ACAPS) The #COVID19 Government Measures Dataset: This dataset provides no information on the introduction date of measures, including entry restrictions.
https://www.acaps.org/projects/covid19/data

(2) The Oxford Covid-19 Government Response Tracker: the international travel ban item (s7) includes bans on any country, and does not specifically code the target country, such as China.
https://covidtracker.bsg.ox.ac.uk/

TABLE A1. Classification of Entry Restrictions Imposed Related to COVID-19

Type	Mode	Measures
Explicit entry ban	refusal of entry	blanket ban; no entry by visitors from China
	refusal of entry	ban on entry to visitors who were in China 14 days before arrival
Visa restrictions	visa restrictions	suspension of no visa entry
	visa restrictions	suspension of visa on arrival issuance
	visa restrictions	suspension of e-visa issuance
	visa restrictions	suspension of visa issuance
	visa restrictions	visa cancelation
	visa restrictions	e-visa cancelation
Transport restrictions	suspension of flights	suspension of flights by state-owned airlines
	suspension of flights	suspension of all direct flights
	suspension of land transport	closure of land crossings
Partial entry ban	refusal of entry based on subnational geography	ban on entry to visitors departing from or traveling with a passport issued in subnational administrative units, such as Hubei, Zhejiang, or Jiangsu
Surveillance and monitoring	quarantine	mandatory institutional quarantine
	quarantine	mandatory self-quarantine
	quarantine	recommended self-quarantine
	surveillance	surveillance, monitoring

Source: Author's classification.

To construct the dataset, I first coded the full range of measures related to entry restrictions reported in the data sources, and I identified 16 distinctive categories (Table A1). Then, I classified them into five types according to the level of stringency.[1] Of the five types, the strictest and most direct is *explicit entry ban*, which includes (1) blanket entry bans for non-citizens traveling from China regardless how recently they have departed from the country, and (2) bans denying entry to visitors who are less than 14 days after visiting China. The denial for entry based on the 14-day incubation period of the virus is an important component of the latter. *Visa restrictions* consist of the suspension of preferential treatments (e.g., visa-free entry or visa on arrival), suspension of visa issuance operations, or visa cancelations. India, for example, suspended the issuance of new e-visas, which account for the majority of entry visas, and invalidated e-visas already issued to noncitizen travelers from China. Such measures are likely to reduce arrival volumes dramatically, but the extent to which they work as a *de facto* entry ban is uncertain *a priori*. Therefore, visa restrictions need to be separated from the "explicit entry ban" category. *Transport restrictions* target transport operations. They include suspension of international flights as well as control of land transport at border crossings. When targeting only individual routes, large loopholes are evident. Italy suspended direct flights from China in late January, but it was unable to implement full control against visitors from China due to the Schengen Agreement. Next, *partial entry bans*, termed as such for the lack of a better word, deny entry to visitors based on geographic sub-localities. Malaysia, South Korea, and Japan limited entry bans to visitors traveling from or with passports issued in Hubei, Zhejiang, or Jiangsu.[2] The final type of ban, *surveillance and monitoring*, includes surveillance and quarantine.

[1] When a country imposed multiple measures, I assigned the most stringent level to the country.
[2] South Korea only targeted Hubei while Japan targeted Hubei and Zhejiang. Malaysia added Jiangsu to the two provinces.

3. CHINESE TOURIST DATA

The share of Chinese visitors in a country's total international visitors for 2018 was calculated using raw data sourced from the Annual Yearbook of Tourism Statistics published by the World Tourism Organization (UNWTO), a specialized United Nations agency on tourism (2020). I also used Chinese inbound tourist statistics from the tourism agencies and statistical offices of individual countries, as well as regional statistical organizations such as ASEANstats and Eurostat, to check data consistency and to cover countries not included in the UNWTO data.

The best data for cross-border mobility may be global aviation data, whose high-frequency and airport-based information provides detailed information on global mobility down to the level of cities and towns. Complete global air travel passenger data are collected and maintained by private associations, most notably the International Air Transport Association (IATA) and the Official Airline Guide (OAG). The proprietary data, nonetheless, are expensive and remain largely out of reach for most individual researchers (Mao et al. 2015).

4. DATA SOURCES

TABLE A2: Data Sources

Variable	Source
Entry restrictions on China, as of Feb 19, 2020	Author's compilation; See Section 2 of this appendix.
Trade relations	Calculations using data from IMF DOTS (2020a), Taiwan Bureau of Trade (2020), KOTRA (2019)
Exports, imports and trade (% GDP)	IMF (2020a), World Bank (2020)
COVID-19 cases	Dong et al. (2020)
Visitor's from China (Chinese visitors as % total visitors)	Calculations using data from UNWTO (2020)
Distance	Mayer and Zignago (2011)
Population density	World Bank (2020), Mayer and Zignago (2011)
Population	World Bank (2020)
GDP	IMF WEO (2020b)
GDP pe capita	IMF WEO (2020b)
Health care expenditure per capita	World Bank (2020)
Physicians per 100,000	World Bank (2020)
Hospital bed per 100,000	World Bank (2020)
Life expectancy	World Bank (2020)
Democracy	Marshall, Gurr, and Jaggers (2019)
UN Voting	Bailey, Strezhnev, and Voeten (2017)
SARS cases	WHO (2003)
MERs cases	WHO (2019)

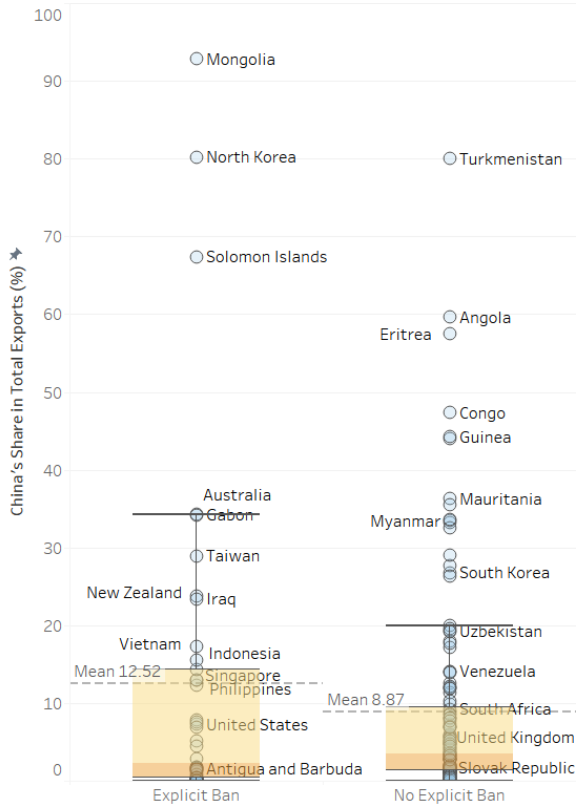
5. SUMMARY STATISTICS

TABLE A3: Summary Statistics (for the sample used for regression analysis, untrimmed)

Variable	N	Mean	Sd	Min	Max
Explicit entry ban	95	0.189	0.394	0	1
China's share in exports (%)	95	9.523	14.68	0.0342	92.78
China's share in imports (%)	95	13.12	8.009	0.811	40.26
China's share in total trade (%)	95	12.14	10.38	0.673	65.76
Trade balance with China/total trade	95	-2.606	8.283	-28.78	35.21
Total exports/GDP (%)	95	32.18	22.75	1.033	113.4
Total imports/GDP (%)	95	39.54	21.23	8.083	101.9
Total trade/GDP (%)	95	71.72	40.94	9.325	215.3
COVID-19 cases as of Feb 18, 2020 (case per 100,000 persons)	95	20.50	147.7	0	1,437
Visitors from China/total visitors (%)	95	5.066	7.889	0.0101	32.65
Distance (km)	95	8,216	3,927	1,168	19,110
Population density (person per sq. kms)	95	216.2	892.2	2.069	8,729
Population (million)	95	45.76	143.9	0.591	1,334
GDP (US$ billion)	95	697.9	2,236	1.378	20,580
GDP per capita (US$)	95	20,217	22,776	448.7	115,536
Health care expenditure per capita (US$)	95	1,686	2,254	38.32	10,624
Physicians per 100,000	95	2.850	1.890	0.0721	8.420
Hospital bed per 100,000	95	3.508	2.570	0.300	12.98
Life expectancy	95	76.05	5.522	52.80	84.21
Political regime	95	5.105	6.276	-10	10
UN Voting	95	0.853	0.643	0.0133	3.025
SARS cases (100,000 persons)	95	5.744	43.82	0	422.1
MERS cases (100,000 persons)	95	9.617	64.24	0	615.9
Asia	95	0.232	0.424	0	1
Latin America	95	0.168	0.376	0	1
Middle East and North Africa	95	0.137	0.346	0	1
Sub-Saharan Africa	95	0.0421	0.202	0	1

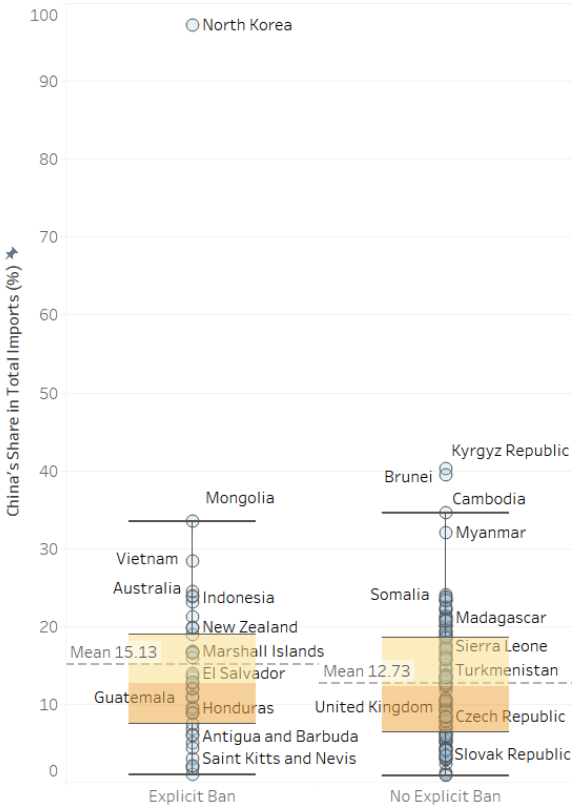
6. TRADE DEPENENCE AND ENTRY BAN

FIGURE A1: Exports and Entry Ban



NOTE: Trade data are from 2018.
SOURCE: By author and IMF DOTS (2020a), Taiwan Bureau of Trade (2020), KOTRA (2019).

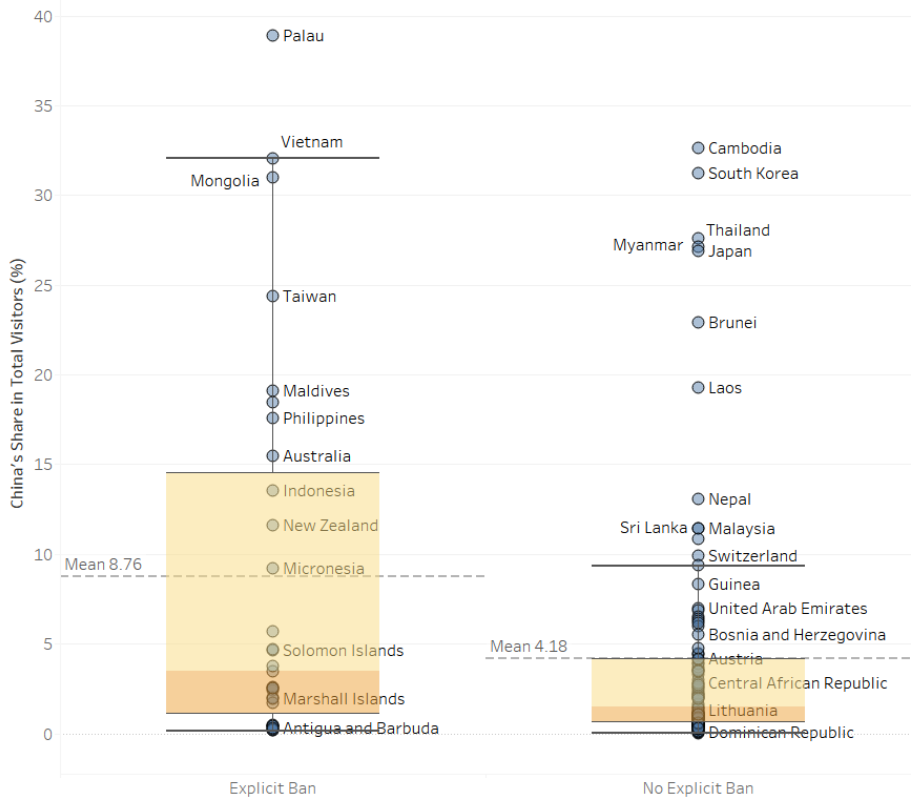
FIGURE A2: Imports and Entry Ban



NOTE: Trade data are from 2018.
SOURCE: By author and IMF DOTS (2020a), Taiwan Bureau of Trade (2020), KOTRA (2019).

7. TRAVEL LINKS AND ENTRY BAN

FIGURE A3: Travel Links and Entry Ban



NOTE: Visitor data are from 2018.
SOURCE: Author's calculations using data from UNWTO.

8. TRIMMED DATA

TABLE A4. Trimmed Observations

		Trimmed due to trade variables	Trimmed due to trade variables and dropped due to missing control variables	Trimmed due to trade variable and with control variables intact*
Variable	Value	Country	Country	Country
China's share in export (%)	0.0015558	Dominica	Dominica	
	0.0003529	Kiribati	Kiribati	
	92.78017	Mongolia		Mongolia (explicit ban)
China's share in import (%)	0.8113891	Bhutan		Bhutan (no ban)
	97.21	North Korea	North Korea	
China's share in total trade (%)	0.6728982	Bhutan		Bhutan (no ban)
	95.76	North Korea	North Korea	
Trade balance with China/total trade	61.4178	Turkmenistan	Turkmenistan	
	-62.78988	North Korea	North Korea	

NOTE: * indicates observations that are absent in the trimmed dataset and present in the untrimmed dataset due to trimming only.

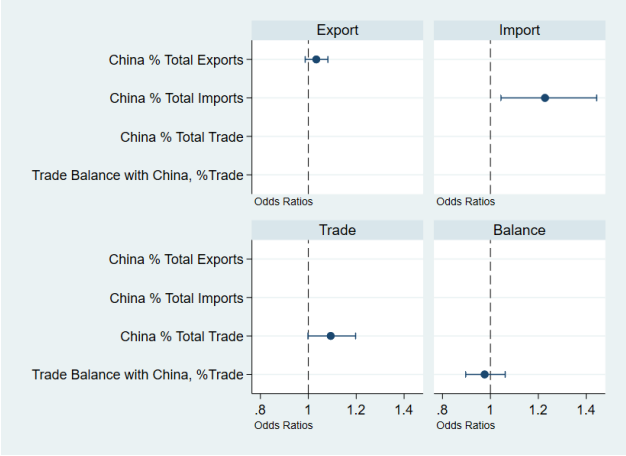
9. VISUALIZED MAIN RESULTS

FIGURE A4: Plotting Regression Coefficients of Main Results (Table 2 in the Main Article)

NOTE: The plots were created by coefplot, a STATA module to graph results from estimation (Jann 2013).

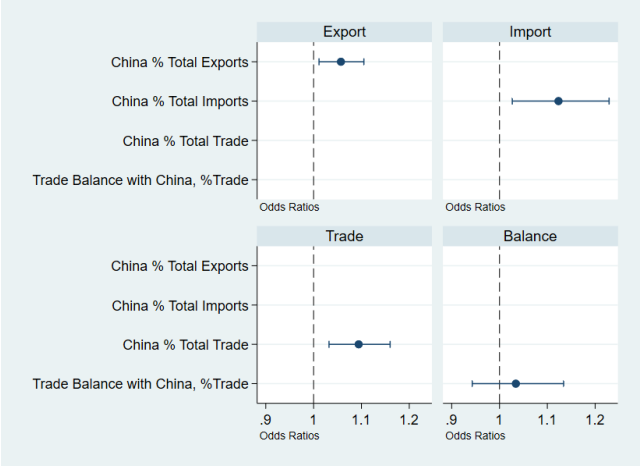
10. VISUALIZED RESULTS OF ROBUSTNESS CHECKS

FIGURE A5: Plotting Regression Coefficients: DV Expanded to Include Visa Restrictions



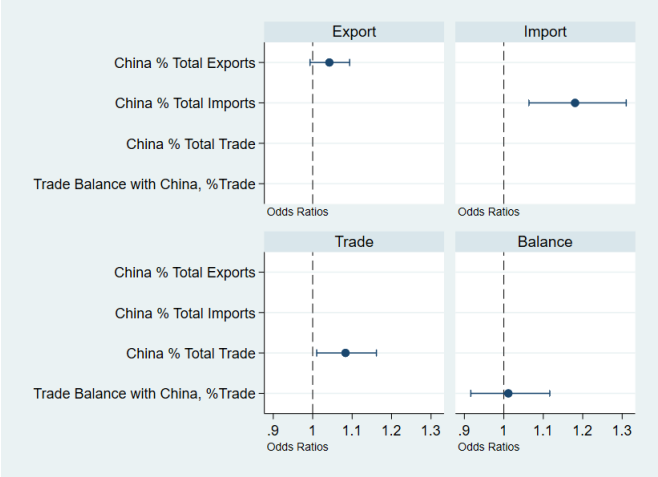
NOTE: The plots were created by coefplot, a STATA module to graph results from estimation (Jann 2013).

FIGURE A6: Plotting Regression Coefficients: Ordinal Logit



NOTE: The plots were created by coefplot, a STATA module to graph results from estimation (Jann 2013).

FIGURE A7: Plotting Regression Coefficients of Main Model Using Untrimmed Data



NOTE: The plots were created by coefplot, a STATA module to graph results from estimation (Jann 2013).

11. MULTICOLLINEARITY

It may be necessary to test for multicollinearity since China's share in a country's trade (in various specifications) and that country's trade openness (trade over GDP) may be highly correlated and can lead to unstable results.

In a linear model, multicollinearity can be detected using variance inflation factor (vif). However, testing for multicollinearity in a non-linear model as used in this paper, is not straightforward and the solution is not readily available.

As a second-best alternative, I re-estimated the logistic regression by omitting potentially highly correlated variables such as export openness, import openness, and trade openness in each specification. The results remain the same. See Table A5 below.

TABLE A5. Logit Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Exports to China/total exports (%)	1.024						
	(0.930)						
Total exports/GDP (%)		0.974					
		(-1.593)					
Imports from China/total imports (%)			1.183***				
			(3.181)				
Total imports/GDP (%)				0.981			
				(-0.991)			
Trade with China/total trade (%)					1.087**		
					(2.384)		
Total trade/GDP (%)						0.986*	
						(-1.689)	
Trade balance with China/total trade							1.007
							(0.139)
Constant	12.162	70.300	3.774	290.884	43.807	173.775	115.706
	(0.293)	(0.578)	(0.174)	(0.702)	(0.472)	(0.674)	(0.596)
Observations	94	95	94	95	94	95	95

NOTE: Odds ratios reported; Trimmed data used; Specifications follow Table 2 in the article; Control variables not shown; Robust z-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1.

12. MEASURES USED IN THE LIBERAL PEACE LITERATURE

The measures used in the liberal peace literature, particularly in the fashion of the ratio of bilateral exports or imports to GDP, are not used in the robustness check because they are not conceptually relevant to the current study. The results using these measures, which are reported below nonetheless, do not contradict the overall findings of this study.

TABLE A6. Logit Results

	(1)	(2)	(3)	(4)
Exports to China/GDP (%)	53.173	11,769.169		
	(0.588)	(1.425)		
Total exports/GDP (%)		0.958*		
		(-1.882)		
Imports from China/GDP (%)			10.761	1,887,472.890
			(0.160)	(0.698)
Total imports/GDP (%)				0.967
				(-1.004)
Constant	125.036	141.622	43.614	290.067
	(0.556)	(0.570)	(0.464)	(0.699)
Observations	93	93	93	93

NOTE: Odds ratios reported; Trimmed data used; Specifications follow Table 2 in the article; Control variables not shown; Robust z-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1.

13. REFERENCES

Barbarani, Sofia "Iraq Extends Ban on Iran Arrivals amid Coronavirus Fears," *Coronavirus Pandemic News | Al Jazeera*, February 22, 2020. https://www.aljazeera.com/news/2020/2/22/iraq-extends-ban-on-iran-arrivals-amid-coronavirus-fears.

China National Immigration Administration. 2020. "Notice on Recent Entry Restrictions." February 16, Accessed on February 26, 2020. https://www.nia.gov.cn/n741440/n741542/c1245203/content.html

Cheng, Cindy, Joan Barceló, Allison Spencer Hartnett, Robert Kubinec, and Luca Messerschmidt. 2020. "COVID-19 Government Response Event Dataset (CoronaNet v. 1.0)." *Nature Human Behaviour* 4:7, 756-768. https://www.coronanet-project.org.

Cowling, Benjamin J., Lincoln L.H. Lau, Peng Wu, Helen W.C. Wong, Vicky J. Fang, Steven Riley and Hiroshi Nishiura. 2010. "Entry Screening to Delay Local Transmission of 2009 Pandemic Influenza A (H1N1)." *BMC Infectious Diseases* 101, 82.

[Dataset] Dong, Ensheng, Hongru Du, and Lauren Gardner. 2020. "An Interactive Web-Based Dashboard to Track COVID-19 in Real Time." *The Lancet Infectious Diseases* 20:5, 533–34.

[Dataset] International Monetary Fund (IMF). 2020a. Direction of Trade Statistics. Accessed on March 8, 2020 https://data.imf.org/

[Dataset] International Monetary Fund (IMF). 2020b. "World Economic Outlook, April 2020: The Great Lockdown." Accessed on July 11, 2020. https://www.imf.org/en/Publications/WEO/Issues/2020/04/14/weo-april-2020

Jann, Ben 2013. "COEFPLOT: Stata Module to Plot Regression Coefficients and Other Results." Statistical Software Components S457686, Boston College Department of Economics. Revised November 23, 2021.

Kiernan, Samantha and Madeleine DeVita. 2020. "Travel Restrictions on China Due to COVID-19: A New Global Tracker Mapping the Impact of the New Coronavirus on Movement Around the World," *Think Global Health*, April 6. Accessed on May 14, 2020. https://www.thinkglobalhealth.org/article/travel-restrictions-china-due-covid-19

KOTRA [Korea Trade-Investment Promotion Agency]. 2019. *2018 Bukhan daeoe muyeog donghyang* [2018 North Korea Foreign Trade Trends]. KOTRA 19-052. https://kosis.kr/bukhan/extrlPblictn/selectExtrnlCmmrcTrend.do?menuId=M_03_02_05

[Dataset] Marshall, M. G., Gurr, T. R., & Jaggers, K. 2019. Polity IV project: Political Regime Characteristics and Transitions, 1800-2018. Center for Systemic Peace. Accessed on March 27, 2020 http://www.systemicpeace.org

Mao, Liang, Xiao Wu, Zhuojie Huang, and Andrew J. Tatem. 2015. "Modeling Monthly Flows of Global Air Travel Passengers: An Open-Access Data Resource." *Journal of Transport Geography* 48, 52–60.

[Dataset] Mayer, Thierry and Soledo Zignago. 2011. "Notes on CEPII's Distances Measures: the GeoDist Database." CEPII Working Paper 2011-25.

[Dataset] Taiwan Bureau of Foreign Trade, Ministry of Economic Affairs. 2020. Trade Statistics. Accessed on March 8, 2020 https://www.trade.gov.tw/English/

[Dataset] World Bank. 2020. World Development Indicators. Accessed on January 29, 2022 http://data.worldbank.org

World Health Organization (WHO). 2003. "Cumulative Number of Reported Probable Cases of Severe Acute Respiratory Syndrome (SARS) from 1 Nov 2002 to 28 May 2003."

World Health Organization (WHO). 2007. *WHO Interim Protocol: Rapid Operations to Contain the Initial Emergence of Pandemic Influenza*. (WHO/CD/EPR/2007/6)

World Health Organization (WHO). 2019. "WHO MERS Global Summary and Assessment of Risk." July 2019.

World Tourism Organization (UNWTO). 2020. Yearbook of Tourism Statistics: Data 2014–2018. Madrid: World Tourism Organization.