

Erasmus University Rotterdam

MSc in Maritime Economics and Logistics

2020/2021

The cost of confronting an awakened dragon:
The economic, trade, and transport flow effects of US-
led multilateral sanctions against China in response to
political conflicts

by

Mark F. A. Claessens

Acknowledgements

As I am about to finish this thesis, and with it the MEL program, it feels a bit unreal to close this chapter of my life. It has been a very intense year, and a very interesting year. I have learned a lot, met a lot of good new people, and am heading for new directions in life. Years ago, my first master's degree ended on a difficult note, due to medical and other personal challenges. This motivated me a lot to give my everything for the classes in MEL, and be in control of my own future again. While the thesis process was a bit more disrupted, having twice started a new job during it, I am satisfied with the results of my efforts. However, none of it would have been possible without the help of a number of other people.

First I would like to thank HY, for bringing up more patience than could ever be asked of anyone over the past years, for being flexible and supportive, and for dealing with me in times of stress and deadlines. Also great thanks to my parents and family, for always supporting me with all means necessary, for being there when needed, and for bearing with me all these years. Of course also lots of thanks to Katarina, for being the cuddly fluffball that she is, and the only living being that can take away all my sorrows just by lying next to me on the couch late at night, climbing on my chest, or rubbing my legs when I come home. I'll do my best to pay a lot more attention to all of you now that this is done.

I also want to thank my thesis supervisor Simme Veldman, for being there when needed, for calling to check up, and for being flexible with planning when my jobs got in the way of things. Perhaps the past months were not the most typical thesis trajectory, but I'm grateful it came to a good end. Furthermore, I'd like to thank Koen Berden, for his engaging and stimulating economics courses, and for his help during my first GSIM course assignment, which taught me the tools needed for this thesis. Finally, I want to thank the MEL students with whom I worked constructively throughout all the group assignments, with whom I could share pain and frustrations, and with whom I could have lots of fun, have interesting conversations, and distract from MEL, Covid, and everything else when needed. Let's see what the future holds for us.

Thank you everyone!

Mark Claessens

April, 2022

Abstract

For the past three to four decades, China has seen a rapid growth of its economy, and has rapidly expanded its trade relations with the world, becoming a leading global manufacturing hub. However, China's renewed economic power has led to an increase in political power as well, and while China has long pursued a foreign policy focused on maintaining stability, and avoiding conflict, more and more often it seeks to exert its power where its interests are at stake. With increasing frequency this has led to clashes with the dominant economy of the past century, the United States, which itself adopted a strategic policy shift to Asia.

Apart from economic and trade issues, which led to a trade war starting in 2018, a number of ongoing political issues cause division. These include the status of Taiwan, the treatment of Uyghurs and other minorities in Xinjiang, the breakdown of democracy in Hong Kong, and recently, China's stance on the Russian war in Ukraine. All these issues have led to calls for sanctions in the US, and limited actions have already been taken. However, it is not unlikely that any of these cases could escalate in the future, likely leading to an increase in US sanctions, as sanctions have been a favorite US foreign policy tool for many decades.

However, due to the large size of the Chinese economy, as well as the far-reaching impact of these issues, the US alone might not be able to inflict sufficient economic damage. It is likely that the US would look for partner countries to join it in a sanctions alliance. We have seen similar united efforts in response to the Russian invasion of Ukraine, and can be expected that US would expect European support in return, in case of a confrontation with China. In addition, a larger sanctions alliance would increase the legitimacy of these actions, as it would become an effort of the international community, rather than the US alone.

This study investigated the effects of multilateral US-led sanctions against China, to find out the impact of political confrontation and ensuing sanctions in terms of economic, trade, and transport flow effects. These effects could severely affect future policy of governments and business, specifically in the logistics and maritime sector. We found that while unilateral sanctions hurt the US itself more than they hurt China, multilateral sanctions reduce the negative effect, and simultaneously increase the damage for China. However, the damage for especially Asian alliance partners was in some cases greater than for the US, and we found that these negative effects could be mitigated by setting up intra-alliance free trade. These observations suggest that in order to reduce the damage from potential conflict, both the US, its allies, as well as businesses, would benefit from "friendshoring", strengthening their policy, networks, and supply chains based on FTAs and alliance networks.

Table of Contents

Acknowledgements.....	i
Abstract.....	ii
Table of Contents.....	iii
List of Tables	v
List of Figures	vi
List of Abbreviations.....	vii
1. Introduction.....	1
1.1 Context and background.....	1
1.2 Topic significance and relevance	2
1.3 Objective & research questions.....	4
1.4 Paper structure and research methodology	5
2. Literature Review	6
2.1 Issues driving the call for sanctions against China	6
2.1.1 Political and human rights issues	6
2.2 Modern developments in China-US economic and trade relations	15
2.2.1 The 2018 US-China trade war	15
2.2.2 Current developments in China-US economic and trade relations	17
2.3 The effectiveness of economic sanctions.....	20
2.3.1 Unilateral vs multilateral sanctions	21
2.4 The effect of sanctions on trade.....	22
2.4.1 Precedent cases of economic sanctions	22
3. Methodology	29
3.1 GSIM approach and its merits.....	29
3.2 Data selection	32
3.3 Shock estimation	36
3.4 Results and conversion to trade volumes.....	37
3.5 Scenario development	38

3.5.1	Scenario 1 – Unilateral US sanctions.....	38
3.5.2	Scenario 2 – Multilateral US, EU & NATO sanctions.....	39
3.5.3	Scenario 3 – Multilateral US, EU & NATO, plus Asia-Pacific allies.....	41
3.5.4	Scenario 4 – Multilateral US, EU & NATO, plus Asia-Pacific allies & ASEAN.....	43
4.	Results and Analysis.....	45
4.1	Economic effects	45
4.2	Trade and transport flow effects.....	48
4.3	Sensitivity analysis.....	53
4.4	Limitations	58
5.	Recommendations and Policy Advice	60
6.	Conclusions	63
6.1	Key findings & implications	63
6.2	Suggestions for future research	65
	Bibliography	66
	Appendices.....	74
	Appendix I – GSIM input: Trade values	74
	Appendix II – GSIM input: Tariff rates.....	75
	Appendix III – GSIM input: AVEs of NTMs.....	76
	Appendix IV – GSIM input: Elasticities.....	77
	Appendix V – GSIM output: Economic effects	78
	Appendix VI – GSIM output: Trade effects.....	80
	Appendix VII – GSIM output: Change in bilateral trade flows.....	82

List of Tables

Table 1 - Change in Producer surplus, Consumer surplus, and Total welfare (in USD mln.)	45
Table 2 - Tax revenue effect (in USD mln.)	47
Table 3 - Trade effects (in %)	49
Table 4 - Bilateral trade change, China (in %)	50
Table 5 - Bilateral trade change, US (in %)	51
Table 6 - Bilateral trade volume change, in TEU	52
Table 7 - Economic effects of Scenario 3x	54
Table 8 - Trade effects of Scenario 3x	54
Table 9 - Economic effects of Scenarios 4x and 4y	56
Table 10 - Trade effects of Scenarios 4x and 4y	57

List of Figures

Figure 1 - Change in output (in %)	48
--	----

List of Abbreviations

AHS	Effectively Applied Tariff
ASEAN	Association of Southeast Asian Nations
AVE	Ad valorem equivalent
BRI	Belt and Road Initiative
CCP	Chinese Communist Party
CTS	Consolidated Tariff Schedules
EU	European Union
FTA	Free trade agreement
G7	Group of Seven
GE	General equilibrium
GSIM	Global Simulation Model
HK	Hong Kong
IDB	Integrated Data Base
KMT	Kuomintang
MFN	Most-Favored Nation
NATO	North Atlantic Treaty Organization
NTM	Non-tariff measure
PE	Partial equilibrium
ROC	Republic of China
RoNATO	Rest of NATO
RoW	Rest of the World
TRAINS	Trade Analysis and Information System
UK	United Kingdom
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
US	United States of America
WITS	World Integrated Trade Solution
WTO	World Trade Organization

1. Introduction

1.1 Context and background

As China's¹ economic power and significance have risen over the past decades, and it has started to increasingly assert its economic and political power outside its own borders (Mastro, 2015; Poh & Li, 2017; Yahuda, 2013), this had led to an increasing rate and scale of clashes in its foreign relations. In the first place, these clashes occur with the dominant economy of the past century, the United States (US). Additionally, a wide range of border disputes, and security, economic and human rights concerns have led to strained relations with most of its neighboring states, as well as with a variety of its trade partners around the world. As a result, calls for boycotts or sanctions versus China appear in international media and sociopolitical discourse with increasing frequency.

As for the US, its principal clashes with China in past years have been of an economic nature. While the US has come to rely on China for much of its manufacturing, this fact has also given rise to protectionist sentiments within the US. These sentiments reached a peak during the Trump presidency, culminating in a trade war between the two, starting from 2018, the effects of which affected third-party states as well. With the election of Biden as president of the US in 2020, many anticipated the trade war to subside, and a return to normalcy, meaning a skeptic, though cooperative US-China economic relationship.

However, nearly a year into the Biden presidency, there are signs that economic concerns persist, and that the return to normalcy might not be what it was expected to be (Kai, 2021; White House, 2021). These concerns include a continued concern with trade imbalances and unfair trade practices, as well as an increase in economic espionage. In addition, the Biden government has shown an increased concern with various human rights and political issues. This includes political developments in Hong Kong, increasing tension with Taiwan, domestic issues including the treatment of minorities, in particular the Uyghurs, and China's stance with regard to the Russian invasion of Ukraine. Whether this is out of legitimate US concern, or the result of a perceived threat to its sphere of influence, and the US foreign policy 'pivot to Asia' that started under the Obama administration and regained momentum under the Biden administration (Davidson, 2014; Myre, 2021), it either way gives the already difficult relationship another dimension, one that's likely more difficult to resolve.

China has for decades pursued a foreign policy focused on stability, however, it has also been observed that its language has become increasingly confrontational in recent years, no longer shunning conflict. While many believe China still prefers to avoid conflict when possible, it is

¹ The name 'China' in this paper refers to the 'People's Republic of China'. The 'Republic of China' shall henceforth be referred to as 'Taiwan'.

also believed that this conflict avoidance has certainly reduced, and that conflict is now seen as an option as well, especially regarding sensitive issues such as Taiwan (Mastro, 2015; Poh & Li, 2017; Qin, 2014). An armed confrontation with other powers is still deemed unlikely, even if just for China's nuclear deterrence capacity, which it is likely to increase in years to come (Krepinevich, 2022). As a result, conflict would more likely take other forms such as sanctions, which have been the go-to foreign policy tool of especially the US for many years now.

Outside politics, public pressure for sanctions on China has also grown, in particular in response to the issues surrounding the Uyghurs and Hong Kong. This became visible for instance in the months leading up to the Beijing 2022 Winter Olympics, which saw calls for boycotts around the world. Various private companies have already taken steps regarding these political issues. Increased global awareness, and rising public interest, are putting pressure on governments to consider taking action as well, and the US has for example already limited exports from the Uyghur-inhabited Xinjiang province of China over forced labor concerns. In the media and sociopolitical discourse there has been increased discussion whether to impose further sanctions against China, while China is simultaneously starting to hit back at existing sanctions (Feng, 2021) and being cautious with retaliations for fear of backfiring (Poh, 2017; Zhou, 2021).

However, due to China's centrality and importance in the world economy and political theatre, there are limited means to really put pressure on it, and to make it change its course (Turkel & Van Schaack, 2021). It has been argued that the type of highly specific and targeted sanctions that were imposed on Russian in 2014, in response to the annexation of Crimea, would not work against China (Mastro, 2022). Sanctions against China might need to be greater in scale, or involved more actors. More countries participating in sanctions could increase their impact on China, limit the options to circumvent sanctions, and limit the options to look for trade elsewhere. As such wide-ranging sanctions could come at great economic cost, it is important to find out what sanctions against China could look like, and what their effects would be on the global economy, trade, and transport flows.

1.2 Topic significance and relevance

The significance and relevance of this topic lie in the fact that sanctions against China could potentially involve a large number of countries and trade blocks, could severely affect economies and businesses around the globe due to the magnitude of the actors involved, and could be triggered by a large number of currently ongoing sociopolitical issues.

What makes the topic even more relevant is the current Russian war in Ukraine in 2022, and the new rounds of sanctions in response to it from especially Western countries. While Russia is a moderately significant economy in the world, it is also highly concentrated on the energy

sector alone. The Chinese economy is much larger in size, much more diversified as a manufacturing hub, and central to many global supply chains. As a result, severe economic sanctions against it could have a much greater impact worldwide. In addition, the currently developing sanctions against Russia could provide an insight into how far countries are willing to go in terms of economic damage for themselves, and which countries are likely to join in a sanctions alliance.

Economic sanctions against China, for political reasons rather than a simple trade war, would most certainly be US-led to have any significant effect in regard to their effectiveness versus China, especially given the already strained relationship between the two countries. However, the number and type of sanction participants could affect the effect and effectiveness of sanctions. In addition, especially in case of non-trade war motivations, the US would be likely to build a network of sanction partners, to increase the legitimacy of its measures, by making clear this is not a one-on-one issue, but a wider, global concern of the international community.

Support for such US-led sanctions could in the first place be found with its oldest Western allies in the European Union (EU) and the North Atlantic Treaty Organization (NATO), which to a large extent share its human rights values and, albeit to a lesser extent, its political and security concerns. In addition, the US has a number of strategic partners in the Asia-Pacific region, with significant economic and political power, which share many of its political concerns versus China. This includes Japan, South Korea, India, Australia, and New Zealand. Finally, the Association of Southeast Asian Nations (ASEAN) could be a source of support, as a large number of its members have their own political disputes with China. At the same time, the group also has strong economic ties to China, which is its largest trading partner (ASEAN, 2020) and vice versa, and some of its member state governments have warm ties with China, likely making it more difficult to get the support from the group as a whole. However, its support would certainly increase the impact of sanctions against China, and limit China's trade alternatives.

As for the economic impact, the US and China are the two largest economies in the world. Any extended conflict between the two is expected to have serious economic consequences for both sides (Guo et al., 2021). In addition, China remains the single-largest production hub of the world, despite recent trends of shifting production to lower-wage countries elsewhere (Ghosh, 2020; Yap & Koh, n.d.). Any such conflict would likely have severe economic and trade effects, as well as affect transport flows in economies around the world, whether they participate in the sanctions or not.

From a business perspective, a severe economic and trade disruption in certain parts of the world might not be limited to the direct effect of disturbing consumer markets, but also the

indirect effects caused by a disrupted supply chain. Many Western businesses rely on China and Southeast Asia for their production and supplies, and a severe reduction in trade flows and economic performance could put their operations at great risk. Such developments would especially affect the logistics and maritime industries, as significant changes in trade flows, be it in volume or direction, would touch right upon their core business.

1.3 Objective & research questions

The objective of this paper is to create an overview of the national and global economic, trade, and transport flow effects resulting from economic sanctions against China in response to political issues, in order to assess the likelihood of such developments taking place from an economic point of view, and with the ultimate goal to guide and advise current and future policy based on the projected economic, trade, and transport flow changes. The research specifically considers the impact of an expanding number of sanctions participants, or multilateral sanctions, as opposed to unilateral US sanctions.

The likelihood of sanctions being imposed could be affected by the strength of the effects for the most relevant actors, as no matter the possibly good intentions behind sanctions, stimulated by human rights and political concerns, politics will always be driven by economic cost concerns as well. If the anticipated economic cost does not weight the benefits, this could affect the readiness of relevant parties to get involved with sanctions versus China. Understanding the size of projected effects, and their likelihood to occur, will help advice policymaking, both for businesses and governments, and help mitigate potential risks.

In order to reach the objective, the guiding research question will be:

What are the economic, trade, and transport flow effects of US-led multilateral economic sanctions against China, on their own economies, as well as for the rest of the world?

Apart from the core research question, the following sub-questions will guide the discussion:

- 1. Which issues are driving the call for sanctions against China?**
- 2. What do US-China economic relations look like at the moment, and how did they develop in recent years?**
- 3. What have historically been the economic, trade and transport flow effects of economic sanctions against other countries?**
- 4. Have economics sanctions historically been successful in achieving their goals, in China or elsewhere?**
- 5. What is the effect of multilateral sanctions, as opposed to unilateral US sanctions?**

6. **What could economic sanctions versus China look like, both in terms of tariffs and NTMs, based on historic precedent and current events?**
7. **How can economic, trade and transport flow effects be measured?**
8. **How can economic sanctions be modelled?**
9. **Which model can best be used to investigate the research question?**

The focus of this research will be on the national and global effects in case of varying groups of sanction participants, ranging from unilateral sanctions put in place by the US alone, to an expanding sanctions coalition of the US plus various other states. This research does not investigate the effects of various levels of sanction regimes by a fixed actor. While the size and weight of sanctions imposed by a certain actor could affect the ensuing economic, trade, and transport flow effects, as well as the effectiveness of the sanctions, this is beyond the focus of this research, and is left for other research to investigate.

1.4 Paper structure and research methodology

In order to answer the research question, this introductory chapter is followed by a literature review in Chapter 2. This chapter will start with discussing the issues driving the call for sanctions, followed by an overview of recent developments in the China-US relationship, and ending with an analysis of the effectiveness and effect of economic sanctions according to earlier research and real-world precedent cases.

Chapter 3 will outline the methodology of this research. First, it will discuss the workings of the GSIM model used in this research, and its merits. Second, the method of data selection will be discussed, followed by an explanation of how the shocks in the model are estimated. Finally, the four scenarios used in this research will be discussed.

Chapter 4 will present an analysis of the outcome of the model for the four respective scenarios. First we discuss the economic effects, followed by the trade and transport flow effects. Next, a sensitivity analysis will be conducted, with the aim to increase the robustness of the GSIM model results, and possible limitations of this research will be given.

Chapter 5 will give a more practical application of the preceding results. It will present recommendations and policy advice from a political, economic and business point of view.

The concluding Chapter 6 will summarize the key findings and implications of this research, and provide suggestions for future research.

2. Literature Review

Four sections will guide the build up to the GSIM analysis performed in this study. (1) First, an overview of the issues that could trigger US-led economic sanctions against China, in order to understand the background, and which countries are relevant for the GSIM scenario development; (2) second, an outline and discussion of recent developments in US-China economic relations, in order to understand the current situation, and what to build further sanctions upon next; (3) third, a discussion of the effectiveness of sanctions in literature, with particular focus on the topic of multilateral sanctions, to lie down the research focus; (4) fourth, a review of two precedent cases, that will help to set up the GSIM model and create an understanding of the willingness of third parties to join a sanctions alliance.

2.1 Issues driving the call for sanctions against China

This section will start with a discussion of ongoing issues that could serve as potential triggers for the hypothesized US-led economic sanctions against China in our GSIM model. The focus here lies with political and human rights-oriented issues. While previous and ongoing US sanctions against China also stem from economic and trade issues, which caused the ongoing trade war, such issues are more likely to lead to unilateral US sanctions, and less likely to involve a multilateral sanctions alliance. A great amount of previous research has dealt with the economic and trade effects of the trade war already, which is why this paper instead focuses on political triggers, which as we will see are just as likely to become reality, and would potentially involve a much greater number of actors.

With regard to our GSIM study, it does not matter which political issue would be the actual trigger in reality, as the ensuing scenarios would be the same. Also, it is possible that a number of triggers could reinforce each other, or could occur simultaneously. However, it is possible that the exact choice of trigger could affect the level of sanctions, and the decision of various countries whether to participate in sanctions or not. The exact assumptions made in this respect are discussed under the scenario development in Section 3.5. As a result, the goal of this section is to provide an overview of the key ongoing issues that we believe could trigger economic sanctions, and that could affect the choice of participant countries in the four scenarios.

2.1.1 Political and human rights issues

Both the current and previous US government have made it clear that they aim to control China's political and economic influence, specifically in the Indo-Pacific region (Rosen, 2022).

To this end, the current US government has been building a network of democracies around the world, and working on strengthening its ties with its traditional partners, as well as new partners. An example of this is the Quadrilateral Security Dialogue, or the Quad, which apart from the US's long-term ally Japan, also includes Australia and India (Murphy et al., 2022).

For this research, we selected four key political and human rights issues which have in recent years caused friction between the US and China, which have already seen calls for sanctions, and which could serve as likely triggers of further expanded US-led economic sanctions. These four issues are (1) the sovereign status of Taiwan, (2) China's response to the 2022 Russia sanctions, (3) the treatment of the Uyghur minority group, and (4) the crackdown on political and individual freedoms in Hong Kong. These four focus topics were selected based on the amount of tension they have caused in recent years, the fact that some issues have already led to minor sanctions, and the observed likelihood that they will continue to play a role in global politics in the short-term.

While there are numerous other political issues between China on the one hand, and the US and various regional neighbors on the other hand, including border disputes with a number of neighboring countries (Murphy et al., 2022), and the political status and treatment of people in Tibet, those issues are either more likely to be local in scale such as the former, or have seen decreased political attention in recent years such as the latter (Nair & Sharma, 2017), and as such are left out of the discussion.

Taiwan

The issue surrounding the sovereignty of Taiwan has seen a recent increased interest in public discourse, resulting from perceived increased tensions in recent years, and in relation to the 2022 Russian invasion of Ukraine. It is one of the longest-running political issues that modern China is faced with. In fact, the issue has existed as long modern-day China, or officially the People's Republic of China (PRC), under the rule of the Chinese Communist Party (CCP), has existed itself. The foundation of the PRC in 1949 was the culmination of the Chinese Civil War. Its principal opponent, the Kuomintang (KMT) retreated to the island of Taiwan, to found its own state, the 'Republic of China' (ROC). However, after initial widespread international recognition of the ROC as 'China', over the years, especially after its expulsion from the United Nations (UN) in 1971 in favor of the PRC, a vast majority of countries switched their recognition of 'China' to the PRC, with only a handful of smaller countries still recognizing the ROC today.

Despite the change in international recognition, the ROC, or colloquially Taiwan, continues to operate as an independent state, whereas the PRC, or China, sees Taiwan as an integral part of China, and until this day emphasizes the message that one day it will “return to the embrace of the motherland” (Murphy et al., 2022). While this status quo has been relatively stable for decades, it has been argued that China also sees Taiwan as an issue that threatens the legitimacy of its own ruling party, the CCP, and it has been perceived that in recent times its language has become stronger in claiming reunification as a sort of requirement (Culver & Hass, 2021). Also, China has emphasized that Western attempts to form closer relationships with Taiwan only increase the Chinese resolve to unify (Emmott, 2021b).

Many believe the rapid growth of Chinese economic, political, and military power has led to these more provocative, and more frequent statement regarding Taiwan (Mastro, 2015), as well as increasingly frequent intrusions of Taiwanese territorial waters and airspace, including into areas where the US conducts patrols and exercises, increasing the risk of accidents (Lindberg & Wang, 2021). In response to increased tensions, the current government of Taiwan has rejected the Chinese claim that it is part of Chinese territory (Murphy et al., 2022).

Some believe that China likely prefers a peaceful unification with Taiwan, and in the first place works towards this goal, arguing that military actions against Taiwan have never been a goal, but rather not losing the option to reunify (Culver, 2020). Nonetheless the option the option of military action cannot be excluded (Culver & Hass, 2021), and others argue that China is increasingly considering a military takeover of Taiwan (Mastro, 2021). In addition, China has made clear that it for example sees a formal declaration of independence from Taiwan as a red line that would justify interference.

Furthermore, recent developments regarding the 2022 Russian invasion of Ukraine have triggered additional concerns. Some for example see China’s refusal to condemn the invasion as a concern (Bloomberg, 2022), while simultaneously arguing that Russia’s perceived struggles against much smaller Ukraine, and the following united international response, could serve as a possible deterrent for China to take action in Taiwan (Bloomberg, 2022), others believe that the situation provides China with valuable lessons, but does not significantly change its willingness to take action if needed (Mastro, 2022). Some believe that, for example, instead of a full-scale invasion, China could take a Russian approach of taking pieces of Taiwan, for example the strategically located Patras Island which it could use as a staging ground or base, to provoke and test the response from not only Taiwan, but also the US (Lindberg & Wang, 2021).

In addition, China has emphasized that issues surrounding Taiwan are in no way comparable to the issues surrounding Ukraine (Murphy et al., 2022). Instead, the Chinese government

believes that support for the territorial integrity of Ukraine should equate to support for China's territorial integrity, which in their view means including Taiwan (Murphy et al., 2022). It believes no country has the right to get involved in a crisis in Taiwan, as China sees any action taken in Taiwan as concerning its own sovereignty and territorial integrity (Condon, 2022). As such, regarding Taiwan, China does not see itself as the aggressor, but as the victim that is forced to defend itself (Martin, 2022).

The Russian invasion of Ukraine in 2022 has also caused doubt as to what extent the international community could prevent a Chinese invasion of Taiwan (Murphy et al., 2022). While the US and its NATO allies did not interfere in Ukraine, both in the West and in China itself there is a strong belief that in case of a Chinese invasion of Taiwan the US would interfere (Mastro, 2022). In case of Ukraine, the US government has also from the start pointed out that it would not interfere in Ukraine, whereas the current US administration regularly repeats its commitment to defend Taiwan (Mastro, 2022), and has stood by its decades-long policy that a forceful unification with Taiwan is unacceptable, not excluding military means.

Furthermore, in response to said concerns, US government officials recently stated that the US would be willing to impose sanctions on China if it would show aggression versus Taiwan (Condon, 2022). The 2022 Russia sanctions have been used as an example, that shows both the willingness of the US to impose sanctions on countries behaving aggressively, and the ability to inflict pain on such target countries. The US has specifically mentioned that the 2022 Russia sanctions should serve as a warning to the Chinese government, that aggression versus Taiwan will not be tolerated not only by the US, but by the international community, and any such incident will see similar multilateral economic sanctions efforts (Martina, 2022).

Some argue that the level of sanctions against Russia would not suffice against China, as it is better able to absorb such measures than Russia, and that the only effective sanctions would be to end all trade relations with China (Bloomberg, 2022). However, the US might be willing to accept higher costs due to Taiwan's economic importance, specifically in the semiconductor industry (Bloomberg, 2022; Eurasia Group, 2020), as well as political and military strategy reasons, resulting in unprecedented economic sanctions. Finally, as the US has so often reiterated its support for Taiwan, not taking action when needed could seriously hurt its reliability and its position in international politics (Ellis, 2020).

Russian war support

A much more recent political issue than the previous, but very recent and relevant, is the 2022 Russian invasion of Ukraine, and specifically China's response to it. Tensions between Russia

and Ukraine had been rising through a series of events, eventually leading to the Russian annexation of Crimea in 2014, which was followed by US and Western sanctions against Russia, and in 2022 the Russian invasion of Ukraine as a whole.

This time in 2022, the US and various other, especially Western, countries imposed severe sanctions on Russia, aimed at crippling the Russian economy, and its ability to fund its military actions. This included for example a nearly complete exclusion from the international financial system, seizing of Russian assets, prohibiting the export of certain goods and technologies, and closing their airspace to Russian flights (Posen, 2022). Especially the reduced access to financing and the lack of specialized components and goods have made a significant impact.

In the face of sanctions, Russia has in multiple ways become increasingly reliant upon China for support (Murphy et al., 2022). As a result, in early 2022 China and Russia have formed what they call a “no limits” partnership, that they claim is “superior to alliances of the Cold War era” (Kremlin, 2022). When Russia invaded Ukraine shortly afterwards, the US government has criticized China for not speaking out enough against the Russian invasion of Ukraine in 2022 (Murphy et al., 2022). The US government has in direct terms warned the Chinese government that material aid to Russia, or helping it circumvent sanctions, would lead to tariffs and sanctions, not only from the US, but from a wide group of countries (Shalal et al., 2022).

Despite the partnership agreement, China has shown signs of being conflicted in its relationship with Russia as the war in Ukraine evolved, and their relationship might be better characterized as a partnership with limits, rather than an alliance (Martina, 2022). China has said that it would provide humanitarian support to Ukraine, which seemingly goes against the rhetoric that Russia uses versus Ukraine (Murphy et al., 2022). Also, in a UN vote to condemn Russia’s invasion of Ukraine, at the start of the conflict, only four countries voted in favor or Russia, China not being one of them, and abstaining from voting instead (Donnan et al., 2022). While there have been rumors that Russia discussed with China the possibility of an invasion of Ukraine taking place, at the same time many believe that the actual invasion also caught China by surprise, for reasons such as not having evacuated its own citizens in time, and its seeming difficulty in forming a clear opinion on the matter (Brooker, 2022). Finally, the Chinese government has called the Russian invasion of Ukraine a “war of aggression”, and has stated that it supports Ukraine’s sovereignty, however it has also shown understanding of Russia’s reasons, and stands by their “no limits” partnership (Mallard, 2022).

The Chinese government publicly states that it does not want its relationship with Russia to be associated with the situation in Ukraine, that it supports peace, but does not support unilateral sanctions by the US (Lawder & Shalal, 2022). Some believe China tries to not take sides, as it on the one hand supports Russia in challenging US geopolitical dominance, but

on the other hand itself wants to be perceived as a benevolent great power, rather than an aggressor (Murphy et al., 2022). Overall, China is perceived to have great difficulty in balancing its “no limits” partnership with Russia, its belief in territorial integrity and no interference in domestic affairs that it has long advocated, and its deep economic relations with the US and Europe (Feigenbaum, 2022).

Some argue that the economic ties that China has with the US and Europe are considered too valuable by China itself for it to give them up by voicing strong support for Russia (Kireeva, 2022). The US government claims to believe that China understands that its future, in economic terms, is much more dependent on the US and the West than it is upon Russia (Renshaw & Hunnicutt, 2022). However, some believe that a continued absence of Chinese pressure on Russia will lead to a further deterioration of its relations with the US and other Western countries (Murphy et al., 2022), and the more its economic relationships with the US and Europe suffer, such as through existing measures between them, the stronger its ties to Russia could become (Kireeva, 2022).

While it is difficult to estimate what China’s exact position in the conflict will be in the future, it is not unlikely to keep siding with Russia. In case it’s support goes any further, the US government has warned China that material support to Russia could lead to similar type sanctions against China, and should serve both as a warning and an example (Martina, 2022).

Uyghurs

A third political issue in the relationship between the US and China, that has seen increasing tensions in recent years, is the treatment of minorities in China’s Xinjiang province. This specifically concerns the Uyghur minority, but also includes smaller groups including Kazakhs, Kyrgyz, and others (Maizland, 2021). The Uyghurs are a largely Muslim minority, that is ethnically more related to the Turkic people of Central Asia than to China’s majority Han population.

Part of the Uyghur group strives for an independent state (Maizland, 2021), and the past one or two decades have seen a steady increase in tensions between the Uyghurs and the Chinese government. The increase in tensions and incidents, and calls for independence, have gone hand-in-hand with increasingly harsh state repercussions, reinforcing tensions from both sides. In recent years the crackdown on the Uyghurs has become so harsh that dissent is hardly possible anymore, and it has been estimated that up to two million Uyghurs and other minorities are now confined to camps (Maizland, 2021).

While at first denying the existence of these camps, evidence of their existence eventually mounted, and the Chinese government now claims they are “re-education camps” to fight extremism, while critics see them as forced labor and brainwashing camps, aimed at the extermination of the Uyghur identity (Leibold & Teng, 2021). Further measures both inside and outside the camp include widespread camera surveillance, police checkpoints, restricting Uyghur language use, and restricting practicing religion. In addition, there are claims of torture, forced sterilization, sexual abuse, and other organized human rights infringements (Leibold & Teng, 2021).

China claims that in Xinjiang it fights against “separatism, terrorism, and extremism”, but many argue that this is a disguise of its real intentions, which would be that it sees a strong Uyghur identity as a threat to the centralized power and national unity that its ruling party, the CCP, stands for (Turkel & Van Schaack, 2021). In addition, Xinjiang embodies great value to China, as it contains a wealth of natural resources, and is a crucial region for its Belt and Road Initiative that intends to connect Europe and Asia over land, but also serves as a tool for China to exert political influence in the region (Putz, 2022).

The current US government has publicly called China’s actions in Xinjiang as resulting in a genocide (Turkel & Van Schaack, 2021). While it is difficult to influence China due to its large size and significance in the global economy and politics, the US has attempted to take action through the use of sanctions. The previous US Trump administration already adopted the “Uyghur Human Rights Policy Act” in 2020, and implemented a first round of sanctions (US Congress, 2020). While some suspected the Trump sanctions to have an ulterior motive versus China, US policy regarding the issue has remained unchanged under the current US government, and it has passed a law titled the “Uyghur Forced Labor Prevention Act” in 2021, which severely restricts overall imports to the US of products from Xinjiang province, as well as from other parts of China in cases where the use of forced labor is suspected (US Congress, 2021).

Despite mounting evidence, most of the rest world has been slow to take action, including in the Muslim world, due to the economic and political power of China, and some states have even returned Uyghur refugees back to China (Turkel & Van Schaack, 2021). However, in order to increase the legitimacy and impact of its measures, the US has united the G7 to voice its united concern, and pushed its members to adopt similar measures (White House, 2021b). Nonetheless, while for example the EU has shown to support the US concerns, it has also been more reluctant to impose a similarly comprehensive import ban (Aarup, 2021), and has so far focused on more targeted sanctions against specific individuals and organizations or companies (Emmott, 2021). This can still be seen as a form of success however, as they are

the first European sanctions against China since the 1989 Tiananmen Square massacre (Turkel & Van Schaack, 2021).

Furthermore, it has been argued that the US should continue its path of leading the way in sanctions regarding the Uyghur issue, in order to reestablish its position as a global supporter of freedom and human rights, and repair the damage to its reputation and credibility that some claim it suffered during the previous US Trump administration (Turkel & Van Schaack, 2021).

In response to Western sanctions, China has repeatedly stated that it sees the treatment of the Uyghurs as an internal affair, urges Western countries to not interfere, and has retaliated with countersanctions (Emmott, 2021b). Nonetheless, it has been argued that this is the time for the US to push through on its efforts, and that while it won't be likely to make the Chinese government publicly revert its course, the US should focus on building an international alliance, in order to show the world that no one gets away with this level of human rights abuses (Leibold & Teng, 2021; Turkel & Van Schaack, 2021).

Hong Kong

The fourth, and last, political issue that we consider as an economic sanctions trigger is the one surrounding Chinese interference in Hong Kong. After the British first arrived in Hong Kong in 1841, eventually in 1898 they signed a lease of the city for 99 years. When this period ended in 1997, Hong Kong was handed over to China, at this time the PRC. However, as a result of its long-term separation, Hong Kong had by now developed a widely different economic, political, and legal system from the one in mainland China. As a result, an agreement was made that for the first 50 years Hong Kong would be allowed to maintain its own systems, under a policy dubbed "One country, two systems" (Maizland & Albert, 2021).

The US acknowledged this separation, and would treat Hong Kong as a separate entity, as long as its autonomy would be preserved (Tong, 2020). In the meantime its special status has benefitted all sides, including the city itself, by providing a great degree of freedom and an influx of wealth; the US and outside world, by providing a safe and reliable gateway to China; and China itself, by serving as a bridge between cultures, and providing access to international capital markets and serving as a trade hub, especially in times when China's own financial centers were underdeveloped (Chang, 2019).

While the openness and freedom that characterized Hong Kong are considered the success factors that led to its prominence (Wong, 2020), despite having reached barely half of the 50-year period, recent years have seen increasing efforts by the Chinese government to control Hong Kong politics. These developments especially took off after the large-scale "Umbrella

Revolution” in 2014, during which large groups of protesters occupied the streets of central Hong Kong for over two-and-a-half months. While the goal of the protests was to show disapproval of current developments, and revert the course Hong Kong politics were going, it has in reality led to increasingly rapid anti-democratic reforms.

Two major developments were the introduction a law that allows for the extradition of Hong Kong citizens to China in 2019, and a “national security law” that severely restricts freedom of speech and other freedoms in 2020 (Maizland & Albert, 2021). While these laws triggered another round of large-scale protests in 2019-2020, these were violently suppressed. After the news laws came into effect, it has been argued that peaceful protest is now virtually impossible, as anything can be used as a pretext for extradition to China, including calling for independence or damaging city property, and many consider this the end of a free Hong Kong (Davis, 2020).

In response to these changes in Hong Kong, the previous US Trump administration in 2020 announced that Hong Kong can no longer be considered autonomous, and its treatment as a separate entity will be ended (Tong, 2020). While this decision did not automatically end all special policies regarding Hong Kong, it creates the possibility of significant changes, such as sanctions tariffs against China being applied against Hong Kong products as well, or extending the ban on the export of dual-use good to China to include Hong Kong (Tiezzi, 2020). However, it has been argued that US economic and foreign policy interests would also suffer greatly from eliminating Hong Kong’s special status (Tong, 2020).

It has been argued that sanctions regarding Hong Kong are extra difficult compared to other cases, as they are likely to hurt Hong Kong itself more than China (Wong, 2020), as such damaging its unique status, which economically has already decreased over time (Chang, 2019), and as a result decreasing the barrier to absorbing it into mainland China (Green & Medeiros, 2020). For example, Hong Kong real estate investments in 2020 were down 70% from 2019, signaling a lack of trust among investors (Wong, 2020). Also, Hong Kong currently has the greatest trade surplus in the world with the US, at USD 31 billion, which could easily be targeted by Chinese countersanctions, and hurt the US, while be replaced by mainland Chinese substitutes, benefitting China (Tong, 2020). In addition, it has been argued that China would be willing to accept a certain economic price with regard to Hong Kong, if in return it meant retaining control of Hong Kong, keeping foreign influence out to limit the risk of spillover domestic issues, and saving its reputation and legitimacy (Wong, 2020).

Considering the aforementioned risks of eliminating the special status of Hong Kong, plus the fact that the new US Biden administration has a less punitive attitude towards China than Trump and his voter base had, this increases the likelihood that any escalation in the situation

surrounding Hong Kong would more likely result in economic sanctions, than a full elimination of the city's special status. Despite the limited effect of sanctions, this is still seen as the most viable course of action, given that the US would be unlikely to engage in military conflict over the city, but would also be unlikely to idly sit by, as this would damage its reputation and strategic interests.

2.2 Modern developments in China-US economic and trade relations

This section will focus on the US-China trade relationship in recent years, in order to show how tensions have grown over the years, which sanctions actions have already been taken, and where we are now. This is important to know, as it will provide a basis upon which to build further sanctions in our GSIM model, and to understand the climate that the US-China relationship is currently in.

2.2.1 The 2018 US-China trade war

While US sanctions against China are not a new phenomenon, their frequency and intensity have strongly increased in recent years under the US Trump administration, leading to what many consider a trade war. While an increase in not only economic, but also political, tensions between the two sides had been building up for several years already, in 2017 the US Trump administration removed all doubt and published a renewed National Security Strategy, in which it claimed for the US to be in "strategic competition" with China, and also acknowledged economic competition as a core aspect of rivalry between global powers (Rosen, 2022).

Motives

The open competition with China, as emphasized by the US Trump administration, led to increased attention for a number of perceived trade issues between the US and China (Bown, 2021). First, these issues include the trade imbalance between the two countries (Kapustina et al, 2020). At the time, the US argued that this imbalance meant that the US was losing to China, and that China was 'ripping them off'. Despite criticism, this moved the then US government to work on improving the balance. Second, it was argued that China engaged in unfair trade practices, including dumping of products, and export subsidies (Morrison, 2018). While such accusations were not new, the severity with which they were addressed was. Third, a less concrete concern was the perceived increase in economic espionage by China (Morrison, 2018). This was argued to occur for example through the theft of high-tech trade information, or by controlling communications systems, where a company that received particular scrutiny and that got restricted in its operations was Huawei.

Besides these direct trade issues, there had also been strategic concerns, for example resulting from US reliance on China for crucial goods such as semiconductors (Eurasia Group, 2020), and the call for a reduction in technological dependence became increasingly prominent (Economist, 2022).

Measures taken

While the US always had a turbulent trade relationship with China, also before the trade war, the rhetoric versus China, and the type of actions taken, quickly escalated. Starting with the threat of cases being taken to the WTO, the US Trump administration quickly took increasingly severe actions by itself, eventually leading to a rapid succession of increasing tariff rates against each other.

While China has historically been very reluctant to use sanctions itself (Nephew, 2019), even in sensitive issues such as the South China Sea sovereignty disputes (Poh, 2017), in case of the trade war with the US it did not hesitate to take countermeasures.

The trade war largely became a game of one-upping each other between the former US Trump administration and China, taking place over various rounds (Chang, 2019). As a result, a full overview of measure taken would span pages, but below follows a condensed overview of the key sanctions rounds and the applied tariffs (Bown, 2021):

- Starting in 2018 with a series of product-specific tariffs up to 25%, both sides imposed tariffs and counter-tariffs on a total of USD 50 billion worth of imports from the other side.
- In September 2018 the US added another USD 200 billion in Chinese imports, applying a 10% tariff.
- In return, China selects USD 60 billion of US imports and applied tariffs ranging from 5% to 10%.
- Negotiations followed, and a draft agreement was set up, but as China withdrew from most aspects, the US was displeased with its outcome, and in May 2019 it increased the tariff on the USD 200 billion imports from 10% to 25%.
- A Chinese response could be anticipated, and China increases the tariffs on its USD 60 billion imports list also to 25%.
- More negotiations followed, this time at a G20 meeting in Osaka. As the outcome was again unsatisfactory for the US, the US Trump administration now threatened 10% tariffs on the remainder of all imports from China, worth USD 300 billion, plus an increase of the current 25% tariffs to 30%.

After this escalation, events came to a halt, and talks towards a new trade deal intensified. However, as it was near the end of the Trump presidency, many hoped that a new presidency could lead to reduced tensions, as many questioned whether the sanctions did not hurt the US itself more than they hurt China.

Despite significant political support in the US for sanctions against China, particularly under the previous Trump administration, there are scholars who argue that China does not have to lose for the US to win (Rosen, 2022), and that both sides would benefit from a cooperative trade relationship. Also, it has been argued that, in other cases of US sanctions, the US is able to successfully enforce sanctions due to its dominance in international services and networks, not in manufacturing jobs (Posen, 2022). This is due to the fact that manufacturing is much easier to replicate, and to become self-sufficient in, which could be one of the reasons for the limited success of the trade war.

2.2.2 Current developments in China-US economic and trade relations

It has been argued that the globalized economy has been slowly getting damaged over the past two decades (Posen, 2022). Firstly due to nationalist and populist governments around the world increasing trade barriers, including under the US Trump administration, and secondly as the result of China's challenging of the international economic system and security relationships in Asia, which caused especially Western countries to limit the degree of Chinese economic integration (Posen, 2022). The US-China trade war has been seen as an event that escalated this trend.

The 2022 sanctions against Russia could lead to further damage to economic globalization for three reasons (Posen, 2022). First, while China tries to stay neutral to some extent, in order to prevent retaliatory sanctions against itself in case it would help out Russia, the lack of sanction support from China will by the US and its allies in any case be seen as non-cooperative, and damage the relationship even further. Second, the display of economic power by the US and its allies can trigger other countries that might fear sanctions for a variety of reasons to become more worried about the prospect, and possibly looking at China as an alternative, or backup plan. Third, the damage that Russia is suffering as a result of sanctions could trigger other countries to focus on becoming more self-reliant, to be less affected in case of sanctions. This is despite the fact that being economically less intertwined also makes it more likely to be the subject of sanctions, as sanctions would hurt the imposing party less (Posen, 2022). This is also a key difference between Russia and China when considering the imposition of sanctions on either one, where many countries and industries rely on China for part of their supply chain, whereas Russia's center of gravity is by and large the energy sector.

The combined effect of these three factors is that the global economy could increasingly split into blocs, with one revolving around the US, and the other around China (Posen, 2022). Signs pointing in this direction include that the period after the initiation of sanctions against Russia has seen a significant outflow of capital from China (Renshaw & Hunnicutt, 2022). Furthermore, Chinese international projects such as the Belt and Road Initiative, could help China to strengthen the bloc around it (Rosen, 2022), even if some scholars doubt the extent to which it will be the game changer popular media regular claims it to be (Gong, 2018; Rolland, 2017). The bloc formation trend is also supported by the observation that currency pegs to a large extent depend on which country a country looks to for military support (Posen, 2008), turning military alliances into economic ones as well.

However, it has been argued that while challenges to the position of the US dollar exist, and might increase, it is unlikely that one significant alternative that is just as appealing by itself will exist any time soon (Posen, 2022). It will be difficult for the Chinese yuan to significantly challenge the position of the US dollar, as long as domestic controls of the currency remain in place (Posen, 2022). China could work around such issues, but that would affect its exchange rate and currency in a number of ways that would make it think twice (Posen, 2022).

Nonetheless, signs of bloc formation have been seen in practice, such as when the largest Chinese offshore oil producing company CNOOC announced it will withdraw a major part of its operations in the US, Canada, and the UK, over concerns regarding future sanctions and tariffs (Bouso & Chen, 2022). This follows the company already having been removed from US stock exchanges during in 2020 during the Trump administration, and these concerns were increased by the 2022 Russia sanctions, both due to potential sanctions resulting from Chinese support for Russia, or future similar sanctions versus China stemming from various trade and political issues (Bouso & Chen, 2022). The company in particular withdrew from projects where it is heavily dependent on technology from Western partners, such as deep-sea projects, and instead will focus on new sources such as Brazil, Uganda, and Guyana (Bouso & Chen, 2022) and Chinese domestic offshore drilling (Bouso et al., 2022).

Furthermore, the Trump administration initiated policies that resulted in delisting Chinese companies from US stock markets, specifically in the tech sector, and China has recently also started to show efforts to withdraw Chinese companies from US stock markets itself (Liu et al., 2021). A recent example is that of Didi, a major Chinese taxi company similar to US-based Uber, which has been ordered to withdraw from US stock markets citing security concerns over data leakage, and even faces potential nationalization. This undermines the trust of foreign investors in Chinese companies (Liu et al., 2021).

However, as the Trump administration has taken a number of measures against China, it refrained from actions that could have significantly negative domestic effects (Bloomberg 2022), for example unpegging the Hong Kong dollar from the US dollar, as it is believed that this would hurt Hong Kong and the US itself more than it would hurt China (Yau & Tsang, 2020).

China has also observed the bloc trend, and has accused increased US alliance building in the Indo-Pacific region as an attempt to build an Indo-Pacific version of NATO, and has warned with repercussions if the US continues on this path (Bloomberg, 2022).

Sanctions versus Russia have also shown the dominance of the US in the current global financial system (Donnan et al, 2022). While China has been aware of this for years, this situation is seen as triggering China to increase steps taken to decrease its financial reliance upon the US, for example by setting the up the CIPS system as an alternative to the US-dominated Swift interbank messaging system, creating a cross-border digital currency, and diversifying its foreign currency reserves (Donnan et al., 2022). China has also made efforts to become increasingly self-reliant in crucial industries, such as semiconductor production, by increasing its own production capacity, as well as buying up the necessary natural resources that can only be sourced abroad (Donnan et al. 2022). However, Chinese efforts to reduce the US dependence of its financial system have a long way to go, as for example only 3% of global payments are performed in Chinese yuan (Donnan et al., 2022).

Even if the complete separation into two blocs might not happen, the processes in this direction can still cause significant damage to the globalized economy, and result in lower growth rates, and less innovation, as the result of reduced competition, reduced access to knowledge, and localized supply chains (Posen, 2022).

The US government has publicly stated that it wants to work together with China to prevent a situation in which two separate financial systems develop that oppose each other (Lawder & Shalal, 2022). It has been argued that trade and financial relations between the US and China are best guarantee of peace, and that any efforts to separate the two would increase tensions and the likelihood of conflict, which is in the interest of neither party (Donnan et al., 2022; Kapustina, 2018).

However, some argue that while China's economic growth rates so far have been stable, there is a risk of it entering a period of slow economic growth, for a wide array of reasons, including domestic market reforms (Rosen, 2022), which presents new risks. It has been argued that China's historic adversity to sanctions is starting to change, and that after retaliating against US sanctions in the recent trade war, it might follow the US in using sanctions for political goals itself in years to come (Nephew, 2019).

2.3 The effectiveness of economic sanctions

This sections will focus on the effectiveness of economic sanctions in academic research and political discourse. First, a general discussion of the perceived effectiveness of economic sanctions, and various aspects that play a role in it, will be covered. Second, we will zoom in on the effect of unilateral versus multilateral sanctions, as the focus area of the GSIM scenarios. This background is important in order to provide a basis for our GSIM and hypotheses regarding multilateralism as a potentially crucial economic sanctions success factor.

Doubts regarding the effectiveness of sanctions are not new, and already in the 1990s, a period in which the US issued sanctions against 30+ countries, research found that only about 20% of these sanctions reached the goals they intended to reach (Griswold, 2000). It was found that sanctions do lose the US money, and cause reputational damage, but do little to increase national security.

When it comes to human rights issues, in reality the damage a target country suffers more likely leads to more severe human rights abuses, rather than an improvement (Griswold, 2000). And as the target countries are usually autocratic in nature, lacking democratic controls to tackle the observed issues, the damage resulting from sanctions frequently leads to a higher concentration of power of the local regime (Griswold, 2000). A clear example of this is Cuba. The US has sanctioned Cuba ever since 1961, and the same regime remains in place, while it is only the Cuban people that suffer (Griswold, 2000). This is also the main reason that, while initially present, international support for sanctions against Cuba has largely disappeared.

The case of South Africa is by some considered an examples of sanctions success, however, the collapse of the Apartheid regime was also dependent on other factors, such as the Soviet Union collapse, the fact that the country was partially democratic, meaning it there is electoral accountability, and the fact that sanctions were multilateral (Griswold, 2000). This last aspect however, is frequently mentioned as a success factor of sanctions, and will as such be investigated further in the next section.

While China is not a democratic country, it still has the potential to in the long-term see similar results as South Africa, due to the face that it has a large and growing middle class. The increased social power of a growing middle class has more often been seen as presenting increasing difficulties for the Chinese government, and in case of this new found success suffering from economic sanctions, it might lead to an increase in domestic discontent.

Lastly, in line with the observed economic bloc formation as mentioned earlier, it has been argued that excessive use of sanctions by the US could trigger countries to develop alternatives, to be less dependent on the US and its allies economically (Posen, 2022), as such reducing sanctions effectiveness. This is a risk that is particularly relevant in case of China, as it has size, means, and reach to do so. However, despite doubts regarding the effectiveness of sanctions, it remains highly likely that the US will continue to use them as its go-to foreign policy tool. Even if they might not achieve the intended results, there are situations in which the US just can't idly sit by and not take action, but also does not want to risk armed conflict. In these situation, economic sanctions are still likely to play a role for years to come.

2.3.1 Unilateral vs multilateral sanctions

While earlier we mentioned the threat that sanctions could become less effective in case the US would resort to them too easily, as sanction targets could develop alternative options, this threat has in reality been seen to be diminished when a sanctions alliance is significant enough (Posen, 2022). The 2022 Russia sanctions have been considered powerful as they were supported by an alliance of high income democracies (Posen, 2022). In this case, Russia was cut off from virtually all significant global financial institutions and systems, except for those under control of China. However, due to the fact that Chinese institutions want to retain access, and prevent retaliatory sanctions, the blockade could be sustained (Posen, 2022). In such cases, a shift from the dollar to other currencies does not make a difference. This case clearly shows the positive effect of multilateral sanctions.

Despite the collaboration in response to the Russian war in Ukraine, in past cases the US has frequently used unilateral sanctions, and it would force third party countries to comply with its sanctions versus a target country by otherwise threatening them with severe retaliatory sanctions, a well-known case of which is Iran (Lovely & Schott, 2021). Companies would practically be forced to choose between doing business with the US, or with the target country. It has been argued that using the same approach versus China would be difficult, if not impossible. First of all, there is the much greater economic significance of China, and secondly, China has started to set up sanctions blocking mechanisms since January 2021 (Lovely & Schott, 2021). An example of such measures is that the Chinese government can prohibit Chinese companies from adhering to foreign sanctions. This would include foreign companies being punished for adhering when they are operating in China under subsidiaries, which due to Chinese business ownership legislation is nearly always the case.

Such blocking measures were first introduced in Europe in the 1980s and 1990s, as an attempt to protect its businesses from having to adhere to US sanctions against for example the Soviet Union or Cuba, but while these European laws have been seen to have had limited effect, the new Chinese mechanisms have the potential to be more obstructive (Lovely & Schott, 2021). Language used in these Chinese regulations is relatively vague, most likely on purpose to keep it widely applicable where needed. Due to its limited use so far however, their exact use in practice remains to be seen (Lovely & Schott, 2021).

Nonetheless, Chinese sanctions blocking measures increase the need for multilateral sanctions alliances (Lovely & Schott, 2021). Having multilateral sanctions would make it more difficult to impose such counter-measures. Losing access to the US market is no minor loss, but additionally losing access to all other developed economies, as was the case for Russia with the 2022 Russia sanctions, makes it virtually impossible for companies to do any business outside their borders at all (Lovely & Schott, 2021).

While unilateral sanctions don't cost the US much in the short term, but can come at a great cost in the long term (Abdelal & Bros, 2020). The frequent use of unilateral sanctions by the US has regularly led to tensions with its oldest allies in Europe, for example with respect to Iran, as well as regarding Russia prior to 2022, for example in its opposition to the Nord Stream project, and these tensions have at times threatened the strength of US-European alliances (Abdelal & Bros, 2020).

Another question is to what extent unilateral sanctions will continue to work as well in a world where power becomes more fragmented, and the relative power position of the US decreases. This development might force the US to work together more often regarding its foreign policy objectives. Increasing the number of sanction participants is expected to increase the effectiveness of sanctions, as well as to strengthen their legitimacy.

2.4 The effect of sanctions on trade

2.4.1 Precedent cases of economic sanctions

This section will provide an overview of two precedent cases of economics sanctions versus other countries. While the large size of the Chinese economy, its high level of interrelatedness with other major economies, and its unique position as the center of global production provide a limitation, and mean that no single precedent case will provide a perfect precedent with similar conditions, these cases might still provide clues as to the potential effects of new sanctions being imposed versus China, and the types of sanctions being utilized. These

insights are important, as they help to structure the sanctions in our GSIM study, and also could affect the decision of countries whether to participate in the sanctions alliance or not, as discussed in the GSIM scenario development further on.

While the US has imposed economic sanctions on a large list of countries over many decades, including well-known ongoing cases such as Cuba, North Korea, and Venezuela, and more historical cases such as South Africa and Yugoslavia, we selected two specific precedent cases that we believe to be the most relevant to have a closer look at: (1) Russia and (2) Iran. The reason for the inclusion of each country is discussed at the start of each respective section.

For both precedent cases we will (1) discuss the motives behind the sanctions; (2) the type of sanctions imposed; (3) their perceived effectiveness towards their intended goals; (4) the economic and trade effects on the target, initiator and global economy; and (5) the position towards the respective sanctions of the other countries that are included in our scenario development later on.

Russia

The case of sanctions against Russia has been selected as it includes very recent, even ongoing developments; because it is a prime example of multilateral sanctions by cooperating countries instead of secondary sanctions; because it plays a major role in the global economy and politics; and because the current US government has openly stated that the 2022 Russia sanctions should serve as a warning to China what to expect in case of escalations over Taiwan (Martina, 2022).

Similar to the case of China, Russia has had a long and fraught relationship with the US, that has seen US sanctions being imposed at multiple times, both against Russia and against its de facto predecessor state the Soviet Union. This section focuses on two specific rounds of sanctions, first, those imposed after the 2014 Russian annexation of Crimea; and second, those imposed in response to the ongoing 2022 Russian invasion of Ukraine. Both cases respond to a Russian violation of Ukrainian territorial sovereignty, with the 2014 case entailing more focused sanctions (Korhonen, 2019), and the 2022 case some of the most extensive sanctions in modern history.

Aspects that make Russia relevant as a precedence case specifically to China are first, sharing a long sanctions history with the US, just like China; second, the sanctions goal in both 2014 and 2022 being to end territorial conflicts, which at least to some extent resembles the potential situation with Taiwan, one of the primary issues regarding China; third, the

significance of Russia as a global political actor; fourth, the perceived heavy reluctance on behalf of the US towards military conflict, due to the fact that it is a nuclear-armed country, the size of its military, and its sheer geographic size and political climate presenting strategic issues.

A point where Russia as a precedent differentiates from China is that its economic importance is much more limited as opposed to China, for the US, and to a great extent for the world as a whole. Both the US and global economy significantly depend on China as a production and exporting hub, and many production supply chains have links to China. Russia is however in the first place an importer, it's primary global exports are oil and gas. While large parts of Europe depend on it for this reason, the US has more easily available alternative sources. This distinction could affect the willingness to impose sanctions against China as opposed to Russia.

Motives

In 2014, sanctions were imposed against Russia in response to its annexation of the Crimea region of Ukraine, and additional hostile actions in other parts of Eastern Ukraine. The intent of these sanctions was to signal disapproval of Russia's actions, to stop further aggressive moves against Ukraine or other neighboring states, and to isolate Crimea economically (Åslund, 2019). In 2022, sanctions were imposed in response to the Russian invasion of Ukraine as a whole. The goal of this round of sanctions was to no longer be merely a signal, but an effort to break the Russian economy, in order to restrict its ability to fund its military actions. In both instances, a major factor for imposing sanctions was also that military action was ruled out (Åslund, 2019).

Type of sanctions

Prior to the 2022 Russian invasion of Ukraine, US and EU sanctions were focused on certain restrictions on Russian access to international capital markets; limiting the access to cheap loans by prohibiting certain debt transactions; and restricting access to specialized technology needed to develop oil resources that are more difficult to exploit (Abdelal & Bros, 2020). In 2022, sanctions further restricted access to international market, to an extent where it has become nearly impossible; the seizing of property of a long list of influential individuals; export bans on dual-use good; flight restrictions; export bans on luxury products; import tariffs on a wide range of Russian products.

The case of the 2022 Russia sanctions shows the importance for the US and the West of being able to shut the country out from the international financial system, with no real alternative to turn to (Posen, 2022).

The effectiveness of economic sanctions to achieve political and economic goals

With regards to its political goals, the sanctions in 2014 have been ineffective in achieving their goals (Åslund, 2019). While Crimea had indeed been economically isolated for years, it has remained under Russian control. Also, Russian aggression continued in Eastern Ukraine, and eventually escalated with its invasion of Ukraine in 2022.

Whether the new rounds of sanctions in 2022 will succeed remains to be seen, but most analysts believe that no significant change in Russian policy will be achieved, as long as the same Russian government remains in place.

The effect of economic sanctions on the target, initiator & global economy and trade

After 2014 the Russian energy sector was more significantly affected by low oil prices than by the sanctions imposed on it, pushing Russia from having a budget surplus into a budget deficit (Abdelal & Bros, 2020). The exploration of new oil resources did halt due to the technology-focused sanctions, and the reduction of foreign investments (Abdelal & Bros, 2020).

Russia has tried to limit the effect sanctions can have on its economy, by refocusing on new markets in Asia; more cooperation with non-Western institutions; developing alternatives to imported goods and technology; reducing its reliance on the US dollar currency; an increased focus on gas versus oil, as in this sector it is easier to reduce US dollar dependency, and the market is more subjected to local forces than that of oil, which is a global commodity (Abdelal & Bros, 2020).

Despite these efforts, it has been projected that the new 2022 sanctions could lead to a decrease in Russian GDP of 15%, and up to 20% inflation (Otero Iglesias, 2022). In addition, the 2022 sanctions against Russia are generally expected to have a major effect on economies around the world (Kennedy & Condon, 2022).

Positions of others in the GSIM model

Section 3.5 will outline the exact motivations for the inclusion of various countries in our model. This section describes their positions in the selected previous sanctions cases, in order to gauge their position towards such measures.

The sanctions participants that we later on introduce in Scenario 2, being the EU and NATO member states, all take part in the sanctions against Russia, with the exception of Turkey, which has attempted to take a neutral role in the conflict (Cuhadar, 2022).

The countries introduced in Scenario 3, being Japan, Korea, Australia, New Zealand, and India, also all take part in the sanctions against Russia, with the exception of India, despite

pressure on it from the US to participate. It is noteworthy that the other four Asia-Pacific allies participate in the sanctions, despite being more removed from the conflict than for example the EU. This indicates a certain willingness of these countries to support the US in case of severe political conflicts.

Scenario 4 adds ASEAN to our model, which did not participate in sanctions against Russia. However, this group will be more likely to be affected by a conflict with China, and is included for reasons discussed further on.

Iran

The second precedent case of US sanctions, against Iran, has been selected as it is one of the longest-running, and most comprehensive of US sanctions. Unlike the case of Russia, sanction support has not been multilateral in recent times, but is a clear example of, more usual, unilateral US economic sanctions, which it enforces upon other countries through secondary sanctions (Katzman, 2022). In addition, Iran is another example of a country that has been vying to be a regional power, and to increase its regional influence; that is seen as a security threat by the US, due its attempts at growing and projecting its military power, including nuclear capabilities; and a country with whom the US strongly disagrees with its type of government, as well as a wide range of political issues.

Aspects in which Iran as a precedent case differentiates from China, is that it is likely to remain a regional power, lacking the capability of China to become a global power; that its economy is currently virtually disconnected from the world, and would in any scenario be unlikely to achieve the global importance and centrality of that of China; that it cannot hit back at sanctions through economic means; and that the US would have military supremacy over it, lacking the force-detering effect that China (and Russia) have.

Nonetheless, the discussion of Iran as a precedent can add to the buildup of the model, through an understanding of the types of measures that have been taken, the economic and trade effects that they have had, and the reaction to these unilateral US sanctions of the various countries that will later be considered for our model in the scenario development.

Motives

The principle motive for the first sanctions by the US dates back to 1979, and the hostage crisis that year (Katzman, 2022). In more recent years a major additional concern became the development of nuclear weapons and ballistic missiles by Iran, which triggered the EU to support sanctions against it. These development also let to wider UN sanctions, however,

those were less wide in scope, and for example excluded the energy sector, which is of great importance to the Iranian economy. Apart from these direct motives, the position of the US versus Iran should also be seen from a strategic point of view, as Iran is a key regional actor, that has conflict with a number of US allies in the region. In this respect, it resembles the case of regional hegemony between the US and China in East and Southeast Asia.

Type of sanctions

While against Russia initial 2014 sanctions only completely prohibited the trade in certain goods, and only restricted the trade in most others goods and services, the US sanctions against Iran have been of a much more severe nature, meaning a full exclusion of any trade relationships for companies that want to do business in the US (Katzman, 2022). In this respect, the sanctions help us to set tariff-related economic sanctions against China in our model. However, the attitude of other countries in the model with regards to the Iran case still helps us to develop our model.

The effectiveness of economic sanctions to achieve political and economic goals

The effectiveness of sanctions against Iran can be seen as a partial success. While the initial sanctions since 1979 did nothing in terms of US political goals, the more recent concern with its nuclear weapons and ballistic missiles program has seen a degree of success (Katzman, 2022). The US, along with other Western allies, managed to strike a deal that halted these programs. However, the former US Trump administration cancelled the deal. Nonetheless, it has been reported that renewed nuclear deal talks are under way, and as such overall a moderate degree of success can be claimed.

The effect of economic sanctions on the target, initiator & global economy and trade

US and EU sanctions led to a severe decrease in oil production exports and revenues; the near total collapse of Iran's potentially very large natural gas market, due to restricted access to technology and shipping services; the end of large refining projects; no more access to the SWIFT international banking system and international financial markets (Abdelal & Bros, 2020).

In response to the sanctions Iran has attempted to set up a self-reliant 'resistance economy', by developing the necessary technology itself, stimulate other industrial sectors apart from energy, and work on improving relations with neighboring states (Abdelal & Bros, 2020). Iran has tried to increase the levels of European and Asian investment in Iran, to make it harder for the US to continue to enforce its policy of secondary sanctions (Abdelal & Bros, 2020).

Apart from its economic response, Iran has also worked the possibility to retaliate in other ways. For example, due to its geographic position and military power, Iran can disrupt trade through the Strait of Hormuz, which is crucial for global trade with the Middle East (Abdelal & Bros, 2020).

Positions of others in the model

Similar as for the precedent case of Russia, we assess the position of other countries in the GSIM model, in order to aid scenario development further on.

Regarding the Scenario 2 actors, the EU reinforced its sanctions blocking mechanisms, mentioned earlier in this paper, to prevent EU companies from adhering to US sanctions, to some extent (Abdelal & Bros, 2020). This is due to the fact that while the EU support sanctions in response to the nuclear and ballistic missiles programs, it disagrees with the US on its cancellation of the deal, and its perceived unwillingness to reach an effective deal, and its frequently changing attitude towards the nuclear deal. Also, in particular the US approach of forcing others to comply, due to secondary sanctions, has antagonized various European states, both as it disrupted established European business interests that were set up in the period of the nuclear deal, and as it does not feel like an equal partnership when one side enforces measures upon the other. An extra factor playing a role here is that the EU suffers much more from conflict in the Middle East than the US, for example in the form of refugee crises. As these factors all have the potential to damage US-EU relationships, using multilateral sanctions are a suitable alternative to prevent such tensions.

As for the actors in Scenario 3, they largely share the position of the EU. Especially Japan and Korea had been working on developing business ties with Iran in the period of the nuclear deal. Similarly as for the EU, their perceptions of US actions in the conflict are not favorable, and would benefit from better future cooperation, through multilateral sanctions.

Finally, the Scenario 4 actor of ASEAN one again plays a very limited role in this conflict. As such the case of Iran provides little guidance with regards to this scenario, and its primary reason for inclusion is its ties with China.

3. Methodology

This section will (1) first discuss how the GSIM method used in this research works and why it was chosen. (2) Second, it will give an overview of which data was selected, why, and how. (3) Third, we describe the shock that the scenarios apply to the model. (4) Fourth, we explain what types of results the GSIM presents, and how the trade value outcome of the model will be converted to trade volumes. (5) Fifth and last, we discuss the four scenarios that were used in this research, and the rationale behind each of them.

3.1 GSIM approach and its merits

This research uses a GSIM approach to model the economic and trade effects of sanctions. The GSIM methodology was developed in 2002 through the work of Francois & Hall (2009), and has been widely used to model shocks that affect international trade. This includes for example shocks resulting from the implementation of FTAs or sanctions, but has also seen more creative use, such as to model the impact of Somali piracy on trade, or the impact of IMO2020 emissions regulations (Berden, 2021). The results of a GSIM model include (1) economic effects, in the form of welfare effects, and (2) trade and transport flow effects, in the form of change in output and changes in bilateral trade flows.

The GSIM uses a Partial Equilibrium approach (PE) to a multi-region model, that assumes imperfect substitutes. This approach provides two core advantages over a General Equilibrium model (GE), which is another commonly used method in trade effects research. The first advantage is that a PE model focuses on a specific shock, excluding other factors that could affect the results (Francois & Hall, 2009). This enables research to evaluate the impact of such a specific shock alone, in this case the imposition of economic sanctions against China. The second advantage of a PE model is that it requires a more limited amount of data input than a GE model (Francois & Hall, 2009). This makes it possible to conduct this type of research with more limited resources, and within a shorter timeframe. The only data needed are trade values, tariff and trade barrier data, and elasticities of demand, supply, and substitution, which model trade behavior. These types of data are in general publicly available in trusted databases.

However, at the same time the GSIM approach comes with certain limitations (Francois & Hall, 2009). Firstly, as a result of a PE model focusing on a single shock event, this also means in reality results could be different when the impact of other factors is taken into account. Second, due to the limited amount of data input, false estimations could easily distort results. While trade values and tariff data are largely fixed, this especially applies to the elasticities used. In

order to test this effect, after our initial research a sensitivity analysis will be performed, in order to increase the robustness and validity of our results.

The GSIM simulation has been built into an Excel model. The mathematical model behind it is developed through the work of Francois & Hall (2009), and the key equations are presented below are all derived from their work.

First, we assume that for every importing country v the import demand of product category i from country r is a function of industry prices and total expenses on the product category (Francois & Hall, 2009), creating the formula below.

$$\text{Equation (1)} \quad M_{(i,v),r} = f(P_{(i,v),r}, P_{(i,v),s \neq r}, Y_{(i,v)})$$

$M_{(i,v),r}$ = import demand of product i from country r in country v

$Y_{(i,v)}$ = total expenditure on imports of product i in country v

$P_{(i,v),r}$ = internal price for goods from region r within country v

$P_{(i,v),s \neq r}$ = price of other varieties

This equation can be differentiated, and using the Slutsky decomposition of partial demand and the zero homogeneity property of Hicksian demand we derive the cross-price and own-price elasticities as seen below:

$$\text{Equation (2)} \quad N_{(i,v),(r,s)} = \theta_{(i,v),s}(E_M + E_S)$$

$$\text{Equation (3)} \quad N_{(i,v),(r,r)} = \theta_{(i,v),r}E_M - \sum_{s \neq r} \theta_{(i,v),s}E_S = \theta_{(i,v),r}E_M - (1 - \theta_{(i,v),r})E_S$$

$\theta_{(i,v),s}$ = expenditure share

E_M = composite demand elasticity

Continuing with the demand and supply equations. Using the export price on world markets, and the domestic price for the same product, the composite demand for national product varieties looks as below:

$$\text{Equation (4)} \quad P_{(i,v),r} = (1 + t_{(i,v),r})P_{i,r}^* = T_{(i,v),r}P_{i,r}^*$$

$P_{(i,v),r}$ = domestic price of goods

$T_{(i,v),r}$ = tariff impact of tariff t

$P_{i,r}^*$ = world price of export from region r

The export supply ($X_{i,r}$) equation is derived as a function of the world price of exports ($P_{i,r}$):

$$\text{Equation (5)} \quad X_{i,r} = f(P_{i,r}^*)$$

Through differentiation the preceding three equations the following equations are derived:

$$\text{Equation (6)} \quad \hat{P}_{(i,v),r} = \hat{P}_{i,r}^* + \hat{T}_{(i,v),r}$$

$$\text{Equation (7)} \quad \hat{X}_{i,r} = \hat{E}_{X(i,r)} \hat{P}_{i,r}^*$$

$$\text{Equation (8)} \quad \hat{M}_{(i,v),r} = \hat{N}_{(i,v),(r,r)} \hat{P}_{(i,v),r} + \sum_{s \neq r} N_{(i,v),(r,s)} \hat{P}_{(i,v),s}$$

$\hat{}$ = a proportional change, such that $\hat{x} = \frac{dx}{x}$.

Next, the global equilibrium condition equations. To form a functioning GSIM model, we use the earlier equations to create the following model, defined in world prices:

$$\begin{aligned} \text{Equation (9)} \quad \hat{M}_{i,r} &= \sum_v \hat{M}_{(i,v),r} = \sum_v N_{(i,v),(r,r)} \hat{P}_{(i,v),r} + \sum_v \sum_{s \neq r} N_{(i,v),(r,s)} \hat{P}_{(i,v),s} \\ &= \sum_v N_{(i,v),(r,r)} [P_r^* + \hat{T}_{(i,v),r}] + \sum_v \sum_{s \neq r} N_{(i,v),(r,s)} [\hat{P}_s^* + \hat{T}_{(i,v),s}] \end{aligned}$$

We equalize the equation above with Equation 7, providing the market clearing condition for all exports seen below. This is the core equation in the system.

$$\begin{aligned} \text{Equation (10)} \quad \hat{M}_{i,r} &= \hat{X}_{i,r} \\ E_{X(i,r)} \hat{P}_{i,r}^* &= \sum_v N_{(i,v),(r,r)} \hat{P}_{(i,v),r} + \sum_v \sum_{s \neq r} N_{(i,v),(r,s)} \hat{P}_{(i,v),s} \\ &= \sum_v N_{(i,v),(r,r)} [P_r^* + \hat{T}_{(i,v),r}] + \sum_v \sum_{s \neq r} N_{(i,v),(r,s)} [\hat{P}_s^* + \hat{T}_{(i,v),s}] \end{aligned}$$

As for the welfare and revenue effects, we first determine the change in producer surplus ($\Delta PS_{(i,r)}$) through the equation below:

$$\begin{aligned} \text{Equation (11)} \quad \Delta PS_{(i,r)} &= R^0_{(i,r)} \times \hat{P}_{i,r}^* + \frac{1}{2} \times R^0_{(i,r)} \times \hat{P}_{i,r}^* \times \hat{X}_{i,r} \\ &= (R^0_{(i,r)} \times \hat{P}_{i,r}^*) \times \left(1 + \frac{E_{X(i,r)} \times \hat{P}_{i,r}^*}{2}\right) \end{aligned}$$

$R^0_{(i,r)}$ = benchmark export values, valued at world prices

The change in consumer surplus ($\Delta CS_{(i,v)}$) looks as follows:

$$\text{Equation (12)} \quad \Delta CS_{(i,v)} = (\sum_r R^0_{(i,v),r} \times T^0_{(i,v),r}) \times \left(\frac{1}{2} E_{M,(i,v)} \hat{P}_{(i,v)}^2 \times \text{sign}(\hat{P}_{(i,v)} - \hat{P}_{(i,v)})\right)$$

$$\text{where} \quad \hat{P}_{(i,v)} = \sum \theta_{(i,v),r} \hat{P}_r + \hat{T}_{(i,v),r}$$

Continuing with the own-trade (or trade creation = $TC_{(i,v),r}$) and cross-trade (or trade diversion = $TD_{(i,v),r}$) effects, these are created as seen below:

$$\text{Equation (13)} \quad TC_{(i,v),r} = M_{(i,v),r} \times [N_{(i,v),(r,r)} \hat{T}_{(i,v),r}]$$

$$\text{Equation (14)} \quad TD_{(i,v),r} = M_{(i,v),r} \times \sum_{s \neq r} N_{(i,v),(r,s)} \hat{T}_{(i,v),s}$$

3.2 Data selection

The GSIM method requires a number of data as input, including (1) trade values between each country (grouping) pair, (2) tariff and NTM data, before and after the shock, (3) three elasticities, for (a) demand, (b) supply, and (c) substitution (Francois & Hall, 2009). This section describes how the relevant data were selected and retrieved.

Country selection

This research studies the effect of sanctions versus China, imposed by the US and an increasing number of sanction partners, building up through four scenarios. A detailed explanation of why each scenario includes certain countries is given in Section 3.5 Scenario Development. From a practical point of view, the GSIM model country selection is based on these four scenarios, and includes all relevant parties from all scenarios. To construct the GSIM model, certain countries are grouped, which is common practice in GSIM models (Francois & Hall, 2009). Following are the considerations made when creating these country groupings.

Scenario 2 introduces the EU and NATO as sanction partners. The EU is included as one group, since due to the economic and political structure of the EU it normally agrees on imposing sanctions collectively, not as individual member states, especially when concerning major international concerns.

As NATO membership for a large part overlaps with that of the EU, and every country can only be included in a GSIM model once, it is not possible to include NATO as a group. When excluding the EU member states, this leaves the NATO member states the United Kingdom, Canada, Iceland, Norway, Montenegro, Albania, Macedonia, and Turkey. However, NATO member states are not bound together to the same extent as EU member states are when it comes to imposing sanctions, and despite a likely alignment of policies, they make their own decisions. A precedent for this can be found in the 2022 Russia sanctions, where most NATO member states participated, but Turkey did not. In addition, there is a huge discrepancy in size of the economy for these remaining NATO member states. In order to be able to observe more specific effects, which apart from political considerations could possibly affect the individual decisions to join sanctions or not, we separate the UK, Canada and Turkey, and group the remaining five states under 'Rest of NATO' or 'RoNATO'.

Scenario 4 introduces ASEAN as sanction participants. While ASEAN does not have the same level of institutionalization and harmonized economic and political policy as the EU, in the GSIM model we group its member states together as well. This is due to a combination of the various states having shared strategic concerns in case of a confrontation with China, and the likelihood of breaking trust and weakening ties within ASEAN in case an individual state would diverge from otherwise shared sanctions policies.

Considering that a GSIM analysis models the total global market, all countries need to be included, not only the ones within our research scope (Francois & Hall, 2009). As a result, countries apart from China, and the various sanction partners introduced in the four scenarios, are included in the model as 'Rest of the World' or 'RoW'.

Following these considerations, this leads to the following selection of 14 countries and groupings in the GSIM model: China, US, EU, UK, Canada, Turkey, RoNATO, Japan, South Korea, Australia, New Zealand, India, ASEAN, RoW.

Trade data

Appendix I shows an overview of the used trade values. The GSIM model uses trade data in the form of trade values in USD, not trade volumes, between countries. The relevant trade value for each country (grouping) pair was obtained from the UN Comtrade Database (UN Comtrade, 2022). We use total trade, rather than focusing on specific sectors. This is due to the eventually large-scale, and indiscriminate, sanctions that the US-China trade war already saw being put in place. A focus on a specific sector would in any case have a much smaller

effect than the trade war already had, and be in no case a sufficiently severe response to a serious political conflict with China.

Two key points of attention were considered during data collection to ensure representative results and consistency: (1) which reporting year to use, and (2) discrepancies between import and export data in the database.

Regarding the year, we used data for the year 2018. There are reasons for the intermediate three years being omitted: (a) The most recent year 2021 could not be used, as while import trade values were already largely available, they were not for one crucial country in the model: China. This could signal the absence of data for other countries outside our model (grouped under RoW) as well, making the results more unreliable. (b) The year 2020 was purposely omitted, as it showed values that greatly diverged from the trend over the preceding years. Since this occurred for various country pairs, including ones with friendly and stable trade relations, we assume that this was not the result of the US-China trade war, but due to the impact of the Covid-19 pandemic in its first year, when it initially severely disrupted global production and trade flows. For 2021 these country pairs returned to values largely in line with expectations, and as such the 2020 numbers do not seem representative of usual trade values. This observed Covid-19 effect is confirmed by an OECD report (OECD, 2022). (c) The 2019 values, especially between the US and China, were severely affected, and reduced, by their ongoing trade war. Combined with the fact that 2020, despite the Covid-19 disruption, already saw a significant recovery of their mutual trade values, and that their 2021 values are expected to return back to pre-trade war levels (Palmer, 2021), the 2019 values do not seem as the most representative data either. Hence, the choice for the year 2018.

In addition, while the UK is currently not a part of the EU anymore, it still was in 2018. However, despite using 2018 data, in our model we use the current situation of the UK being and independent actor in the model. Where needed, the 2018 data has been corrected to exclude UK trade values, in order to not count them twice.

Regarding import vs export data discrepancies, these are common in the UN Comtrade database. The import volume as reported by country A from country B, and the export volume as reported by country B to country A, do regularly not match. To mitigate this discrepancy, and ensure data consistency, we decided to always rely on import data, not export data. Import data is arguably more reliable, as the importing country has an incentive to record imports accurately in order to levy tariffs and import taxes where possible. The exporting party does not have a financial or other equally significant incentive in most cases.

Tariff data

Appendix II shows an overview of the used tariff rates. To obtain the tariff rates we used the most recent data from the World Bank and its World Integrated Trade Solution, or WITS (World Bank, 2022; World Bank, 2022b). The information in this database is retrieved from the World Trade Organization's (WTO) Integrated Data Base (IDB) and Consolidated Tariff Schedules (CTS) database, and the United Nations Conference on Trade and Development's Trade Analysis and Information System (TRAINS) database.

We selected the weighted mean (weighted for product import shares), effectively applied (AHS) rates. For country pairs where FTAs are in effect, tariffs reduced or eliminated, depending on the specific situation.

AVEs of NTMs

Whereas tariffs are easily quantifiable barriers to trade, there are also numerous other barriers to trade, or Non-Tariff Measures (NTM). This includes all other barriers apart from tariffs, such as technical regulations, licensing issues, import quotas, etc. In order to test the impact of such non-quantifiable measures, research aims to convert them into Ad Valorem Equivalents (AVE), which equate to tariffs (Kee et al., 2009). Appendix III shows an overview of the used AVEs of NTMs.

The AVEs of NTMs in our model are based on previous research (Kee et al., 2009) that researched trade restrictiveness across 91 countries of all levels of economic development, across industries. This earlier study separated between the effects for low-, middle-, and high-income countries, both with respect to import destination and origin. While the global average was found to be 15%, it also found that trade restrictiveness increases as country income-level goes down, both as country of destination and country of origin. Using the findings and data in this study, we estimated the AVEs of NTMs in our model.

For country (grouping) combinations where FTAs or other barrier reducing agreements are in force, we applied a discount by reducing the AVE by half its value, as FTAs not only concern tariffs, but generally also reduce the impact of NTMs.

Elasticities

Appendix IV shows an overview of the used elasticities. The GSIM model requires demand elasticities, the elasticity of substitution, and supply elasticity.

Demand elasticity: The demand elasticity varies per country (grouping) in the model (Francois & Hall, 2009). The elasticity values were obtained from earlier research that estimated global demand elasticities (Kee et al., 2008; Ghodsi et al., 2016). We used the mean values obtained in this research, not the average, as the mean gives a more accurate representation. For the country groups EU, RoNATO, ASEAN, and RoW an average of the constituent countries was used.

Substitution elasticity: It is common for multi-country models to keep the substitution elasticity equal for all countries, due to reliable cross-country estimates having limited availability, and lacking empirical validity (Imbs & Méjean, 2017). Previous research by GSIM pioneers Francois & Hall (2009) has used a standardized global elasticity of substitution of 5. Other research, covering total trade of 73 countries, found elasticities ranging from 2.3 to 5, with a median of 3.4, which did not differ for developed or developing country subsets (Broda et al., 2006). Another research with a focus on the US, for 84 specific industries in 2017, found elasticities ranging from 1.22 to 5.69 (Ahmad & Riker, 2020). A final research, across industries, found median supply elasticities ranging from 2.7 to 3.6 (Broda & Weinstein, 2006). Combined with the fact that the elasticity of substitution has been observed to decline over time, due to increasing product variety (Broda & Weinstein, 2006), in our model we used a rounded average, on the lower end of the range, of 3 as elasticity of substitution, for all countries and groupings.

Supply elasticity: The supply elasticity is assumed to be constant, based on previous research, with the main reason being the lack of research for most countries (Francois & Hall, 2009; Imbs & Méjean, 2017). Previous research, based on 15 countries, has found an overall supply elasticity of 0.9 (Broda et al., 2006b). This is the value used in our model, for all countries and groupings.

3.3 Shock estimation

After inserting the data just discussed into the GSIM model, we need to model a shock for each of the scenarios. The shock consists of the change in tariffs, and the change in NTMs.

While some have argued that the only effective sanctions against China would be to completely end all trade relations with it (Bloomberg, 2022), this is a very extreme step, that would likely only take in case of an extreme escalation of conflicts. In this study we rely on more intermediate sanctions levels, that are more likely to take place as a first response to situations as described earlier.

Some say that the type of sanctions imposed against Russia would not hold back the Chinese government, as China would be better suited to counter them than Russia, due to its large domestic production capacity, and strong connections with partner countries (Mastro, 2022), and would for example need to target its foreign currency reserves (Lee & Wu, 2022). However, the US might be willing to accept higher costs due to Taiwan's economic importance, specifically in the semiconductor industry (Bloomberg, 2022; Eurasia Group, 2020), as well as due to military strategic reasons. At the same time, it has been argued that due to China's ability to hurt the US and its Western allies, sanctions on China would likely be softer than they were against Russia (Mastro, 2022).

The shocks used in our study are based on the situation that started with the trade war between the US and China, which has still not been resolved. Regarding the tariffs, we increased these by 10 percentage points on top of the current high tariff rates. For allies that join the sanctions alliance we add 20 percentage points to their existing tariffs, as these countries do not yet impose the tariffs that the US already does due to the trade war, and as such need a more significant increase to approach a similar level. The AVEs of NTM are increased by 10 percentage points, both for the US and allies versus China, and represent additional trade restrictions between the sanctions partners and China.

3.4 Results and conversion to trade volumes

The GSIM delivers economic effects principally in the form of changes in producer surplus and consumer surplus, and total welfare effects. The trade effects are presented as change in output, and change in producer revenue. Trade flow effects are shown as percentage changes in bilateral trade relationships between the various country (grouping) pairs in the model.

The percentage change in bilateral trade remains rather abstract however, and does not say much about actual trade volume change. Nonetheless it is worthwhile to know the trade volume effect, as this is more significant for various actors, such as businesses, when deciding on future policy. For this reason we convert the percentages in to changes in trade volumes in TEU (Twenty-foot Equivalent Unit), a common measure in trade and shipping to estimate volumes. We assume the contents of an average TEU to be worth USD 40,000, based on observations the port of Los Angeles (Miller, 2021). We apply the percentage decrease retrieved from the GSIM results to the total trade value between a country pair, and divide the resulting change in trade value by 40,000, resulting in the change in TEU.

3.5 Scenario development

This section will discuss the four scenarios employed in this research, and discuss the logic behind the incorporation of each scenario. The scenarios will move from the first one, consisting of unilateral US sanctions, to various levels of multilateral sanctions, with an increasing number of sanction participants. As such, the scenarios are not ranked in order of likelihood to occur, but only based on the width of the sanctions alliance. The likelihood of each scenario occurring is discussed per scenario below.

The focus on multilateral sanctions has been indicated earlier on, and is the result of observations such as that the 2022 Russia sanctions have been considered powerful as they were supported by an alliance of high income democracies (Posen, 2022), and that Chinese sanctions blocking measures increase the need for multilateral sanctions alliances (Lovely & Schott, 2021).

The four factors that are assumed to play a role in determining whether countries participate in imposing sanctions, and that guide the construction of the four scenarios, are (1) existing political alliances and considerations, (2) whether countries share the concerns that trigger the imposition of sanctions, (3) the degree to which countries have an import and export dependency on China, and (4) the robustness of a countries domestic economy.

3.5.1 Scenario 1 – Unilateral US sanctions

The first scenario to be tested is one in which the United States unilaterally imposes economics sanctions against China. This scenarios would primarily be the result of factors 3 and 4 playing such a significant role, that they overpower factors 1 and 2 for the otherwise most likely possible sanction partners. In reality, this situation could develop as a result of the global significance of China as a center of global production, as well as due to the size of its domestic market.

Due to China still largely being the production center that it has been for the past few decades, other countries could be reluctant to join sanctions. This would be problematic when a countries' own businesses are dependent on China for either base, intermediate or finished goods, especially when substitutes are not readily available or expensive. Also, rising consumer prices at home, as the result of importing more expensive substitute goods from elsewhere, would be a concern when deciding to join sanctions or not, as this could cause unrest among the own population.

The large size of China's domestic consumer and industrial market is another consideration. Restrictions on trade with China would suddenly reduce access to the largest market on the

planet. While most countries depend on China in the first place for their imports, and only secondly for exports, for certain industries the effect could be severe, for example for various raw materials, electrical machinery, and cars. For countries with industries with strong export relationships with China, this could be a barrier to joining sanctions.

The effect of all aforementioned obstacles to joining sanctions would be enhanced in case countries do not, or not fully, share the concerns triggering the sanctions. Also, countries with more fragile domestic economies would be more reluctant to participate, as their economies would be more at risk, posing a greater risk of domestic turmoil, than in countries with a more robust economy. In this scenario, it is assumed that even for the strongest, and oldest allies of the US, factors 1 and 2 do not compensate for the concern caused by factors 3 and 4.

While there is still the option that the US would enforce third parties to adhere to its sanctions, as for example in the case of Iran, this would in reality be much more difficult with regards to China. In case of Iran, the US forces all third party countries to adhere to its sanctions versus the country, as it would otherwise punish countries breaking the sanctions. Due to the great economic and political power that the US and US companies hold around the world, the US is able to do this. However, we also need to consider the fact that the Iranian economy is of limited significance for most of the world, and that also for its main exports, oil and gas, there are various alternative exporting sources. In case of China, it would be much more difficult for the US to enforce sanctions in a similar manner, as China is much more interwoven with the global economy, and many more countries having a dependency on it. In addition, due to the vast, and increasing, economic and political power of China itself, it would have more options to counter US sanction enforcement, and to build its own 'alliance' of countries that could ignore US enforcement (SOURCE). As such, it is deemed unlikely that US sanction enforcement would be practically feasible, to the extent that it is in the example of Iran.

This Scenario 1 is considered the least likely scenario to occur, as unilateral US sanctions are expected to have limited effect when excluding other major trading partners of China, and as it would limit the perceived legitimacy of such sanctions when the US acts alone.

3.5.2 Scenario 2 – Multilateral US, EU & NATO sanctions

The second scenario is a situation in which the US is joined by EU and NATO member states in imposing economics sanctions against China. As discussed in Scenario 1, a universal enforcement by the US of US sanctions is unlikely in case of targeting China. As a result it would look for voluntary partner countries. This means that this scenario would likely be triggered by factors 1 and 2, while overcoming the challenges presented by factors 3 and 4.

This scenario is important, as while sanctions have at times divided the US and Europe (Abdelal & Bros, 2020), it has been argued that the effect of US secondary sanctions is strengthened by the dependence of EU firms on US financial markets (Helwig et al., 2020), which forces EU firms to comply, as such creating forced 'multilateral' sanctions.

When the US would aim to increase the effectiveness and legitimacy of its sanctions, and search for partner countries, it would likely first turn to its oldest and strongest allies in Western Europe, including countries such as the UK, France, and the Netherlands. Due to strong political and economic ties within Europe, the dominance of the EU as a political and economic actor, and the declining relative position of individual European economies, it is unlikely that EU member states such as France and the Netherlands would individually join sanctions, but would rather do so as part of the EU as a whole. While the EU has long been seen as highly divided and ineffective in cases where national economic concerns are at stake, developments regarding recent sanctions versus Russia, in response to the war in Ukraine, have shown that the EU is able to come together when it manages to create a sense of urgency, and sees a strong threat to its own stability and values.

While the UK is not part of the EU anymore, the UK economy is so highly dependent on the combined US and EU economy, that it would feel the potential negative consequences of sanctions versus China in any case, whether it joins or not. In addition, the UK is widely regarded as the staunchest ally of the US, and would be highly unlikely to stay outside of a combined US and EU effort.

The same arguments and logic as for UK participation in sanctions apply to the participation of other NATO member states. This adds Canada, Iceland, Norway, Montenegro, Albania, Macedonia, and Turkey to the list of sanction participants. Just as the UK, all of these countries have economies that are highly intertwined with the economies of the US and EU, and while not all share the same historic ties with the US as the UK does, all are declared allies through NATO. A precedent for this participation can again be found in the 2022 Russia sanctions, where the same countries cooperate, with the exception of Turkey.

In case of China it is however assumed that Turkey would in a way be forced to participate for political reasons, due to the situation of the Uyghurs in China. The Uyghurs, being a Turkic people, share deep historic and cultural ties with the Turkish, and following the current course of Turkish politics, it would be virtually impossible for the Turkish government to remain neutral in this instance. Even as Turkey has so far shown little interference with the issue, and has tried to maintain a healthy relationship with the Chinese government, it would lose all credibility if it stayed on the sideline as other countries took action, and is as such expected to participate in this situation. While this research considers a variety of potential triggers for economic

sanctions against China, not only the situation regarding the Uyghurs, it is of such importance that we need to include Turkey in this list, leading to the situation where all of NATO is included in this scenario.

In principle, this Scenario 2 could be the most likely scenario to occur, due to the very strong historical, political and defense ties between the US, the EU, and NATO. However, versus China, Scenario 3 is considered the most likely, for the reasons outlined under that scenario.

3.5.3 Scenario 3 – Multilateral US, EU & NATO, plus Asia-Pacific allies

The third scenario builds upon the sanction participants of Scenario 2, while adding key Asia-Pacific allies of the US as well, which in this case includes Japan, South Korea, Australia, New Zealand, and India. This scenario further builds upon the effect of factors 1 and 2 for countries to join in imposing sanctions against China.

Originally initiated by Japan, the US has in recent years developed its 'Free and Open Indo-Pacific' Strategy (White House, 2022).

The US maintains a number of regional partnerships, including the US-Japan-Australia dialogue, the US-Japan-India dialogue, and the Quadrilateral Security Dialogue which includes the US, Japan, India, and Australia (Szechenyi & Hosoya, 2019).

Japan and *South Korea* both have for decades maintained strong economic and political ties with the US, as well as important defense agreements, and both host a large number of US military bases and personnel. While both these countries also have strong trade relationships with China, and major companies from both countries rely on China for production facilities, their strong ties to the US are for a significant part the result of shared security concerns versus China. In reality, it would be practically impossible for both these states to not join US sanctions, as the US would likely see this a major betrayal of their decades long defense relationship, and non-participation would be almost guaranteed to severely damage their own defense and economic ties with the US.

Australia and *New Zealand*, while physically separated from the US and earlier sanction partners in Europe, maintain very strong cultural, historic and economic ties to both the US and Europe. This results in significant cooperation in the sphere of national defense, and shared values regarding human rights, democracy, and national self-determination. Due to their geographic proximity to Asia both countries however also maintain strong economic ties with China, and other Asian economies. Trading volumes are especially high between Australia and China, due to the high amount of raw materials that Australia possesses, and

that it exports primarily to China. However, over the past years political tensions between Australia and China have also rapidly grown significantly. These factors combined, there is a high likelihood of both states joining this round of multilateral sanctions. Also, to a large extent these two states face the same situation as Japan and South Korea, where it would vis-à-vis China be nearly impossible to not join US sanctions, without the risk of severely damaging their own defense and economic ties with the US. Furthermore, public opinion in Australia has quickly become increasingly negative over the period 2017-2022, following a poll by an Australian think-tank (Lowy Institute, 2022). A majority of 63% of Australians now see China in the first place as a security threat, and only 34% see it in the first place as an economic partner. This changed from 41% and 55% respectively in 2020, only two years earlier. In 2018, 82% of Australian still saw China as an economic partner (Lowy Institute, 2022). Even China's general economic growth is now seen as a negative by 50% of Australians, up from only 19% in 2016, and 79% believes Chinese investments in Australia are a negative (Lowy Institute, 2022). These developments could help to build popular support for Australian participation in sanctions against China.

The inclusion of *India* in this scenario is more two-sided, but is nonetheless considered crucial and logical for this level of multilateral sanctions. On the one hand, India has a history of trying to remain neutral in geopolitical issues outside its immediate sphere of influence, and skepticism towards Western political ambitions around the world. In case of the 2022 Russia sanctions India has also remained largely neutral to date, despite heavy criticism for this from the US and various European states. On the other hand, the case of sanctions against China is a more sensitive one, as India has a number of border conflicts and other political issues with China. This includes China's frequent support for Pakistan in regional issues, especially regarding the disputed Kashmir region (Khan, 2021), with whom India maintains very difficult relations. In addition, while in the case of Russia an additional issue is the high reliance of India on Russian military and technology imports, this is not the case with China, as India has maintained a distance in this respect for aforementioned strategic concerns. Finally, India is a part of the Quadrilateral Security Dialogue, or Quad, together with the US, Japan, and Australia (Szechenyi & Hosoya, 2019). While less perhaps 'forced' to participate as the other four states in this scenario, India would still risk future political or military support from the Quad, and the US in particular, if it would not participate. Given India's own regional intentions, it is unlikely to risk being on its own. All aspects considered, it is deemed likely that India would join sanctions in this round of multilateral sanctions.

India has concerns over China's growing economic influence in neighboring areas through its BRI initiative, and is worried about increase Chinese navy presence in the Indian Ocean (Gong, 2018).

This Scenario 3 is seen as *the most likely scenario* to occur in reality, for the reasons discussed under Scenario 2, plus the reasons outlined for each country under Scenario 3.

3.5.4 Scenario 4 – Multilateral US, EU & NATO, plus Asia-Pacific allies & ASEAN

In the fourth and final scenario, the US-led sanction alliance from Scenario 3 is further strengthened by the inclusion of the ASEAN member states. ASEAN is the Association of Southeast Asian Nations, consisting of Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam.

ASEAN is in the first place an organization for merely economic cooperation, not a political or defense alliance. It's power as a regional actor is growing however, and it has been argued that due to increasing US-China tensions, it is slowly becoming forced to choose sides, while this has not always been easy. On the one hand, several ASEAN member states have their own border disputes and political issues with China, which lead to wider security concerns for the group (Buszynski, 2012). On the other hand, some member states have shown closer ties to China, such as Cambodia.

While China mostly uses its economic power to develop influence, China also uses 'non-traditional security' efforts to develop stronger ties with ASEAN member states, which includes areas such as healthcare, disaster support, and food and energy security (Gong, 2020), and there has been an increasing level of Chinese development aid in Southeast Asia (Yamamoto, 2020). It has been argued that while China's increased involvement with ASEAN members on the one hand brought them closer together, it simultaneously increased the level of skepticism and mistrust, strengthening ASEAN-US ties, for reasons including a fear of economic dependence on China, a threat to the unity and regional centrality of ASEAN (Gong, 2018). Apart from China's BRI initiative, Japan has been actively working on its own large-scale infrastructure projects in the ASEAN region, in certain areas in cooperation with India, which many in the region consider a more reliable alternative (Gong, 2018).

The US has been openly accepted as a counterbalance to Chinese power in the region, however the high degree of economic dependence on China means most states prefer to remain neutral in conflict situations (Yahuda, 2013). The US and other Western countries openly use their economic power for political goals, such as through sanctions, while China attempts to present itself as being opposed to such measures until today, however, many in the region believe China does so nonetheless, only more secretive, which adds to existing concerns regarding its reliability and trustworthiness (Lai, 2017). Some argue that the US

should focus on pointing out the long-term growth risks of the Chinese economic model, and the risk of taking development loans from China (Rosen, 2022).

Singapore has long positioned itself as a neutral financial and trade hub, however in case of the 2022 Russia sanctions it decided to impose sanctions unilaterally for the first time since 1978, including measures such export controls on certain products, and restricting access of various Russian banks and financial transactions to its own financial system (Donnan et al., 2022).

While this Scenario 4 is not seen as unrealistic, it could be harder to achieve than Scenario 3, due to more internal division within ASEAN regarding attitudes towards China, the economic dependence of the member states on China, and their overall more limited economic stability and strength.

4. Results and Analysis

This section will present and analyze the outcomes of the GSIM model for the four scenarios. As the intent of this study was to compare the outcomes across various levels of sanctions alliances, the results are not presented per scenario individually. Instead, the results for the four scenarios are presented side by side, first covering the economic effects, and second the trade and transport flow effects. We will consider the effects per scenario, and general observations. Third, we perform a number of sensitivity analyses to test the robustness of our results. Fourth, we discuss the limitations of our research approach and results. Detailed results of the GSIM model are attached in Appendices V-VII.

The focus in this section is on an observation of the simulation results, and an initial analysis of the observed trends. A deeper analysis of the results presented here, and their implications for both government and business policy, will be provided in the next Section 5.

4.1 Economic effects

Regarding the economic effects, the main result that a GSIM delivers is the welfare effect on the various actors in the model. I also provides an insight into the welfare effect's constituent parts of producer surplus, consumer surplus, and government tax revenue. The table below shows the condensed results as retrieved from the four simulations.

Country	Scenario 1			Scenario 2			Scenario 3			Scenario 4		
	Producer surplus	Consumer surplus	Total welfare	Producer surplus	Consumer surplus	Total welfare	Producer surplus	Consumer surplus	Total welfare	Producer surplus	Consumer surplus	Total welfare
China	-50.362	-27.631	-79.168	-134.904	-48.678	-179.506	-200.931	-174.465	-325.997	-245.488	-261.373	-436.838
US	-14.209	-94.447	-108.701	-12.387	-69.971	-75.956	-11.912	-40.926	-40.904	-11.809	-23.678	-19.325
EU	23	11.673	11.964	10.085	-87.776	-38.097	5.823	-68.491	-20.390	2.822	-56.108	-8.909
UK	177	1.683	1.891	-2.191	-11.664	-8.398	-2.481	-9.239	-5.895	-2.698	-7.842	-4.438
Canada	2.221	3.468	5.704	-1.459	-8.505	-5.010	-1.960	-6.348	-3.008	-2.312	-5.167	-1.921
Turkey	-34	468	451	-140	-3.975	-2.454	-307	-2.901	-1.423	-423	-2.434	-978
RoNATO	-17	287	282	42	-1.983	-1.064	-41	-1.420	-516	-102	-1.139	-244
Japan	995	4.138	5.274	919	10.699	11.984	-22.489	-24.505	-30.797	-21.409	-18.951	-23.354
Rep. of Korea	728	2.518	3.267	866	6.515	7.479	-26.445	-14.535	-30.866	-25.148	-11.543	-26.133
Australia	212	1.367	1.581	276	3.517	3.800	-13.350	-8.086	-15.604	-12.867	-6.111	-12.921
New Zealand	33	205	240	37	532	571	-1.355	-858	-1.355	-1.309	-589	-1.006
India	195	1.562	1.885	166	4.359	4.877	-2.472	-10.551	-7.289	-2.436	-8.297	-4.654
ASEAN	605	6.308	7.047	-339	17.211	17.228	1.787	35.771	38.184	-32.683	-23.531	-28.405
RoW	4.788	24.537	29.864	7.697	60.666	69.722	16.325	105.302	124.057	21.838	137.878	162.975
Total welfare effect			-118.418			-194.822			-321.803			-406.151

Table 1 - Change in Producer surplus, Consumer surplus, and Total welfare (in USD mln.)

A first observation of the results shows that total global welfare decreases rapidly with each next scenario. However, when we compare this with the negative effect on China, the intended target of the sanctions, we see that China accounts for an increasingly large portion of the

welfare loss. Initially the welfare loss in China is lower than the total global loss, and as the difference decreases each scenario, eventually China's welfare loss is larger than the global total in Scenario 3 and 4. This indicates that while global welfare decreases, China bears the brunt of this, and the combined world apart from China actually sees a welfare increase.

However, the results also show that for all four scenarios total welfare decreases for all sanctions participants, whereas it increases for all non-participants. This clearly shows that participation in these sanctions is guaranteed to lead to a welfare loss, and that all countries need to consider whether this is worth it for them to participate. The fact that none of the non-participants ever suffers a welfare loss, is an additional factor that could stimulate countries to not participate in sanctions.

For the US itself however, as the sanctions leader, the results indicate an incentive to expand its sanctions alliance as far as possible, as for each next scenario the loss in welfare reduces for the US, while it increases for China. This means the damage for China increases, and as such sanctions should be more effective. Especially noteworthy is Scenario 1, which assumes unilateral US sanctions. While China here already suffers a welfare loss, the negative result is even larger for the US itself, indicating that unilateral sanctions hurt the US itself more than they hurt China, both relative and in absolute numbers. Also, we see that in case of China the reduced welfare is in the first place caused by a reduction in producer surplus, whereas for the US the main cause by far is a significantly decreased consumer surplus. This could be a trigger for domestic issues or a lack of popular support in the US in case of unilateral sanctions.

With regards to expanding the sanctions alliance a particular cause for concern takes place in Scenarios 3 and 4, when the Asia-Pacific allies and ASEAN are included respectively. The negative welfare effects for in particular Japan, Korea, Australia, and in Scenario 4 ASEAN are large. Especially when considering the size of the population and economy of these countries versus the US, they bear a disproportionate share of the negative welfare effects. In Scenario 4 the damage for the US is even lower than for all, except Australia. A likely reason for this effect is the strong trade relationship that these parties have with China. Appendix I shows that the Chinese imports from these countries (except Australia) are greater than from the US. This observation could signal an obstacle for the US to convince its potential Asia-Pacific partners to join its sanctions efforts.

A look at the countries introduced in Scenario 2, some of the oldest allies of the US, shows a similar trend for the EU as for the US, with a rapidly decreasing welfare loss for the three scenarios that it is a part of, giving it a similarly strong incentive as the US to push for alliance expansion, when it decides to join. For the UK however, we see that this effect is much weaker, and its relative share of the welfare loss, versus the US and EU, increases. Regarding

Canada, we see that it gains significantly in the first scenario, where it does not join sanctions. This is likely the result of its very high trade volumes with the US, where it can replace some of the imports that the US no longer receives from China.

Another observation worth mentioning is the result observed for Rest of World (RoW) across categories. It is commonly argued that lower-income economies tend to suffer most from trade conflicts between larger economies, even when they are not part of the conflict (Posen, 2022), however, our results show the opposite. While RoW in principle covers all remaining countries in the world, not specifically lower-income economies, the vast majority of higher- and high-medium income economies is covered in the model either individually, or as part of one of the country groupings. RoW largely consists of lower- and low-medium income economies. The results show with each next scenario the welfare effect for RoW increases, whereas the total global welfare effect decreases. An explanation for this effect could be that due to an increasing number of countries imposing severe sanctions against China, countries and companies look elsewhere for their import sources. It appears that RoW countries manage to play an increasingly important role in global trade, leading to increased welfare effects. Section 4.2 will come back to the observed trade effect.

Country	Tax Revenue			
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
China	-1.176	4.076	49.400	70.023
US	-44	6.402	11.934	16.162
EU	269	39.594	42.279	44.377
UK	31	5.457	5.825	6.101
Canada	16	4.954	5.299	5.557
Turkey	17	1.661	1.784	1.879
RoNATO	12	877	945	997
Japan	140	365	16.196	17.006
Rep. of Korea	21	99	10.114	10.558
Australia	2	8	5.832	6.058
New Zealand	1	3	858	893
India	129	352	5.735	6.080
ASEAN	134	356	626	27.809
RoW	540	1.359	2.430	3.259

Table 2 - Tax revenue effect (in USD mln.)

The table above shows the effect on tax revenue for the various countries in the model. A first observation is that the tax revenue increases for all countries in all scenarios, except for China in the first scenario. Also, tax revenue increase even further with each consecutive scenario, for all countries. For the countries not participating in sanctions, this is likely the result of an increase in trade numbers. We will have a closer look at this in Section 4.2 on trade effects. However, also for the countries that impose sanctions, the tax revenue continues to increase.

This suggests that the now higher tariff rates versus China compensate any potential loss in trade.

While this could be seen as a positive, and an incentive for governments to participate in the sanctions alliance, it is important to remember that the reductions in producer and consumer surplus are much larger in size than the increase in tax revenue. This results in the total welfare reduction as discussed earlier, for all countries that participate in sanctions. This effect is especially strong for the Asia-Pacific allies that suffer some of the greatest welfare losses, while also receiving among the highest increases in tax revenue. The EU is another interesting case, as while its welfare loss was relatively limited, its tax revenues increase the most.

4.2 Trade and transport flow effects

The trade effects that a GSIM simulation delivers focus on the change in output, and changes in the bilateral trade relations. Bilateral trade relations are important to include, as a focus on only the change in output can obscure the much more significant impact on specific trade relationships, and would lead to less meaningful policy recommendations.

The figure below shows a graphic representation of the change in output for each country, across scenarios. The table below couples the change in output with a change in prices, leading to a change in producer revenue. The change in prices tends to increase the effect of a change in output, both in negative and positive directions.

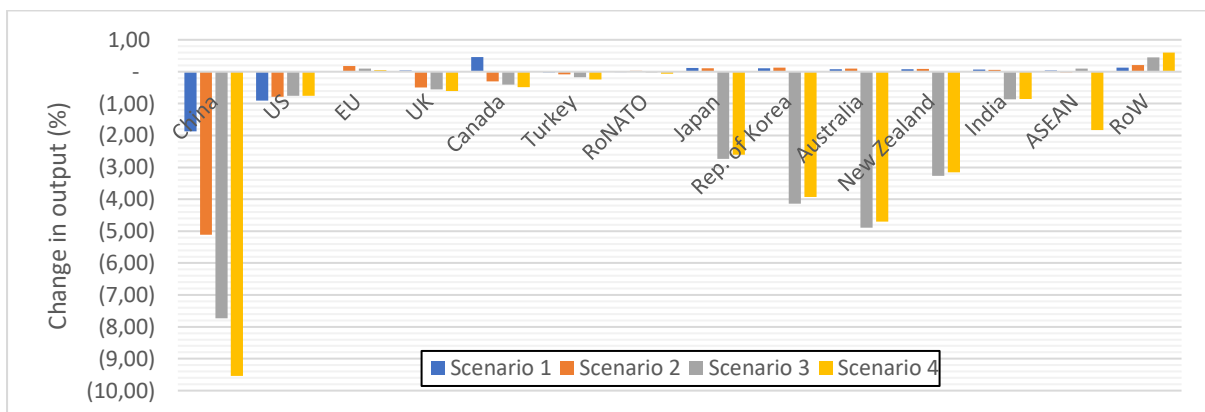


Figure 1 - Change in output (in %)

Country	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
	Change in output (%)	Change in producer revenue (%)	Change in output (%)	Change in producer revenue (%)	Change in output (%)	Change in producer revenue (%)	Change in output (%)	Change in producer revenue (%)
China	-1,87	-3,91	-5,11	-10,48	-7,73	-15,62	-9,54	-19,08
US	-0,91	-1,90	-0,79	-1,66	-0,76	-1,60	-0,75	-1,58
EU	0,00	0,00	0,18	0,37	0,10	0,21	0,05	0,10
UK	0,04	0,08	-0,49	-1,03	-0,56	-1,17	-0,60	-1,27
Canada	0,46	0,98	-0,30	-0,64	-0,41	-0,86	-0,48	-1,02
Turkey	-0,02	-0,04	-0,08	-0,17	-0,18	-0,37	-0,24	-0,51
RoNATO	-0,01	-0,02	0,03	0,06	-0,03	-0,05	-0,06	-0,13
Japan	0,12	0,25	0,11	0,23	-2,73	-5,68	-2,60	-5,41
Rep. of Korea	0,11	0,23	0,13	0,28	-4,13	-8,53	-3,93	-8,11
Australia	0,08	0,16	0,10	0,21	-4,89	-10,04	-4,71	-9,67
New Zealand	0,08	0,17	0,09	0,18	-3,27	-6,78	-3,16	-6,55
India	0,07	0,14	0,06	0,12	-0,87	-1,82	-0,85	-1,80
ASEAN	0,03	0,07	-0,02	-0,04	0,10	0,21	-1,83	-3,81
RoW	0,13	0,28	0,21	0,45	0,45	0,95	0,60	1,27

Table 3 - Trade effects (in %)

Focusing on China first, as the sanctions target, we once again see a progressively severe, negative impact, following the same trend as the rapidly increasing welfare loss in the previous section. This is a clear and direct impact of the increasing number of countries that impose heavy sanctions against it.

Regarding the US however, we observe a relatively stable loss of output. Whereas we saw earlier how each next scenario increased its welfare loss, providing an initiative to expand the sanctions alliance, this effect is hardly present with regards to its output. We still see a slightly higher loss in case of unilateral sanctions, but the gains from forming an alliance are more modest, and do not significantly increase in case of expanding the alliance further. This signals a somewhat decreased need for the US to expand a US-led sanctions alliance.

With regards to the key Asia-Pacific partners, the results once again show a severe negative impact, with these countries suffering the most significant decrease in output, after China itself. This matches with the previously observed strong decline in total welfare for these countries. And exception to this trend is India. While India also suffers a loss in output, the decrease is relatively small. This reduce the barrier for India to join sanctions.

When it comes to the oldest allies of the US, we see relatively limited decreases in output. A special case here is the EU, which as the only actor in the model does not suffer an output loss at all when joining sanctions. The EU actually experiences an increase in output in all three scenarios that it is a part of. While the benefit decreases with each next scenario, it remains positive, and coupled with the comparatively limited welfare effects in the previous

section, this could significantly increase the likelihood of the EU imposing sanctions against China.

For the Rest of World we observed positive welfare effects, and this trend continues with regards to trade. In each next scenario RoW output increases further. This once again goes against the argument that lower-income economies suffer the most from the trade conflicts of others.

China	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
	Import change %	Export change %	Import change %	Export change %	Import change %	Export change %	Import change %	Export change %
US	-35,47	-33,18	-35,17	-25,79	-32,15	-19,22	-30,17	-14,13
EU	1,16	6,30	-52,57	-45,27	-50,18	-40,11	-48,63	-36,14
UK	1,03	6,26	-51,50	-45,24	-49,08	-40,08	-47,50	-36,10
Canada	-0,37	5,74	-51,80	-45,12	-49,33	-40,01	-47,71	-36,06
Turkey	1,23	6,31	-51,89	-43,98	-49,43	-38,75	-47,83	-34,68
RoNATO	1,20	6,26	-52,33	-44,92	-49,97	-39,80	-48,44	-35,82
Japan	0,76	6,16	1,66	18,08	-46,21	-40,41	-44,88	-36,58
Rep. of Korea	0,79	6,06	1,58	17,82	-44,61	-40,19	-43,39	-36,39
Australia	0,91	5,95	1,70	17,49	-43,61	-40,31	-42,32	-36,67
New Zealand	0,90	6,04	1,74	17,75	-46,64	-40,95	-45,28	-37,25
India	0,94	6,31	1,83	18,50	-49,17	-38,87	-47,70	-34,85
ASEAN	1,05	6,06	2,09	17,74	6,55	27,57	-46,20	-36,13
RoW	0,72	5,88	1,31	17,37	5,31	27,38	7,86	34,92

Table 4 - Bilateral trade change, China (in %)

The table above shows the change in bilateral trade between China and the other actors in the model. A similar table with effects for the US follows below. It is immediately clear that imposing severe economic sanctions on China has a very large negative effect on bilateral trade. For all actors that join a sanctions alliance, this reduces their bilateral trade by up to half. The effect is largely the same for all participants in each scenario. However, the effect is significantly less negative for the US itself. This means that the negative impact on trade flows is less severe for the US than for its partners.

For all non-sanctions countries however, Chinese exports to these countries strongly increase, and this effect is stronger in each next scenario. This suggests that while China faces high import tariffs in the alliance countries, it still manages to export other countries instead.

We also observe that across scenarios the negative effects slightly decrease. This is likely the result of more countries imposing sanctions on China, as such leaving less low-tariff alternatives for China, which could lead to more exports still going to the sanctions-imposing countries anyway. However, we also see that negative effect on Chinese imports is much

more stable than for exports. This suggests that as the sanctions alliance increases in size, Chinese imports remain low, leading to a strong welfare loss as seen before, whereas sanctions-imposing countries see slowly recovering imports from China, indicating a more moderate loss in welfare.

The very high percentual changes in trade flows indicate a major disruption of global trade. Shipping routes will certainly be affected, and this will have a spillover effect on the operation of terminals and ports in various countries. In addition, these changes could affect where companies decided to locate their production capacities, which could further disrupt trade flows and affect the logistics and maritime industries.

US	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
	Import change %	Export change %	Import change %	Export change %	Import change %	Export change %	Import change %	Export change %
China	-33,18	-35,47	-25,79	-35,17	-19,22	-32,15	-14,13	-30,17
EU	2,79	2,88	1,49	4,15	0,89	3,72	0,55	3,49
UK	2,65	2,84	3,77	4,31	3,13	3,87	2,77	3,66
Canada	1,22	2,34	3,13	4,44	2,62	3,89	2,35	3,63
Turkey	2,85	2,89	2,36	4,23	1,83	3,71	1,54	3,51
RoNATO	2,82	2,85	1,99	4,27	1,32	3,71	0,93	3,47
Japan	2,38	2,74	1,71	1,79	11,03	4,48	9,96	4,04
Rep. of Korea	2,41	2,65	1,63	1,56	16,53	4,96	15,10	4,46
Australia	2,53	2,54	1,75	1,28	19,63	5,63	18,27	4,87
New Zealand	2,52	2,63	1,79	1,51	13,09	4,40	12,08	3,81
India	2,55	2,89	1,89	2,15	4,22	3,80	3,64	3,52
ASEAN	2,67	2,65	2,15	1,50	0,90	0,08	7,10	4,11
RoW	2,34	2,48	1,36	1,17	-0,27	-0,07	-1,27	-0,95

Table 5 - Bilateral trade change, US (in %)

The table above shows the bilateral changes in trade for the US. It is immediately clear that these effects are significantly different than they are for China. While the trade flow reductions between the US and China are the same as seen in the previous table, all other trade relations of the US see a positive effect, with the exception of RoW in Scenarios 3 and 4.

Most likely these changes are the result of strongly decreased US imports from China, leading to products now being imported from elsewhere. For each scenario the positive effect is most pronounced for countries that take part in the sanctions. This shows that as the trade relationship between various countries and China damages, the participant countries themselves develop stronger ties with each other. The positive effect on output is particularly large for the Asia-Pacific allies, whom we saw earlier also suffered strongly from negative

welfare effects. The stronger trade relationship with the US could be a factor for these countries to mitigate their reluctance to join sanctions.

A last noteworthy point is the negative effect for RoW in Scenario 3 and 4. This shows that as the sanctions alliance starts to include Asia-Pacific and ASEAN, the rest of the world sees a weakening of their trade ties with the US, whereas we saw earlier that their ties with China increase. This could push these countries further into the sphere of influence of China, which could be an unintended negative side effect for the US and its sanctions partners.

Country	Scenario 4 - China				Scenario 4 - US			
	Import change %	Import change, TEU	Export change %	Export change, TEU	Import change %	Import change, TEU	Export change %	Export change, TEU
China		-		-	-14,13	-1.989.131	-30,17	-1.176.663
US	-30,17	-1.176.663	-14,13	-1.989.131		-		-
EU	-48,63	-3.001.508	-36,14	-4.213.476	0,55	65.276	3,49	276.706
UK	-47,50	-283.718	-36,10	-572.152	2,77	42.834	3,66	57.842
Canada	-47,71	-338.209	-36,06	-525.740	2,35	191.697	3,63	213.160
Turkey	-47,83	-44.992	-34,68	-186.450	1,54	4.199	3,51	11.396
RoNATO	-48,44	-45.807	-35,82	-96.638	0,93	1.861	3,47	6.742
Japan	-44,88	-2.024.186	-36,58	-1.588.853	9,96	363.333	4,04	84.378
Rep. of Korea	-43,39	-2.219.197	-36,39	-968.907	15,10	287.740	4,46	65.835
Australia	-42,32	-1.111.737	-36,67	-529.001	18,27	46.631	4,87	30.058
New Zealand	-45,28	-125.426	-37,25	-80.493	12,08	13.184	3,81	4.216
India	-47,70	-224.801	-34,85	-641.195	3,64	51.383	3,52	28.769
ASEAN	-46,20	-3.107.739	-36,13	-2.572.335	7,10	338.542	4,11	106.042
RoW	7,86	1.734.973	34,92	8.318.003	-1,27	-218.332	-0,95	-120.915

Table 6 - Bilateral trade volume change, in TEU

Finally, in order to add a more relatable dimension to the bilateral trade change percentages, the table above presents the changes in bilateral trade flows, converted into hypothetical TEUs. This also adds more detail regarding the exact effect, as for example for China earlier we saw a largely equal bilateral trade percentage decrease with all sanctions partners. However, due to the widely diverging trade values with each partner, the impact in volumes, or TEU, differs significantly. As explained in the methodology, we applied the reduction percentages to total trade values, and converted them into TEU through an average value of USD 40,000 per TEU. We used the most extensive scenario, Scenario 4 to illustrate. While this table does not change the effects described earlier, it makes clear the large extent to which trade volumes are affected in certain countries, while a similar decrease percentage has a limited volume effect in other countries.

4.3 Sensitivity analysis

In this section a sensitivity analysis will aim to study the effects of a selected number of uncertainties in this research, in an attempt to increase their robustness. First, we will test the sensitivity of the model to changes in the elasticity data, specifically the elasticity of substitution. Second, we will introduce an alternative scenario, to potentially mitigate the negative effects for the Asia-Pacific allies and ASEAN.

Elasticity of substitution impact

The three elasticities used in the model are key aspects of a GSIM, and a wrong estimation could potentially alter the outcome of the model (Francois & Hall, 2009). While the demand and supply elasticities used were based on strong and comprehensive previous research, the elasticity of substitution has seen a wide variation in earlier studies. As such, we will test whether a change in the elasticity of substitution significantly alters the model outcome.

While we used the value of 3 in our models, we will perform an additional simulation with an increased elasticity of 4. This increase falls within the range of earlier research, but was increased as the relatively low value of 3 was based on research that found that the elasticity of substitution declined over time (Broda & Weinstein, 2006). However, given the trend of production slowly moving out of China in recent years, to new destinations such as Southeast Asia, as well as the recent trend of nearshoring, it can be assumed that production locations become more diverse, and that ease of substitution would actually increase.

We will use Scenario 3 to test the alternative Scenario 3x on. This scenario was chosen as it is seen as the most likely scenario to evolve in reality. The inclusion of ASEAN in Scenario 4 was already more uncertain for political reasons, and the strongly negative economic and trade effects seen in previous sections cast further doubt on the ability or willingness of these countries to join sanctions.

Country	Scenario 3			Scenario 3x			Percentage change		
	Producer surplus	Consumer surplus	Total welfare	Producer surplus	Consumer surplus	Total welfare	Producer surplus	Consumer surplus	Total welfare
China	-200.931	-174.465	-325.997	-205.147	-169.822	-335.385	-2%	3%	-3%
US	-11.912	-40.926	-40.904	-11.137	-43.590	-48.041	7%	-7%	-17%
EU	5.823	-68.491	-20.390	13.024	-72.061	-23.599	124%	-5%	-16%
UK	-2.481	-9.239	-5.895	-2.130	-9.720	-6.922	14%	-5%	-17%
Canada	-1.960	-6.348	-3.008	-754	-6.140	-2.454	61%	3%	18%
Turkey	-307	-2.901	-1.423	-193	-3.115	-1.818	37%	-7%	-28%
RoNATO	-41	-1.420	-516	262	-1.447	-402	732%	-2%	22%
Japan	-22.489	-24.505	-30.797	-21.223	-23.686	-31.176	6%	3%	-1%
Rep. of Korea	-26.445	-14.535	-30.866	-25.164	-14.216	-30.833	5%	2%	0%
Australia	-13.350	-8.086	-15.604	-12.339	-7.636	-14.942	8%	6%	4%
New Zealand	-1.355	-858	-1.355	-1.227	-811	-1.308	9%	5%	3%
India	-2.472	-10.551	-7.289	-2.451	-10.992	-8.748	1%	-4%	-20%
ASEAN	1.787	35.771	38.184	3.819	35.313	39.894	114%	-1%	4%
RoW	16.325	105.302	124.057	29.157	106.492	138.058	79%	1%	11%

Table 7 - Economic effects of Scenario 3x

Country	Scenario 3		Scenario 3x		Percentage change	
	Change in output (%)	Change in producer revenue	Change in output (%)	Change in producer revenue	Change in output (%)	Change in producer revenue
China	-7,73	-381.793	-7,90	-389.803	-2%	-2%
US	-0,76	-22.633	-0,71	-21.159	7%	7%
EU	0,10	11.063	0,23	24.746	124%	124%
UK	-0,56	-4.714	-0,48	-4.048	14%	14%
Canada	-0,41	-3.723	-0,16	-1.434	62%	61%
Turkey	-0,18	-582	-0,11	-367	37%	37%
RoNATO	-0,03	-79	0,16	497	731%	732%
Japan	-2,73	-42.729	-2,58	-40.323	6%	6%
Rep. of Korea	-4,13	-50.246	-3,93	-47.812	5%	5%
Australia	-4,89	-25.366	-4,51	-23.445	8%	8%
New Zealand	-3,27	-2.575	-2,96	-2.332	10%	9%
India	-0,87	-4.698	-0,86	-4.657	1%	1%
ASEAN	0,10	3.395	0,21	7.256	114%	114%
RoW	0,45	31.017	0,80	55.399	78%	79%

Table 8 - Trade effects of Scenario 3x

The two tables above show the economic and trade effects of the new Scenario 3x in comparison to the original Scenario 3. The main observation from the new economic effects is that the total welfare loss for all countries that participate in the sanctions shows a decrease, except Canada and RoNATO. In addition, this loss is caused by a greater loss of consumer surplus. Only for China the cause lies in a greater producer surplus. This suggests that in case of increased ease of substitution, Chinese producers lose, while Western consumers lose, likely as the consequence of higher prices. The alliance producers surplus on the other hand shows strongly positive effects. This matches with the observed trade effects, where it shows

that change in output is strongly positive for the sanctions partners, in particular the EU. In the original four scenarios the EU was already the exception that showed increased output while all others lost, and this effect has become enhanced with an increased elasticity of substitution. This indicates that EU producers are in a favorable position regarding international trade, and are attractive as substitute products.

However, while the percentage change for producers is high versus the loss for consumers, in absolute number the loss in consumer surplus is much high, leading to the observed total welfare loss for most countries. This leads to a situation that overall, the new scenario is not more positive for the sanctions-imposing countries.

Overall we can conclude that while an increased elasticity of substitution does change the results, the results still move in the same direction, and the change in absolute values are limited. As such, the new scenario does not change the conclusions that can be drawn from the numbers. And the likelihood of this scenario taking place, and the general effects on China, the US, and the other parties, remains the same.

Alternative scenario: Sanctions alliance free trade

While not so much a sensitivity analysis per se, as in testing the sensitivity of values in the model, we introduce an alternative scenario that tests the effects observed in Scenario 4. The reason for this is that Scenario 3 and 4 both showed strongly negative effects for the key Asia-Pacific allies, and ASEAN. This might reduce the likelihood of these countries joining sanctions, even though their participation would be highly desirable, as it would greatly increase the impact on China, and reduce its options to find alternative sources of trade.

In order to mitigate this effect, we test two alternative scenarios that introduce reduced trade barriers between alliance partners, in order to stimulate intra-alliance trade benefits. While not exactly the same, the war in Ukraine has seen similar efforts of behalf of the EU, which eliminated tariffs on Ukrainian imports for a year, in order to help it economically (EC, 2022). Also, the US government has publicly called for more “friendshoring”, a variation on offshoring that implies moving parts of supply chains to more reliable partner countries (Lawder & Shalal, 2022). In addition, it has been argued that the perceived damage to the globalized economy, and shift towards divided economic blocs, can be restored or mitigated to a certain extent by strengthening the common market of allied democracies, that would increase positive competition and improve the state of the own economies (Posen, 2022). Considering these facts, a temporary suspension of tariffs could strengthen a sanctions alliance internally, and does not seem unlikely.

Scenario 4x eliminates tariffs between all sanctions alliance members, and reduces the respective AVEs of NTMs by half. This still leaves a variation in AVEs of NTMs between various country pairs, due to other trade restrictions. As discussed in Section 3.2 regarding NTMs, this is due to lower income economies both having higher NTMs on their imports, and being faced with higher NTMs when exporting (Kee et al., 2009).

Scenario 4y resembles Scenario 4x, with the addition of a lowering of NTMs on imports from lower income alliance members to higher income alliance members. This reduction only takes place one way, as for higher income economies it is possible to reduce their trade barriers versus lower income economies, whereas the normally higher NTMs present in lower income countries on their imports are largely due to factors such as bureaucracy, which are harder to reduce in the short term. These NTMs do still see the reduction by half as introduced in Scenario 4x.

Country	Scenario 4			Scenario 4x			Scenario 4y		
	Producer surplus	Consumer surplus	Total welfare	Producer surplus	Consumer surplus	Total welfare	Producer surplus	Consumer surplus	Total welfare
China	-245.488	-261.373	-436.838	-245.788	-272.452	-450.413	-245.643	-280.658	-459.992
US	-11.809	-23.678	-19.325	18.621	16.732	36.084	24.197	23.765	48.421
EU	2.822	-56.108	-8.909	37.071	-60.513	13.200	66.363	-38.696	64.097
UK	-2.698	-7.842	-4.438	1.980	-6.125	481	3.844	-3.756	4.687
Canada	-2.312	-5.167	-1.921	-1.423	-8.906	-5.398	1.241	-6.835	-691
Turkey	-423	-2.434	-978	842	1.135	2.907	2.510	179	3.634
RoNATO	-102	-1.139	-244	584	-847	343	1.480	-361	1.721
Japan	-21.409	-18.951	-23.354	-17.995	-19.211	-23.698	-15.711	-17.218	-19.458
Rep. of Korea	-25.148	-11.543	-26.133	-24.542	-13.967	-28.752	-23.220	-12.399	-25.906
Australia	-12.867	-6.111	-12.921	-10.070	-4.855	-9.374	-9.334	-4.038	-7.841
New Zealand	-1.309	-589	-1.006	-794	-206	-250	-647	-44	54
India	-2.436	-8.297	-4.654	6.023	11.694	16.712	10.468	14.120	23.526
ASEAN	-32.683	-23.531	-28.405	-14.970	-3.204	3.287	15.381	12.700	49.173
RoW	21.838	137.878	162.975	19.310	113.245	135.175	18.153	94.892	115.199
Total welfare effect			-406.151			-309.695			-203.377

Table 9 - Economic effects of Scenarios 4x and 4y

Country	Scenario 4		Scenario 4x		Scenario 4y	
	Change in output (%)	Change in producer revenue	Change in output (%)	Change in producer revenue	Change in output (%)	Change in producer revenue
China	-9,54	-466.471	-9,55	-467.040	-9,55	-466.765
US	-0,75	-22.436	1,17	35.380	1,52	45.974
EU	0,05	5.362	0,65	70.435	1,15	126.090
UK	-0,60	-5.126	0,44	3.763	0,85	7.304
Canada	-0,48	-4.392	-0,30	-2.704	0,26	2.359
Turkey	-0,24	-804	0,48	1.599	1,43	4.768
RoNATO	-0,06	-194	0,36	1.109	0,92	2.813
Japan	-2,60	-40.678	-2,18	-34.190	-1,90	-29.851
Rep. of Korea	-3,93	-47.782	-3,83	-46.631	-3,62	-44.118
Australia	-4,71	-24.449	-3,66	-19.134	-3,39	-17.736
New Zealand	-3,16	-2.488	-1,90	-1.508	-1,55	-1.230
India	-0,85	-4.628	2,08	11.444	3,59	19.890
ASEAN	-1,83	-62.098	-0,83	-28.443	0,85	29.224
RoW	0,60	41.493	0,53	36.688	0,50	34.490

Table 10 - Trade effects of Scenarios 4x and 4y

The two tables above show the economic and trade effects of the two new scenarios. Regarding the effect on China, as the target, we see little change, and actually a slightly more negative effect, especially regarding the total welfare loss. More interesting however, are the significant changes for the alliance members. Here we see that while in the original Scenario 4 all alliance members suffer both negative economic and trade effects, these effects disappear for several actors.

The primary purpose of intra-alliance free trade was to improve the position of the Asian economies, however, first of all we see that also the position of the US strongly improves. Both its economic and welfare effects turn positive in both the alternative scenarios. Also the other Western economies significantly gain in this situation.

However, the key Asia-Pacific allies Japan, Korea, and Australia see only very limited changes in economic effects. In fact, in Scenario 4x both Japan and Korea are actually slightly worse off, though negligible. The lack of a positive effect for these countries is likely due to their relatively high trade volumes with China, and perhaps due to the fact that these countries already had more FTA's of their own in place beforehand, benefitting less from the new reduced trade barriers than other economies.

Despite this limited effect, we do see large positive effects for India and ASEAN. Both these actors see very large positive changes for each next scenario. While for both the economic effects already turn positive in Scenario 4x, for ASEAN this scenario is still negative in terms

of trade effects. This becomes positive in Scenario 4y. These large effects are most likely due to these countries having face relatively high tariffs and NTMs before, which are now largely eliminated.

With regards to Rest of World (RoW), which we earlier found out benefitted from from the sanctions versus China, we now see that their benefit decreases with each next scenario. This is more in line with existing beliefs that lower-income economies suffer from the trade conflicts of others. In this case, the clear cause here is that the economies in India and ASEAN greatly benefit from reduced barriers, while other economies around the world do not.

These results show that an intra-alliance provides great benefits, both for western economies and lower-income partner countries. While Japan, Korea, and Australia do not see these effects, their economies are stronger to start with, and their alliances with the US are older and stronger. In this regard, the intra-alliance free trade still achieves its goal of providing the more vulnerable economies with an economic safety net, to compensate of joining potential sanctions against China. This greatly increases the likelihood of such a scenario taking place, and would have an even greater effect on trade flows around the world.

4.4 Limitations

This study has attempted to model potential sanctions against China as accurately as possible. However, certain limitations remain, some due to practical reasons, others as the result of choices that have to be made.

A primary limitation, stemming from the use of a partial equilibrium GSIM analysis, is that this method focuses on one shock alone, while ignoring other potentially important factors or influences. In reality, situations as we investigated are much more complex. However, this was beyond the resources available for this research, and GSIM was considered a tried and tested method that has been used for similar studies numerous times before.

Another key limitation of this study is that, for practical reasons and research focus, the sanctions design was highly modelled, and standardized. The focus was only on the impact of unilateral versus increasing levels of multilateral sanctions, but varying intensity or weight or sanctions was not considered. It is possible that our results would have shown different results if more mild, or more severe sanctions were used.

An additional limitation of this study was that it considered the effects on total trade, and the economy as a whole, without considering the effects on specific sectors. In reality, it is possible that sanctions would not be applied to all sectors equally, but would attempt to target certain

industries specifically. Since not all sectors are equally dependent on foreign trade, or are equally substitutable, this could show diverging results for various industries.

Furthermore, due to the use of grouped countries, (e.g. EU, RoNATO, ASEAN) we cannot observe the effects on individual countries that are covered by these groups. While this is a common characteristic of GSIM studies, it could in some cases nonetheless be important to observe individual differences. Countries within a group can show diverging results, due to the nature of their economy, such as being import- or export-focused, or which industries they are active in. Different effects can also affect countries' decisions to join sanctions differently. For example, in case of the 2022 sanctions against Russia, we saw that while the EU imposes sanctions jointly, different member states have different attitudes, for example due to some being more reliant on Russia regarding energy imports or economic ties. Similar differences could be observed with regards to China, for example among members of ASEAN of the EU.

A final limitation is that we did not zoom in on one potential sanctions triggers, and depending on the trigger this could affect the decision of countries to join. For example, the somewhat uncertain case of Turkey could be different depending on if the main trigger concerns the Uyghurs, an issues that Turkey feels very close to, or if the trigger would be aggression versus Taiwan, or China's support to Russia in times of sanctions, in which case Turkey could be more likely to stay neutral. However, we believe that the specific sanctions trigger is not the focus point here, and that general trends in alliance formation remain the same across scenarios. This also increases the wider applicability of this study on the topic.

5. Recommendations and Policy Advice

This section considers the implications of the results presented in the previous section. First, we consider the impact on governments. Second, we discuss the impact on businesses, with special mention of the logistics and maritime industries, and supply chain effects.

Governments

Regarding the impact on governments, we pay special attention to the two main countries in the model, the US and China. In addition, we discuss the impact on the other individual countries and groups in the model.

For the US, as the anticipated initiator of economic sanctions against China, the core advice resulting from the model is that unilateral sanctions would hurt itself more than they would hurt China, whereas these results can largely be mitigated when expanding a sanctions alliance. While the US has a history of using secondary sanctions to involuntarily make other countries follow its sanctions, this policy does not seem sustainable in a future where it might more often need to rely on international support. In addition, the model results showed the positive effect of intra-alliance free trade. As such, the core policy advice for the US would be to focus increasing trade ties with core future production centers of the world, particularly in Southeast Asia and India, in order to have a strong, multilateral sanctions network to rely on in case of a future confrontation with China.

For the EU, the model showed mixed results. The in certain areas strongly negative effect on the EU is likely caused by its strong trade ties with China. Also, as the EU in 2022 could count on US support in its sanctions against Russia, the US will likely expect equal EU support in case of a future confrontation with China. Once again, due to the proven effect of multilateral sanctions, and the importance of free trade among allies, the EU is also strongly advised to improve its network of FTAs with like-minded states, and especially to prove its relations with the US, including potential new FTA discussions.

Regarding Japan, Korea, and Australia, the model results showed consistently the most negative effects. This is the result of their strong trade relationship with China. However, as all of these states have also seen an increase in political tensions with China themselves, and in a future case of US-China escalations would most certainly would be expected by the US to support its efforts, the governments of all these countries are advised to revise their trade dependencies, and work on strengthening ties with each other, with the US, and other countries with whom they maintain friendly relations, in order to reduce the currently highly negative anticipated effects.

As for ASEAN, this organization, and the countries that are part of it, are highly advised to work on improving their trade relations with US and other Western and East Asian partners as well. While they currently maintain a significant trade relationship with China, several countries in this region have their own conflicts with China as well. This makes it likely for these countries to get pulled in to a future conflict between the US and China, and if their trade relationships are not prepared for it, they could suffer greatly.

Businesses

As for businesses, first we discuss the main industries affected by the severe disruptions in trade flows that have been observed in the model results. Second, we mention the overall supply chain implications for all business that rely on production networks.

Shipping liner companies will be severely affected by the change in trade flows. While at present global shipping lanes are highly centered around China, the results show that this could change a lot, losing over 50% on trade routes between China and sanctions partners in case of wide-ranging multilateral sanctions. In addition, trade flows between sanctions partners are projected to significantly increase, especially in case of intra-alliance free trade. This means that shipping lines need to be prepared for a shift in their operations, and a revision of trade routes. As shipping lines depend on numerous other countries for their operations, this is not an easy feat, and takes time to accomplish, as such, measure need to be taken to be prepared, and to smooth out further trade disruptions.

A similar effect applies to the wider logistics sector. This sector is at the core of global trade flows, and heavily interacts with the shipping industry. The logistics industry needs to be prepared for changes in trade flows by setting up warehouses in the anticipated new centers of production after sanctions, and need to be able to move transport capacity from one region to another.

Furthermore, terminal and port operators would be greatly affected. While shipping and logistics would already struggle to quickly move capacity around, this situation is much worse for terminals and ports, as they are geographically fixed, and very long-term investments. Nonetheless, operators need to consider the potential escalation scenarios, and take these into account when deciding where to develop additional terminal capacity. It is advisable to not only consider current economic trends, but also to consider FTAs and political alliances, as our model results have shown that alliances and FTAs strongly increase transport flows among them, especially in a world that is increasingly shifting to a division in two economic blocs.

Regarding business that rely on production networks in general, it is important to revise their supply chain networks, in order to ensure the continuity of their processes in the future. The recent Covid-19 situation, combined with other supply disruptions, have already made very clear the fragility of global supply chain networks. The effect of the pandemic on Asian ports has led to shortages in supplies worldwide. Another simple example is again the war in Ukraine, which has quickly led to a scarcity in various agricultural resources, and rapidly increasing prices. Similarly as for other actors, it is advisable to take political alliances into consideration when designing supply chains. This follows the US suggestion of 'friendshoring', and increase the robustness and dependability of supply chains in times of conflict.

6. Conclusions

6.1 Key findings & implications

The goal of this research was to investigate the economic, trade, and transport flow effects of US-led multilateral sanctions against China.

Regarding the cost of sanctions, we have seen severe negative effects for especially China, but also for the US itself, as well as for its alliance partners, and the world as a whole. What this means for the likelihood of sanctions being imposed will ultimately come down to the question whether the intended goals of the sanctions outweigh their cost. This is a highly subjective question, but while the US might convince itself through the perceived strategic and political importance of a confrontation with China, the results of our study have shown that the cost for potential sanctions partners is severe, which could present a significant barrier to the participation of others in a sanctions alliance. However, the results clearly show that unilateral sanctions would hurt the US more than they would hurt China, and as such the case for multilateral sanctions is strong.

While the US has previously attempted to overcome such issues by imposing secondary sanctions, such actions have been seen as highly unfavorable by key allies such as the EU. In a world where the US increasingly finds itself in confrontation with China, and recently Russia, it might not want to antagonize its oldest allies further, and would more likely focus on sanctions cooperation, especially when it involves a major EU trade partner as China. These core US allies, included in Scenarios 2 and 3, might be willing to make certain economic sacrifices in case of a serious escalation with China in any case. This is due to their economic strength enabling them to overcome the damage as projected in the model, their participation in the precedent case of Russia in 2014 and 2022, and out of allegiance to their long-lasting political alliances with the US. This makes it likely that in reality a confrontation with China would at least result in a Scenario 3 situation.

However, regarding the lower/medium-income economies in the model, including ASEAN and India, the results project significant economic damage, which their economies might not be able to handle, reducing their likeliness to impose sanctions. Nonetheless, their inclusion would greatly reduce the punitive effect on China, and would be highly desirable. Our additional analysis that modelled intra-alliance free trade arrangements gave a strong indication that the negative effect for these countries can be overcome. Whether the US and Western allies would be willing to make such concessions, in terms of lower tariffs and reduced other barriers to trade, in reality remains to be seen, though the fact that ASEAN is already working hard to increase its number of FTAs around the world, makes it not unlikely that this situation could unfold.

Furthermore, the GSIM results showed a strong indication that sanctions would affect China significantly, seeing a decrease in output of up to nearly 10%, much more so than the combined alliance partners. This perceived effectiveness, combined with the long-standing US habit of using sanctions as a primary foreign policy tool, and the increasing tensions around the potential triggers discussed in the paper, make it highly likely that a situation with increased sanctions, and likely multilateral sanctions, will arise at some point in the future.

As a result of the likeliness of these sanctions to occur, governments and businesses around the world should keep the realistic chance of such events in mind when setting their policies for the decades to come. The key aspect to consider is that such large-scale sanctions events would lead to major trade flow and supply chain disruptions. In this regard, for logistics and maritime companies it is important to be able to react to a strong reduction in trade flows involving China, and a major increase elsewhere. This increase elsewhere would especially be strong in case of intra-alliance free trade. Furthermore, all other types of businesses, that for part of their supply chain rely on Chinese production, need to reconsider the design of their supply chain. In line with the earlier introduced term of 'friendshoring', supply chains can be made more robust when they rely on production in countries with whom the US shares political goals, FTAs, or even alliances.

Despite the anticipated likeliness of sanctions occurring at some point, and their strongly negative effect, it should not be assumed that this scenario is a given. While Russia in 2022 has been a strong precedent case, showing the willingness of, especially Western, allies to work together in the face of severe political issues, it remains to be seen whether the same actors would be willing to face China in a similar manner. The potential cost of such a confrontation could be much more devastating for the own economies, than it was with Russia. Also, there are wider concerns at stake beyond immediate economic and trade effects, as reduced collaboration and innovation can have a wider impact, such as less cooperation and progress regarding decarbonization (Posen, 2022).

Nonetheless, if the current trend of increasing confrontations between the US and China continues, and potentially escalates on one of the numerous potential sanctions triggers, it is plausible that a scenario as developed in our research will happen in reality. As a result of the reported benefits of multilateral sanctions, this situation would likely involve numerous actors, and have far-reaching economic and trade effects. In order to not be faced with surprises, it is of utmost importance for both governments and businesses to make their future policy sanctions-proof, and work on the reliability of their alliances, supply chains, and networks.

6.2 Suggestions for future research

Future research could investigate the effect of the type of sanctions considered in this research on other regions of the world specifically. Our research detailed the effects for the US, its various sanctions partners, and China, while grouping all remaining countries under RoW (Rest of the World). This design was chosen as the decision whether to participate in sanctions or not could at least in part be guided by the expected domestic economic damage for each of the participants, and this was the focus and goal of our research. However, this approach provides no insight into possibly diverging regional spillover effects for non-sanction partners, for example in Sub-Saharan Africa, the Middle East, or Latin America. Sub-Saharan Africa could be a particular region of interest, as China has in recent years rapidly expanded economic and political ties with the region, engaging in numerous infrastructure projects, and starting to outsource production to various African countries.

Another approach for future research could be to focus on different aspects of sanctions variety. While this research focused on unilateral versus increasing levels of multilateral sanctions, it could be interesting to investigate the effect of various intensity levels of sanctions by the same actors, from mild to increasingly more severe. In addition, it could be worthwhile to investigate the effect of sanctions on specific sectors of the economy, instead of on the effect for the economy as whole, as was done in this research.

Finally, while we provided an alternative scenario of intra-alliance free trade for our anticipated sanctions partners, we did not do the same for China. However, there is a realistic chance that in such a scenario China would respond by increasing its trade relations with its own allies, and reduce trade barriers as well in order to achieve similar positive results. This follows the observations by other research that in some aspects it seems that the world is developing into opposing economic alliance blocs. Despite current global political alliances indicating that such a China-led alliance would likely include less significant economic actors, it remains worthwhile to investigate a situation in which both the US and China would build an economic bloc around themselves.

Bibliography

Aarup, S. A. (2021). Ban on Uyghur imports becomes EU's hot potato. *Politico*. Retrieved from <https://www.politico.eu/article/uyghur-china-europe-ban-imports-europe-trade-hot-potato-forced-labor/>.

Abdelal, R. & Bros, A. (2020). The End of Transatlanticism? - How Sanctions are Dividing the West. *Horizons: Journal of International Relations and Sustainable Development*, 16: 114-135.

Ahmad, S. & Riker, D. (2020). Updated Estimates of the Trade Elasticity of Substitution. *US International Trade Commission – Economics Working Paper Series, Working Paper 2020–05-A*. Retrieved from https://www.usitc.gov/publications/332/working_papers/ahmad_and_riker_eos_2020.pdf.

ASEAN. (2020). *ASEAN Statistical Yearbook 2020*. ASEAN. Retrieved from https://www.aseanstats.org/wp-content/uploads/2020/12/ASYB_2020.pdf.

Åslund, A. (2019). Western Economic Sanctions on Russia over Ukraine, 2014–2019. *CESifo Forum*, 4. Retrieved from <https://www.cesifo.org/DocDL/CESifo-Forum-2019-4-aslund-economic-sanctions-december.pdf>.

Berden, K. (2021). International Economics, lecture series. *Center for Maritime Economics & Logistics*.

Bloomberg. (2022). Putin's War on Ukraine Shows Xi the Dangers of Attacking Taiwan. *Bloomberg*. Retrieved from <https://www.bloomberg.com/news/features/2022-03-07/what-china-s-xi-is-learning-about-taiwan-from-putin-s-war-in-ukraine>.

Bouso, R. & Chen, A. (2022). Exclusive: China's oil champion prepares Western retreat over sanctions fear. *Reuters*. Retrieved from <https://www.reuters.com/business/energy/exclusive-chinas-oil-champion-prepares-western-retreat-over-sanctions-fear-2022-04-13/>.

Bouso, R., Nasralla, S. & Chen, A. (2022). EXCLUSIVE China's CNOOC plans North Sea oil exit in strategic shift. *Reuters*. Retrieved from <https://www.reuters.com/world/china/exclusive-chinas-cnooc-plans-north-sea-oil-exit-strategic-shift-2022-03-30/>.

Bown, C. P. (2021). The US–China trade war and phase one agreement. *Peterson Institute for International Economics*, 21(2). Retrieved from <https://www.piie.com/publications/working-papers/us-china-trade-war-and-phase-one-agreement>.

Broda, C., Greenfield, J. & Weinstein, D. (2006). From Groundnuts to Globalization: A Structural Estimate of Trade and Growth. *NBER Working Paper No. 12512*. Retrieved from https://www.nber.org/system/files/working_papers/w12512/w12512.pdf.

Broda, C., Limão, N. & Weinstein, D. (2006b). Optimal Tariffs: The Evidence. *NBER Working Paper No. 12033*. Retrieved from https://www.nber.org/system/files/working_papers/w12033/w12033.pdf.

Brooker, M. (2022). Did Xi Jinping Get Played by Putin on Ukraine? *Bloomberg*. Retrieved from <https://www.bloomberg.com/opinion/articles/2022-03-01/did-china-s-xi-jinping-get-played-by-putin-on-ukraine>.

- Buszynski, L. (2012). The South China Sea: Oil, Maritime Claims, and U.S.–China Strategic Rivalry. *The Washington Quarterly*, 35(2): 139-156.
- Chang, F. K. (2019). Endangered Golden Goose: Hong Kong's Economic Value to China. *Foreign Policy Research Institute*. Retrieved from <https://www.fpri.org/article/2019/08/endangered-golden-goose-hong-kongs-economic-value-to-china/>.
- Condon, C. (2022). Yellen Says U.S. Would Use Sanctions If China Invaded Taiwan. *Bloomberg*. Retrieved from <https://www.bloomberg.com/news/articles/2022-04-06/yellen-says-u-s-would-use-sanctions-if-china-invaded-taiwan>.
- Cuhadar, E., Diaz-Prinz, J. (2022). To Sustain Hopes for Peace in Ukraine, Keep an Eye on Turkey. *US Institute of Peace*. Retrieved from <https://www.usip.org/publications/2022/04/sustain-hopes-peace-ukraine-keep-eye-turkey>.
- Culver, J. (2020). The unfinished Chinese civil war. *Lowy Institute / The Interpreter*. Retrieved from <https://www.lowyinstitute.org/the-interpreter/unfinished-chinese-civil-war>.
- Culver, J. & Hass, R. (2021). Understanding Beijing's motives regarding Taiwan, and America's role. *The Brookings Institution*. <https://www.brookings.edu/on-the-record/understanding-beijings-motives-regarding-taiwan-and-americas-role>.
- Davidson, J. (2014). The U.S. "Pivot to Asia". *American Journal of Chinese Studies*, 21: 77-82.
- Davis, M. C. (2020). Hong Kong Is Part of the Mainland Now. *Foreign Affairs*. <https://www.foreignaffairs.com/articles/china/2020-07-02/hong-kong-part-mainland-now>.
- Donnan, S., Curran, E. & Miller, R. (2022). Putin's Financial Isolation by World's Powerful Is a Cautionary Tale for Xi Jinping. *Bloomberg*. Retrieved from <https://www.bloomberg.com/news/articles/2022-03-04/ukraine-war-putin-s-financial-isolation-is-a-warning-sign-for-xi-jinping>.
- Economist. (2022). China wants to insulate itself against Western sanctions. *The Economist*. Retrieved from <https://www.economist.com/business/china-wants-to-insulate-itself-against-western-sanctions/21807805>.
- Ellis, S. (2020). Here's What Could Happen If China Invaded Taiwan. *Bloomberg*. Retrieved from <https://www.bloomberg.com/news/features/2020-10-07/here-s-what-could-happen-if-china-invaded-taiwan>.
- Emmott, R. (2021). EU extends human rights sanctions, including on Chinese officials. *Reuters*. Retrieved from <https://www.reuters.com/world/eu-extends-human-rights-sanctions-including-chinese-officials-2021-11-24/>.
- Emmott, R. (2021b). China's EU envoy says no flexibility on Taiwan, sanctions, trade. *Reuters*. Retrieved from <https://www.reuters.com/world/asia-pacific/chinas-eu-envoy-says-no-flexibility-taiwan-sanctions-trade-2021-11-16/>.
- Eurasia Group. (2020). The Geopolitics of Semiconductors. *Eurasia Group*. Retrieved from <https://www.eurasiagroup.net/files/upload/Geopolitics-Semiconductors.pdf>.

- Feigenbaum, E. A. (2022). China Faces Irreconcilable Choices on Ukraine. *Carnegie Endowment for International Peace*. Retrieved from <https://carnegieendowment.org/2022/02/24/china-faces-irreconcilable-choices-on-ukraine-pub-86515>.
- Feng, E. (2021). China's New Anti-Foreign Sanctions Law Sends A Chill Through The Business Community. *NPR*. Retrieved from <https://www.npr.org/2021/06/11/1005467033/chinas-new-anti-foreign-sanctions-law-sends-a-chill-through-the-business-communi>.
- Ghodsí, M., Gröbler, J. & Stehrer, R. (2016). Import Demand Elasticities Revisited. *The Vienna Institute for International Economic Studies*. Retrieved from <https://wiiw.ac.at/import-demand-elasticities-revisited-dlp-4075.pdf>.
- Ghosh, P. (2020). The Exodus Of Chinese Manufacturing: Shutting Down 'The World's Factory'. *Forbes*. Retrieved from <https://www.forbes.com/sites/princeghosh/2020/09/18/the-exodus-of-chinese-manufacturing-shutting-down-the-worlds-factory/>.
- Gong, X. (2018). The Belt & Road Initiative and China's influence in Southeast Asia. *The Pacific Review*, 32(4): 635-665.
- Gong, X. (2020). Non-traditional security cooperation between China and south-east Asia: implications for Indo-Pacific geopolitics. *International Affairs*, 96(1): 29-48.
- Green, M. & Medeiros, E. (2020). Is Taiwan the Next Hong Kong? – China Tests the Limits of Impunity. *Foreign Affairs*. Retrieved from <https://www.foreignaffairs.com/articles/east-asia/2020-07-08/taiwan-next-hong-kong>.
- Griswold, D. (2000). Going Alone on Economic Sanctions Hurts U.S. More than Foes. *Cato Institute*. Retrieved from <https://www.cato.org/commentary/going-alone-economic-sanctions-hurts-us-more-foes>.
- Guo, L., Wang, S. & Xu, N. (2021). US economic and trade sanctions against China: a loss-loss confrontation. *Economic and Political Studies*. Retrieved from <https://doi.org/10.1080/20954816.2021.1920195>.
- Helwig, N., Jokela, J. & Portela, C. (2020). Sharpening EU sanctions policy for a geopolitical era. *Prime Minister's Office of Finland*. Retrieved from https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/162257/VNTEAS_2020_31.pdf.
- Imbs, J. & Méjean, I. (2017). Trade elasticities. *Review of International Economics*, 25(2).
- Kai, J. (2021). The Biden Administration's China Sanctions Dilemma. *The Diplomat*. Retrieved from <https://thediplomat.com/2021/08/the-biden-administrations-china-sanctions-dilemma/>.
- Kapustina, L., Lipkova, L., Silin, Y. & Drevalov, A. (2020). US-China Trade War: Causes and Outcomes. *SHS Web of Conferences*, 73(01012). Retrieved from https://www.shs-conferences.org/articles/shsconf/pdf/2020/01/shsconf_ies_2019_01012.pdf.
- Katzman, K. (2022). Iran Sanctions. *Congressional Research Service*, RS20871. Retrieved from <https://sgp.fas.org/crs/mideast/RS20871.pdf>.
- Kee, H. L., Nicita, A. & Olarreaga, M. (2008). Import Demand Elasticities and Trade Distortions. *The Review of Economics and Statistics*, 90(4): 666-682.

- Kee, H. L., Nicita, A. & Olarreaga, M. (2009). Estimating Trade Restrictiveness Indices. *The Economic Journal*, 119(534), 172-199.
- Kennedy, S. & Condon, C. (2022). Yellen to Warn War Threatens 'Enormous Economic Repercussions'. *Bloomberg*. Retrieved from <https://www.bloomberg.com/news/articles/2022-04-06/yellen-to-warn-war-threatens-enormous-economic-repercussions>.
- Khan, S. (2021). China's Xinjiang Policy: The Imperative for India. *Observer Research Foundation, Issue brief No. 464*. Retrieved from <https://www.orfonline.org/research/chinas-xinjiang-policy-the-imperative-for-india/>.
- Kireeva, A. (2022). The limits to Russia and China's 'no limits' friendship. *East Asia Forum*. Retrieved from <https://www.eastasiaforum.org/2022/03/23/the-limits-to-russia-and-chinas-no-limits-friendship/>.
- Korhonen, I. (2019). Economic Sanctions on Russia and Their Effects. *CESifo Forum*, 4. Retrieved from <https://www.ifo.de/DocDL/CESifo-Forum-2019-4-korhonen-economic-sanctions-december.pdf>.
- Kremlin. (2022). Joint Statement of the Russian Federation and the People's Republic of China on the International Relations Entering a New Era and the Global Sustainable Development. *Kremlin*. Retrieved from <http://en.kremlin.ru/supplement/5770>.
- Krepinevich Jr., A. F. (2022). The New Nuclear Age How China's Growing Nuclear Arsenal Threatens Deterrence. *Foreign Affairs*. Retrieved from <https://www.foreignaffairs.com/articles/china/2022-04-19/new-nuclear-age>.
- Lai, C. (2017). Acting one way and talking another: China's coercive economic diplomacy in East Asia and beyond. *The Pacific Review*, 31(2): 169-187.
- Lawder, D. & Shalal, A. (2022). Yellen to China: Help stop Russia's war in Ukraine or lose standing in the world. *Reuters*. Retrieved from <https://www.reuters.com/world/us-allies-will-not-be-indifferent-those-who-undermine-russia-sanctions-yellen-2022-04-13/>.
- Lee, A. & Wu, W. (2022). US sanctions threat if China aids Russia stirs fear in Beijing about forex assets. *SCMP*. Retrieved from <https://www.scmp.com/economy/china-economy/article/3173273/us-sanctions-threat-if-china-aids-russia-stirs-fear-beijing>.
- Leibold, J. & Teng, B. (2021). What is Happening to the Uyghurs in Xinjiang? *Council on Foreign Relations*. Retrieved from <https://www.cfr.org/event/what-happening-uyghurs-xinjiang>.
- Lindberg, K. & Wang, C. (2021). A Far-Flung Taiwan Island Risks Triggering a U.S.-China Clash. *Bloomberg*. Retrieved from <https://www.bloomberg.com/news/articles/2021-06-16/a-far-flung-taiwan-island-risks-triggering-a-u-s-china-clash>.
- Liu, J., Che, C., Cao, D., Liu, C. & Hyuga, T. (2021). China Asks Didi to Delist From U.S. On Security Fears. *Bloomberg*. Retrieved from <https://www.bloomberg.com/news/articles/2021-11-26/china-is-said-to-ask-didi-to-delist-from-u-s-on-security-fears>.
- Lovely, M. E. & Schott, J. J. (2021). Can China Blunt the Impact of New US Economic Sanctions? *Peterson Institute for International Economics*, 21(13). Retrieved from <https://www.piie.com/sites/default/files/documents/pb21-13.pdf>.

Lowy Institute. (2022). Themes: China. *Lowy Institute*. Retrieved from <https://poll.lowyinstitute.org/themes/china/>.

Maizland, L. (2021). China's Repression of Uyghurs in Xinjiang. *Council on Foreign Relations*. Retrieved from <https://www.cfr.org/backgrounder/chinas-repression-uyghurs-xinjiang>.

Maizland, L., & Albert, E. (2021). Hong Kong's Freedoms: What China Promised and How It's Cracking Down. *Council on Foreign Relations*. Retrieved from <https://www.cfr.org/backgrounder/hong-kong-freedoms-democracy-protests-china-crackdown>.

Mallard, W. (2022). China on the right side of history over Ukraine war, foreign minister says. *Reuters*. Retrieved from <https://www.reuters.com/world/china/china-right-side-history-over-ukraine-war-foreign-minister-2022-03-20/>.

Martin, X. (2022). Three misunderstandings about China's policy on Taiwan. *Clingendael Spectator*. Retrieved from <https://spectator.clingendael.org/en/publication/three-misunderstandings-about-chinas-policy-taiwan>.

Martina, M. (2022). U.S. says China could face sanctions if it supports Russia's war in Ukraine. *Reuters*. Retrieved from <https://www.reuters.com/world/us-says-china-could-face-sanctions-if-it-supports-russias-war-ukraine-2022-04-06/>.

Mastro, O. S. (2015). Why Chinese Assertiveness is Here to Stay. *The Washington Quarterly*, 37(4): 151-170.

Mastro, O. S. (2021). The Taiwan Temptation. *Foreign Affairs*. Retrieved from <https://www.foreignaffairs.com/articles/china/2021-06-03/china-taiwan-war-temptation>.

Mastro, O. S. (2022). Invasions Are Not Contagious. *Foreign Affairs*. Retrieved from <https://www.foreignaffairs.com/articles/taiwan/2022-03-03/invasions-are-not-contagious>.

Miller, G. (2021). \$25B worth of cargo stuck on 80 container ships off California. *Freightwaves*. Retrieved from <https://www.freightwaves.com/news/22b-worth-of-cargo-is-now-stuck-on-container-ships-off-california>.

Morrison, W. M. (2018). China-U.S. Trade Issues. *Congressional Research Service*, 7-5700, RL33536. Retrieved from <https://sgp.fas.org/crs/row/RL33536.pdf>.

Murphy, C., Liu, L., Li, J. & Glamann, P. (2022). China Warns U.S. Over Forming Pacific NATO, Backing Taiwan. *Bloomberg*. Retrieved from <https://www.bloomberg.com/news/articles/2022-03-07/china-urges-world-not-to-add-fuel-to-fire-in-war-in-ukraine>.

Myre, G. (2021). Long promised and often delayed, the 'pivot to Asia' takes shape under Biden. *NPR*. Retrieved from <https://www.npr.org/2021/10/06/1043329242/long-promised-and-often-delayed-the-pivot-to-asia-takes-shape-under-biden>.

Nair, P. & Sharma, S. (2017). Did the US Just Abandon Tibet? *The Diplomat*. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2997926.

Nephew, R. (2019). China and Economic Sanctions: Where Does Washington Have Leverage? *The Brookings Institute / Global China*. Retrieved from

https://www.brookings.edu/wp-content/uploads/2019/09/FP_20190930_china_economic_sanctions_nephew.pdf.

OECD. (2022). International trade during the COVID-19 pandemic: Big shifts and uncertainty. *OECD*. Retrieved from <https://www.oecd.org/coronavirus/policy-responses/international-trade-during-the-covid-19-pandemic-big-shifts-and-uncertainty-d1131663/>.

Otero Iglesia, M. (2022). Can the Russian economy withstand the sanctions? *Real Instituto El Cano*. Retrieved from <https://www.realinstitutoelcano.org/en/analyses/can-the-russian-economy-withstand-the-sanctions/>.

Palmer, D. (2021). America's trade gap soared under Trump, final figures show. *Politico*. Retrieved from <https://www.politico.com/news/2021/02/05/2020-trade-figures-trump-failure-deficit-466116>.

Peksen, D. (2019). When Do Imposed Economic Sanctions Work? A Critical Review of the Sanctions Effectiveness Literature. *Defence and Peace Economics*, 05: 635-647. Retrieved from <https://doi.org/10.1080/10242694.2019.1625250>.

Poh, A. (2017). The Myth of Chinese Sanctions over South China Sea Disputes. *The Washington Quarterly*, 40(1): 143-165.

Poh, A. & Li, M. (2017). A China in Transition: The Rhetoric and Substance of Chinese Foreign Policy under Xi Jinping. *Asian Security*, 13(2): 84-97.

Posen, A. (2008). Why the Euro will Not Rival the Dollar. *International Finance*, 11(01): 75-100.

Posen, A. (2022). The End of Globalization? *Foreign Affairs*. Retrieved from <https://www.foreignaffairs.com/articles/world/2022-03-17/end-globalization>.

Putz, C. (2022). China's Inadvertent Empire: Welcome to Sinostan. *The Diplomat*. <https://thediplomat.com/2022/04/chinas-inadvertent-empire-welcome-to-sinostan/>.

Qin, Y. (2014). Continuity through Change: Background Knowledge and China's International Strategy. *The Chinese Journal of International Politics*, 7(3): 285-314.

Rosen, D. (2022). The Age of Slow Growth in China. *Foreign Affairs*. Retrieved from <https://www.foreignaffairs.com/articles/china/2022-04-15/age-slow-growth-china>.

Renshaw, J. & Hunnicutt, T. (2022). Biden says Xi knows that China's future is linked to West. *Reuters*. Retrieved from <https://www.reuters.com/world/china/biden-china-knows-its-economic-future-is-tied-more-west-than-russia-2022-03-24/>.

Rolland, N. (2017). China's "Belt and Road Initiative": Underwhelming or Game-Changer? *The Washington Quarterly*, 40(1): 127-142.

Shalal, A., Martina, M. & Woo, R. (2022). After Biden-Xi call, U.S. warns China it could face sanctions if it backs Russia in Ukraine. *Reuters*. Retrieved from <https://www.reuters.com/world/china/biden-xi-set-clash-over-putins-war-ukraine-2022-03-18/>.

Szechenyi, N. & Hosoya, Y. (2019). Working Toward a Free and Open Indo-Pacific. *Carnegie Endowment for International Peace*. Retrieved from

<https://carnegieendowment.org/2019/10/10/working-toward-free-and-open-indo-pacific-pub-80023>.

Tiezzi, S. (2020). The US No Longer Considers Hong Kong Autonomous. What Does That Mean? *The Diplomat*. <https://thediplomat.com/2020/05/the-us-no-longer-considers-hong-kong-autonomous-what-does-that-mean/>.

Tong, K. (2020). Washington's Self-Defeating Hong Kong Strategy. *Foreign Affairs*. Retrieved from <https://www.foreignaffairs.com/articles/china/2020-06-02/washingtons-self-defeating-hong-kong-strategy>.

Turkel, N. & Van Schaack, B. (2021). What America Owes the Uyghurs – A Plan for Stopping China's Genocide. *Foreign Affairs*. Retrieved from <https://www.foreignaffairs.com/articles/china/2021-07-16/what-america-owes-uyghurs>.

US Congress. (2020). S.3744 - Uyghur Human Rights Policy Act of 2020. *US Congress*. Retrieved from <https://www.congress.gov/bill/116th-congress/senate-bill/3744>.

US Congress. (2021). H.R.1155 – Uyghur Forced Labor Prevention Act. *US Congress*. Retrieved from <https://www.congress.gov/bill/117th-congress/house-bill/1155/text>.

White House. (2021). FACT SHEET: Executive Order Addressing the Threat from Securities Investments that Finance Certain Companies of the People's Republic of China. *The White House*. Retrieved from <https://www.whitehouse.gov/briefing-room/statements-releases/2021/06/03/fact-sheet-executive-order-addressing-the-threat-from-securities-investments-that-finance-certain-companies-of-the-peoples-republic-of-china/>.

White House. (2021b). FACT SHEET: New U.S. Government Actions on Forced Labor in Xinjiang. *The White House*. Retrieved from <https://www.whitehouse.gov/briefing-room/statements-releases/2021/06/24/fact-sheet-new-u-s-government-actions-on-forced-labor-in-xinjiang/>.

White House. (2022). Indo-Pacific Strategy of the United States. *The White House*. Retrieved from <https://www.whitehouse.gov/wp-content/uploads/2022/02/U.S.-Indo-Pacific-Strategy.pdf>.

Wong, B. (2020). Hong Kong Is the First Casualty of the New Cold War. *The Diplomat*. <https://thediplomat.com/2020/08/hong-kong-is-the-first-casualty-of-the-new-cold-war/>.

World Bank. (2022). World Bank Database. Retrieved from <https://data.worldbank.org/>.

World Bank. (2022b). WITS – World Integrated Trade Solution. Retrieved from <https://wits.worldbank.org/>.

Yahuda, M. (2013). China's New Assertiveness in the South China Sea. *Journal of Contemporary China*, 22: 446-459.

Yamamoto, R. (2020). China's Development Assistance in Southeast Asia: A Threat to Japanese Interests? *Asian Survey*, 60(2): 323-346.

Yap, K. & Koh, Y. H. (n.d.). Manufacturing for global businesses: what's next after China? *Kearney*. Retrieved from <https://www.kearney.com/operations-performance-transformation/article/?/a/manufacturing-for-global-businesses-what-s-next-after-china>.

Yau, C. & Tsang, D. (2020). Donald Trump unlikely to target Hong Kong dollar peg to US dollar, says former top diplomat. *SCMP*. Retrieved from <https://www.scmp.com/news/hong-kong/hong-kong-economy/article/3094685/donald-trump-unlikely-target-hong-kong-dollar-peg>.

Zhou, C. (2021). US sanctions on China will continue but Beijing 'unlikely to escalate' amid decoupling fears. *South China Morning Post*. Retrieved from <https://www.scmp.com/economy/global-economy/article/3140815/us-sanctions-china-will-continue-beijing-unlikely-escalate>.

Appendices

Appendix I – GSIM input: Trade values

TRADE	d: destination						
s: source	China	US	EU	UK	Canada	Turkey	RoNATO
China	0	563.203.119.540	466.353.183.054	63.391.696.591	58.326.303.197	21.506.001.136	10.792.660.956
US	156.004.352.076	0	316.760.344.641	63.294.165.556	235.121.903.895	12.995.813.667	7.775.390.561
EU	246.870.847.442	472.950.657.488	3.428.835.836.748	286.411.255.486	48.231.064.487	90.483.969.334	73.227.279.714
UK	23.893.335.363	61.748.826.091	172.426.189.826	0	7.108.536.199	7.637.467.795	6.104.113.777
Canada	28.354.110.457	325.683.550.892	36.258.826.464	13.667.460.232	0	1.982.554.294	2.249.595.449
Turkey	3.762.714.131	10.897.623.964	89.667.315.805	11.546.552.433	1.804.281.506	0	1.887.230.582
RoNATO	3.782.627.813	7.990.081.910	97.252.480.211	26.288.578.690	1.861.291.975	953.684.221	1.494.312.792
Japan	180.401.786.146	145.902.252.542	82.508.650.022	12.917.862.825	13.001.917.346	4.515.221.751	1.974.438.436
Rep. of Korea	204.566.451.226	76.200.587.119	59.411.114.503	5.191.608.047	7.291.570.798	6.638.437.911	2.542.659.030
Australia	105.083.000.000	10.209.238.802	13.160.461.486	3.715.597.032	1.619.314.944	1.073.871.306	562.158.537
New Zealand	11.079.793.163	4.363.883.424	4.080.046.651	1.129.352.835	578.921.575	41.996.597	48.788.932
India	18.850.036.974	56.443.791.815	54.102.003.115	9.668.982.957	3.917.372.166	7.524.705.173	718.818.390
ASEAN	269.090.088.176	190.810.935.892	164.392.738.830	18.303.300.471	13.967.237.247	7.548.526.722	2.704.220.064
RoW	883.243.472.022	685.027.940.678	783.730.099.521	156.167.844.611	67.115.327.925	68.250.232.738	5.529.503.520

TRADE	s: source						
d: destination	Japan	Rep. of Korea	Australia	New Zealand	India	ASEAN	RoW
China	173.717.000.000	106.488.000.000	57.703.270.419	8.643.468.142	73.605.377.603	284.798.056.126	952.795.296.498
US	83.640.150.948	59.080.559.387	24.666.302.853	4.424.717.082	32.715.037.043	103.083.685.542	507.332.115.992
EU	74.403.568.632	58.597.471.378	41.841.071.386	6.600.103.852	52.744.706.513	113.142.974.439	743.390.621.704
UK	8.231.614.335	6.806.667.052	5.605.121.853	1.249.551.892	7.053.525.675	15.180.968.711	124.013.043.241
Canada	11.720.575.319	5.750.215.490	1.702.618.908	487.244.863	3.466.798.911	7.002.163.509	20.225.345.231
Turkey	754.685.681	1.188.879.060	820.126.922	140.966.087	2.040.273.001	2.507.527.213	46.198.103.763
RoNATO	2.034.880.836	1.658.485.200	372.441.034	105.852.589	508.351.029	1.834.657.516	6.234.930.827
Japan	0	54.603.331.337	17.352.257.361	3.036.360.491	12.536.654.345	116.881.876.233	182.944.948.521
Rep. of Korea	32.134.290.278	0	10.183.163.508	2.003.617.258	16.388.475.984	100.987.266.349	127.149.875.029
Australia	45.731.434.968	20.717.135.553	0	5.018.782.465	14.080.338.276	26.958.067.175	29.708.990.446
New Zealand	2.651.187.004	1.379.941.843	6.057.465.764	0	633.033.777	4.228.550.113	5.390.596.797
India	5.495.270.931	5.884.707.470	4.242.233.418	509.968.764	0	30.329.601.533	105.593.754.577
ASEAN	112.221.187.200	59.627.916.303	40.108.800.576	6.252.192.970	57.322.548.429	310.174.760.125	588.394.029.963
RoW	195.789.432.054	153.400.063.314	24.879.975.875	5.263.419.218	234.520.612.441	277.578.282.834	301.857.889.719

Appendix II – GSIM input: Tariff rates

INITIAL								
ImportTAX (TM=1+tm)								
s: source	d: destination							
	China	US	EU	UK	Canada	Turkey	RoNATO	
China	1,0000	1,1930	1,0148	1,0128	1,0149	1,0285	1,0258	
US	1,2120	1,0000	1,0148	1,0128	1,0006	1,0285	1,0258	
EU	1,0610	1,0152	1,0000	1,0000	1,0006	1,0000	1,0000	
UK	1,0610	1,0152	1,0000	1,0000	1,0006	1,0000	1,0000	
Canada	1,0610	1,0006	1,0006	1,0006	1,0000	1,0285	1,0006	
Turkey	1,0610	1,0152	1,0000	1,0128	1,0149	1,0000	1,0258	
RoNATO	1,0610	1,0152	1,0000	1,0000	1,0006	1,0285	1,0000	
Japan	1,0610	1,0152	1,0000	1,0100	1,0149	1,0285	1,0258	
Rep. of Korea	1,0200	1,0006	1,0000	1,0006	1,0006	1,0000	1,0000	
Australia	1,0030	1,0006	1,0148	1,0128	1,0149	1,0285	1,0258	
New Zealand	1,0050	1,0152	1,0148	1,0128	1,0149	1,0285	1,0258	
India	1,0610	1,0152	1,0148	1,0128	1,0149	1,0285	1,0258	
ASEAN	1,0610	1,0152	1,0148	1,0128	1,0149	1,0285	1,0258	
RoW	1,0247	1,0152	1,0148	1,0128	1,0149	1,0285	1,0258	

INITIAL								
ImportTAX (TM=1+tm)								
s: source	d: destination							
	Japan	Rep. of Korea	Australia	New Zealand	India	ASEAN	RoW	
China	1,0222	1,0200	1,0030	1,0050	1,0619	1,0163	1,0259	
US	1,0222	1,0006	1,0006	1,0085	1,0619	1,0163	1,0259	
EU	1,0000	1,0000	1,0071	1,0085	1,0619	1,0163	1,0259	
UK	1,0100	1,0006	1,0071	1,0085	1,0619	1,0163	1,0259	
Canada	1,0222	1,0006	1,0071	1,0085	1,0619	1,0163	1,0259	
Turkey	1,0222	1,0000	1,0071	1,0085	1,0619	1,0163	1,0259	
RoNATO	1,0222	1,0000	1,0071	1,0085	1,0619	1,0163	1,0259	
Japan	1,0000	1,0030	1,0006	1,0030	1,0030	1,0100	1,0259	
Rep. of Korea	1,0030	1,0000	1,0006	1,0030	1,0100	1,0100	1,0259	
Australia	1,0006	1,0006	1,0000	1,0000	1,0619	1,0020	1,0259	
New Zealand	1,0030	1,0030	1,0000	1,0000	1,0619	1,0020	1,0259	
India	1,0030	1,0100	1,0071	1,0085	1,0000	1,0100	1,0259	
ASEAN	1,0100	1,0100	1,0020	1,0020	1,0100	1,0000	1,0259	
RoW	1,0222	1,0548	1,0071	1,0085	1,0619	1,0163	1,0259	

Appendix III – GSIM input: AVEs of NTMs

Export TAX (TX=1+tx)	d: destination						
s: source	China	US	EU	UK	Canada	Turkey	RoNATO
China	1,03	1,14	1,14	1,14	1,14	1,22	1,14
US	1,19	1,03	1,08	1,08	1,04	1,19	1,08
EU	1,19	1,08	1,04	1,04	1,04	1,10	1,04
UK	1,19	1,08	1,04	1,03	1,04	1,10	1,04
Canada	1,19	1,04	1,04	1,04	1,03	1,19	1,04
Turkey	1,22	1,09	1,05	1,05	1,09	1,03	1,09
RoNATO	1,19	1,08	1,04	1,04	1,04	1,19	1,04
Japan	1,10	1,04	1,04	1,04	1,08	1,19	1,08
Rep. of Korea	1,10	1,04	1,04	1,04	1,04	1,10	1,04
Australia	1,10	1,04	1,08	1,08	1,08	1,19	1,08
New Zealand	1,10	1,08	1,08	1,08	1,08	1,19	1,08
India	1,13	1,14	1,14	1,14	1,14	1,25	1,14
ASEAN	1,11	1,09	1,09	1,09	1,09	1,22	1,09
RoW	1,25	1,14	1,14	1,14	1,14	1,25	1,14

Export TAX (TX=1+tx)	d: destination						
s: source	Japan	Rep. of Korea	Australia	New Zealand	India	ASEAN	RoW
China	1,07	1,07	1,07	1,07	1,13	1,11	1,25
US	1,04	1,04	1,04	1,08	1,08	1,23	1,23
EU	1,04	1,04	1,08	1,08	1,23	1,19	1,23
UK	1,04	1,04	1,08	1,08	1,23	1,19	1,23
Canada	1,08	1,04	1,08	1,08	1,23	1,19	1,23
Turkey	1,09	1,05	1,09	1,09	1,25	1,22	1,25
RoNATO	1,08	1,04	1,08	1,08	1,23	1,19	1,23
Japan	1,03	1,04	1,04	1,04	1,12	1,10	1,23
Rep. of Korea	1,04	1,03	1,04	1,04	1,12	1,10	1,23
Australia	1,04	1,04	1,03	1,04	1,23	1,10	1,23
New Zealand	1,04	1,04	1,04	1,03	1,23	1,10	1,23
India	1,07	1,07	1,14	1,14	1,03	1,13	1,26
ASEAN	1,05	1,05	1,05	1,05	1,11	1,11	1,22
RoW	1,14	1,14	1,14	1,14	1,26	1,25	1,13

Appendix IV – GSIM input: Elasticities

The elasticities of demand, substitution, and supply. For references, see Section 3.2.

Country (group)	Demand	Substitution	Supply
China	-1,14	3	0,9
US	-1,16	3	0,9
EU	-1,04	3	0,9
UK	-1,06	3	0,9
Canada	-1,05	3	0,9
Turkey	-1,09	3	0,9
RoNATO	-1,06	3	0,9
Japan	-1,40	3	0,9
South Korea	-1,10	3	0,9
Australia	-1,10	3	0,9
New Zealand	-1,07	3	0,9
India	-1,38	3	0,9
ASEAN	-1,07	3	0,9
RoW	-1,09	3	0,9

Appendix V – GSIM output: Economic effects

Scenario 1

	Producer Surplus	Tax Revenue Effects	Downstream/Final Consumer Effects			Total Welfare
	F	J	K	L	M	N = F+G+H+I+J+K
	part 1, change in producer surplus	change in import taxes	change in consumer surplus	consumer prices, % change	total consumption, % change	Net welfare effects
China	-50.361.694.873,2	-1.175.565.020,7	-27.630.544.926,6	1,36	-2,84	-79.167.804.820,5
US	-14.209.067.554,3	-44.479.940,2	-94.447.262.413,3	3,33	-6,83	-108.700.809.907,7
EU	22.777.989,8	268.806.709,3	11.672.526.017,8	-0,20	0,41	11.964.110.716,8
UK	177.107.521,2	30.790.017,5	1.683.454.295,5	-0,25	0,52	1.891.351.834,3
Canada	2.220.508.722,7	15.507.130,7	3.468.448.473,6	-0,76	1,57	5.704.464.327,0
Turkey	-33.889.400,8	16.813.555,7	468.070.933,4	-0,20	0,42	450.995.088,3
RoNATO	-17.144.939,0	11.969.314,5	287.260.483,8	-0,24	0,50	282.084.859,4
Japan	994.835.546,4	140.323.047,6	4.138.351.844,6	-0,55	1,33	5.273.510.438,6
Rep. of Korea	727.670.320,0	20.751.515,9	2.518.405.086,2	-0,46	0,98	3.266.826.922,1
Australia	211.962.338,9	2.374.613,3	1.367.030.151,8	-0,58	1,23	1.581.367.104,0
New Zealand	33.055.623,4	1.294.803,3	205.337.203,4	-0,47	0,98	239.687.630,1
India	194.955.187,3	128.590.173,1	1.561.918.304,3	-0,29	0,70	1.885.463.664,7
ASEAN	604.864.099,8	134.108.885,2	6.307.811.975,9	-0,45	0,94	7.046.784.961,0
RoW	4.787.532.219,3	539.503.259,5	24.536.852.577,6	-0,64	1,36	29.863.888.056,5

Scenario 2

	Producer Surplus	Tax Revenue Effects	Downstream/Final Consumer Effects			Total Welfare
	F	J	K	L	M	N = F+G+H+I+J+K
	part 1, change in producer surplus	change in import taxes	change in consumer surplus	consumer prices, % change	total consumption, % change	Net welfare effects
China	-134.904.096.604,2	4.076.298.764,3	-48.678.138.725,3	2,36	-4,88	-179.505.936.565,2
US	-12.386.939.874,9	6.402.453.528,2	-69.971.272.720,1	2,48	-5,16	-75.955.759.066,8
EU	10.085.164.690,0	39.594.498.134,0	-87.776.323.648,0	1,49	-2,98	-38.096.660.824,0
UK	-2.190.539.234,5	5.456.569.613,2	-11.663.767.247,4	1,70	-3,41	-8.397.736.868,8
Canada	-1.459.284.457,9	4.954.198.522,9	-8.504.708.106,3	1,81	-3,60	-5.009.794.041,3
Turkey	-140.086.562,8	1.660.859.302,2	-3.975.081.473,7	1,67	-3,39	-2.454.308.734,4
RoNATO	42.469.631,6	876.947.692,3	-1.982.924.238,5	1,65	-3,31	-1.063.506.914,6
Japan	918.991.231,8	365.075.250,3	10.699.470.053,4	-1,43	3,52	11.983.536.535,6
Rep. of Korea	865.889.481,6	98.624.583,7	6.514.973.859,6	-1,21	2,58	7.479.487.924,9
Australia	275.505.416,1	8.011.517,3	3.516.833.975,6	-1,51	3,25	3.800.350.909,1
New Zealand	36.646.131,4	2.842.988,0	531.782.460,6	-1,23	2,58	571.271.579,9
India	166.203.674,8	352.011.424,7	4.358.664.706,0	-0,82	1,99	4.876.879.805,4
ASEAN	-339.163.885,4	355.944.538,8	17.211.171.329,8	-1,24	2,61	17.227.951.983,2
RoW	7.697.029.173,1	1.359.004.019,3	60.666.174.847,7	-1,61	3,45	69.722.208.040,2

Scenario 3

	Producer Surplus	Tax Revenue Effects	Downstream/Final Consumer Effects			Total Welfare
	F	J	K	L	M	N = F+G+H+I+J+K
	part 1, change in producer surplus	change in import taxes	change in consumer surplus	consumer prices, % change	total consumption, % change	Net welfare effects
China	-200.931.398.954,4	49.399.976.388,5	-174.465.411.866,1	8,06	-15,29	-325.996.834.432,0
US	-11.912.022.287,2	11.934.188.202,4	-40.925.907.465,7	1,47	-3,10	-40.903.741.550,5
EU	5.822.573.650,7	42.278.624.908,6	-68.490.828.928,9	1,17	-2,34	-20.389.630.369,6
UK	-2.481.183.404,9	5.824.508.290,4	-9.238.510.235,2	1,35	-2,72	-5.895.185.349,7
Canada	-1.959.723.326,5	5.298.806.632,2	-6.347.517.099,4	1,35	-2,72	-3.008.433.793,7
Turkey	-306.563.077,3	1.783.818.220,5	-2.900.644.767,4	1,22	-2,50	-1.423.389.624,2
RoNATO	-41.386.064,8	945.286.949,9	-1.419.816.660,7	1,18	-2,40	-515.915.775,6
Japan	-22.488.886.463,6	16.196.202.550,4	-24.504.529.332,6	3,11	-7,09	-30.797.213.245,8
Rep. of Korea	-26.444.651.217,4	10.113.507.754,1	-14.534.940.927,6	2,59	-5,23	-30.866.084.390,9
Australia	-13.350.371.456,2	5.832.291.153,1	-8.086.317.645,3	3,31	-6,61	-15.604.397.948,4
New Zealand	-1.355.104.810,0	858.390.409,4	-857.819.136,6	1,91	-3,85	-1.354.533.537,3
India	-2.472.375.512,0	5.734.959.727,7	-10.551.262.534,1	1,93	-4,45	-7.288.678.318,4
ASEAN	1.786.958.559,1	626.162.676,1	35.771.265.601,3	-2,61	5,63	38.184.386.836,5
RoW	16.324.754.550,1	2.430.151.655,1	105.301.972.970,2	-2,83	6,19	124.056.879.175,4

Scenario 4

	Producer Surplus	Tax Revenue Effects	Downstream/Final Consumer Effects			Total Welfare
	F	J	K	L	M	N = F+G+H+I+J+K
	part 1, change in producer surplus	change in import taxes	change in consumer surplus	consumer prices, % change	total consumption, % change	Net welfare effects
China	-245.488.211.678,6	70.023.489.549,0	-261.373.275.209,3	11,76	-21,17	-436.837.997.338,9
US	-11.808.642.876,6	16.161.914.518,9	-23.678.080.141,9	0,85	-1,82	-19.324.808.499,6
EU	2.822.056.190,2	44.377.238.901,8	-56.108.406.988,2	0,96	-1,93	-8.909.111.896,2
UK	-2.697.672.521,6	6.101.403.343,5	-7.842.065.539,2	1,15	-2,32	-4.438.334.717,4
Canada	-2.311.742.947,4	5.557.380.681,3	-5.166.545.069,0	1,10	-2,23	-1.920.907.335,2
Turkey	-423.048.975,6	1.879.337.963,2	-2.434.344.496,7	1,03	-2,11	-978.055.509,1
RoNATO	-102.073.627,3	996.859.730,6	-1.139.198.966,9	0,95	-1,93	-244.412.863,6
Japan	-21.409.242.694,0	17.005.795.913,6	-18.950.741.994,0	2,42	-5,59	-23.354.188.774,4
Rep. of Korea	-25.148.057.317,2	10.557.903.605,7	-11.542.799.709,8	2,07	-4,21	-26.132.953.421,3
Australia	-12.867.410.863,7	6.057.649.072,0	-6.111.145.239,9	2,52	-5,09	-12.920.907.031,6
New Zealand	-1.309.469.508,8	893.141.368,8	-589.283.526,7	1,32	-2,68	-1.005.611.666,7
India	-2.435.769.621,2	6.079.545.800,4	-8.297.348.256,2	1,53	-3,54	-4.653.572.077,0
ASEAN	-32.682.948.210,2	27.809.476.462,1	-23.531.226.427,8	1,64	-3,31	-28.404.698.175,9
RoW	21.838.490.281,0	3.258.617.421,0	137.877.816.190,3	-3,75	8,31	162.974.923.892,3

X

Appendix VI – GSIM output: Trade effects

Scenario 1

	Produce Prices, Quantities, and Revenues -- change				
	A	B	C	D	E
	% change in OUTPUT	% change in PRODUCER PRICE	% change in FOB (or ex-factory) PRICE	% change in producer revenues	value of change in producer revenues
China	-1,87	-2,08	-2,08	-3,91	-95.687.537.135,7
US	-0,91	-1,01	-1,01	-1,90	-26.997.249.079,9
EU	0,00	0,00	0,00	0,00	43.278.180,6
UK	0,04	0,04	0,04	0,08	336.504.290,8
Canada	0,46	0,51	0,51	0,98	4.218.967.399,6
Turkey	-0,02	-0,02	-0,02	-0,04	-64.389.861,5
RoNATO	-0,01	-0,01	-0,01	-0,02	-32.575.384,0
Japan	0,12	0,13	0,13	0,25	1.890.187.562,8
Rep. of Korea	0,11	0,12	0,12	0,23	1.382.573.623,9
Australia	0,08	0,08	0,08	0,16	402.728.446,0
New Zealand	0,08	0,09	0,09	0,17	62.805.684,9
India	0,07	0,08	0,08	0,14	370.414.857,5
ASEAN	0,03	0,04	0,04	0,07	1.149.241.790,9
RoW	0,13	0,15	0,15	0,28	9.096.311.363,6

Scenario 2

	Produce Prices, Quantities, and Revenues -- change				
	A	B	C	D	E
	% change in OUTPUT	% change in PRODUCER PRICE	% change in FOB (or ex-factory) PRICE	% change in producer revenues	value of change in producer revenues
China	-5,11	-5,66	-5,66	-10,48	-256.324.313.864,2
US	-0,79	-0,88	-0,88	-1,66	-23.535.199.460,1
EU	0,18	0,20	0,20	0,37	19.161.813.460,5
UK	-0,49	-0,55	-0,55	-1,03	-4.162.025.478,4
Canada	-0,30	-0,34	-0,34	-0,64	-2.772.640.708,4
Turkey	-0,08	-0,09	-0,09	-0,17	-266.164.470,9
RoNATO	0,03	0,03	0,03	0,06	80.692.300,2
Japan	0,11	0,12	0,12	0,23	1.746.083.360,0
Rep. of Korea	0,13	0,15	0,15	0,28	1.645.190.041,6
Australia	0,10	0,11	0,11	0,21	523.460.295,3
New Zealand	0,09	0,10	0,10	0,18	69.627.650,1
India	0,06	0,06	0,06	0,12	315.786.983,1
ASEAN	-0,02	-0,02	-0,02	-0,04	-644.411.382,5
RoW	0,21	0,24	0,24	0,45	14.624.356.038,3

Scenario 3

	Produce Prices, Quantities, and Revenues -- change				
	A	B	C	D	E
	% change in OUTPUT	% change in PRODUCER PRICE	% change in FOB (or ex-factory) PRICE	% change in producer revenues	value of change in producer revenues
China	-7,73	-8,55	-8,55	-15,62	-381.792.507.636,2
US	-0,76	-0,84	-0,84	-1,60	-22.632.854.519,8
EU	0,10	0,11	0,11	0,21	11.062.890.042,2
UK	-0,56	-0,62	-0,62	-1,17	-4.714.249.826,5
Canada	-0,41	-0,45	-0,45	-0,86	-3.723.474.899,1
Turkey	-0,18	-0,20	-0,20	-0,37	-582.469.863,7
RoNATO	-0,03	-0,03	-0,03	-0,05	-78.633.523,1
Japan	-2,73	-3,03	-3,03	-5,68	-42.729.188.038,7
Rep. of Korea	-4,13	-4,58	-4,58	-8,53	-50.245.666.261,2
Australia	-4,89	-5,41	-5,41	-10,04	-25.366.295.194,3
New Zealand	-3,27	-3,63	-3,63	-6,78	-2.574.725.473,5
India	-0,87	-0,96	-0,96	-1,82	-4.697.516.776,5
ASEAN	0,10	0,11	0,11	0,21	3.395.221.292,9
RoW	0,45	0,50	0,50	0,95	31.017.039.429,3

Scenario 4

	Produce Prices, Quantities, and Revenues -- change				
	A	B	C	D	E
	% change in OUTPUT	% change in PRODUCER PRICE	% change in FOB (or ex-factory) PRICE	% change in producer revenues	value of change in producer revenues
China	-9,54	-10,54	-10,54	-19,08	-466.470.982.477,7
US	-0,75	-0,84	-0,84	-1,58	-22.436.433.323,7
EU	0,05	0,05	0,05	0,10	5.361.906.773,4
UK	-0,60	-0,67	-0,67	-1,27	-5.125.579.537,4
Canada	-0,48	-0,54	-0,54	-1,02	-4.392.312.551,4
Turkey	-0,24	-0,27	-0,27	-0,51	-803.793.098,1
RoNATO	-0,06	-0,07	-0,07	-0,13	-193.939.892,6
Japan	-2,60	-2,88	-2,88	-5,41	-40.677.822.448,2
Rep. of Korea	-3,93	-4,35	-4,35	-8,11	-47.782.018.616,6
Australia	-4,71	-5,21	-5,21	-9,67	-24.448.606.310,8
New Zealand	-3,16	-3,50	-3,50	-6,55	-2.488.015.772,1
India	-0,85	-0,95	-0,95	-1,80	-4.627.965.438,6
ASEAN	-1,83	-2,03	-2,03	-3,81	-62.097.796.772,5
RoW	0,60	0,67	0,67	1,27	41.493.145.337,1

Appendix VII – GSIM output: Change in bilateral trade flows

Scenario 1

CHANGE IN BILATERAL TRADE FLOWS (%)

	China	US	EU	UK	Canada	Turkey	RoNATO	Japan	Rep. of Korea	Australia	New Zealand	India	ASEAN	RoW
China	NA	-33,2	6,3	6,3	5,7	6,3	6,3	6,2	6,1	5,9	6,0	6,3	6,1	5,9
US	-35,5	NA	2,9	2,8	2,3	2,9	2,8	2,7	2,7	2,5	2,6	2,9	2,7	2,5
EU	1,2	2,8	-0,2	-0,2	-0,7	-0,2	-0,2	-0,3	-0,4	-0,5	-0,4	-0,2	-0,4	-0,6
UK	1,0	2,7	-0,3	NA	-0,8	-0,3	-0,4	-0,5	-0,5	-0,7	-0,6	-0,3	-0,5	-0,7
Canada	-0,4	1,2	-1,7	-1,8	NA	-1,7	-1,7	-1,8	-1,9	-2,0	-2,0	-1,7	-1,9	-2,1
Turkey	1,2	2,9	-0,1	-0,2	-0,7	NA	-0,2	-0,3	-0,4	-0,5	-0,4	-0,1	-0,4	-0,5
RoNATO	1,2	2,8	-0,2	-0,2	-0,7	-0,1	-0,2	-0,3	-0,4	-0,5	-0,4	-0,1	-0,4	-0,6
Japan	0,8	2,4	-0,6	-0,6	-1,1	-0,6	-0,6	NA	-0,8	-0,9	-0,8	-0,6	-0,8	-1,0
Rep. of Korea	0,8	2,4	-0,6	-0,6	-1,1	-0,6	-0,6	-0,7	NA	-0,9	-0,8	-0,6	-0,8	-1,0
Australia	0,9	2,5	-0,4	-0,5	-1,0	-0,4	-0,5	-0,6	-0,7	NA	-0,7	-0,4	-0,7	-0,8
New Zealand	0,9	2,5	-0,5	-0,5	-1,0	-0,4	-0,5	-0,6	-0,7	-0,8	NA	-0,4	-0,7	-0,8
India	0,9	2,6	-0,4	-0,5	-0,9	-0,4	-0,5	-0,6	-0,6	-0,7	-0,7	NA	-0,6	-0,8
ASEAN	1,1	2,7	-0,3	-0,3	-0,8	-0,3	-0,3	-0,4	-0,5	-0,6	-0,5	-0,3	-0,5	-0,7
RoW	0,7	2,3	-0,6	-0,7	-1,2	-0,6	-0,7	-0,8	-0,9	-1,0	-0,9	-0,6	-0,9	-1,0

Scenario 2

CHANGE IN BILATERAL TRADE FLOWS (%)

	China	US	EU	UK	Canada	Turkey	RoNATO	Japan	Rep. of Korea	Australia	New Zealand	India	ASEAN	RoW
China	NA	-25,8	-45,3	-45,2	-45,1	-44,0	-44,9	18,1	17,8	17,5	17,8	18,5	17,7	17,4
US	-35,2	NA	4,1	4,3	4,4	4,2	4,3	1,8	1,6	1,3	1,5	2,2	1,5	1,2
EU	-52,6	1,5	0,8	1,0	1,1	0,9	1,0	-1,4	-1,7	-1,9	-1,7	-1,1	-1,7	-2,0
UK	-51,5	3,8	3,1	NA	3,4	3,2	3,2	0,8	0,5	0,3	0,5	1,1	0,5	0,2
Canada	-51,8	3,1	2,5	2,6	NA	2,6	2,6	0,2	-0,1	-0,4	-0,1	0,5	-0,1	-0,5
Turkey	-51,9	2,4	1,7	1,9	2,0	NA	1,8	-0,6	-0,8	-1,1	-0,9	-0,2	-0,9	-1,2
RoNATO	-52,3	2,0	1,3	1,5	1,6	1,4	1,5	-0,9	-1,2	-1,4	-1,2	-0,6	-1,2	-1,6
Japan	1,7	1,7	1,1	1,2	1,3	1,1	1,2	NA	-1,4	-1,7	-1,5	-0,9	-1,5	-1,8
Rep. of Korea	1,6	1,6	1,0	1,1	1,3	1,1	1,1	-1,3	NA	-1,8	-1,6	-0,9	-1,6	-1,9
Australia	1,7	1,8	1,1	1,3	1,4	1,2	1,2	-1,2	-1,4	NA	-1,5	-0,8	-1,5	-1,8
New Zealand	1,7	1,8	1,1	1,3	1,4	1,2	1,3	-1,1	-1,4	-1,6	NA	-0,8	-1,4	-1,7
India	1,8	1,9	1,2	1,4	1,5	1,3	1,4	-1,1	-1,3	-1,6	-1,3	NA	-1,3	-1,7
ASEAN	2,1	2,1	1,5	1,7	1,8	1,6	1,6	-0,8	-1,0	-1,3	-1,1	-0,4	-1,1	-1,4
RoW	1,3	1,4	0,7	0,9	1,0	0,8	0,8	-1,6	-1,8	-2,1	-1,8	-1,2	-1,8	-2,2

Scenario 3

CHANGE IN BILATERAL TRADE FLOWS (%)

	China	US	EU	UK	Canada	Turkey	RoNATO	Japan	Rep. of Korea	Australia	New Zealand	India	ASEAN	RoW
China	NA	-19,2	-40,1	-40,1	-40,0	-38,8	-39,8	-40,4	-40,2	-40,3	-40,9	-38,9	27,6	27,4
US	-32,1	NA	3,7	3,9	3,9	3,7	3,7	4,5	5,0	5,6	4,4	3,8	0,1	-0,1
EU	-50,2	0,9	0,8	0,9	0,9	0,8	0,8	1,5	2,0	2,6	1,4	0,9	-2,8	-2,9
UK	-49,1	3,1	3,0	NA	3,2	3,0	3,0	3,8	4,2	4,9	3,7	3,1	-0,6	-0,8
Canada	-49,3	2,6	2,5	2,7	NA	2,5	2,5	3,3	3,7	4,4	3,2	2,6	-1,1	-1,2
Turkey	-49,4	1,8	1,7	1,9	1,9	NA	1,7	2,5	2,9	3,6	2,4	1,8	-1,9	-2,0
RoNATO	-50,0	1,3	1,2	1,4	1,4	1,2	1,2	1,9	2,4	3,1	1,9	1,3	-2,3	-2,5
Japan	-46,2	11,0	10,9	11,1	11,1	10,9	10,9	NA	12,2	12,9	11,6	11,0	7,0	6,8
Rep. of Korea	-44,6	16,5	16,4	16,6	16,6	16,4	16,4	17,2	NA	18,5	17,2	16,5	12,3	12,1
Australia	-43,6	19,6	19,5	19,7	19,7	19,5	19,5	20,4	20,9	NA	20,3	19,6	15,3	15,1
New Zealand	-46,6	13,1	13,0	13,1	13,2	13,0	13,0	13,8	14,3	15,0	NA	13,0	9,0	8,8
India	-49,2	4,2	4,1	4,3	4,3	4,1	4,1	4,9	5,3	6,0	4,8	NA	0,4	0,3
ASEAN	6,5	0,9	0,8	0,9	1,0	0,8	0,8	1,5	2,0	2,6	1,4	0,9	-2,7	-2,9
RoW	5,3	-0,3	-0,4	-0,2	-0,2	-0,4	-0,4	0,3	0,8	1,4	0,3	-0,3	-3,9	-4,0

Scenario 4

CHANGE IN BILATERAL TRADE FLOWS (%)

	China	US	EU	UK	Canada	Turkey	RoNATO	Japan	Rep. of Korea	Australia	New Zealand	India	ASEAN	RoW
China	NA	-14,1	-36,1	-36,1	-36,1	-34,7	-35,8	-36,6	-36,4	-36,7	-37,3	-34,8	-36,1	34,9
US	-30,2	NA	3,5	3,7	3,6	3,5	3,5	4,0	4,5	4,9	3,8	3,5	4,1	-1,0
EU	-48,6	0,6	0,8	0,9	0,9	0,8	0,7	1,3	1,7	2,1	1,1	0,8	1,4	-3,6
UK	-47,5	2,8	3,0	NA	3,1	3,0	3,0	3,5	3,9	4,4	3,3	3,0	3,6	-1,4
Canada	-47,7	2,4	2,6	2,7	NA	2,6	2,5	3,1	3,5	3,9	2,9	2,6	3,2	-1,8
Turkey	-47,8	1,5	1,7	1,9	1,9	NA	1,7	2,3	2,7	3,1	2,1	1,8	2,4	-2,6
RoNATO	-48,4	0,9	1,1	1,3	1,3	1,1	1,1	1,7	2,1	2,5	1,4	1,2	1,7	-3,2
Japan	-44,9	10,0	10,2	10,4	10,3	10,2	10,2	NA	11,2	11,7	10,5	10,2	10,8	5,4
Rep. of Korea	-43,4	15,1	15,3	15,5	15,5	15,4	15,3	15,9	NA	16,9	15,7	15,4	16,0	10,4
Australia	-42,3	18,3	18,5	18,7	18,7	18,5	18,5	19,1	19,6	NA	18,9	18,5	19,2	13,4
New Zealand	-45,3	12,1	12,3	12,5	12,5	12,3	12,3	12,9	13,4	13,8	NA	12,3	13,0	7,5
India	-47,7	3,6	3,9	4,0	4,0	3,9	3,8	4,4	4,8	5,2	4,2	NA	4,5	-0,6
ASEAN	-46,2	7,1	7,3	7,5	7,4	7,3	7,3	7,9	8,3	8,7	7,6	7,3	8,0	2,7
RoW	7,9	-1,3	-1,1	-0,9	-0,9	-1,1	-1,1	-0,6	-0,2	0,2	-0,8	-1,1	-0,5	-5,3