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**MEASURES OF ECONOMIC
VULNERABILITY AND INTER-DEPENDENCY
IN THE GLOBAL ECONOMY**

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Abstract

Amidst the on-going US-China trade and technology war, as well as supply chain disruptions owing to the COVID-19 pandemic, issues of economic diversification and resilience have increasingly occupied policymakers and businesses alike. Yet despite the ascendance of these policy issues, identifying, measuring, and evaluating levels of economic risk, vulnerability, and inter-dependence to generate policy action is not always a straightforward and clear process. Moreover, although much has been written on economic inter-dependence, less is known about the vulnerabilities of the vast majority of countries. In other words, how might we measure and quantify economic dependency and vulnerability? How would we normatively evaluate these factors? Are certain countries more economically dependent and vulnerable than others? Similarly, how might we recognise appropriate diversity in risk-exposure? In this paper, we develop the indices of vulnerability and inter-dependence to address the aforementioned issues. As a quantitative gauge of levels of vulnerability and inter-dependence across countries, these indicators are intended to serve as instruments in the formulation of national economic policies and address concerns over economic security by enabling cross-country comparisons and the qualitative assessments of economic dependency and vulnerabilities.

Introduction

From early-2018, economic diversification and decoupling with respect to participation in the global economy increasingly occupied the minds of policymakers and businesses as President Trump's "trade war" against a number of trading partners, in particular China, ramped up.¹ At the heart of these disagreements is the Trump administration's perception that American industries and workers, and by extension its economy, have been disadvantaged through a range of unfair practices employed by its trading partners. The Trump administration's response was to confront its partners assertively and unilaterally raise barriers to trade, resorting primarily to tariffs and quotas, if an acceptable solution was not forthcoming. This has disrupted the flow and increased the cost of trade. These actions have had the greatest bearing on China where barriers (heightened tariffs) have been imposed for the longest period and trade volumes are substantial.² Repercussions have also been felt beyond China and the United States as the wide use of global supply chains spans multiple countries, as well as the complexity of contemporary global economic flows.

As the "trade war" with China escalated and continued into 2019, the idea of diversifying economic links to avoid the fallout from the US-China "trade war" gained increasing traction among policymakers and businesses. This was compounded by two developments: Trump's "trade war" with China morphing into a "tech war" with Chinese technology firm Huawei as its primary target and the onset of the COVID-19 pandemic in early-2020. The "tech war" further underlined structural tensions in the relationship between China and the United States and access to the US market, while the pandemic vividly illustrated gaping holes in many countries' access to emergency medical supplies and "essential" goods. In combination, these events sensitised policymakers and business actors to economic and business risks, dependencies, and vulnerabilities that might have hitherto been present but did not previously pose serious issues. Concerns over related concepts such as economic "resilience" and diversification also began to surface. Major business and media groups began to conduct and report surveys of firms' intentions to "decouple" from China (see for instance Mitchell 2020). The Taiwanese (in 2018) and Japanese (in 2020) governments offered their firms financial incentives to relocate their production facilities from China back home or to third countries.

Despite the ascendance of these debates and policy issues, the move from conceptual discussions of economic risk and vulnerability to tangible business or policy action is not always clear. Since very few countries would contemplate absolute autarchy, and given that very few, if any,

¹ The Peterson Institute of International Economics maintains a timeline of the United States multi-faceted "trade war" which can be accessed at the following link: Bown, Chad P., and Melina Kolb. "Trump's Trade War Timeline: An Up-to-Date Guide." *Peterson Institute for International Economics*, December 18, 2020. www.piie.com/blogs/trade-investment-policy-watch/trump-trade-war-china-date-guide.

² A chart on tariffs imposed by China and the United States on bilateral trade over the course of the "trade war" can be found on: Bown, Chad P. "US-China Trade War Tariffs: An Up-to-Date Chart." Peterson Institute of International Economics, February 14, 2020. www.piie.com/research/piie-charts/us-china-trade-war-tariffs-date-chart

economic transactions carry zero risks or vulnerability, the question is not whether economic risks and vulnerabilities exist but rather how we identify levels or types of economic risks and vulnerabilities and whether those demand tangible action. In other words, how might we measure and quantify economic dependency or vulnerability? How would we normatively evaluate this measurement? Are certain countries more economically dependent or vulnerable than others? Similarly, how might we recognise appropriate diversity in risk-exposure?

Motivated by these debates, this paper develops measures of economic vulnerability and inter-dependency that arise from participation in the global economy. We call these measures indices of vulnerability and inter-dependence. They are intended to assist with identifying levels of risks and vulnerability, and to enable qualitative assessments of exposure. These indices will also facilitate cross-national comparisons, and indirectly act as benchmarks for assessment purposes. These indices might ultimately serve as instruments in the formulation of national economic policies and help address some of the concerns underlying the debates outlined above.

In the next section, we briefly survey how the concepts of economic vulnerability and dependency have hitherto been understood and operationalised in the literature. We then discuss and elaborate on our proposed measures of economic vulnerability and inter-dependency. We conclude by illustrating how empirical findings from the use of these measures can usefully illuminate debates that we briefly outlined earlier.

Conceptualisations of “Economic Vulnerability” and “Economic Dependence”

Although much ink has been spilled on economic inter-dependence, inquiries into vulnerabilities have so far focused on their potential impact on power, conflict, and the effectiveness of sanctions.³ Conceptualisations of inter-dependence and their operationalisations have drawn limited scrutiny, barring some animated debate stretching into the new millennium.⁴

³ See, for instance, Erik Gartzke, Quan Li, and Charles Boehmer, "Investing in the Peace: Economic Interdependence and International Conflict," *International Organization* 55, no. 2 (2001); and Peksen Dursun and Timothy M Peterson, "Sanctions and Alternate Markets: How Trade and Alliances Affect the Onset of Economic Coercion," *Political Research Quarterly* 69, no. 1 (2016), <https://doi.org/10.1177/1065912915620049>.

⁴ Albert O. Hirschman, *National power and the structure of foreign trade*, The Politics of the International Economy, (Berkeley: University of California Press, 1980); David A. Baldwin, "Interdependence and Power: A Conceptual Analysis," *International Organization* 34, no. 4 (1980); Jean-Marc F Blanchard and Norrin M. Ripsman, "Measuring Economic Interdependence: A Geopolitical Perspective," *Geopolitics and international Boundaries* 1, no. 3 (1996), <https://doi.org/10.1080/13629379608407567>; Mark J. C. Crescenzi, "Economic Exit, Interdependence and Conflict," *The Journal of Politics* 65, no. 3 (2003), <https://doi.org/10.1111/1468-2508.00213>; Edward D. Mansfield and Brian Pollins, eds., *Economic Interdependence and International Conflict: New Perspectives on an Enduring Debate*, Michigan Studies in International Political Economy (Ann Arbor: University of Michigan, 2003); and Erik Gartzke and Quan Li, "Measure for Measure: Concept Operationalization and the Trade Interdependence-Conflict Debate," *Journal of Peace Research* 40 (2003), <https://doi.org/10.1177/00223433030405004>.

There is a longstanding definition of economic inter-dependence, sensitivity, and vulnerability deployed in international political economy (IPE). Inter-dependence broadly refers to reciprocal economic relations marked by costs of interconnectedness. As subsets of inter-dependence, sensitivity and vulnerability are distinguished by degrees of harm and capacity for footing the costs of disruption.⁵ Fundamentally, sensitivity refers to covariance or ripple effects transmitted between partner economies, be they intentional political-economic shocks or otherwise. Vulnerability, meanwhile, connotes relations that are costly to disrupt and/or replace, with these exit costs being borne symmetrically or asymmetrically between partners. Export restrictions, for instance, inflict sensitivity but not vulnerability if countries can source those same products from elsewhere or reverse policy through diplomatic channels. What sets vulnerability apart is hence structural dependence, generally with regards to securing strategic imports⁶, that is difficult to mediate due to unviable or inadequate policy options.

The standardised definition notwithstanding, measures of economic inter-dependence reflect greater divergence. The literature treats openness as a primary indicator — the logic being that bilateral trade as a share of national income or GDP shows dollar values and trade volumes that, if disrupted, would be forfeited.⁷ Others gauge inter-dependence via bilateral trade intensity [share of partner's trade in total trade], trade symmetry [the greater importer and/or exporter is more vulnerable], and trade dependence [bilateral trade intensity as a share of GDP].⁸ Some studies treat vulnerability as a function of diversification, e.g., the trade partner concentration and commodity concentration of exports indices.⁹ Under these rubrics, economies exporting to a limited number of countries, or a small bandwidth of products, are considered more vulnerable.

⁵ R.O. Keohane and J.S. Nye, *Power and Interdependence: World Politics in Transition* (Little, Brown, 1977). ; Hirschman, *National power and the structure of foreign trade*; Baldwin, "Interdependence and Power: A Conceptual Analysis."; Blanchard and Ripsman, "Measuring Economic Interdependence: A Geopolitical Perspective."; and Mansfield and Pollins, *Economic Interdependence and International Conflict: New Perspectives on an Enduring Debate*.

⁶ See Blanchard and Ripsman, "Measuring Economic Interdependence: A Geopolitical Perspective." See also Eshita Gupta, "Oil vulnerability index of oil-importing countries," *Energy Policy* 36, no. 3 (2008), <https://doi.org/https://doi.org/10.1016/j.enpol.2007.11.011>; John Ravenhill, "Resource Insecurity and International Institutions in the Asia-Pacific Region," *The Pacific Review* 26, no. 1 (2013), <https://doi.org/10.1080/09512748.2013.755364>; and Willeke Veninga and Rico Ihle, "Import vulnerability in the Middle East: effects of the Arab spring on Egyptian wheat trade," *Food Security* 10, no. 1 (2018), <https://doi.org/10.1007/s12571-017-0755-2>.

⁷ Edward D. Mansfield, *Power, Trade, and War* (Princeton University Press, 1995); and Gartzke and Li, "Measure for Measure: Concept Operationalization and the Trade Interdependence-Conflict Debate."

⁸ Hirschman, *National power and the structure of foreign trade*; John R. Oneal and Bruce M. Russett, "The Classical Liberals Were Right: Democracy, Interdependence, and Conflict, 1950-1985," *International Studies Quarterly* 41, no. 2 (1997), <http://www.jstor.org/stable/3013934>; John R. Oneal and Bruce M. Russett, "Assessing the Liberal Peace with Alternative Specifications: Trade Still Reduces Conflict," *Journal of Peace Research* 36, no. 4 (1999), <http://www.jstor.org/stable/425297>; Katherine Barbieri, "Economic Interdependence: A Path to Peace or a Source of Interstate Conflict?," *Journal of Peace Research* 33, no. 1 (1996), <http://www.jstor.org/stable/425132>; and Katherine Barbieri, *The Liberal Illusion: Does Trade Promote Peace?* (University of Michigan Press, 2002).

⁹ Hirschman, *National power and the structure of foreign trade*; and Richard Rosecrance and Arthur Stein, "Interdependence: Myth or Reality?," *World Politics* 26, no. 1 (1973), <https://doi.org/10.2307/2009915>.

Departing from approaches centred on trade salience and diversification, which they argue demonstrates sensitivity rather than vulnerability, Blanchard and Ripsman¹⁰ focus on trade composition in their four-step strategic goods test. It analyses essential goods to national strategic industries; their exposure to trade, investment, and conflict shocks; and available policy tools for mitigating import vulnerability. More recent work similarly probes the ease and cost of disruption. This includes analysing exit costs via demand elasticities, for instance, and use of third-party states or allies as substitute markets¹¹— albeit mostly in the context of merchandise trade.

Tellingly, data availability has hindered the use of trade-plus inter-dependence measures in general, though the landscape of the literature is changing. These studies involve calculating portfolio and FDI flows as a percentage of total GDP, alongside binary coding for the presence of fixed exchange rate systems vis-à-vis other partner economies.¹² A smaller body of work has similarly probed services trade and migration inter-dependence, though they offer no quantitative measure.¹³

There are certain limitations to the above treatment of inter-dependence and related concepts. Vulnerability viewed through the prism of structural dependence overlooks political-security and cultural considerations, which feed into risk appetites and are factored into distinctions made between acceptable and unacceptable dependencies. Perhaps more critically for our purposes, the literature does not inform us of the actual vulnerabilities of the vast majority of countries and avenues for managing these dependencies. Research on economic inter-dependence and conflict is an exercise in establishing causality between the two factors via regression analyses¹⁴; it does not provide cross-country assessments of vulnerability. Studies on the effectiveness of sanctions essentially interrogate whether and under what conditions sender countries can best exploit chinks in economic armour¹⁵.

¹⁰ "Measuring Economic Interdependence: A Geopolitical Perspective."

¹¹ Crescenzi, "Economic Exit, Interdependence and Conflict."; Timothy M Peterson, "Dyadic Trade, Exit Costs, and Conflict," *Journal of Conflict Resolution* 58, no. 4 (2014), <https://doi.org/10.1177/0022002713478794>; and Dursun and Peterson, "Sanctions and Alternate Markets: How Trade and Alliances Affect the Onset of Economic Coercion."

¹² Gartzke, Li, and Boehmer, "Investing in the Peace: Economic Interdependence and International Conflict."; Richard Rosecrance and Peter Thompson, "Trade, Foreign Investment and Security," *Annual Review of Political Science* 6, no. 1 (2003), <https://doi.org/10.1146/annurev.polisci.6.121901.085631>; and Mark Souva and Brandon Prins, "The Liberal Peace Revisited: The Role of Democracy, Dependence, and Development in Militarized Interstate Dispute Initiation, 1950–1999," *International Interactions* 32, no. 2 (2006), <https://doi.org/10.1080/03050620600719361>.

¹³ Alexander Betts and Lucie Cerna, "High-Skilled Labour Migration," *Global Migration Governance* (2011), <https://doi.org/10.1093/acprof:oso/9780199600458.003.0003>; Gerasimos Tsourapas, "Labor Migrants as Political Leverage: Migration Interdependence and Coercion in the Mediterranean," *International Studies Quarterly* 62, no. 2 (2018), <https://doi.org/10.1093/isq/sqx088>; and Darren J. Lim, Victor A. Ferguson, and Rosa Bishop, "Chinese Outbound Tourism as an Instrument of Economic Statecraft," *Journal of Contemporary China* 29, no. 126 (2020), <https://doi.org/10.1080/10670564.2020.1744390>.

¹⁴ See, for instance, Gartzke, Li, and Boehmer, "Investing in the Peace: Economic Interdependence and International Conflict."; Rosecrance and Thompson, "Trade, Foreign Investment and Security."; Souva and Prins, "The Liberal Peace Revisited: The Role of Democracy, Dependence, and Development in Militarized Interstate Dispute Initiation, 1950–1999."; and Zeev Maoz, "The Effects of Strategic and Economic Interdependence on International Conflict across Levels of Analysis," *American Journal of Political Science* 53, no. 1 (2009), <http://www.jstor.org/stable/25193877>.

¹⁵ Dursun and Peterson, "Sanctions and Alternate Markets: How Trade and Alliances Affect the Onset of Economic Coercion."; Eugene Gholz and Llewelyn Hughes, "Market structure and economic sanctions: the 2010 rare earth elements episode as a pathway case of market adjustment," *Review of International Political Economy* (2019), <https://doi.org/10.1080/09692290.2019.1693411>; Sajjad Faraji Dizaji et al., *What the*

They delve less into how target states, rather than affected firms¹⁶, understand their dependencies and overcome punitive measures. Where certain offshoots of IPE do examine the related concepts of vulnerability and resilience, this is mostly in the context of least developed countries and small states.¹⁷

Proposed Measures of Economic Vulnerability and Inter-dependency

We build on foundations laid by some of the work identified above. Notably, we employ multiple types of economic flows and newly available data to construct indices that enable normative assessments of vulnerability. In particular, we construct these indices as empirical tools to facilitate the analysis of issues of contemporary relevance.

Consistent with much of the literature, we understand economic vulnerability and inter-dependency in a general manner as economic transactions that can potentially be disrupted as a consequence of action taken by or unexpected events occurring with a trade partner. The past decade has offered vivid examples of potential actions or unexpected events that have disrupted global economic flows. In 2010, China restricted its exports of rare earths which led to a huge rise in the price of the commodity in global markets. In 2011, a natural disaster in Japan's Fukushima Prefecture interrupted the global supply chain of the tech industry. From 2018 to 2020, the United States unilaterally threatened to slap tariffs and quotas on exports from a number of countries to pursue trade-related and national security objectives. More recently, COVID-19 disrupted global economic flows.

In order to measure economic vulnerability and inter-dependence, our starting point is the notion of "bilateral trade intensity" but we expand this to include other types of economic flows. In other words, "bilateral economic transactions intensity". This expanded and more generalised measure arguably better reflects the growing importance of cross-border economic flows other than trade, and the comprehensive approach with which economic vulnerability and inter-dependence is now discussed among policymakers. We include in our indices the following cross-border economic flows:

- exports and imports of goods and services, and
- cross-border financial flows that include foreign direct investment and remittances.

political economy literature tells us about blockades and sanctions, International Institute of Social Studies of Erasmus University (ISS) (2020), <http://hdl.handle.net/1765/130655>; and Lim, Ferguson, and Bishop, "Chinese Outbound Tourism as an Instrument of Economic Statecraft."

¹⁶ See, for instance, Xianwen Chen and Roberto Javier Garcia, "Economic sanctions and trade diplomacy: Sanction-busting strategies, market distortion and efficacy of China's restrictions on Norwegian salmon imports," *China Information* 30, no. 1 (2016), <https://doi.org/10.1177/0920203x15625061>.

¹⁷ Lino Briguglio et al., "Economic Vulnerability and Resilience: Concepts and Measurements," *Oxford Development Studies* 37, no. 3 (2009), <https://doi.org/10.1080/13600810903089893>; and Matthew Louis Bishop, "The political economy of small states: Enduring vulnerability?," review of *Profiling Vulnerability and Resilience: A Manual for Small States*, L. Briguglio, G. Cordina, S. Vella, C. Vigilance; *The Diplomacies of Small States: Between Vulnerability and Resilience*, A. F. Cooper, T. M. Shaw; *Small States in International Relations*, C. Ingebritsen, I. Neumann, S. Gstohl, J. Beyer, *Review of International Political Economy* 19, no. 5 (2012), <http://www.jstor.org/stable/42003243>.

These types of economic flows cover the most significant and the majority of most countries' external economic transactions. They can be measured relatively easily and are, for the most part, widely reported, both of which are helpful in the construction of quantitative measures with which assessments about dependency and vulnerability can be made.

We describe as an example the calculation of bilateral trade intensity. Say, the total value of Country A's exports to Country B is \$X million. This quantified measure of \$X million gives us some information with which a policymaker can make an assessment about Country A's export vulnerability to Country B. In practice, this single value (of \$X million) will not be sufficient for a good analysis. It needs to be supplemented with additional information such as how the value of \$X million compares with Country A's exports to other economic partners — in other words, the relative values of Country A's exports to various economic partners.

What we have just described represents the general approach of our proposed measures of economic vulnerability and inter-dependency. However, instead of measuring just trade flows, our measures or indices of economic vulnerability or inter-dependency are constructed by identifying and aggregating the values of different types of economic flows (trade in goods, trade in services, FDI, remittances, etc.) for each of Country A's various economic partners, which we discuss in greater detail in the following section. We thus build on existing work on trade dependency measures found in existing literature.

Economic vulnerability vs economic inter-dependency

In this paper, we construct two indices using the following datasets and computation:

Table 1: Overview of indices of economic vulnerability and inter-dependency

Economic Flow	Source	Index of Economic Vulnerability	Index of Economic Inter-dependency
Trade in Goods	IMF Direction of Trade Statistics	Exports only	Exports and Imports
Trade in Commercial Services	WTO Statistics on Trade in Commercial Services	Exports only	Exports and Imports
Investment Flows	IMF Coordinated Direct Investment Survey (CDIS)	Inward-flows only	Inward- and Outward-flows
Remittances	World Bank Bilateral Remittances Dataset	Inward-flows only	Inward-flows only

Country A's **vulnerability** to Country B

$$= \frac{A's \text{ export of goods to B} + A's \text{ export of services to B} + A's \text{ inflow of investments from B} + A's \text{ inflow of remittances from B}}{A's \text{ total export of goods} + A's \text{ total export of services} + A's \text{ total inflow of investments} + A's \text{ total inflow of remittances}}$$

Country A's **inter – dependence** with Country B

$$= \frac{A's \text{ import and export of goods with B} + A's \text{ import and export of services with B} + A's \text{ inflow and outflow of investments with B} + A's \text{ inflow of remittances from B}}{A's \text{ total import and export of goods} + A's \text{ total import and export of services} + A's \text{ total inflow and outflow of investments} + A's \text{ total inflow of remittances}}$$

The distinction that we make between economic vulnerability and inter-dependency is consistent with what we encounter in the literature, where economic vulnerability is a subset of inter-dependency. While other authors might employ “vulnerability” in a narrow sense to refer to disruptions that bear *high* costs in contrast to “sensitivity” to refer to disruptions that bear *low* costs, in this paper “vulnerability” is used in a more general sense to refer to potential disruptions regardless of the level of potential costs. Although the distinction in the literature between “vulnerability” and “sensitivity” might make conceptual sense, in practice it is difficult to determine the levels of costs that might separate the two, especially when costs might include subjective factors such as national security or cultural values. Our preference for a more general term is also partially explained by our objective, which is to construct standardised and measurable indices to facilitate cross-country comparisons and normative assessments.

In our mind, economic vulnerability points more to the susceptibility of *unidirectional* actions taken by or events happening in an economic partner whereas economic inter-dependence suggests more *bidirectional* exposure and leverage. While the distinction between unidirectional vs bidirectional is conceptually close to the distinction between asymmetry vs symmetry, they do not convey the same conceptual meaning in this context. It is entirely possible for Country A to have a high measure of inter-dependence vis-à-vis Country B, but for Country B to have a low measure of inter-dependence vis-à-vis Country A. This situation will arise if most of Country A's foreign economic transactions are concentrated with Country B, whereas Country B's foreign economic transactions are dispersed across a number of economic partners. Inter-dependence in this context does not imply symmetrical dependence.

Our selection of the direction of various economic flows to include in each of the indices reflect the distinction between unidirectional and bidirectional exposure (see Table 1).¹⁸ There is admittedly a certain artifice in the distinction between vulnerability and inter-dependency, which in practice might be

¹⁸ Only inward-flows were available in the World Bank's dataset of bilateral remittances, thus differentiation could not be made in this type of flow in the construction of our indices.

blurred. For instance, we consider exports a measure of “vulnerability” but not imports because an economic partner can inflict damage on another by arresting purchases through the use of tariffs and quotas whereas they might be less likely to stop sales since this will have immediate and direct cost on the economic partner’s economy. That said, in some rare instances, a country might consider arresting sales to punish an economic partner as illustrated by the case of Japan when its government decided in mid-2019 to limit the exports of “sensitive” goods to South Korea.¹⁹ Japan claimed that South Korean firms had mishandled materials with potential military applications, whereas South Korea believed that the restrictions were imposed in connection with bilateral disputes over the legacy of Japan’s occupation of the Korean Peninsula.

Our measures, as they are constructed in this paper, also treat all sub-flows with equal weight. For instance, we make no distinction between the import of children’s toys and the import of medical equipment. Although distinctions between types of sub-flows might matter in practice, they are too challenging to accommodate in constructing the indices in this paper for at least two reasons. One, there is an element of subjectivity in making these distinctions. While the relative importance between children’s toys and medical equipment might be obvious, the distinction between rice and potatoes, both essential food staples but in different cultures and countries, might be more difficult. Similarly, while some countries deem 5G communication equipment to be of “strategic” importance, others do not regard it with the same sensitivity. Two, our objective in this paper is to construct measures with global coverage to facilitate comparative analysis. It is an exceedingly demanding task to accommodate varying and subjective determinations of “strategic” or “sensitive” flows for all countries. That said, it is entirely possible to adapt the construction of our indices to accommodate distinctions between types of flows especially if we narrow the focus down to a small number of countries. In other words, sacrifice breadth for depth, but that is a different exercise entirely.

A note on data flows and sources

We use datasets compiled by international organisations since these offer the best quality of data for cross-country comparisons, with the usual caveats of the shortcomings and limitations of such compilations. It is widely acknowledged that the datasets on trade in goods and investment flows are the most comprehensive and of high quality among all cross-national statistics collected on international economic flows. There is a long history in the collection of these statistics and the subject matter is generally widely understood.

There are, however, significant gaps in available datasets on trade in services and remittance flows, particularly coverage of countries in the “South”. With trade in services, there is also paucity of data on a wide range of services that are transacted across borders — due in large part to the relative

¹⁹ See for instance this article by Dooley, Ben, and Choe Sang-Hun. “Japan Imposes Broad New Trade Restrictions on South Korea.” *The New York Times*, August 1, 2019. www.nytimes.com/2019/08/01/business/japan-south-korea-trade.html.

novelty of the subject matter (when compared to trade in goods), the intangible nature of services, and the resources required to collect such information. Consequently, the measurements that we construct for our indices are driven mostly by data of trade in goods and investment flows. Data on trade in services and remittances are material only on the margins and only for selected countries.

A note on computation

In computing our indices, we use a 3-year average of annual values of the economic flows identified above instead of single-year values. This is to smoothen out annual variations in the data and allow us to better interrogate the core-issue in this debate, which is underlying vulnerability as opposed to transitory changes in economic transactions.

In this working paper, we produce, for the most part, a static-snapshot of a single-year to illustrate the utility of the proposed indices as it would require considerably more resources than were available to compute a time-series. Since it is quite likely that data from 2018 onwards would have been affected by the China-US “trade war”, we therefore produce a snapshot of 2017, using the average of data from 2015 to 2017 (inclusive). It is entirely possible to adopt our conceptual approach to construct a time-series, especially if the breadth coverage was narrowed to render the exercise more tractable.

What do these indices tell us?

The indices of vulnerability and of inter-dependency are, at their simplest, a percentage of an economic partner’s contribution to the totality of our external economic transactions. If we sum the values of the index of all our economic partners, we will get 100 (or 100 per cent).

The value of the index (say, X) for any one economic partner tells us nothing more or less than the economic partner’s (Country B) contribution to our total external economic transactions. In principle, X alone does not tell us whether we are vulnerable or dependent on Country B. Of course, if X is a very large number (for example, 90 per cent) or a very small number (2 per cent), a normative assessment of the value of X might be obvious. However, if X is a middling number, say 20 per cent, would that be a cause for concern? How would we assess the normative value of X being 20 per cent?

We suggest that a normative assessment of X would, for the most part, be informed by two main factors. One is the level of risk preference. An exposure of 20 per cent to Country B might be acceptable to some countries but not others depending on their respective risk preferences. A factor that may figure in this risk preference is the identity of Country B. We might accept a higher level of exposure to Country B if it was a long-standing ally instead of an economic partner with whom we might have a more contentious relationship.

The other main factor is the distribution of the values of the index. There are two distributions that may matter. One distribution is the value of X in relation to the values of the index with our other trade partners. Do we have economic relationships with other countries that are equally as big as, or even bigger than X? How many such countries are there? Is X a relatively high or relatively low number when seen in the context of our relationships with all our economic partners?

If X is the share of our external economic transactions with Country B, the second distribution we may consider when evaluating X is the share of Country B in other countries' external economic transactions. Are there many other countries where Country B's share of their external economic transactions is larger than X? How high or low is the value of X when seen in the context of other countries economic relationship with Country B?

Strictly speaking, the indices of vulnerability and inter-dependence do not on their own imply that a country is vulnerable or dependent. To say or conclude that a country is vulnerable requires a normative judgement that the indices alone cannot accomplish. The indices merely provide information, potentially among other sources of information, that enables assessments about vulnerability and dependency.

Empirical Findings of Economic Vulnerability and Inter-dependency

In this section, we begin by illustrating how the methodology described above can be operationalised and how the values of the indices might change with various combinations of data flows. We then present empirical findings to discuss selected key issues that have emerged in recent debates about economic vulnerability and diversification.

A reminder that we are using the average of 3-years' data from 2015 to 2017 to calculate the indices discussed in this section.

Simple illustration of the construction of indices

The data in Table 2 focusses on Singapore as the main reporting country. The percentages listed next to each counterpart economy reflect the share of the counterpart economy in Singapore's **total exports of goods only**, using the average of values from 2015 to 2017. Table 2 has been truncated to list only the top 10 shares.

Table 2: Countries with top 10 share of Singapore’s total export of goods (average of 2015–17)

Reporting Economy	Counterpart Economy	Share of Total Exports of Goods
Singapore	China	13.82%
	Hong Kong SAR, China	12.22%
	Malaysia	10.73%
	Indonesia	7.29%
	United States	6.79%
	Japan	4.53%
	Taiwan, China	4.38%
	Korea, Rep. of	4.37%
	Thailand	3.97%
	Vietnam	3.48%

Table 3 lists the top 10 shares when **inward direct investment flows** are added to the exports of goods. Note how the constituents of the list have changed.

Table 3: Countries with top 10 share of Singapore’s total export of goods and total inward direct investment (average of 2015–17)

Reporting Economy	Counterpart Economy	Share of Total Exports of Goods and Total Inward Direct Investment Flows
Singapore	United States	16.35%
	Japan	6.36%
	China	6.31%
	Hong Kong SAR, China	6.09%
	Malaysia	5.99%
	Cayman Islands	5.97%
	British Virgin Islands	5.31%
	Netherlands, The	4.90%
	United Kingdom	3.54%
	Indonesia	3.16%

In Table 4, we add the values of **trade in commercial services** and **bilateral remittances**. Although the values have changed, the change is minimal compared with the change when investment flows were added to exports of goods (moving from Table 2 to Table 3). The constituent counterpart economies and their rankings did not change moving from Table 3 to Table 4. This illustrates the marginal materiality of data on trade in commercial services and remittances due to the paucity of available data for these flows that we noted earlier. Since Table 4 contains all four export- and inward-flows that we listed under “economic vulnerability” in Table 1, the values or percentages listed in Table 4 are effectively our index of economic vulnerability for Singapore.

Table 4: Index of economic vulnerability for Singapore (top 10 countries, average of 2015–17)

Reporting Economy	Counterpart Economy	Index of Economic Vulnerability
Singapore	United States	16.63%
	Japan	6.74%
	China	6.49%
	Hong Kong SAR, China	6.26%
	Malaysia	5.81%
	Cayman Islands	5.79%
	British Virgin Islands	5.16%
	Netherlands, The	4.76%
	United Kingdom	3.44%
	Indonesia	3.07%

In Table 5, we added the remaining flows (imports of goods, imports of commercial services, and outward investment flows), thus constructing an index of economic inter-dependency for Singapore. There has been some change in the rankings but not in the constituent counterpart economies when we went from Table 4 to Table 5.

Table 5: Index of economic inter-dependency for Singapore (top 10 countries, average of 2015–17)

Reporting Economy	Counterpart Economy	Index of Economic Inter-dependency
Singapore	United States	16.72%
	China	7.89%
	Japan	6.75%
	Malaysia	6.62%
	Hong Kong SAR, China	5.43%
	Cayman Islands	4.65%
	British Virgin Islands	4.14%
	Netherlands, The	4.03%
	Indonesia	3.20%
	United Kingdom	3.07%

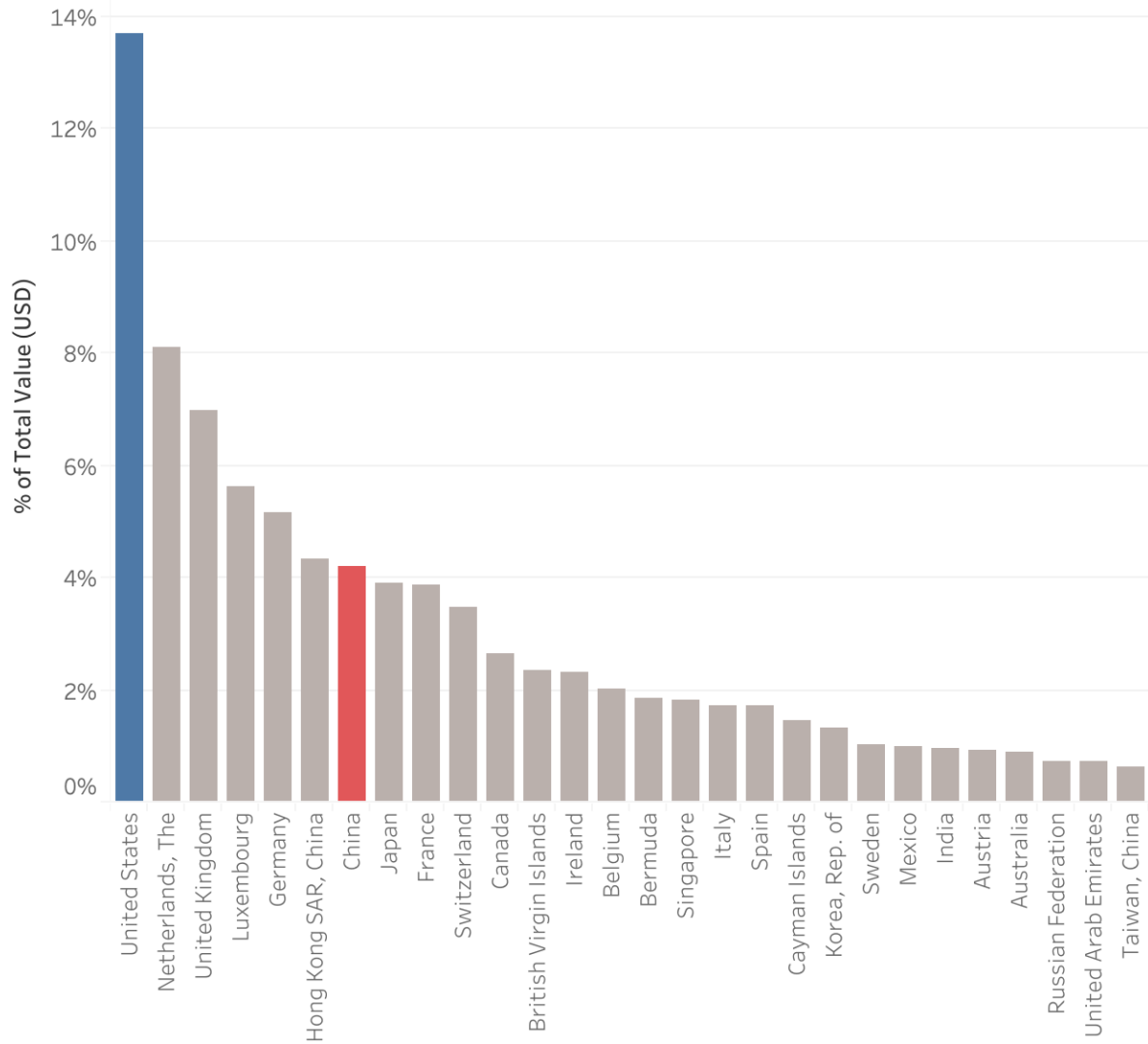
Before we leave this simple example, note how the values drop very quickly to under 5 per cent in Tables 2 to 5. Even though we have not provided the full dataset, we can confidently conclude that there are at most only a handful of countries with which Singapore might be construed as having a highly dependent relationship, and that Singapore’s economic engagement with the global economy appears, on the aggregate, to be diversified.

Using the indices of economic vulnerability to inform recent debates

One of the key concerns that recently emerged in the context of the US-China “trade war” and subsequently also the COVID-19 pandemic is the extent to which we are economically dependent on, and by extension vulnerable to, specific countries and in particular one of the two superpowers.

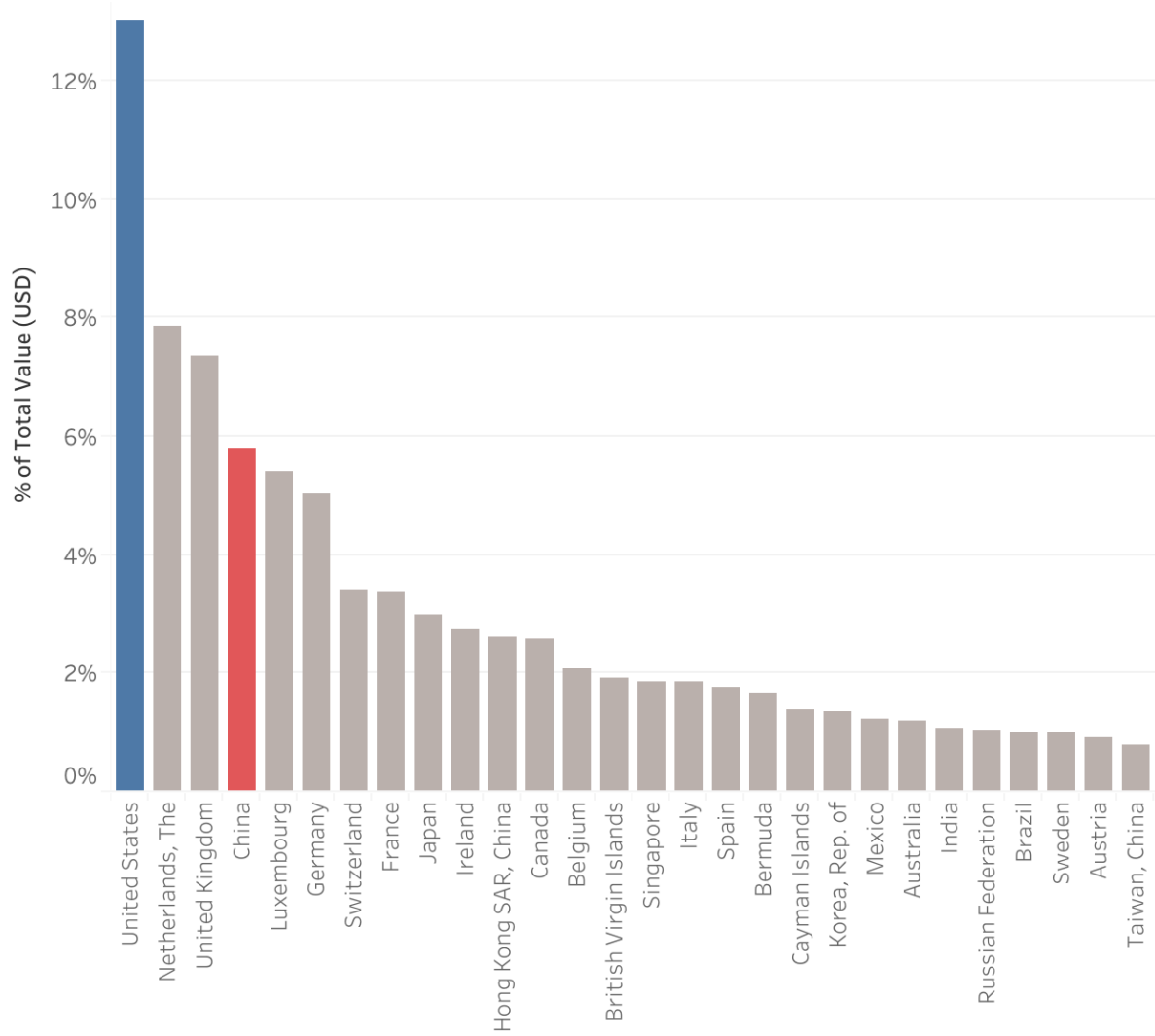
If we consider all reporting countries as one single unit, then Figure 1 shows (a truncated list of) the share of the “economic vulnerability” flows with various economic partners. The United States heads this list, taking approximately 13.71 per cent of the economic flows, whereas China, the other superpower, took approximately 4.22 per cent only.

Figure 1: Index of economic vulnerability for the world (truncated list, average of 2015–17)



If we were to consider the full range of flows, i.e., those we listed under “economic inter-dependency”, then China’s share goes up to 5.76 per cent (see Figure 2). Although the United States’ share falls to 13.01 per cent, it still has the larger share of global economic transactions.

Figure 2: Index of economic inter-dependency for the world (truncated list, average of 2015–17)



It is only when we look at **exports and imports of goods** (leaving out investment flows, trade in commercial services, and remittances) that China tops the list with a share of 11.46 per cent, with the United States not far behind at 10.90 per cent (see Figure 3). If we were to leave out imports of goods and focus on **exports of goods alone**, China's share falls to 8.77 per cent and the United States' rises to 13.14 per cent (Figure 4). In other words, China only looms large when we count what China buys and sells to the rest of the world. If we count only what China buys, then its share falls behind the United States. To use the distinction that we make in this paper, the world is, in aggregate, more inter-dependent with China than it is vulnerable to China. On the matter of vulnerability, the world is, in aggregate, more vulnerable to the United States than it is to China.

Figure 3: Share of the world's export and import of goods (truncated list, average of 2015–17)

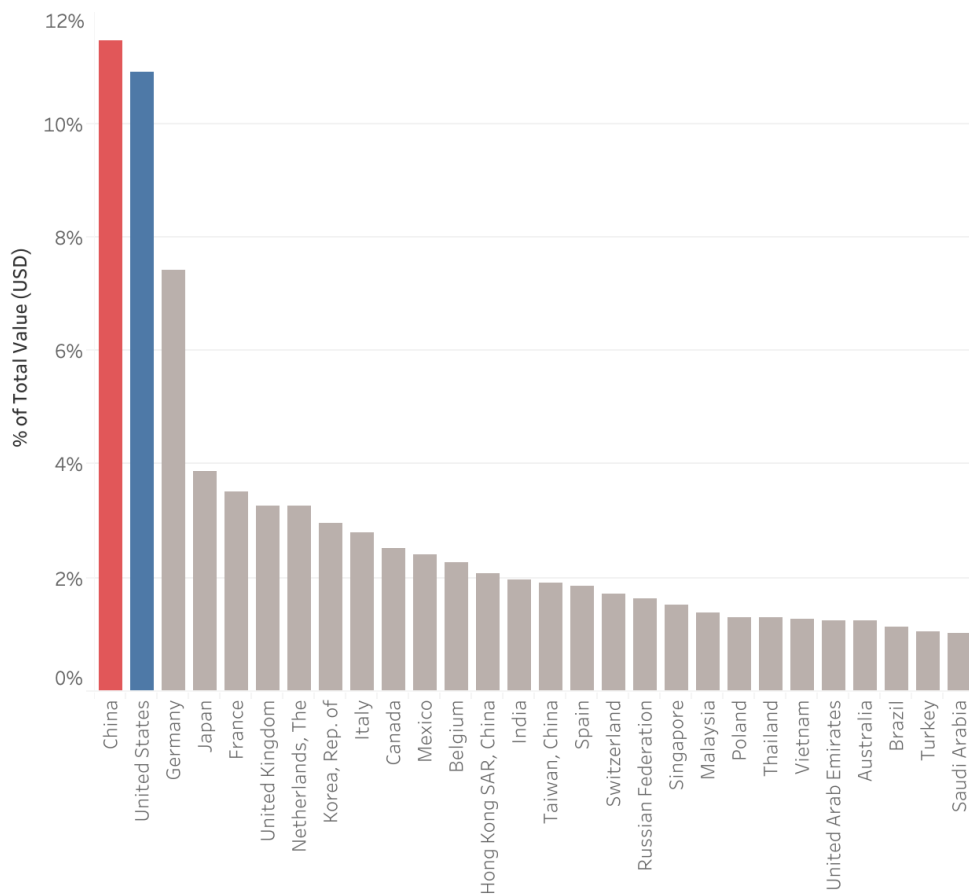
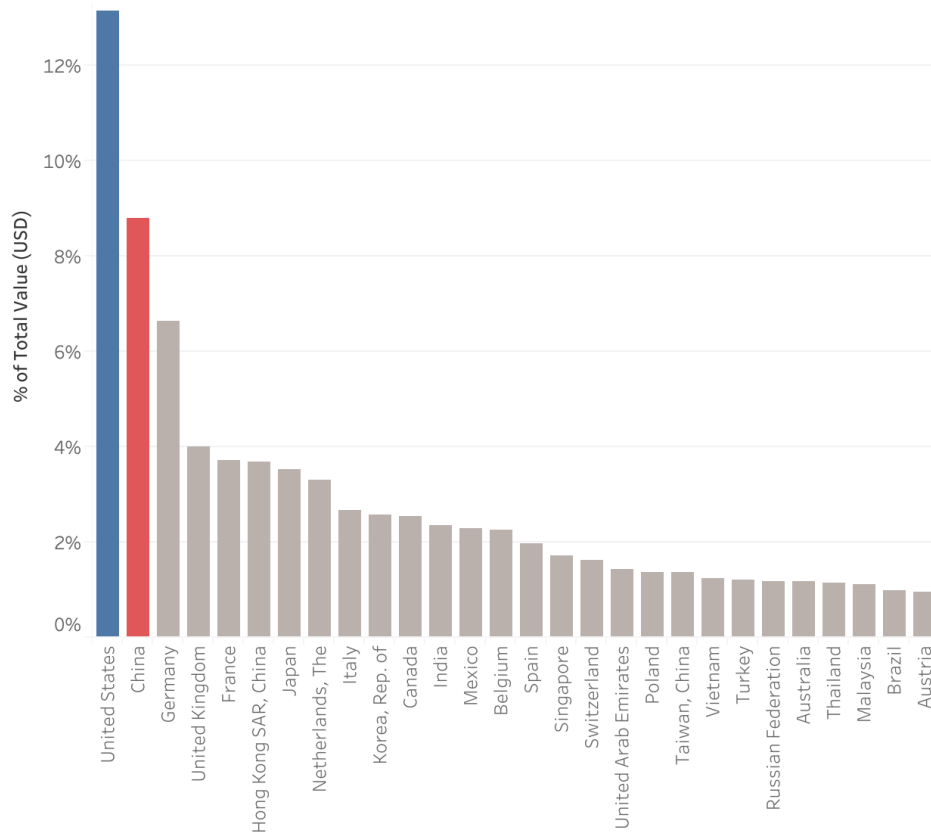


Figure 4: Share of the world's export of goods (truncated list, average of 2015–17)



We constructed a time-series of the data for exports and imports of goods only (Figure 5). The world's "inter-dependence" with China exceeded its "inter-dependence" with the United States in 2012.

Figure 5: China and the US' share of the world's export and import of goods (average of 2015–17)

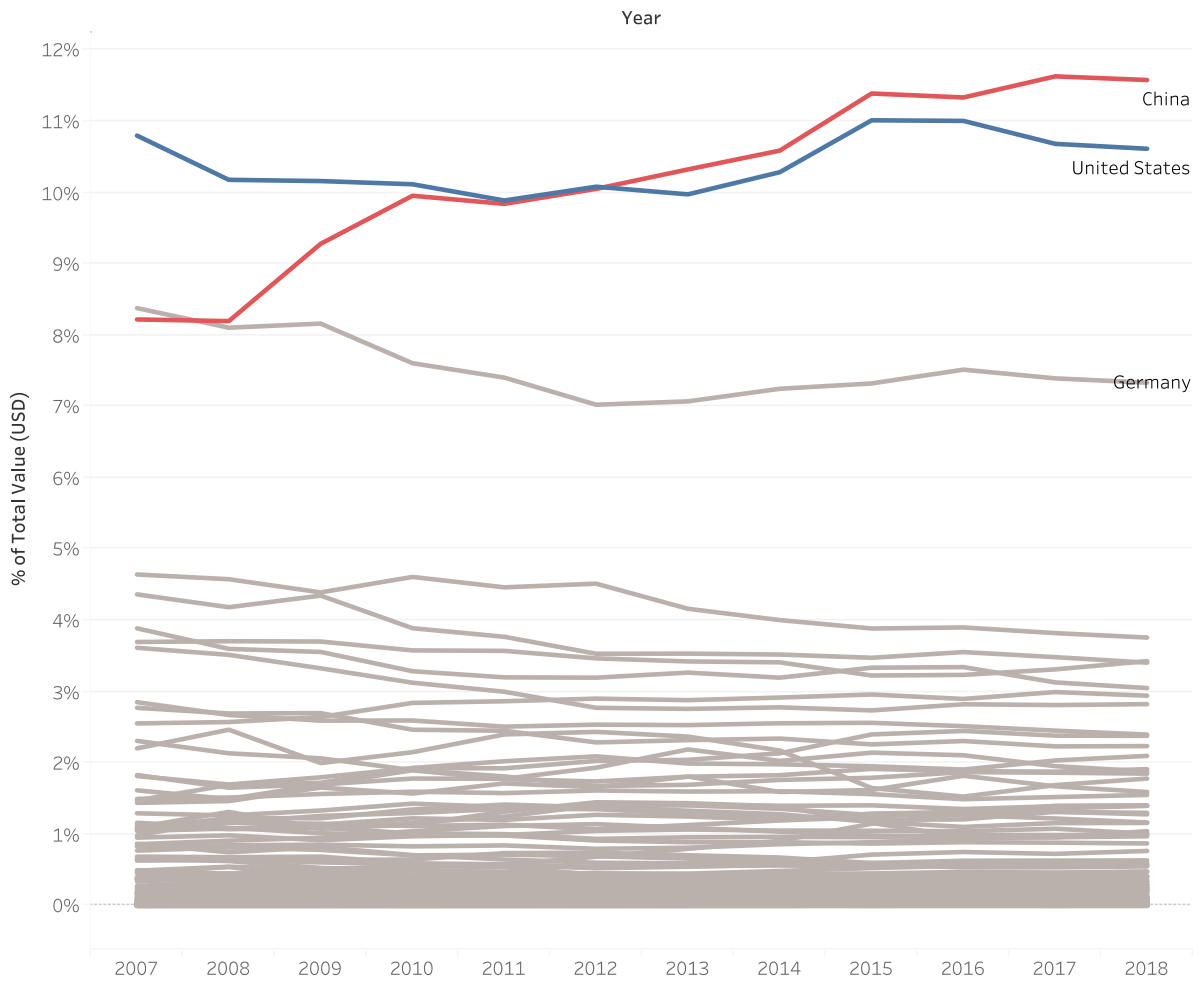
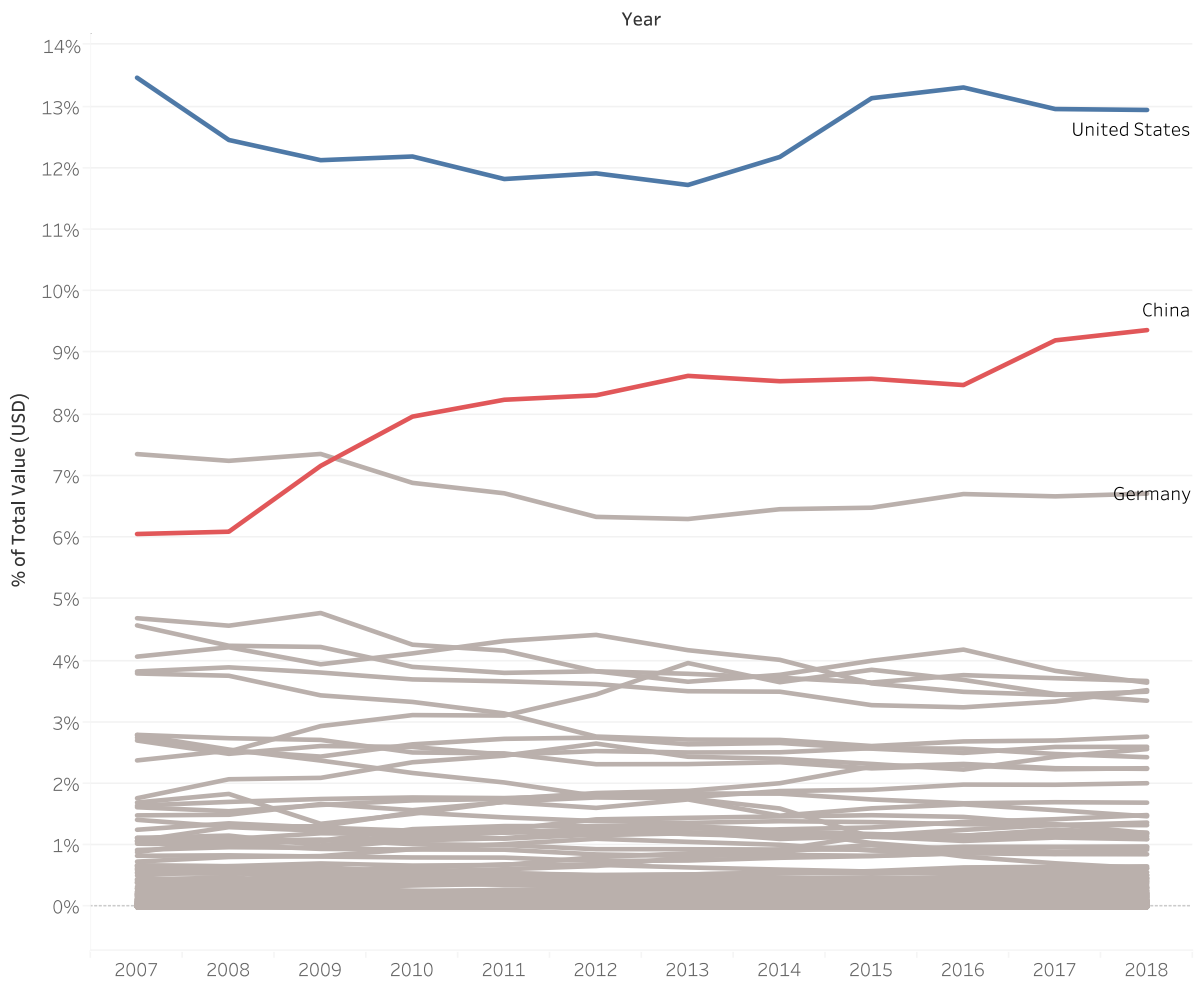


Figure 6 presents a time-series for flows of export of goods only, that is the world’s vulnerability in the trade of goods alone. The gap between China and the United States is closing but the world remains more “vulnerable” to the United States than it is to China.

Figure 6: China and the US’ share of the world’s export of goods (average of 2015–17)

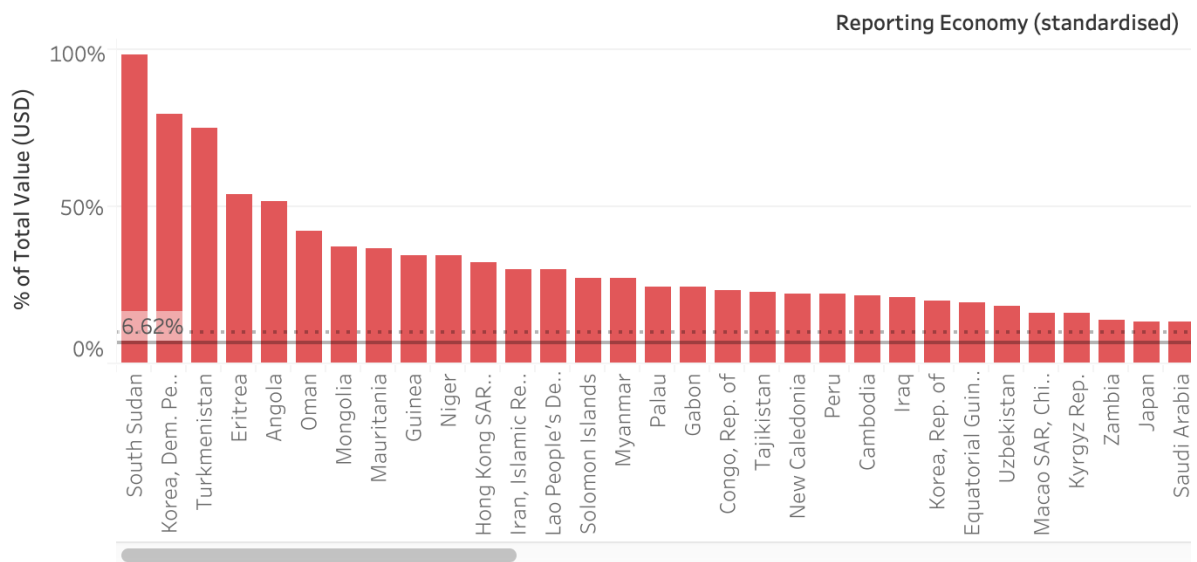


If we were to look at individual countries, which country is more vulnerable to either of the two superpowers?

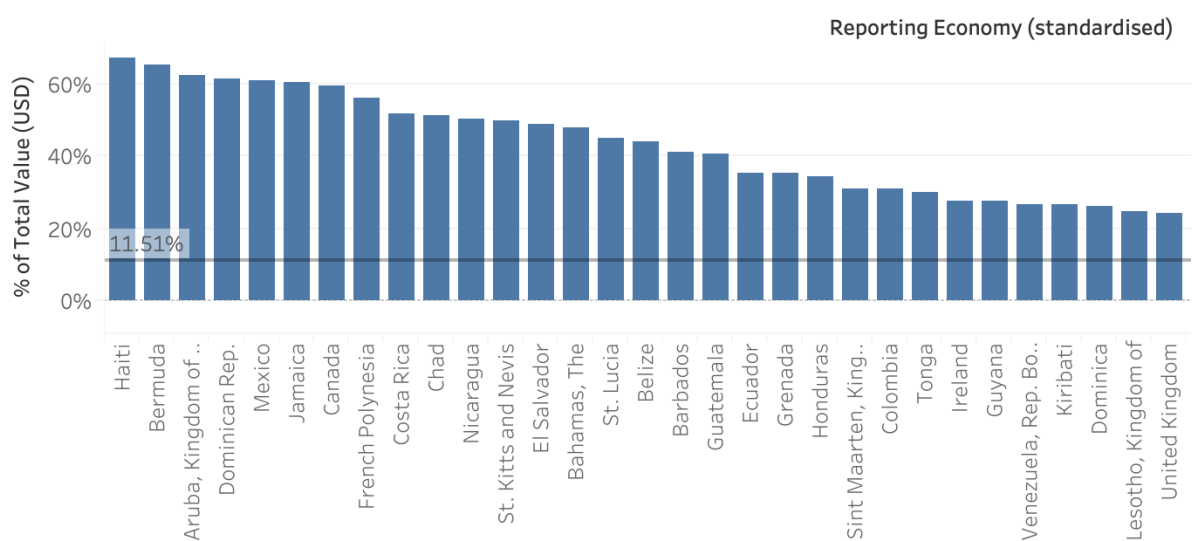
When we focus on economic flows of “vulnerability” (Figure 7), South Sudan is the most exposed to China with over 98 per cent of its external economic transactions conducted with China. This is mostly attributed to the export of petroleum products from South Sudan to China. The country most exposed to the United States is Haiti with a share of over 67 per cent of its external economic transactions conducted with the US. Across all countries, China’s average share is 6.62 per cent, whereas the average share for the United State is higher at 11.51 per cent. This is consistent with our earlier observation when we looked at the world as a single-reporting unit.

Figure 7: Indices of vulnerability vis-à-vis China and the US (truncated list, average of 2015–17)

How vulnerable are countries to China?



How vulnerable are countries to US?



In Tables 6 and 7, we list the 10 countries most vulnerable to China and to the United States, with their respective share of exposure to China and the United States. Table 8 enumerates the distribution of the indices of vulnerability to either China or the United States, with the distribution for the United States being more top-heavy. In other words, more countries are vulnerable to the United States than China.

Table 6: Ranking of vulnerability to China (top 10 countries, average of 2015–17)

Reporting Economy	Counterpart Economy - China
South Sudan	98.43%
Korea, Dem. People's Rep. of	79.46%
Turkmenistan	75.18%
Eritrea	53.88%
Angola	51.68%
Oman	42.16%
Mongolia	36.99%
Mauritania	36.51%
Guinea	34.45%
Niger	34.25%

Table 7: Ranking of vulnerability to the US (top 10 countries, average of 2015–17)

Reporting Economy	Counterpart Economy – US
Haiti	67.37%
Bermuda	65.09%
Aruba, Kingdom of the Netherlands	62.38%
Dominican Rep.	61.14%
Mexico	60.88%
Jamaica	60.35%
Canada	59.36%
French Polynesia	55.87%
Costa Rica	51.65%
Chad	51.30%

Table 8: Descriptive summary of countries' index of vulnerability to China versus the US (average of 2015–17)

Value of Index	Vulnerability to China	Vulnerability to US
50% and higher	5	11
40% to 50%	1	7
30% to 40%	5	6
20% to 30%	12	15
10% to 20%	13	30
5% to 10%	23	32
Less than 5%	150	108
Total No. of Countries	209	209

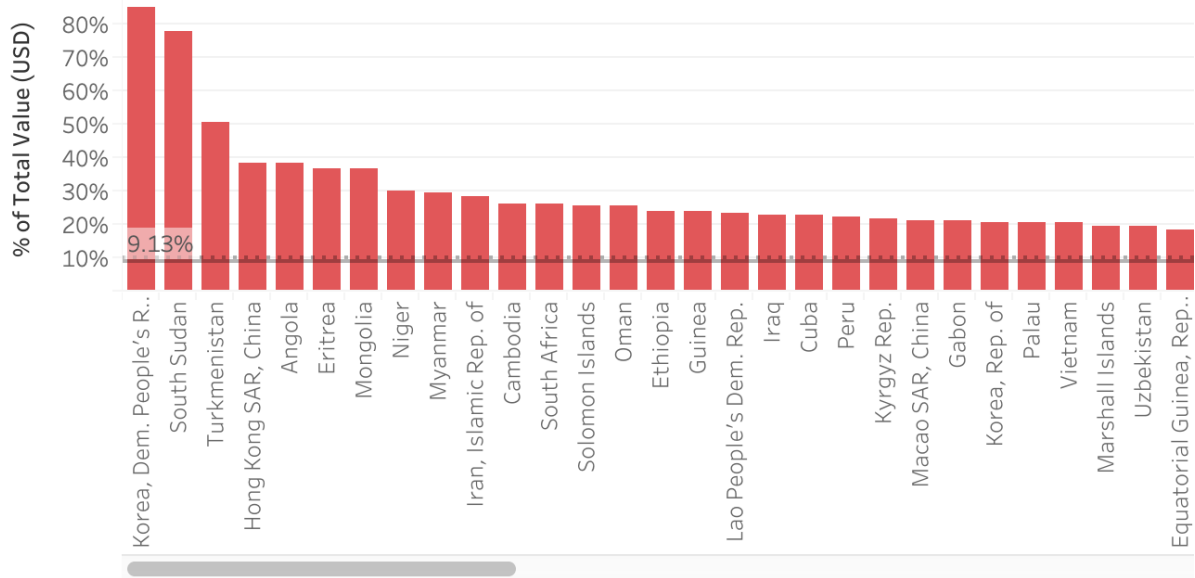
How will the picture change if we calculated the index of inter-dependency?

We see in Figure 8 and Tables 9 to 11 that North Korea is the most inter-dependent with China, with an index value of over 85 per cent. South Sudan is now second with an index value of over 78 per cent. With an index value of 74.55 per cent, the Bahamas is the most inter-dependent with the United States. Both North Korea and the Bahamas rely considerably on China and the United States, respectively, as sources for their import of goods.

The distribution of the values of the index has not changed very much for the United States, but has shifted slightly upwards where China is concerned. This is again consistent with our earlier observation that the world is more inter-dependent with China than it is vulnerable.

Figure 8: Indices of inter-dependency vis-à-vis China and the US (truncated list, average of 2015–17)

How inter-dependent are countries with China?



How inter-dependent are countries with US?

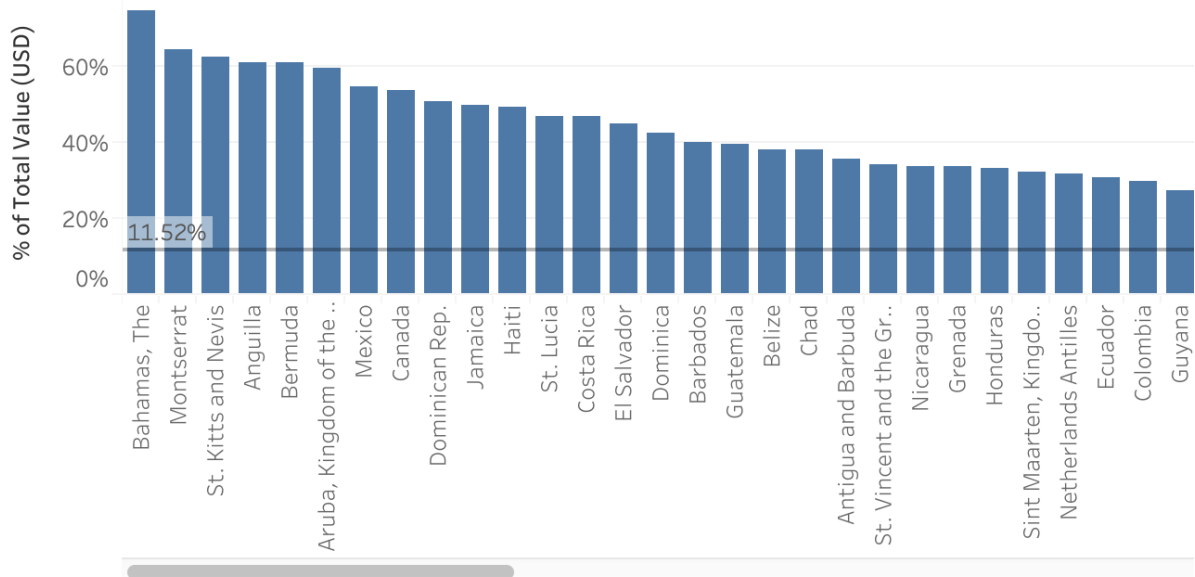


Table 9: Ranking of inter-dependence with China (top 10 countries, average of 2015-17)

Reporting Economy	Counterpart Economy - China
Korea, Dem. People's Rep. of	85.35%
South Sudan	78.10%
Turkmenistan	50.68%
Hong Kong SAR, China	38.32%
Angola	38.14%
Eritrea	36.70%
Mongolia	36.46%
Niger	30.17%
Myanmar	29.57%
Iran, Islamic Rep. of	28.17%

Table 10: Ranking of inter-dependence with the US (top 10 countries, average of 2015-17)

Reporting Economy	Counterpart Economy – US
Bahamas, The	74.55%
Montserrat	64.06%
St. Kitts and Nevis	62.46%
Anguilla	61.01%
Bermuda	60.55%
Aruba, Kingdom of the Netherlands	59.32%
Mexico	54.50%
Canada	53.45%
Dominican Rep.	50.70%
Jamaica	49.48%

Table 11: Descriptive summary of countries' index of inter-dependence with China versus the US (average of 2015-17)

Value of Index	Inter-dependence with China	Inter-dependence with US
50% and higher	3	9
40% to 50%	0	6
30% to 40%	5	12
20% to 30%	18	9
10% to 20%	40	32
5% to 10%	51	37
Less than 5%	92	105
Total No. of Countries	209	210

Regardless of whether we look at the index of vulnerability or index of inter-dependence, and regardless of whether the focus is on China or on the United States, more than 50 per cent of the reporting countries have index values that are less than 10 per cent. In fact, with the exception of the index of inter-dependence with China, more than 50 per cent of countries have index values that are less than 5 per cent. Recall that the value of the index represents the reporting country's exposure to an economic partner. Most analysts would probably consider a value of 5 per cent as not very significant. To put it another way, despite the recent debates and concerns over economic vulnerability and dependence, the data here suggests that these concerns were probably overblown, at least at an aggregate level.

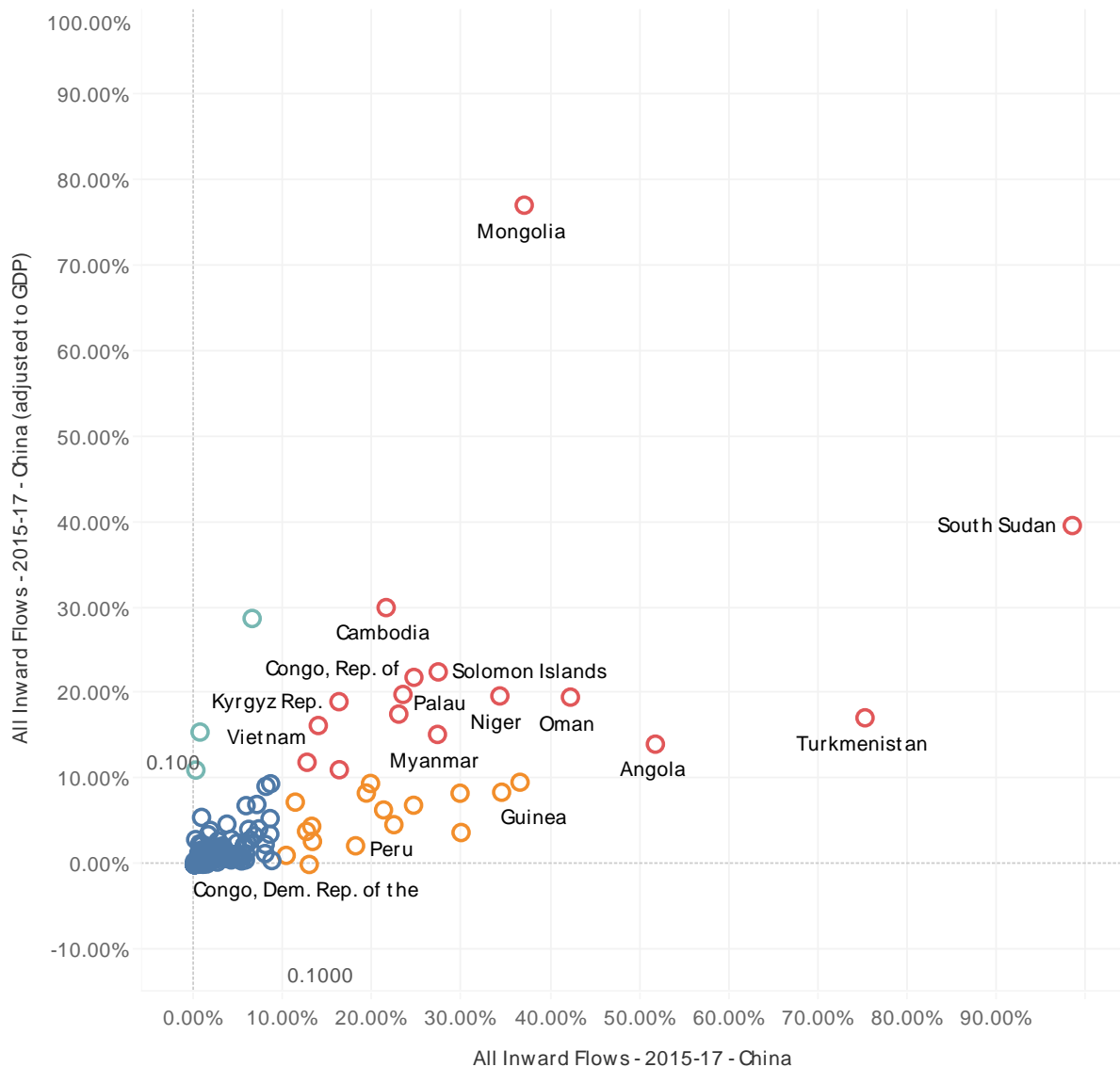
We attach the full indices of vulnerability and inter-dependence with respect to both China and the United States in the appendix.

Refining and Extending the Indices

It is important to note that the indices we have constructed in this paper offer us only an aggregate, not a micro, perspective. Even if the index suggests that a country is not vulnerable to an economic partner at the aggregate, it does not mean that the country might not be vulnerable to an economic partner at a disaggregated level (for instance, when it concerns a specific type of good or service, or even for a specific type of flow). Similar indices can be constructed at different levels of disaggregation to suit different analytical purposes.

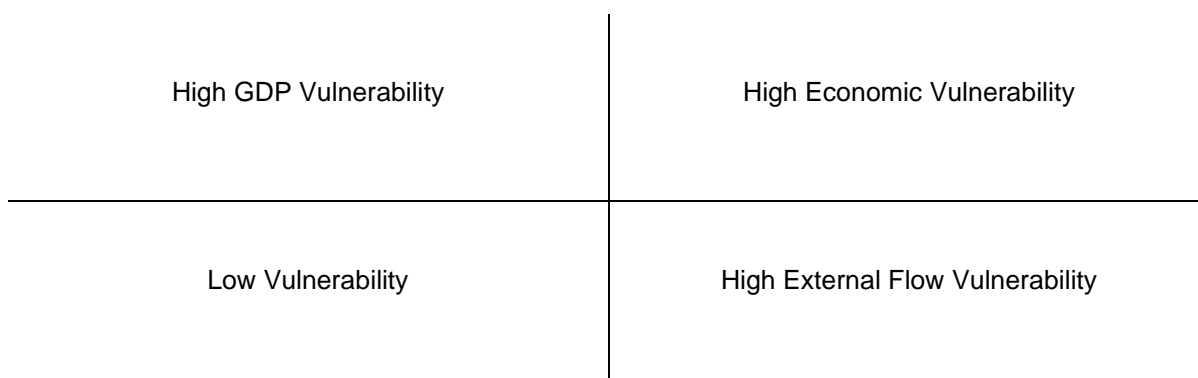
The use of these indices can be extended by bringing an additional dimension: normalising the values of these external economic flows against the reporting country's GDP. This offers us the following additional insight: the relative contribution of each economic partner in relation to the size of the reporting country's GDP, not just to the reporting country's external economic flows. This extension is demonstrated in Figure 9.

Figure 9: Vulnerability to China: Index of vulnerability vs vulnerability flows weighted against GDP (average of 2015–17)



In figure 9, we have, along the x-axis the index of vulnerability for all countries vis-à-vis China as the counterpart. This is the same index that we had in Figure 7 and Table 6. Along the y-axis, we weight the economic flows used to construct the index of vulnerability against the GDP of the reporting country. The values along the y-axis tell us the relative importance of China's share in the reporting country's external economic flows in terms of the reporting country's GDP. Taking South Sudan as an example, although over 98 per cent of its "vulnerable" economic flows are with China, the value of these flows represents only about 40 per cent of its GDP.

For analytical purposes, we can potentially segment the scatter plot into four quadrants, using 10 per cent along both axes as an illustrative threshold, thus identifying four classifications of countries:



With the quadrant in Figure 9, countries in the top right can be identified as having “high economic vulnerability” vis-à-vis China since China makes a large (this being relative) contribution towards the reporting country’s external economic flows **and** its GDP. Countries in the lower-right quadrant experience “high external flow vulnerability” since China represents a large share of the reporting country’s external economic flows but not of its GDP. In the top-left quadrant, we have countries with “high GDP vulnerability” where China represents a large share of the reporting country’s GDP but not of its external economic flows. Finally, the countries in the lower-left column experience “low vulnerability” on both variables.

A priori, from a policymaking perspective, countries who might find themselves in the top-right quadrant would probably be among those who would, and perhaps should, be most concerned about their economic vulnerability and actively seek ways to diversify their economic risks.

With China as the counterpart country, 16 countries were identified as being of “high economic vulnerability”. With the United States as the counterpart country (Figure 10), 24 countries were identified as being of “high economic vulnerability”.

Conclusion

Concerns over economic risks and vulnerabilities have captured the political imagination owing to both longstanding and emerging risks in the global economy. The indices of vulnerability and inter-dependence constructed in this paper enabled us to measure levels of risks and vulnerability, and to form qualitative assessments of exposure using cross national data as benchmarks. Our indices suggest that while the vast majority of countries are enmeshed in complex economic inter-dependencies, few are mired in vulnerability vis-à-vis either the United States or China, the two economic actors of most concern, on an aggregate level.

As our index demonstrates, the world in aggregate is predominantly inter-dependent with China and nowhere is this more evident than in merchandise trade. Whether measured in terms of vulnerability or inter-dependence flows, the world is in aggregate more exposed to the United States than it is to China. Our cross-country analysis suggests similar conclusions. Compared to the five countries with an index of vulnerability of at least 50 per cent with China, there are 11 countries with similar values of vulnerability with the United States. Overall, however, at least half of the countries analysed report less than 5 per cent vulnerability with either the US or China. This picture shifts only slightly when we look at flows of inter-dependence: again, 50 per cent of countries have a value of the index of inter-dependence with the United States that is less than 5 per cent, whereas that proportion dips to circa 44 per cent with respect to China. This suggests that, for many countries, concerns of vulnerability and inter-dependence may be misplaced at least on an aggregate level.

The use of our indices in a cross-country comparison helps to illuminate empirical dimensions of current debates about economic security and vulnerability. However, it should also be noted that numbers ultimately only capture what is measurable and cannot take into account normative factors that policymakers might consider important. Taken in tandem with less quantifiable normative factors, such as cultural values and national security concerns, we offer these indices not as a decisive judgement of vulnerability and inter-dependence but as an enabler of qualitative assessments of vulnerability and inter-dependence — one which may allay percolating fears of economic security and aid policymaking.

Appendix 1a.

How vulnerable are countries to China?

We list here reporting economies and the values of their index of vulnerability vis-à-vis China. Due to space-constraint, we list only reporting economies with the top 200 highest value of the index.

1	South Sudan	98.43%
2	Korea, Dem. People's Rep. of	79.46%
3	Turkmenistan	75.18%
4	Eritrea	53.88%
5	Angola	51.68%
6	Oman	42.16%
7	Mongolia	36.99%
8	Mauritania	36.51%
9	Guinea	34.45%
10	Niger	34.25%
11	Hong Kong SAR, China	32.11%
12	Iran, Islamic Rep. of	29.91%
13	Lao People's Dem. Rep.	29.79%
14	Solomon Islands	27.35%
15	Myanmar	27.26%
16	Palau	24.62%
17	Gabon	24.58%
18	Congo, Rep. of	23.40%
19	Tajikistan	22.91%
20	New Caledonia	22.40%
21	Peru	22.37%
22	Cambodia	21.50%
23	Iraq	21.22%
24	Korea, Rep. of	19.75%

25	Equatorial Guinea, Rep. of	19.29%
26	Uzbekistan	18.08%
27	Macao SAR, China	16.25%
28	Kyrgyz Rep.	16.22%
29	Zambia	13.91%
30	Japan	13.25%
31	Saudi Arabia	13.16%
32	Congo, Dem. Rep. of the	12.89%
33	Vietnam	12.64%
34	Papua New Guinea	12.58%
35	Australia	11.31%
36	Cameroon	10.30%
37	Venezuela, Rep. Bolivariana de	9.45%
38	Ethiopia	8.69%
39	Malaysia	8.55%
40	Faroe Islands	8.50%
41	Qatar	8.45%
42	Kazakhstan	8.04%
43	Libya	7.96%
44	Chad	7.93%
45	New Zealand	7.22%
46	Thailand	7.01%
47	Ghana	6.72%
48	Singapore	6.49%
49	United Arab Emirates	6.26%
50	South Africa	6.10%
51	Indonesia	5.95%
52	Chile	5.80%
53	Madagascar, Rep. of	5.76%
54	Central African Republic	5.72%

55	Philippines	5.62%
56	Brazil	5.59%
57	Tuvalu	5.38%
58	Sierra Leone	5.30%
59	Fiji	5.02%
60	Malawi	4.93%
61	Russian Federation	4.81%
62	Micronesia, Federated States of	4.69%
63	Tanzania	4.50%
64	Pakistan	4.22%
65	Germany	4.13%
66	Colombia	4.13%
67	Argentina	3.90%
68	Sri Lanka	3.84%
69	Georgia	3.65%
70	Brunei Darussalam	3.50%
71	Ecuador	3.48%
72	Uruguay	3.21%
73	United States	3.05%
74	Ukraine	3.03%
75	Nigeria	2.99%
76	Sweden	2.67%
77	Finland	2.66%
78	Canada	2.64%
79	Somalia	2.59%
80	Israel	2.58%
81	Barbados	2.58%
82	Bolivia	2.56%
83	Benin	2.56%
84	Senegal	2.32%

85	Lebanon	2.11%
86	Denmark	1.91%
87	Bangladesh	1.80%
88	Switzerland	1.78%
89	Namibia	1.76%
90	France	1.76%
91	Armenia, Rep. of	1.72%
92	Belarus	1.68%
93	Norway	1.64%
94	Marshall Islands	1.56%
95	India	1.52%
96	Italy	1.52%
97	Kuwait	1.51%
98	Rwanda	1.41%
99	Afghanistan	1.40%
100	North Macedonia	1.39%
101	Jordan	1.38%
102	Vanuatu	1.35%
103	Portugal	1.31%
104	Nepal	1.30%
105	Turkey	1.30%
106	United Kingdom	1.25%
107	Suriname	1.24%
108	Kenya	1.21%
109	Azerbaijan	1.17%
110	Guyana	1.10%
111	Timor-Leste	1.10%
112	Guinea-Bissau	1.05%
113	San Marino, Rep. of	1.05%
114	Seychelles	1.03%

115	Cuba	0.97%
116	Slovenia, Rep. of	0.97%
117	Bulgaria	0.97%
118	Austria	0.97%
119	Slovak Republic	0.94%
120	Algeria	0.93%
121	St. Lucia	0.92%
122	Czech Republic	0.90%
123	Egypt, Arab Rep. of	0.88%
124	Mozambique, Rep. of	0.83%
125	Uganda	0.83%
126	Burundi	0.83%
127	Kiribati	0.82%
128	Netherlands, The	0.82%
129	Albania	0.78%
130	Dominican Rep.	0.76%
131	Burkina Faso	0.75%
132	Greece	0.75%
133	Belgium	0.75%
134	Latvia	0.72%
135	Spain	0.70%
136	Mexico	0.70%
137	Jamaica	0.69%
138	Côte d'Ivoire	0.68%
139	Gambia, The	0.66%
140	Mauritius	0.64%
141	Tonga	0.63%
142	Ireland	0.61%
143	Iceland	0.60%
144	Estonia	0.56%

145	Montenegro	0.56%
146	Trinidad and Tobago	0.53%
147	Romania	0.53%
148	Poland	0.52%
149	Hungary	0.52%
150	Mali	0.48%
151	Panama	0.46%
152	Morocco	0.44%
153	French Polynesia	0.44%
154	Bahamas, The	0.43%
155	Bahrain	0.42%
156	Guatemala	0.41%
157	Botswana	0.37%
158	Nauru	0.37%
159	Costa Rica	0.36%
160	Samoa	0.36%
161	Nicaragua	0.35%
162	Serbia	0.35%
163	Lithuania	0.34%
164	Togo	0.33%
165	Moldova	0.24%
166	Croatia	0.24%
167	Haiti	0.23%
168	Montserrat	0.20%
169	Tunisia	0.19%
170	Paraguay	0.17%
171	El Salvador	0.17%
172	Luxembourg	0.17%
173	São Tomé and Príncipe, Dem. Rep. of	0.15%
174	Cyprus	0.15%

175	Maldives	0.14%
176	Greenland	0.14%
177	St. Kitts and Nevis	0.13%
178	Bosnia and Herzegovina	0.13%
179	Yemen, Rep. of	0.12%
180	Kosovo, Rep. of	0.12%
181	Honduras	0.12%
182	Liberia	0.10%
183	Syrian Arab Republic	0.09%
184	Holy See	0.09%
185	Bhutan	0.09%
186	Zimbabwe	0.07%
187	Antigua and Barbuda	0.07%
188	Aruba, Kingdom of the Netherlands	0.06%
189	Netherlands Antilles	0.05%
190	Gibraltar	0.03%
191	Belize	0.02%
192	Malta	0.02%
193	Dominica	0.02%
194	Grenada	0.01%
195	Eswatini, Kingdom of	0.01%
196	Comoros, Union of the	0.01%
197	Djibouti	0.01%
198	Sudan	0.00%
199	St. Vincent and the Grenadines	0.00%
200	Anguilla	0.00%

Appendix 1b.

How vulnerable are countries to the United States?

We list here reporting economies and the values of their index of vulnerability vis-à-vis the United States. Due to space-constraint, we list only reporting economies with the top 100 highest value of the index.

1	Haiti	67.38%
2	Bermuda	65.10%
3	Aruba, Kingdom of the Netherlands	62.39%
4	Dominican Rep.	61.40%
5	Mexico	60.91%
6	Jamaica	60.38%
7	Canada	59.38%
8	French Polynesia	55.87%
9	Costa Rica	51.77%
10	Chad	51.31%
11	Nicaragua	50.37%
12	St. Kitts and Nevis	49.79%
13	El Salvador	48.65%
14	Bahamas, The	47.87%
15	St. Lucia	45.46%
16	Belize	43.95%
17	Barbados	41.45%
18	Guatemala	41.05%
19	Ecuador	35.49%
20	Grenada	35.17%
21	Honduras	34.18%
22	Israel	32.61%
23	Ireland	31.65%
24	Colombia	30.99%

25	Sint Maarten, Kingdom of the Netherlands	30.98%
26	Tonga	30.10%
27	Guyana	27.77%
28	Venezuela, Rep. Bolivariana de	27.59%
29	Kiribati	26.65%
30	Dominica	26.42%
31	Lesotho, Kingdom of	24.90%
32	United Kingdom	24.44%
33	Liberia	24.01%
34	Japan	23.11%
35	Vietnam	23.00%
36	Panama	22.66%
37	Micronesia, Federated States of	22.22%
38	Australia	21.91%
39	Fiji	21.60%
40	Sierra Leone	20.34%
41	Mauritius	19.90%
42	Luxembourg	19.75%
43	Netherlands, The	19.28%
44	St. Vincent and the Grenadines	18.78%
45	Philippines	18.08%
46	Jordan	18.05%
47	Peru	17.10%
48	Singapore	16.85%
49	Chile	16.66%
50	Brazil	16.58%
51	Argentina	16.22%
52	India	16.08%
53	Korea, Rep. of	15.59%
54	Montserrat	14.93%
55	Bangladesh	14.52%

56	Madagascar, Rep. of	13.39%
57	Kazakhstan	13.28%
58	Kenya	12.44%
59	Switzerland	12.33%
60	Iraq	12.21%
61	Sri Lanka	12.17%
62	Gambia, The	11.84%
63	Anguilla	11.37%
64	Nigeria	11.06%
65	China	10.98%
66	Palau	10.37%
67	Gabon	10.31%
68	Germany	10.31%
69	New Zealand	10.28%
70	Ethiopia	10.08%
71	Indonesia	9.98%
72	Lebanon	9.84%
73	Cambodia	9.78%
74	Thailand	9.69%
75	Bolivia	9.37%
76	Malaysia	9.36%
77	France	9.02%
78	Saudi Arabia	9.00%
79	Samoa	8.74%
80	Pakistan	8.52%
81	Marshall Islands	8.35%
82	Algeria	8.32%
83	Maldives	8.26%
84	Sweden	8.18%
85	Timor-Leste	8.06%
86	Paraguay	7.93%

87	Denmark	7.64%
88	Côte d'Ivoire	7.40%
89	Antigua and Barbuda	7.35%
90	South Africa	7.14%
91	Armenia, Rep. of	6.86%
92	Falkland Islands (Malvinas)	6.69%
93	Italy	6.33%
94	Egypt, Arab Rep. of	6.32%
95	Tuvalu	6.24%
96	Curaçao, Kingdom of the Netherlands	6.24%
97	Finland	5.99%
98	Vanuatu	5.57%
99	Trinidad and Tobago	5.56%
100	Eswatini, Kingdom of	5.39%
101	New Caledonia	5.16%
102	Nepal	5.16%
103	Norway	4.94%
104	Rwanda	4.76%
105	Hong Kong SAR, China	4.68%
106	Kosovo, Rep. of	4.66%
107	Faroe Islands	4.64%
108	Turkey	4.61%
109	Mozambique, Rep. of	4.60%
110	Malawi	4.52%
111	Spain	4.47%
112	Togo	4.45%
113	Georgia	4.45%
114	Equatorial Guinea, Rep. of	4.24%
115	Angola	4.19%
116	Djibouti	4.01%
117	Netherlands Antilles	3.95%

118	Lithuania	3.89%
119	Yemen, Rep. of	3.87%
120	Cameroon	3.81%
121	Cyprus	3.74%
122	Greece	3.72%
123	Cabo Verde	3.56%
124	Solomon Islands	3.45%
125	Austria	3.24%
126	Romania	3.20%
127	Poland	3.16%
128	Bahrain	3.07%
129	Libya	3.05%
130	Seychelles	3.05%
131	Nauru	2.95%
132	Congo, Dem. Rep. of the	2.92%
133	Belgium	2.86%
134	Bulgaria	2.86%
135	Portugal	2.82%
136	Ukraine	2.79%
137	Senegal	2.72%
138	Congo, Rep. of	2.71%
139	Montenegro	2.64%
140	Estonia	2.56%
141	Uruguay	2.55%
142	Moldova	2.54%
143	Mongolia	2.49%
144	Holy See	2.44%
145	Czech Republic	2.41%
146	Serbia	2.40%
147	Morocco	2.37%
148	Croatia	2.26%

149	Suriname	2.26%
150	Russian Federation	2.22%
151	Tunisia	2.18%
152	Latvia	2.14%
153	Uganda	2.03%
154	Oman	2.02%
155	Hungary	1.97%
156	Azerbaijan	1.97%
157	Albania	1.96%
158	Lao People's Dem. Rep.	1.91%
159	United Arab Emirates	1.90%
160	Slovak Republic	1.90%
161	Tanzania	1.83%
162	Namibia	1.81%
163	West Bank and Gaza	1.75%
164	Guinea	1.73%
165	Tajikistan	1.68%
166	North Macedonia	1.66%
167	Syrian Arab Republic	1.65%
168	Bosnia and Herzegovina	1.63%
169	Botswana	1.60%
170	Macao SAR, China	1.54%
171	Slovenia, Rep. of	1.53%
172	Kyrgyz Rep.	1.35%
173	Qatar	1.32%
174	Burundi	1.25%
175	Niger	1.23%
176	Afghanistan	1.18%
177	Papua New Guinea	1.11%
178	Kuwait	1.10%
179	San Marino, Rep. of	1.02%

180	Zambia	0.93%
181	Guinea-Bissau	0.91%
182	Ghana	0.90%
183	Malta	0.90%
184	Comoros, Union of the	0.83%
185	Myanmar	0.77%
186	Belarus	0.74%
187	Iran, Islamic Rep. of	0.73%
188	Bhutan	0.67%
189	São Tomé and Príncipe, Dem. Rep. of	0.59%
190	Brunei Darussalam	0.54%
191	Sudan	0.37%
192	Turkmenistan	0.33%
193	Benin	0.30%
194	Gibraltar	0.23%
195	Mali	0.18%
196	Somalia	0.16%
197	Uzbekistan	0.14%
198	Burkina Faso	0.08%
199	Zimbabwe	0.07%
200	Mauritania	0.05%

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