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Trade, Technology and Security: Exploring the Linkages.

Institute for International Trade

Executive Summary

Global trade tensions have been steadily increasing since the Global Financial Crisis of 2008 and the havoc that it left in its wake. What was particularly clear after the dust had settled was a relative strengthening of China vis-à-vis the United States, much to chagrin of politicians of all stripes in the latter.[1]

These tensions became even more acute in response to the actions of the so-called nativist wing of the Trump White House, which joined forces with hawkish national security interests across the political spectrum to unleash a trade war between the world's two largest economies.[2] Tensions only heightened during the 2020 presidential election season and the COVID-19 pandemic, which many blamed (rightly or wrongly) on China.

As tensions between China and the US have grown, so too have China's economic and political difficulties with a number of other countries, particularly those in the Five Eyes intelligence sharing relationship (to the exclusion perhaps of New Zealand). Relations between the European Union and China have also experienced their fair share of troubles, with different Member States split on whether and to what degree they wish to confront China.[3]

Although the causes of this chilling in economic and political relations between China and many of its largest trading partners are complex, one area where we are seeing this play out most acutely is in the area of techno-nationalism, with more and more countries enacting broad-based trade and investment restrictions against Chinese technology companies and justifying these actions by invoking national security.[4]

This is a path that China has itself been fully committed to for many decades, steadily ramping up the pressure on US and other foreign technology companies in its own market as it sought to become self-reliant on a broad range of technologies.[5] Indeed, this global trend is driving moves by countries such as China, the United States, India, Japan, Australia and many others to embrace a limited degree of technological decoupling, which could, if unchecked, spill over into a broader economic unwinding that would involve the deconstruction of several decades of concerted efforts to achieve broader and deeper international economic integration.[6]

This working paper explores the linkages between the areas of trade, technology and security which have become so prevalent over the last half-decade. In doing so, it addresses these issues by focusing on three core research questions, namely:

[1] This was perhaps most visibly on display in the form of the Obama administration's "pivot" to Asia; White (2013).
[2] Davis and Wei (2020).
[3] Dinic (2020).
[4] Carnegie Endowment (2020), Mulvenon (2021).
[5] Feigenbaum (2003).
[6] Inkster (2021), Goldman (2020).

GROUP OF EIGHT AUSTRALIA

make history.

1. What activities do technology firms pursue on foreign markets and how do restrictions imposed by governments for national security reasons circumscribe either these firms' market access or freedom of action in a way that prejudices their relative competitive position on these markets?
2. What obligations are incumbent upon governments by virtue of international trade and investment treaty commitments to permit the entry and operation on their domestic markets of foreign technology firms and to what extent do national security exceptions as formulated in these same treaties allow governments to set aside these obligations?
3. What are some solutions to balancing the need for an open and non-discriminatory trading system with the imperative of upholding national security where these policy priorities collide in the area of trade and technology, and what role do different actors (States, firms, others) have to play?

In exploring tentative and preliminary responses to these questions, this working paper seeks to disentangle the various competing interests and policy linkages that interact in the areas of trade, technology and security. In doing so the paper aims to sketch out a wider research agenda that can contribute to a better understanding of how to resolve some of the most divisive and potentially damaging tensions and conflicts currently besetting the international economic and global geopolitical order.

Today bellicose rhetoric, political ideology and a zero-sum narrative have often come to dominate the debate of these issues in a climate where the scope for objective analysis, nuance and evidence-based decision-making seems to be rapidly shrinking.

If political leaders and policymakers cannot return to a more objective and factual discussion of the issues, grave errors risk being made that could negatively impact innovation, economic welfare and the security of all peoples for many generations to come.

Contents

Abbreviations and Acronyms

BIS
Bureau of Industry and Security of the United States Department of Commerce

BIT
Bilateral Investment Treaty

CCC
Chinese Compulsory Certification system

CIA
Central Intelligence Agency

CIFIUS
Committee on Foreign Investment in the United States

CPTPP
Comprehensive and Progressive Agreement for Trans-Pacific Partnership

DOC
United States Department of Commerce

DOD
United States Department of Defense

DSU
WTO Dispute Settlement Understanding

EEC
European Economic Community

ECIPE
European Centre for International Political Economy

EU
European Union

FCC
United States Federal Communications Commission

FDI
Foreign Direct Investment

FSB
The Federal Security Service of the Russian Federation

FTA
Free Trade Agreement

GATS
General Agreement on Trade in Services

GATT
General Agreement on Tariffs and Trade

GINs
Global Innovation Networks

GSM
The Global System for Mobile Communications

GTA
Global Trade Alert

GVCs
Global Value Chains

ICT
Information and Communications Technology

ILSA
Iran and Libya Sanctions Act (1996)

ISDS
Investor-State Dispute Settlement

ITO
International Trade Organization

ITU
International Telecommunications Union

MFN
Most Favoured Nation

MLPS
Multi-Level Protection Scheme (China)

MNCs
Multinational Corporations

NBN
Australian National Broadband Network

OECD
Organization for Economic Cooperation and Development

R&D
Research and Development

SMEs
Small and Medium-sized Enterprises

TBT
Technical Barriers to Trade

TD-SCDMA
Time division synchronous code division multiple access

TRIPS
Trade-Related Intellectual Property Rights

UK
United Kingdom of Great Britain

U.S.
United States of America

USSR
Union of Soviet Socialist Republics

USTR
United States Trade Representative

VCLT
Vienna Convention on the Law of the Treaties

WAPI
WLAN Authentication and Privacy Infrastructure (WAPI)

WLAN
Wireless Local Area Network

WTO
World Trade Organization

ZTE
Zhong Xing Telecommunication Equipment (China)

... one of the most fundamental reasons for establishing the rules-based trading system was to underpin world peace after the Second World War ...

Aims and Scope

Launching a Research Agenda

This paper is the first of a series of planned outputs under a new research agenda being launched by the Institute for International Trade, part of the School of Economics and Public Policy of the University of Adelaide. This research agenda focuses on the linkages between international trade, technology and security. The ultimate objective of this research agenda is to provide researchers, policymakers, as well as leaders from both the private sector and government with a better understanding of how these different policy areas interact and what legislative, regulatory and policy interventions in the areas of trade and investment[7] are the most likely to achieve optimal outcomes in terms of economic welfare, supporting innovation, and ensuring the benefits of technology are shared as widely as possible, while at the same time not unduly undermining vital national security interests.

Trade Liberalisation and other Societal Values and Interests

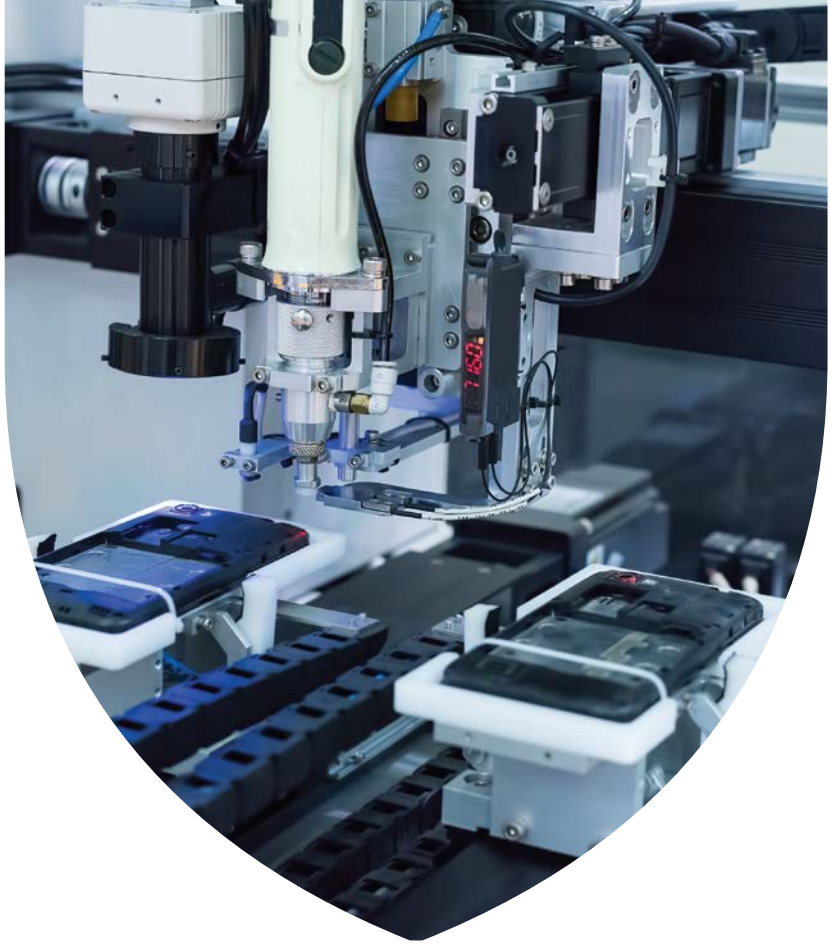
Since the earliest days of the multilateral trading system, the goal of closer economic integration through trade liberalisation was always subject to the constraints placed upon it by other important public policy objectives, such as protecting public morals, safeguarding human, animal, plant life or health, or upholding national security. Indeed, in many ways one of the most fundamental reasons for establishing the rules-based trading system was to underpin world peace after the Second World War, thereby promoting global security.[8]

In many cases, there is no intrinsic conflict between trade and investment liberalisation on the one hand and the protection of such other "higher-order" priorities on the other. But in those instances where governments may feel compelled to restrict international trade or investment, or deny market access, or discriminate against or between firms, service providers or investors from other countries in a manner potentially in conflict with their international trade and investment obligations, governments are able to defend

[7] For the sake of clarity, when the terms "international trade" or "trade" are used here in a general sense, this also encompasses cross-border investment flows and thus the field of international investment more generally.

[8] Wilcox (1949).

such actions by invoking a number of different exceptions generally available to them under international law. This should be obvious since trade and investment liberalisation is not an absolute good in and of itself, but is rather pursued by governments in relative and proportionate degrees of prioritisation to other public policy objectives (including national security). In international treaty terms this reality is articulated through the existence of carefully carved out general and security exceptions in the World Trade Organization (WTO) Agreements and many other similar treaty documents that both pre- and post-date the 1947 General Agreement on Tariffs and Trade (GATT) and its 1995 successor the WTO.[9]



Emerging Tensions between Trade Liberalisation and National Security

This research agenda aims to examine tensions between international treaty obligations made in the context of trade and investment liberalisation - typically under the auspices of the GATT, WTO, Free Trade Agreements (FTAs) or Bilateral Investment Treaties (BITs) - and governments' sovereign right (and responsibility) to take such measures as are deemed necessary to protect national security. In particular, it seeks to elucidate how these tensions play out with respect to technology companies. This discussion is particularly topical now given the unprecedented actions taken in recent years by governments in a small number of emerging markets with growing technology sectors as well as in some advanced industrialised countries, which not so long ago were consistently and openly in favour of broad and deep trade and investment liberalisation. Today these same countries are pursuing more nuanced and restrictive and discriminatory policies towards firms from selected trading partners.

The Kind of Measures at Issue

The measures this working paper focuses on are trade and investment measures that restrict or discriminate against or between foreign firms, service providers, and/or investors in the technology sector broadly defined.[10] In order to qualify as discriminatory, such measures would need to be conceived, applied or successfully conspire to tilt the playing field against or between foreign firms.[11]

Countries are of course free – within limits – to restrict access to their markets under various legislative and regulatory instruments, but in order to fall within the scope of the analysis undertaken here, these measures would need to be considered "problematic" under either the international rules that govern trade in goods, trade in services, trade-related intellectual property rights, investment or some combination thereof.

What measures may or may not ultimately be found to be in violation of international treaty commitments is arguably a moot point in the fast-moving technology sector and where governments increasingly feel that no international tribunal has the competence to dictate to them what they may or may not do to uphold one of their most solemn obligations. Arguments that invoke international treaty obligations are less likely to be deemed compelling when governments believe they are dealing with higher-order priorities such as national security, an area of policymaking where most if not all governments brook few compromises.

This working paper does not aim to make findings of legal compliance or non-compliance, but rather explores the linkages between these three policy areas and describes the broader research agenda to be undertaken in order to clarify what is the right balance to be struck between openness and restrictiveness. This in order to further the objectives of the rules-based trading system, namely, to improve the lives, fortunes and economic wellbeing of the world's peoples and to put an end to the devastating wars that had wracked the first half of the 20th century.[12]

[9] For a historical (pre-WTO) discussion of the General Exceptions and the Security Exception in the GATT see Jackson (1969) at pp. 741 ff. For a more contemporary discussion of these provisions including their interpretation under the WTO, see Van den Bossche and Zdouc (2017) at pp. 544 ff.

[10] A useful taxonomy of trade restrictions that apply to the digital economy (any by extension the technology sector) can be found in Ferracane, Lee-Makiyama and van der Marel (2018) although not all of the restrictions discussed in the very comprehensive analysis were adopted for reasons of national security.

[11] The reader should recall that international trade obligations in the area of discrimination essentially take two forms: (1) most-favoured nation (MFN) which prohibits discrimination in favour of domestic firms against foreign firms; and (2) national treatment, which prohibits discrimination between foreign firms, i.e., affording preferable treatment of one form of another to firms from one trading partner to the detriment of competing firms from another.

[12] The preambles to the GATT and the WTO explicitly list these objectives as: raising standards of living, ensuring full employment, securing a large and steadily growing volume of real income and effective demand, expanding the production of and trade in goods and services, the optimal use of the world's resources for sustainable development, protecting and preserving the environment, and ensuring that developing countries, particularly LDCs share in the growth of international trade. For a better understanding of the thinking behind using the rules-based and non-discriminatory trading system to anchor efforts to achieve a post-war peace, see Wilcox (1949).

Research Questions

Preliminary Remarks

This research agenda is being pursued on the basis of three underlying assumptions. The first of these is that innovation and technology are aspirational objectives for governments because of all the positive spill-over effects they engender. This is not to deny that technologies can have unintentional negative social and environmental effects. Nonetheless, there is a general recognition that technological progress has overwhelmingly brought substantial improvements to the human condition and the potential to better preserve the environment.[13] The implication of historically proven positive net effects is that policies for driving innovation and better technology are desirable outcomes in and of themselves).[14]

The second assumption is that trade and investment policies are primarily enablers, i.e., although they may also harbour aspirational elements in their own right (meaning their own set of positive spill-over effects), from a conceptual standpoint and in the context of the research undertaken here, they are viewed in terms of their impact on other higher-order policy priorities, such as reducing unemployment, alleviating poverty, underpinning economic prosperity, and supporting peaceful relations between States, to name just a few. Trade and investment openness inevitably entail trade-offs between positive spill-over effects (greater efficiency leading to net increases in economic welfare) and negative externalities (higher unemployment in import-competing sectors), i.e., between short-run costs and benefits that drive interest group contestation of trade, even though economists can prove that in the long run trade liberalisation is net welfare enhancing.

The third and final assumption is that security interests primarily represent a constraining factor, particularly with regard to trade and investment openness. This is not to deny that security interests can certainly act as enablers of technological innovation, and that security is in and of itself both a higher-order priority and an aspirational goal (since very little can be achieved in any other policy areas without it), but for the purpose of the analysis to be conducted here, the primary focus is on the limits that national security interests place on trade and investment openness towards technology firms, digital service providers or investors in the technology sector.

Three Research Questions

The linkages and limitations that govern these three areas of policy are explored across three narrowly formulated research questions:

1. What cross-border activities and objectives do private actors (firms) pursue in the innovation and technology spaces and how do restrictions imposed for national security reasons circumscribe their freedom of action in ways that constitute trade and investment restrictions?
2. What obligations are incumbent upon governments by virtue of international trade and investment treaty commitments to permit the entry and operation on their domestic markets of foreign technology firms, and to what extent do national security exceptions as formulated in these same treaties allow governments to set aside these obligations?
3. What are some solutions to balancing the need for an open and non-discriminatory trading system with the imperative of upholding national security where these policy priorities collide in the area of trade and technology, and what role do different actors (States, firms, others) have to play?

Geographic Scope

Because this research agenda seeks to explore the linkages between government actions taken for reasons of national security that affect the trade and investment interests of technology companies, it seems reasonable to limit the geographic scope of our examination to countries of interest in terms of both the home country of the research institution leading this agenda (Australia) as well as those countries that have been at the forefront of these issues, either because their firms have achieved positions of leadership across different technologies or areas of innovation, or because of government policy, regulatory and/or legislative activism in these cross-cutting areas. For this reason, we propose to limit our explorations under this agenda to the following countries:

1) Australia (home country of the Institute for International Trade and an activist government).
2) China (home of leading technology firms and an activist government).
3) The United States of America (home of leading technology firms and an activist government).
4) The European Union (home of leading technology firms and increasingly activist governments).
5) India (an aspiring technological leader and increasingly activist government).

Importance and Contribution

The unresolved frictions between trade, technology and security are at the very heart of the escalating tensions between some of the world's largest economies and threaten to further throttle the future growth of international trade at a time when the world economy simply cannot afford it. If these tensions are not resolved to the mutual satisfaction of all parties, the results could be both economically costly as well as geopolitically calamitous. This is arguably one of the most pressing issues of our times. This working paper seeks to both clarify the issues and propose solutions, making its contemporary importance paramount and its potential future contribution indispensable.

[13] Norberg (2016) makes this case at great length.

[14] This assumption underpins studies such as the Global Innovation Index, jointly produced by INSEAD, Cornell University and the World Intellectual Property Organization, which ranks countries by their capacity to engage in and their success at achieving technological innovation.

Conceptual Framework

This chapter discusses both a number of the distinct concepts that this paper addresses specifically, such as "trade", "technology" and "security" as well as the different policy linkages that coexist between these different areas of corporate activity and government action. It concludes with a discussion of some of the more obvious trade-offs involved when governments enact measures that emphasise one set of policy priorities over others.

Trade

Trade means different things to different people. At one very fundamental level, trade can be equated with economic freedom, since the specialisation that is intrinsic to trade allows each of us to focus our energies on those things we do well. This results in the division and specialisation of labour essential to modern economic life, which is what frees individuals from the drudgery that would ensue if everyone had to meet every personal need through their own labour. Economies that are based on the division of labour and the specialisation intrinsic to such an organisational approach are ones that are inevitably richer and more prosperous than subsistence economies.[15] Trade is an application of this division of labour and is the mechanism by which we exchange the goods, services or intangibles that we spend our time producing for the goods, services and intangibles that others have produced and that we want or need.

Trade is thus essential to the way modern economies function. International trade extends specialisation across borders allowing countries to specialise in those goods, services and intangibles that they are able to provide most efficiently (cost-competitively) and to exchange them for other desired or needed goods, services or intangibles produced in other countries. The theories of absolute and comparative advantage that explain how and why countries choose to specialise in and trade certain products were developed hundreds of years ago but are still relevant today. This despite the fact that today we live in a global economy that is infinitely more complex and characterised by much higher degrees of specialisation and product sophistication than was the case when international trade between nation states first emerged several centuries ago.

International trade in the modern era is governed by a set of principles that for all intents and purposes were first codified as a set of international treaty rules after the Second World War and which have evolved to some degree since then.[16] The most important of these is arguably non-discrimination, which requires that countries afford equal treatment to foreign products regardless of which trading partner they emanate from, and also requires that countries treat foreign products the same as domestically produced products once they are on the market. This is about basic notions of fairness and allowing different firms to compete against one another on a level playing field irrespective of where they originate from or where their products are made.[17]

Another important principle of international trade today is continued liberalisation through trade negotiations, meaning that trade barriers should in theory be getting progressively lower over time.[18] Yet another, more recent principle of international trade is that when governments enact technical regulations that end up constraining how products can be sold on markets, then such interventions should be minimally trade restrictive, meaning they should only negatively impact international trade to the extent necessary to achieve the legitimate regulatory objective being pursued.[19]

Trade, like technology (discussed below) is an area where companies and countries compete in order to gain a strategic advantage over one another. Up until fairly recently, trade, like technology, was seen as something overwhelmingly positive. But recently the tables have turned, so that electorates, particularly in advanced industrialised countries, have started to see trade, and the cross-border economic integration it facilitates as being potentially threatening to their economic livelihoods and thus their way of life. We are unmistakably experiencing a backlash against globalisation and trade liberalisation on the part of many working people as well as among certain policy elites in advanced industrialised countries such as the United States, many parts of Europe, and a growing number of developing countries, particularly in Africa and Latin America.[20]

The principles upon which the current trading system was built, particularly non-discrimination, eschewing protectionism by providing a level playing field, and the desire to achieve closer economic integration have all come to be questioned either explicitly (through outright rejection) or implicitly (through specific policy choices) by an increasing number of trading nations, big and small. The sudden and dramatic rise of China to become the world's largest trading nation and the world's second largest economy, has been a source of major disruption and has caused tensions to erupt between large trading nations and China.

One of the areas where these tensions have manifested themselves most acutely is in the area of international trade.

[15] Smith (1776).
[16] Irwin, Mavroidis and Sykes (2008).
[17] Jackson (1969).
[18] See for example, GATT Art. XXVIIIbis (*Tariff Negotiations*), or Art. III.2 of the WTO Agreement (*Functions of the WTO*), or GATS Art. XIX (*Negotiation of Specific Commitments*).
[19] Article 2.2 of the WTO Agreement on Technical Barriers to Trade. See also Meltzer and Porges (2014).
[20] Stiglitz (2017).

Technology

It would probably not be an overstatement to say that technology is what defines us as a species. Our ability to imagine, conceptualise and develop new creations or repurpose existing materials and phenomena to modify our environment in ways that make our lives easier, safer, healthier, longer, and more productive are certainly one of the most compelling aspects that differentiate us from the rest of Earth's living things.[21]

Technology plays an integral part in daily life. This is particularly true in advanced industrialised countries and emerging markets, where citizens have historically unprecedented access to information in terms of both the scope of the information available and the ease with which to tap into it, literally by doing nothing more than consulting a screen. It has never been easier to connect to and collaborate with people that are geographically far removed from one another, often living and working on entirely different continents and in completely different time zones.

This has all been made possible thanks to technology and the innovation driving technological change. Without innovation there is no technological advancement, so innovation is crucial to continuously advance what is technologically possible.

Technological innovation is the key determinant for the success of companies and nations. Just as in previous centuries and millennia, technological superiority when applied effectively allowed one group of people to dominate and impose their will on another.[22] Today having a technological edge over another company or another nation can dictate important outcomes like market share and profitability for companies, and economic power for nations.[23]

Technology is thus an area of intense competition between nations and today we see this competition taking place in ways that seem to be stoking bitter rivalries. Nowhere is this more apparent than in the tensions currently surrounding relations between China and a number of other technologically advanced trading nations or blocks such as the United States, the European Union, and Japan, among others.[24]

Security

The concept of security has evolved over time in conjunction with the changing nature of conflict. Similarly, the threats that societies and countries perceive to their continued existence, welfare and prosperity have likewise constantly evolved over time. Since the turn of the 20th Century, wars became both all-encompassing in terms of the national economic resource commitments they demanded, as well as truly global in scale. The 20th Century also saw the advent of wars that were both highly mechanised and fought not only on the ground, but also in the air and under the sea.[25]

Historians disagree about the value or contribution of war to the advance of civilisation. However, the evidence seems to suggest that military conflict has driven humanity to develop and master increasingly complex (and lethal) technologies as well as increasingly sophisticated forms of organisation and – by extension - governance. As weapons have become increasingly lethal, to the point where nuclear and biological weapons massively increase the cost of waging total war, the world has – somewhat paradoxically - become a more peaceful or at least less violent place overall since even before the advent of the atomic bomb in 1945.[26]

Following the end of the Cold War in 1989, the world entered what was perhaps an unprecedented period of unipolarity in which only one nation, the United States, towered over the rest of the world in terms of its military superiority but also its technological sophistication and economic strength. However, this was not to last and recently we have re-entered a period of great power rivalry, even though, for now, the United States remains clearly ascendant, with its lead over revisionist powers only shrinking in relative but not absolute terms.

Because the cost of war is so prohibitive, but also because countries have become increasingly interconnected and interdependent, the onus of big power rivalry has shifted from one defined almost exclusively in terms of comparative military capabilities to one where nations compete across a wide range of – often complimentary - battlefronts. By the same token, increasing interconnectedness and mutual dependence have also led to a broadening of potential attack vectors and to a deepening of the destructive impact a successful assault on any one of these vectors might entail.[27]

For this reason, there has been an incremental but discernible shift from defining national security in the conventional but narrow terms of physical control over defined territories and their inhabitants, to one that encapsulates a broad range of strategically significant endowments, factors and capabilities. Today, nations define security in response to the various attack vectors they identify, which themselves are a function of perceived vulnerabilities.

The 2017 U.S. National Security Strategy serves as a suitable example of this trend for the purposes of our research and breaks down its objectives into a set of four over-arching pillars. The first is to protect the American people, the Homeland and the American way of life, thereby signifying a more conventional understanding of potential threats and their appropriate responses. The remaining three pillars, however, display a more holistic interpretation of the potential threats to U.S. pre-eminence and how to meet them. The second pillar is promoting American prosperity (i.e., economic leadership); The third pillar is preserving peace through strength (i.e., deterrence, albeit across a range of both conventional and newer battlefields such as space and cyberspace); and finally the fourth pillar is to advance American influence (through non-military means).[28]

[21] Hogenboom (2015).
[22] Diamond (1997).
[23] Niosi (1991).
[24] Wu (2020) and Tyson (1992).
[25] Gat (2006).
[26] Morris (2014).
[27] Mazarr (2015).
[28] National Security Council (2017).

This holistic approach to defining and defending national security allows one to appreciate that we are living in a more complex world than in previous centuries, and that this complexity gives rise to linkages between trade, technology and security that are novel in light of the profound degree of international economic integration today. These in turn have important implications for individuals, firms and societies at a time of increased tensions, as discussed in more detail next.

Policy Linkages

The linkages between **technology and trade** are relatively obvious on the one hand, although there are also more subtle ways in which these two phenomena are linked. Throughout history one of the ways through which different societies and countries interacted was of course through trade and this allowed for different technologies to be disseminated and for innovation to take place.[29] Most of this traffic was initially from East to West, at least up until the modern era, by which time the West became more technologically advanced.[30]

Today East and West are more evenly matched in terms of technology and innovation.

Innovation requires the free flow of ideas, people and products across markets, so open trade and investment regimes are important if firms and countries are to keep innovating and not fall too far behind the technological frontier.[31] This is particularly true of foundational and enabling general purpose technologies that are fundamental to the supply of so many other products and services like communication networks, sensor technologies, or machine learning and artificial intelligence.

Governments enact many policies in the area of science, technology and innovation that impact international trade and investment, as well as enacting many trade and investment policies that have the potential to limit their access to important technological developments. Some of these have been discussed under Aims and Scope above, whereas some of the implications of these measures are discussed in more detail in the next section (Choices & Trade-offs).

Linkages between Trade and Security are becoming increasingly prevalent because today countries take a more holistic approach to defining potential threats, which has profound implications for the level of trade and investment openness they are willing to countenance. The increasing level of economic integration that has taken place since the end of the Second World War has also carried with it a range of implications for regulatory sovereignty and thus to some extent governments' ability to safeguard their own security interests.

In some cases, this was an entirely deliberate strategy, with the desired result being to create a sense of collective security and deny countries the ability to take up arms against one another. This was very much one of the core rationales for binding the economies of France and Germany together after the Second World War.[32] Much of the post-war multilateral institution-building that occurred was predicated on the notion that a world more closely integrated economically though trade would be a less belligerent and thus a more secure place for peaceful nations to co-exist.[33]

Today, tensions are emerging as the core principles that have underpinned trading relations between nations, such as non-discrimination, continued trade and investment liberalisation and the least-trade restrictiveness of measures, begin to rub up against a more holistic understanding of what countries can and should do to safeguard their perceived national security interests.

The linkages between security and technology should be the easiest to understand, since wars are more often than not won by those with the most advanced weaponry and the best organised processes for collecting intelligence and exploiting information gaps, both of which rely on superior technology and innovation.[34]

Both the Second World War and the Cold War saw the major antagonists in a race with one another to develop and deploy superior technologies. When the United

[29] Bernstein (2008).
[30] Frankopan (2015).
[31] Johnson (2010).
[32] van Middelaar (2013).
[33] Wilcox (1949).
[34] van Creveld (1989).

States perceived that the Soviet Union had developed superiority and parity in conventional forces in Europe as well as nuclear weapons respectively, then Secretary of Defence Harold Brown turned to the U.S.'s lead in technology to develop what became the "off-set strategy" in an effort to use innovation and technology to off-set the USSR's perceived lead.[35]

Today, the race to be at the technological cutting edge as a part of a country's military posture is still on, albeit it with different competitors. In addition to this, threat perceptions have evolved so that the notion of critical national infrastructure encompasses a broad array of national assets that must all be protected against attack, meaning that key technologies such as semiconductors, and ubiquitous communication networks take on new significance from the perspective of national security.[36]

Choices and Trade-Offs

One trade-off is undoubtedly between having access to more or less advanced technology. Because countries see themselves increasingly forced to exclude technology providers based on perceptions of underlying or inherent security vulnerabilities, countries have some difficult choices to make.

We have seen this in the investment space where many start-ups have been denied funding or access to similar resources because the financial support or know-how on offer originated in a country deemed to be a strategic competitor or was otherwise deemed to be "compromised".[37]

We have likewise seen this in the area of 5G communications technology, where for the very first-time leadership is in the hands of a company from China.[38] After decades of being followers in these key technologies, a Chinese company has assumed a position of technological leadership. But a number of nations have now questioned whether they are still willing to sanction an open and welcoming trade and investment regime now that China has emerged as a technological leader in a sector of such strategic importance (network communications).

We have also seen nations such as India, China, the U.S. Japan and Australia impose restrictions on market access based on the country of origin of suppliers, and this inevitably raises the question whether in doing so, they have forced their firms and citizens to settle for less advanced technology as a result of what some have argued ultimately boils down to a lack of trust.[39]

Real or Imagined Security. How to achieve genuine security in an age where the attack vectors are so diverse and are constantly evolving? That is the challenge that governments face in an era of increasing complexity. The answer many seem to be turning to, particularly those willing to learn the lessons of the COVID-19 pandemic and its economic shocks, is to place a new focus on systemic resilience. For example, the nuclear power industry in advanced industrialised countries achieves acceptable levels of safety through an approach known as "integrated defence in depth", whereby safety concerns are taken into account in reactor design, hardware performance, but also in terms of human and organisational elements.[40]

In the area of cybersecurity, experts tend to agree that restrictions based on the nationality of a provider or supplier contribute virtually nothing to achieving any improvement in security. Instead, all parts, components, software coding, access protocols, and other integrative elements of a product or system needs to be subject to regular reviews in the form of recurring security audits.[41]

What's more, because the attack vectors are so numerous and multifaceted, achieving 100% cybersecurity is impossible, so that a systemic resilience approach is again required. This means relying on multi-vendor strategies, and building-in alternative and spare capacity as well as other redundancies as part of any network or system. This raises costs, as do the performance of recurring audits.

Free Trade or Managed Openness. Any measures that governments enact with the stated intention of safeguarding national security and which are likely to have a bearing on technology and innovation need to be carefully weighed in terms of their actual effectiveness in achieving their purported goal, their impact on international trade, and their likely propensity to have unforeseen consequences. Reducing such negative externalities is best achieved by consulting widely before enacting regulations so that stakeholders from industry, trading partners, consumer groups and civil society can all be heard. This at least allows governments and their regulators to hear from those that might be negatively impacted and to gain a more holistic understanding of what consequences might ensue from the planed regulatory action.

Restrictions that reduce the number of eligible suppliers or which exclude certain technologies need to be justified in terms of higher-order public policy objectives because of the high costs they impose on societies, citizens and firms. National security is certainly such a higher-order objective, but any measures imposed in invocation of national security have to be carefully chosen and their utility in achieving their stated goals has to be more than just a matter of conjecture.[42]

When enacting measures that result in trade or investment restrictions, governments must be conscious of the fact that this affords any remaining suppliers monopoly rents and is almost certain to have damaging effects on competition and innovation in the short, medium and long terms. Any such regulatory measures need to be scrutinised with regard to their effect on the competitive landscape, their proportionality and their ultimate effectiveness in achieving the goals for which they were purportedly enacted.[43]

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[35] Weiss (2014).
[36] Capri (2020).
[37] Ruehl, Kynge and Kruppa (2019).
[38] Feldman (2019).
[39] Botton and Lee-Makiyama (2018).
[40] Discussed in OECD (2020).
[41] Singer and Friedman (2014).
[42] Ikenson (2019).
[43] United Kingdom Intelligence and Security Committee of Parliament (2019).

Literature Review

This research agenda seeks to identify linkages between three major areas of study and policy, namely trade, technology and security. Each of these separate areas comprise many thousands of studies and other research works so that any attempt to summarise this literature would take up several hundred pages. For this reason, I have chosen to make a virtue of necessity by delimiting the literature review to a select number of what is argued to be the most relevant contributions with respect to the questions addressed under this research agenda. In doing so, I have structured the survey first in terms of the existing literature addressing trade, technology and security before moving on to review a number of contributions to the different areas discussed in the previous chapter (Conceptual Framework), namely 1) technology and trade, 2) trade and security, and 3) security and technology.

Select Literature on Trade, Technology and Security

This first section discusses one historical (1987) contribution before moving on to a number of more contemporary research efforts that focus specifically on China and the challenges its rise as a leading developer, manufacturer and exporter of various cutting-edge technologies poses to established powers, specifically the United States.

Inoguchi (1987) takes up the linkages between these three areas of policy in the context of US-Japan rivalry over semiconductors which culminated in the 1986 Semiconductor Agreement, and which Inoguchi characterises (like so many other commentators then and since), as "a familiar story of protection and managed trade".[44] Professor Inoguchi presciently predicts the competitive effects this will have for the benefit of other industry actors besides those in the U.S., specifically naming South Korean technology firms, who - as history has shown – were able to benefit from the stifling effects of managed trade between the U.S. and Japanese semiconductor sectors and the impact that had on both countries technology sectors more generally, to become some of the leading technology firms globally, with all kinds of positive spill-over effects for the country's entire technology value chain including its country's consumer electronics industry.[45] Inoguchi notes that the imperative driving the heavy-handed intervention by U.S. authorities at the time was their fear that the "decline of the domestic industrial basis for manufacturing weapons [for which semiconductors are a key component] is seen as a grave problem for U.S. national security."[46] Professor Inoguchi's examination of these linkages takes place in the context of East Asia (primarily focused on the economies of Japan, South Korean and Taiwan), with his main conclusions being that " trade and technology issues can often give rise to sensitive questions of security" and that "prudent and balanced management of trade, technology and security is increasingly necessary in this region".[47] When discussing the issue of "security-inspired technological protectionism" Inoguchi begins his discussion with an examination of the use of Section 232 of the Trade Enhancement Act of 1962, which interestingly for our study had largely languished in long-forgotten legislative obscurity between 1986 and 2017, when the Trump administration invoked it to launch various investigations on the national security implications of imports of steel, aluminium, cars, uranium ore and other products.[48] Inoguchi cites a number of examples from the 1980s when executive authorities in the U.S. (particularly the Department of Defense -DOD) intervened to separate Japanese companies from corporate assets they owned in the United States thereby imposing limited decoupling in technologically sensitive sectors and proving that the efforts we are seeing today in this direction between China and the United States are nothing new.[49] Inoguchi notes that four arguments dominated the debates surrounding security-inspired technological

[44] Inoguchi (1987) p. 39. For a comprehensive analysis of the US-Japan semiconductor dispute, see, among the many good commentaries that offered by Flamm (1996).

[45] As Johnson (1991) noted, as a result of the U.S.-Japan Semiconductor Agreement, "American computer manufacturers found themselves less competitive due to higher prices and even shortages of the low-end chips that they incorporate in their products".

[46] Ibid, p. 40 citing William (1984) and Frost (1987).

[47] Ibid, p. 40.

[48] Feder and Jones (2020).

[49] Inoguchi (1987), p. 48-49. One interesting example of this cited by Inoguchi is Mitsubishi Chemicals Inc. which was "asked" to sell Optical Information Systems to McDonnell Douglas Inc. in 1983

protectionism. These were: 1) the security argument, namely that restrictions on mergers between domestic firms making security-sensitive products and foreign firms are necessary to prevent the transfer of sensitive technology to hostile powers, 2) the competition argument, namely restricting foreign competing firms protects domestic firms thus helping to ensure their competitive survival, 3) the technology argument, namely that trying to impose restrictions on technologies and thus isolate innovation is ultimately doomed to fail over the longer term, since technological diffusion is bound to happen anyway given that "absolute geographical and communicational isolation does not exist".[50] The fourth argument of the time was what Inoguchi refers to as the "liberal one" namely that "under conditions where flows of trade and, by extension, flows of research communications are restricted, the global level of research advancement is likely to fall", by which Inoguchi means enforced system fragmentation can result in reduced innovation, an argument that many observers in the technology world also make today. For Japan in the 1980s, Inoguchi affirms that increased technological protectionism from the United States on national security grounds forced leaders in Japan to hedge their bets in terms of simultaneously pursuing indigenous innovation in some areas, while partnering with U.S. firms and institutions on research and development in others where this was still possible. This is a pragmatic solution that is difficult to fault. Beyond an exhortation to "prudence and moderation"[51] Inoguchi offers no solutions in terms of governing principles or possible mechanisms for reconciling the conflicting interests that must find some degree of accommodation when trade, security and technology collide.

In what represents one of the most succinct and cogent contributions to the debate, **Ikenson (2017)** first traces the change in U.S. attitudes towards China from collaboration to confrontation (he lays the blame squarely on the shoulders of the 2006 indigenous innovation policy discussed in more detail under the next heading on technology and trade), before chronicling the evolution of increasing protectionism in both China and the United States towards each other's respective technology sectors. Ikenson makes a number of interesting arguments that predate the radical ratcheting up of pressure by the Trump administration against Chinese technology companies, but that at the time of writing are still valid. One such argument is "[whereas] the U.S. government may have reasons to consider Chinese ICTs intolerable risks to U.S. critical infrastructure, the available evidence does not support that conclusion".[52] Reiterating the need for trade and investment openness in the global technology sector, Ikenson notes that "U.S. semiconductor makers depend on open markets and the smooth functioning of complex global supply chains" while also pointing out that "half of the industry's production capacity is located overseas, and foreign markets account for 80 percent of its sales".[53] Ikenson points out that neither the U.S. nor China are playing with a straight bat in this debate, arguing that

> *The actions and policies of the U.S. and Chinese governments over the past decade which maintain some plausible links to cybersecurity, ultimately seem to be less concerned about securing supply chains from cyber threats than they are about protecting or creating domestic advantages in the race for 21st century technological preeminence.*[54]

Ikenson goes on to elaborate what both governments could do if they were genuinely interested in mitigating cybersecurity risks, and refers to a number of industry best practices that could, he suggests, be codified and adopted in some form of bilateral agreement between the U.S. and China. Ikenson also highlights the danger to the rules-based multilateral trading system that an upsurge in invocations of the GATT/WTO national security exception brings, noting that its "use, and ultimately abuse as a rationale for protectionism could permanently cripple the WTO's capacity to reverse or reign in unilateral rogue trade measures".[55] Ikenson concludes his analysis by affirming that "[current] policies adopted by both the United States and China in the name of cybersecurity are either weighted disproportionately to the security goal or are fig leaves for protectionism" while also noting that "If cybersecurity is the real objective, there are far less intrusive approaches that are much more likely to keep us secure". In what has proven to be a highly prescient piece of analysis Ikenson warns that "Washington and Beijing [must] find a way to reach a solution before industrial policy begets a high technology trade war, which will leave the U.S., Chinese, and global economies in bad shape and the trading system in tatters".[56]

Lim and Ferguson (2019), analyse the current state of antagonism between the United States and China within the prism of a classic "security dilemma" paradigm and develop some useful thinking on how to limit ongoing efforts to decouple these two countries' technology sectors and avoid this trend from spilling over to other sectors of the economy. Lim and Ferguson argue that given the current level of mutual distrust, any action taken by any one country, like, say, the U.S. to protect its perceived security interests, such as safeguarding its companies from what it perceives as rampant technology theft by China, merely serves to reinforce the existing insecurities of the other party, in this case China's sense that the U.S. is seeking to contain it and prevent its economic rise. The solution, according to Lim and Ferguson, is for both countries to take steps that help reduce the space for any continued escalation of mutual mistrust. For the United States, this could, they argue, take the shape of sending a "credible signal that it will not interfere with the operation of global markets that supply Chinese firms", whereas for China, this could involve "[exploring] credible ways through which Beijing could limit state influence over [its technology] companies".[57] Finally, Lim and Ferguson argue that at the very least, the United States and China could agree to limit decoupling to only those products and sectors that are necessary, what they argue others have

[50] Ibid, p. 49.
[51] Inoguchi (1987) p. 53.
[52] Ikenson (2017), p. 4.
[53] Ibid, p. 5.
[54] Ibid, p. 7.
[55] Ibid. p. 11.
[56] Ibid, p. 12.
[57] Lim and Ferguson (2019), p. 7-8.

called "managed interdependence".[58] This contribution is very relevant for our research since it also asks what countries need to do in order to correctly balance their security interests against the desire for trade and investment openness in the area of technology and innovation. Lim and Ferguson offer both a conceptual framework from which to address this as well as a number of practical ways in which the world could go about stepping back from the abyss of unwinding globalisation through an ill-advised and ultimately disastrous campaign of broad-based technological and economic decoupling.

Select Literature on Technology and Trade

Different studies approach the nexus of technology and trade from different angles. **Grossman (1989)** examines Japan's success in nurturing what he refers to as "a vigorous high-technology sector based largely on indigenous research and development efforts".[59] He seeks to explore the relationship between different trade policy interventions (tariffs, government procurement preferences and subsidies in particular) and innovation, and finds that market distorting public procurement preferences (that exude similar effects to subsidisation) slow the rate of innovation in the country enacting these policies, while having the opposite effect on its trading partner(s) and ultimately "slows the global rate of technological progress".[60] In fact Grossman finds that countries employing protectionist measures in their technology sector inevitably end up making a trade-off between being efficient and competitive producers or cutting-edge innovators: "[a] country that introduces a subsidy will see its competitiveness in high-technology products grow, but its long-run rate of indigenous innovation decline".[61] This argument is very salient in the Chinese context, as the discussion below on China's indigenous innovation policies reveals.

Tyson (1993) was written after the euphoria of "winning" the Cold War had slowly settled and the U.S. was facing the sobering reality of its perceived declining economic competitiveness, particularly with respect to technological rivals such as Japan (in cellular communication devices and semiconductors) and Europe (in semiconductors, commercial aircraft and consumer electronics). Tyson's analysis begins with a series of introspective questions such as:

> *To what extent does responsibility for the nation's decline lie with its trading partners, and to what extent does responsibility lie at home? How should the nation's existing trade laws be used to reverse this decline? Should trade policy remedies be used instead of or in addition to, economy-wide or sector-specific measures to improve national competitiveness? Are new trade policies needed to reflect the fact that the United States is no longer the only economic superpower?*[62]

In her attempt to answer these questions, Tyson takes the case study approach, examining different technologies and trading partners (see above). Ultimately, Tyson comes down on the side of an approach she calls "cautious activism" which calls for US policymakers to be "guided by the principle of selective reciprocity and motivated by the goal of opening foreign markets" and wherever possible "favor approaches that encourage trade and competition over that that discourage them".[63] In several ways Tyson's analysis was overtaken by events, particularly the conclusion of the Uruguay Round later that year (where she does not seem to have been privy to the discussions going on in Geneva at the time), but more importantly the economic stagnation which dogged Japan for several decades and, of course, the revitalisation of the U.S. technology sector which accompanied the emergence of the commercial internet and saw the rise of a new generation of U.S based technology behemoths whose dominance would only come to be challenged very slowly, and this time from competing firms originating in China. But in several ways the intellectual path that Tyson walks to articulate and answer the particular challenges that emanated at the time from the U.S.'s main technological rivals are still highly relevant, particularly her discussion of how to address the peculiarities of "the unique structural features of Japanese capitalism".[64]

Autor et al (2016) attempt to identify the impact that import competition with China has had on innovation in the United States, and conclude that not only did the "China shock" result in the hollowing out of US manufacturing generally, but because U.S. manufacturing firms were so heavily represented in new patent filings, import competition from China also caused a substantial contraction in U.S. innovation. The authors found that "the China trade shock reduces firm profitability in U.S. manufacturing, leading firms to contract operations along multiple margins of activity, including innovation".[65] Interestingly, the authors cite another study (Bloom, Draca, and Van Reenen [2016]) which came to the opposite conclusion when performing a similar analysis for the European market, namely "in response to greater import competition from China, firms [in Europe] create more patents [i.e. they invest more in R&D], expand investment in information technology, and have higher TFP growth".[66]

Ferracane, Lee-Makiyama and van der Marel (2018) have done a comprehensive job of cataloguing and analysing a very large number of trade restrictions that apply to both the digital economy and the technology sector more broadly across 64 counties and thus the vast majority of the global value in markets where these products are traded. They have done this by relying on an index and underlying database which itself was made possible thanks to the pain-staking collection and collation of

[58] Ibid, p. 9, citing Moraes (2018).
[59] Grossman (1989), p. 1.
[60] Ibid, p. 30.
[61] Ibid. p. 34.
[62] Tyson (1993) p. 2.
[63] Ibid. p. 13.
[64] Ibid. p. 6. Very relevant given a similar analysis made more than two decades later of the unique features of Chinese capitalism, see Wu (2016).
[65] Autor et al (2016) p. 5.
[66] Ibid, p. 3, citing Bloom, Draca, and Van Reenen (2016), but they qualify this finding with the caveat that it only applies to those European firms that survived import competition from China and that "[consistent] with empirical literature on the U.S., Bloom, Draca and Van Reenen (2016) find that more trade-exposed European industries are subject to higher rates of plant shutdown and lower overall employment growth", thereby confirming the broader impact of the "China shock" that Dorn et al (2016) posit more generally. Another important limitation on the study by Bloom, Draka and Van Reenen is that the underlying data it is based on is only up to 2007, whereas Chinese firms continued to make serious inroads into European markets well after that.

thousands of such measures over several years, and which is kept up to date by the think tank behind these efforts.[67] The report's findings are unequivocal and do not mince words:[68]

> ***China is the most restricted country in digital trade.*** *China applies sweeping regulatory measures including trade in digital goods and services, investment in the information and communications technology (ICT) sector, as well as the movement of data and ICT professionals.* ***China is followed by Russia, India, Indonesia and Vietnam.*** *They all have very restrictive regimes for digital trade.*

Equally importantly, the report praises those economies that are the most open to international trade in digital and technology products,[69] and notes very importantly for our purposes, that "digital openness boosts productivity and investments in so-called knowledge-based intangibles such as research and development (R&D), design, (digital) training and data, which spurs growth in digital and non-digital sectors."[70] This finding seems to correspond to the findings of **Bloom, Draca, and Van Reenen (2016)**. Specifically on the relationship between trade and technology, Ferracane, Lee-Makiyama and van der Marel (2018) note that "[open] digital markets also encourage the diffusion of new technologies", adding that "technology itself has been a strong driver of trade in the last two centuries".[71]

The assertion by Ferracane, Lee-Makiyama and van der Marel seems to be supported by the research on global innovation networks (GINs), namely the idea that by diffusing tasks and promoting network effects in research and development across different countries and regions (a pre-requisite of which, is a minimum degree of trade and investment openness), breakthroughs in innovation can be achieved. The underlying thinking behind the creation of GINs certainly conforms to the findings of **Johnson (2010)** on how innovation takes place, and was already being documented as early as 2003 by University of Berkeley organisational theorist Henry Chesbrough in his work on Open Innovation.[72] **Tyrell and Mitchell (2007)** explored the concept of GINs and found that the conventional model of having an in-house R&D department where all new research and innovation is centralised had become obsolete (Chesbrough argues this was already the case by the 1980s based on the experiences of companies such as Xerox and IBM).[73] They found that due to a confluence of factors including the high cost of R&D in their home markets (often advanced industrialised countries), but also the desire to tap into skills and capabilities found in greater quantities abroad, the most innovative companies were increasingly resorting to a mixed model of internal and external research and development processes that resembled more of a network. As Tyrell and Mitchell articulate: "[in] order to realise the full potential of ideas, companies recognise that they need to let them flow out of their originating organisations to wherever they can be most efficiently handled at each stage of R&D."[74] Another important point that must be understood in any debate about innovation, and which Tyrell and Mitchell (2007) discuss in some detail, is how important proximity to the end user is (sometimes referred to in the corporate world as "customer-centricity"). This involves making customers part of the R&D process as early as possible, helping companies to differentiate between innovation that is useful and for which there is a market, and innovation that is not. On the one hand, this helps companies avoid waste (and thus helps them save costs). The other implication of this is that companies have to locate R&D capabilities and processes in close proximity to customers, which today means in foreign markets, thereby reinforcing the need for a certain level of trade and investment openness. Tyrell and Mitchell (2007) showcase this model in a short case study of Intel, noting that (already in 2006), "Intel also has dedicated R&D facilities in Ireland, Russia, Malaysia and the Philippines".[75]

Barnard and Chaminade (2012) take a more structured and dogmatic approach to the emergence of Global Innovation Networks discussed above in the context of Tyrell and Mitchell (2007) and attempt to provide a taxonomy of this phenomenon. They point to the existence of a growing field of literature (of which they consider themselves a part) "examining the drivers, consequences and dynamics of the new global configuration of innovation activities".[76] They also highlight the fact that this is no longer a trend driven almost exclusively by established and large MNCs from developed countries but that (by 2012 at least), standalone firms from emerging countries such as Brazil, India and China were also starting to expand their innovation efforts across national borders. Barnard and Chaminade (2012) find that firms choose to expand beyond their borders as part of their innovation efforts either to "accelerate innovation, complementing existing research at the headquarters" (this is predominantly the case for MNCs), or to compensate for a lack of suitable resources in their home market (this is largely the case for standalone firms from emerging markets).[77] The important point for our research, which focuses on the links between trade and technology (and subsequently between these two areas and national security) is that trade and investment openness is a facilitator for innovative firms (particularly but not exclusively those in the technology sector) to overcome capacity constraints at home, to tap into more diverse and/or larger pools of qualitatively differentiated skills than those they can access domestically, and to get closer to end-users and customers so as to integrate them into the innovation process as early as possible.

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[67] The European Center for International Political Economy (ECIPE), the database and index itself can be found at https://ecipe.org/dte/.
[68] Ferracane, Lee-Makiyama and van der Marel (2018), p. 4.
[69] At the time the report was issued these were New Zealand, Iceland, Norway, Ireland and Hong Kong.
[70] Loc cit.
[71] Ibid, p. 9.
[72] Chesbrough (2003).
[73] Ibid.
[74] Tyrell and Mitchell (2007), p. 3.
[75] Ibid, p. 12.
[76] Barnard and Chaminade (2012), p.
[77] Ibid, p. 31.

Trade and investment openness are thus enablers and facilitators of innovation and the technological breakthroughs it leads to.

The relationship between trade and technology is also taken up in Geneva-based trade economist Richard Baldwin's sweeping and seminal assessment of almost three centuries of globalisation culminating in the effects unleashed by the ICT revolution *The Great Convergence*.[78] **Baldwin (2016)** explores the relationship between technology and trade, arguing that it was the ICT revolution that fundamentally altered the onward march of international economic integration, and that - starting in 1990 - "a century's worth of rich nations' rise had been reversed in just two decades".[79] Baldwin's contribution is a new way at looking at how technological progress first led to a decline in transport costs for the movement of goods, for the first time allowing consumption to be separated from production on a hitherto unprecedented scale (what Baldwin refers to as "the First Unbundling"). This allowed production (and thus productive knowhow) to concentrate in the industrialising North and gave rise to the massive wage disparities that emerged between the North and the South (what Baldwin notes many have come to call "the Great Divergence"). Baldwin goes on to posit that once technology again intervened in the form of the ICT revolution, it became possible to move not just goods but also ideas inexpensively, which allowed firms to coordinate complex activities at a distance. What is more, according to Baldwin, the wage disparities that the First unbundling had created made it highly profitable for firms in the North to relocate production to the South but with production flowed important know-how, leading to what Baldwin calls "the Second Unbundling" and what others have called the "global value chain revolution". In his 2016 book, Baldwin predicts that a Third Unbundling could potentially take place if advances in technology "allow labor services to be physically unbundled from laborers".[80] Although in 2016 Baldwin predicts this could happen through either advances in telepresence or tele-robotics, in his 2019 follow-on book entitled *The Globotics Upheaval*, Baldwin argues that this is already happening to some extent and will only accelerate in the future through advanced AI and what he calls "remote intelligence".[81] Baldwin's 2019 book examines the impact that these two technologies – again made possible by the revolution in ICT but also by advances in machine learning – are likely to have on international trade, particularly the disruption it will cause in labour markets across the advanced industrialised world.

Andreasson and West (2014) offer some significant findings for the research being undertaken here. Based on 25 indicators selected across four broad analytical frameworks, the report seeks to explore the linkages between trade and investment openness, the depth of a country's involvement in innovation (it's "R&D globalisation"), and the strength of a country's ICT environment (connectivity and usage). It finds that "[the] link between ICT globalisation and economic growth is strong"[82] meaning that trade and investment openness, investment in R&D, and promoting the right policies to enhance both connectivity and uptake all correlate to better economic outcomes.

Also relevant in this context is the literature on China's indigenous innovation policies, although it is important to recognise that China was certainly not the first country to recognise the importance of upskilling and developing domestic capabilities in advanced technologies and then dedicating vast resources to achieving this goal by virtually any means possible.[83] Be that as it may, given the focus of this research agenda on security, China's relative position in this debate is of paramount importance. Accurately positioning this literature in the taxonomy adopted here is somewhat perplexing, since it demonstrates strong linkages between both trade and technology and technology and security, as well as of course being of tangential interest to the relationships between trade and security. However, given the strong links that policy debates and research have to the trade and innovation literature, and the emphasis placed on China's attempts to achieve innovation while limiting trade and investment openness (i.e. behind various barriers to market access against foreign firms), we review this literature here under the heading trade and technology.

Lazonick (2004), together with **Lu (2000)** were some of the earliest contributors to this literature in the specific context of China.[84] Lazonick essentially provides a summary and commentary of his research associate's work in Lu (2002) and describes the experiences of four indigenous Chinese computer electronics companies founded in the mid-1980s from a number of existing domestic science and technology research and teaching institutions. Interesting for the point of view of our research is that although all four of the companies studied relied to varying degrees on cooperation with foreign firms, whose technology and other know-how they could "borrow" and re-engineer, it is equally true that "when

[78] Baldwin (2016).

[79] Baldwin (2016), p. 1.

[80] Ibid, p. 10.

[81] Remote intelligence in Baldwin's understanding is the process whereby somebody can perform a function that would normally require an employee working in an office, to be done by somebody else, cheaper and without the formal constraints of an employment relationship. The "somebody else" here is from a low-wage economy and is working on a freelance basis. Baldwin's 2019 book is as much about the future of work than globalisation, but Richard Baldwin is first and foremost a trade economist, and so his interests lie primarily in the impact these trends will have on international trade.

[82] Andreasson and West (2014), p. 3.

[83] Those interested in other historical examples of this could start with Chang (2002). Kim (1980) discusses the various state measures imposed by the Korean government authorities to help its companies become competitive in the electronics industry. Studwell (2013) examines the industrialisation drives of several Asian economies and discusses the role that trade policy (infant industry protection and forcing domestic companies to compete on global markets) played in those countries that succeeded. Also interesting in this context is the often quoted Vannevar Bush (1945) who in the closing months of the Second World War submitted a report to President Eisenhower in which he stated " [a] nation which depends upon others for its new basic scientific knowledge will be slow in its industrial progress and weak in its competitive position in world trade", thereby publicly affirming the U.S.'s continued commitment to indigenous innovation (after that advocated and implemented by Alexander Hamilton 150 years earlier) for the rest of the 20th Century.

[84] Much of Lazonick's work on indigenous innovation in China was actually done in collaboration with a Chinese PhD student at Harvard and a research associate of Lazonick's at MIT (Qiwen Lu) in the 1990s, who published some of his research on Chinese indigenous innovation in the computer sector in 2000 in *China's Leap into the Information Age: Innovation and Organization in the Computer Industry* (OUP). Lu had left the United States in 1997 to join the faculty of INSEAD in France but tragically died of liver cancer in 1999 shortly after submitting the manuscript to Oxford University Press.

these companies were founded, foreign computer companies had not yet mastered the problem of Chinese-language word processing", so that "this particular problem provided all four firms with a dimension of computing in which they could become world leaders".[85] This complementarity in terms of technical superiority by foreign firms but an intuitively and natural understanding of the workings and needs of the uniquely complex Chinese market is a theme that recurs predominantly in case studies on the experiences of Western firms in China, and this is equally true across various consumer-facing economic sectors.[86]

Ahrens (2010) offers some interesting insights through his analysis of how China has attempted to use public procurement to drive indigenous innovation. In doing so he seeks to find answers to a number of questions, such as: are there ways to encourage indigenous innovation while still keeping markets open, and are open markets good for innovation? Through a wide-ranging exploration of the available literature on how other countries have achieved this and on the basis of his own observations as a specialist on China, Ahrens concludes that "despite the loud cries of protest against it, the global trend toward 'home grown' innovation is a healthy, positive development", but adds that "maintaining open markets and international linkages is critical".[87] He finds that "[current] Chinese policies embody an entrenched belief that protecting domestic companies from foreign competition gives them time to innovate and capture enough market share to scale up their production" but argues that this approach has proven to be flawed since it only works for low-end manufacturing (which is all about imitation) and ultimately results in "product substitution and not innovation".[88]

McGregor (2010) offers a sweeping overview of China's drive to catch up to the West in terms of technology and innovation and places this narrative firmly in the context of what it means for foreign technology firms operating in China as well as China's overall economic and geopolitical relations with its trading partners. Writing in 2010, McGregor presages the tensions unfolding less than a decade later when he writes "these indigenous innovation industrial policies are headed toward triggering contentious trade disputes and inflamed political rhetoric on both sides".[89] Also strangely prescient of the Section 301 investigation that would officially kick off the Trump administration's trade war with China eight years later is McGregor's conclusion that the 2006 plan articulating China's new indigenous innovation drive was "considered by most international technology companies to be a blueprint for technology theft on a scale the world has never seen before".[90] McGregor documents a number of cases where China's drive to impose indigenous technologies on its own market failed in the absence of global buy-in (its abortive filtering software Green-dam, its failed wireless standard WAPI, and its belated attempt to establish a global 3G standard to compete with GSM, TD-SCMA), but also documents a number of cases where partnership with foreign companies resulted in successes for China albeit with commensurate losses for the aggrieved foreign firms (for example Siemens, Schneider as well as the global wind turbine industry). McGregor also discusses how China has used domestic technical standards such as its Chinese Compulsory Certification system to impede market access for the products of foreign firms, as well as how it has employed a domestically developed system of utility and design patents as leverage against foreign firms that sue Chinese firms for patent infringement in overseas jurisdictions. He also details the establishment of cybersecurity certification schemes which, together with those schemes that confer the "CCC Mark" have allegedly been used by Chinese authorities to compel foreign technology companies to divulge their encryption algorithms and other trade secrets. Similar to Ahrens (2010), McGregor also details how local content requirements, preferences and other instruments are used in China's public procurement regime to essentially exclude or severely disadvantage foreign firms in what is arguably the world's largest public procurement market. McGregor's overall assessment is that China's innovation drive ultimately cedes too much power to state planners and bureaucrats, who in the interest of expanding and protecting their own regulatory turf, have opted for an innovation model based on mega-projects which employ various levers to ensure local content and local intellectual property (techno-nationalism). In doing so, McGregor concedes that China has opted for the model employed by the U.S. until the 1970s, where most breakthrough innovation was achieved either at large in-house R&D facilities such as those of AT&T's Bell Labs or Xerox's the Park, or even earlier when these efforts were driven by U.S. military and space programs. This model ignores the reality of today's technology landscape which is driven by so-called Open Innovation models that cross international borders and involve collaboration between experts and firms of varying nationalities and commercial orientations (private firms and non-profit public research institutes). Given the increasing importance of intellectual property and technology for U.S. exports even back in 2010, McGregor rightly predicts that China's indigenous innovation policies as then conceived and implemented could only lead to conflict as politicians in the West increasingly came to understand China's indigenous innovation policies as "an assault on their core national economic strengths".[91] Interestingly, McGregor argues that a good place for the U.S. and China to start reconciling their differences is in the area of intellectual property, where he contends "[the] best opportunity for real progress is for the US and China to focus on IPR protection". In making this statement, McGregor (2010) once again presages the future battles and attempts to resolve them that would dominate the Trump administration's trade relationship with China.

Lui and Cheng (2011) attempt to answer the question "[can] a national strategy for indigenous innovation be made compatible with the globalisation of markets, suppliers,

[85] Lazonik (2004), p. 292.

[86] See for example Dunne (2011) who discusses the experiences of General Motors in China; or McGreggor (2005), which discusses the efforts of major U.S. investment banks to establish a foothold in China.

[87] Ahrens (2010), p. 1.

[88] Ibid, p. 13.

[89] McGregor (2010), p. 6.

[90] Ibid, p. 4.

[91] Ibid, p. 37.

and technologies?".[92] They ask this question against the backdrop of China's 2006 national indigenous innovation strategy which "called for increased research and development to reduce reliance on foreign technology"[93] and concede that this was to some degree, "intended to protect domestic enterprises from global competition while leveraging an exceptionally large domestic market to promote the diffusion of innovative products within China", and thus essentially mercantilist in its underlying ideological outlook.[94] Lui and Cheng (2011) document the thinking behind the Chinese leadership's shift towards an indigenous innovation policy, with one factor being a perception that China's economic growth up to that point had been achieved only through heavy dependence on foreign technology and foreign direct investment. Another factor was a perception among China's leaders that the original bargain made when opening the domestic market to foreign companies, namely market access in exchange for technology transfer had largely failed to upgrade the country's technological capabilities. A third factor was the lessons that had been learned from the 1960s when China acquired nuclear weapons, namely that solely the "ability to develop their own technology will provide China true economic sovereignty".[95] Yet another factor was some degree of resentment over the high royalty payments that had to be made to Western owners of intellectual property rights by Chinese companies every year, and the realisation this brought that China was some way behind in the global rankings for patent filings. Yet another factor was the recognition that without technological upskilling, China risked remaining a low-cost manufacturing economy which would relegate it to the middle-income trap in perpetuity, an outcome its leaders were desperate to avoid in light of the fact that then as now, they recognised that China runs the risk of becoming old before it becomes rich.[96] Lui and Cheng don't actually appear to explicitly answer the question they sought to address in their research (see above), but do conclude that "[for] China to succeed as an innovative country it needs to provide more opportunity for market competition [so as] to incubate and generate radical innovations". By the same token, they go on to assert that "China also needs more open innovation policies than those used in the past" as well as conceding that "Chinese enterprises cannot succeed if they close themselves from global technologies".[97] This would seem to contain at least muted or veiled criticism of the approach taken by China's leadership under the 2006 indigenous innovation program as being too inwardly focused.

Select Literature on Trade and Security

This section of the literature review first examines various contributions over the years to the question of how countries have addressed the trade-offs between their perceived security interests and their foreign economic policy objectives. This first section also looks at some of the literature on the role played by the GATT during the Cold War. Next this section turns to the extensive literature on the formulation and application of the so-called national security exception in international trade and investment law.

Holsti (1986) offers an insightful overview of countries' efforts to balance their perceived national security interests against conflicting pressures for increased international economic engagement, using Japan and Finland as case studies. He documents how certain elements of the Japanese business community sought - over several decades - to restore the country's trading ties with China, but that this had been resisted by the United States which was seeking to maintain a common front against Communist China. Ultimately, Japan's political leadership chose to subordinate the potential for lucrative trade and investment opportunities in China to the needs of maintaining its security alliance with the United States, which is part of the explanation as to why Japanese companies were some of the first to establish themselves on markets in South East Asia in the post-war decades. Interestingly, Japan's leaders were completely blindsided by the U.S.'s very public reversal on engagement with China when President Nixon visited the country and met with Chairman Mao in 1972, and it was only after this that they felt significantly less constrained to forge their own deepening economic ties with China. In the case of Finland, the hegemon to which it was required to defer for the sake of its perceived national security interests was the Soviet Union, which consistently sought to rein in tentative efforts by successive generations of Finish political leaders to join the various processes of Western economic integration and cooperation. Holsti notes that for Finland "[where] necessary, welfare goals would have to be subordinated to security goals – and in the 1940s and 1950s, this was usually the case".[98] This tension only began to subside several years after Khrushchev succeeded Stalin and in the context of Finland's efforts to join the European Free Trade Association (EFTA) in 1960. To avoid endangering its security position vis-à-vis Moscow, Finland initially only became an associate member of EFTA and immediately after concluding this arrangement, signed a special customs agreement with the Soviet Union guaranteeing the latter MFN access to the Finnish market.[99] Holsti opines that

> *By 1961 Finland's capacity to maneuver, to diversify, and to protect its trade interests in the West had increased dramatically. In part this was the result of the Soviet Union's coming to terms with European economic realities, but it also reflected the long-range success of Finnish diplomatic efforts to create trust in Moscow.*[100]

[92] Lui and Cheng (2011), p. 5.
[93] Ibid p. 9.
[94] Ibid.
[95] Lui and Cheng (2011), p. 12.
[96] Ibid.
[97] Ibid, p. 47.
[98] Holsti (1986), p. 660.
[99] Ibid, p. 663.
[100] Ibid, p. 664.

This is a remarkable statement given the well-known depths of Soviet paranoia and insecurity but also shows the importance of trust in managing nations' competing security and economic interests in the shadow of great-power rivalry. This is a topic we shall come back to subsequently when discussing the contribution to the literature on security and technology made by Botton and Lee-Makiyama (2017). In his concluding observations, Holsti again returns to the importance of trust arguing that for Japan and Finland, although their respective situations were each very different "economic opportunities had to be subordinated or forsaken until, through diplomacy, the two states could build up trust, both by overcoming the attitudinal legacies of former battlefield enemies and by establishing the parameters of foreign-policy roles and orientations acceptable to the superpowers.".[101]

Skaperdas and Syropoulas (1991) discuss the relationship between trade and security in terms of a binary-juxtaposition analysis of how countries choose to interact (either through confrontation or cooperation). They argue that "while trade and economic interdependence can contribute to the peaceful resolution of disputes, they are not sufficient by themselves to guarantee the absence of war and the reduction of arming".[102] Skaperdas and Syropoulas use a simple model that seeks to demonstrate the trade-offs between arming for conflict and integrating economically (trading) and posit that "the incentives for arming can be very different in the presence of trade than under autarky". They conclude that "[solving] the problem of insecurity entails the development of commitment devices that would reduce or eliminate the need to arm".[103] They elaborate further that "[such] commitment devices, however, are not easy to come by, and take a long time to develop". and point to the long decades of economic and political integration in Europe started by the Treaty of Rome (1957) as one such commitment device.[104] What Skaperdas and Syropoulas are in fact referring to -without explicitly saying so- is trust (discussed above in the context of Holsti [1986] and again below in the context of Botton and Lee-Makiyama [2017]. The commitment devices Skaperdas and Syropoulas refer to allow countries to contract with one another and resolve differences by other means than armed conflict, but more importantly they are a mechanism by which to build trust between nations.

In a refreshing and timely piece of analysis **McKenzie (2008)** challenges the long-held view that the GATT operated beyond the pale of Cold War confrontation and demonstrates unequivocally the link between economics and politics and thus trade policy and national security interests. McKenzie begins by pointing out that "[many] scholars have asserted that GATT carried on with trade liberalisation unaffected by the Cold War and was generally impervious to political pressures" and that this view was also shared by many former trade negotiators. However, she refutes this view claiming it is "not borne out by the evidence, which indicates that GATT could not function in isolation from the pressures and vicissitudes of the Cold War".[105] One poignant example of this that McKenzie highlights is the strong disagreement between the United States and Great Britain over the system of imperial preference, which the UK sought to preserve and the U.S. intended to dismantle in favour of non-discrimination. Disagreements over this issue caused Will Clayton, the chief negotiator for the U.S. to advise President Truman to walk away from the talks altogether and abandon efforts to establish the ITO. However, Truman ignored this advice, sensing that as tensions with the Soviet Union were increasing (this was 1947 after all), the United States could not afford a rift with the U.K. As McKenzie notes -citing Zeiler (1999) "national security officials, not free-trade experts, made the ultimate decisions regarding the Geneva round [and thus whether to accede to British demands to retain some form of imperial preference]".[106] McKenzie recounts a number of episodes throughout the GATT's history where national security imperatives trumped economic interests, including the accession of Japan in 1955, which was resisted by several contracting parties fearing commercial competition from Japan, but which ultimately accepted U.S. arguments that this was necessary to bolster Japan's induction into the club of prosperous capitalist democracies resisting Communist expansion from either the Soviet Union or the People's Republic of China.[107] McKenzie also examines the complex tangle of interests that accompanied different GATT contracting parties responses to the accession applications of the Eastern-bloc countries of Poland, Yugoslavia and Hungary, and

[101] Ibid, p. 671.
[102] Skaperdas and Syropoulas (1991), p. 353.
[103] Ibid, p. 357.
[104] Ibid.
[105] McKenzie (2008) p. 79.
[106] Ibid, p. 86.
[107] Ibid, p. 93 f.

concludes that "[the] complex of factors that influenced national positions on accession highlights the many functions of trade policy and commercial diplomacy. Trade could be an expression and instrument of national foreign policy, as well as a category of international contact in its own right".[108]

Turning now to the expansive literature on the GATT/WTO national security exception, this review proceeds in chronological order tackling the earlier contributions first before concluding with the most recent research. In doing so, it seeks to be selective rather than comprehensive in its scope.

Bhala (1998) examines GATT Article XXI (Security Exceptions) with a view to determining the legality of the 1996 Iran and Libya Sanctions Act (ILSA). Conceding first that "national security and international trade law are closely linked"[109] and that "Article XXI of GATT establishes a broad framework for imposing international trade measures for national security purposes", Bhala goes on to conclude -after an expansive analysis- that "Article XXI provides little effective restraint on WTO Members from enacting national security sanctions legislation".[110]

Alford (2011) also offers an expansive discussion of the WTO Security Exception (as articulated in GATT Article XXI) primarily in the light of its ability to provide legal cover for economic and trade sanctions, and seeks to answer the questions of whether it is self-judging and why it was invoked so rarely during the GATT years. He ultimately concludes that the security exception is in fact self-judging (a position that would later prove to be wrong at a technical level, even if perhaps correct at a substantive one) and that reciprocity considerations are primarily the reason why countries have refrained from abusing the security exception, arguing that "States do not abuse the security exception because doing so will encourage other States to do the same".[111] By the same token the theory of reciprocity explains why countries refrain from challenging the invocation by other countries of the security exception, since they do not want to invite retaliation and thus enhanced scrutiny of their own use, current or future, of the security exception (a version of the old adage that people in glass houses don't throw stones). This line of argument, which resurfaces often, contends that national security is an absolute good that brooks no compromise and thus is not up for external review for how it sits with other areas of government action. Many governments and observers would concede there is some merit to this view, whereas others argue this ultimately serves to diminish accountability and invites non-compliance as any get-out-of-jail-free card is likely to do.

Peng (2015), writing five years before the panel ruling in *Russia -Traffic in Transit* (discussed immediately below) lays out the difficulties she believes a government would face in successfully invoking the national security exception to justify trade restrictions in the context of trying to achieve greater cybersecurity. She argues that the burden of proof that the GATT/WTO provisions impose on a member invoking this exception would likely be too great for it to prevail, stating that

> *The responding member invoking Article XXI(b) must 'reasonably' classify cybersecurity as 'essential security interests' in the context of an 'international relations emergency', and it must 'genuinely believe' that cybersecurity regulations based solely upon where the supplier's headquarter is located in a globally connected world can contribute to the achievement of the country's national security protection.*[112]

Peng carries out her analysis on the basis of a hypothetical WTO dispute between China and the United States over the latter's restrictions against Chinese ICT company Huawei. Not seeking to resolve the issues surrounding the WTO compliance of measures taken against the company by the American and Australian governments, Peng instead proposes to explore "the trade implications of security measures, which are important to members in determining the sweeping range of permissible national security policy under the WTO".[113] Peng makes a number of findings that are of relevance to our research. Based on technical documents from the International Telecommunications Union (ITU) and research by cybersecurity experts such as General Keith Alexander, she concludes that "[the] ever-growing reliance upon the Internet places all governments, businesses, and individual net users at the risk of a cyber threat" and therefore "such a threat, when severe, can destabilise the economy, undermine sovereignty and disrupt the operation of vital services, and thus, can constitute a direct threat to national security".[114] Although this may seem obvious to any reader today, this finding puts any cybersecurity measure taken by a government firmly within the scope of a measure taken for national security within the meaning envisaged under the WTO national security exceptions. Peng then asks whether cybersecurity risks can be subsumed under the language of "essential security interests" which would be necessary if a WTO member were to invoke the security exceptions in defence of trade restrictions imposed for the purpose of improving cybersecurity. In answering this question, Peng first points out that "[the] word 'essential' indicates that general security should not suffice" and that "['essential] security interests' within the classification of the 'security interests' must meet a higher standard that can be distinguished from other 'non-essential security interests', although not just military factors can satisfy the requirement of essentiality".[115] In this context she goes on to note that from a purely technical perspective, it is impossible to completely eliminate all cybersecurity risks, so that "the core issue turns out to be determining how much 'risk' in cyberspace would amount to a danger to 'essential interests'". Peng ultimately leaves this question unanswered but points out that a panel would have to decide which party, i.e. the complainant (challenging a trade

[108] Ibid, p. 107.
[109] Bhala (1998), p. 265.
[110] Ibid, p. 317.
[111] Alford (2011), p. 756.
[112] Peng, (2015), p. 449.
[113] Ibid, p. 451.
[114] Ibid, pp. 469-470.
[115] Ibid, p. 470.

restrictive measure) or the respondent (who would be invoking the exception) would bear the burden of proof on whether a specific, perceived cybersecurity threat rose to the level of an essential security interest within the meaning of the WTO security exceptions. Peng then moves on to a consideration of how an invoking member could demonstrate that it had not enacted trade restrictions purely for protectionist reasons rather than out of genuine concern for its national security interests. She argues that it would be up to a panel or the Appellate Body to borrow from the necessity test developed in the case law to the general exceptions (GATT Article XX) and in doing so to "consider the relevant factors, particularly the importance of the essential security interests or values at stake, the extent of the contribution to the achievement of the measure's objective, and its trade restrictiveness", in addition to considering if the measure at issue is "apt to make a material contribution to the achievement of its objective".[116] It is in the application of this test that Peng sees current trade restrictions (against Huawei in her analysis) imposed for cybersecurity reasons essentially foundering on the dual industry realities of 1) unachievable comprehensive cybersecurity and 2) an ICT supply chain that is inherently global. Peng seems to imply, without openly stating so that that given the high level of trade restrictiveness of the various measures taken against Huawei, and the existence of less trade restrictive alternatives that even the U.S. technology sector has advocated in favour of, an invoking member would be unlikely to prevail on this score. However she does hold out the prospect that a defence could succeed if it were able to demonstrate that given the dynamic and rapidly evolving nature of cybersecurity threats and the inevitable slowness of more measured regulatory responses to such threats, the only appropriate action is to ban all equipment and software from suppliers deemed untrustworthy. Interestingly for the purpose of our research, Peng ultimately concludes that the balancing of trade and security interests that inevitably needs to take place in the context of any ruling on the WTO compliance of a given instance in which the WTO national security exceptions have been invoked, comes down to the principle of good faith. In making this argument Peng affirms "some particularisations of the principle of good faith in international law, including 'good faith performance of treaties' and 'good faith interpretation of treaties', can explain how this 'balancing' should be done" and in doing so squares the circle again emphasising the importance of trust or the lack thereof that has brought the world to its current position on the precipice of a new era of technological decoupling driven by a toxic mix of protectionism, techno-nationalism and geopolitical rivalry.

Boklan and Bahri (2020), writing in the context of the first time a WTO panel has ruled on the invocation of GATT Article XXI[117], offer some insightful analysis into the binding constraints the security exceptions effectively seem to provide, while at the same time sharing their assessment of how successful the panel ultimately proved in balancing the tensions and conflicts inherent to these provisions. In doing so, the authors draw a distinction between subjective and objective interpretations of Article XXI. Recalling Article 31 of the Vienna Convention on the Law of the Treaties (VCLT) they argue that interpreting treaty provisions "requires some level of objectiveness as it invokes the requirement of 'good faith', which is to be ascertained in light of the 'ordinary meaning' and 'object and purpose' of the text".[118] The subjective interpretation on the other hand is one that rests on the degree to which a provision is wholly self-judging and thus solely within the discretion of the party imposing the measure to review. Those claiming that GATT Article XXI was self-judging (and this included Russia the respondent as well as the United States which participated as a third party) relied on the argument that the operative language found in the provision, namely "it considers" and "necessary" are to be read together, whereas those arguing against this position claimed that these two clauses were to be read separately and that Article 11 of the WTO Dispute Settlement Understanding (DSU) provided further support for this argument by mandating that "a panel should make an objective assessment of the matter before it, including an objective assessment of the facts of the case and the applicability and conformity with the relevant covered agreements".[119] Interesting for our analysis is that for many decades, and in a number of previous instances (that were not litigated before a panel), GATT contracting parties such as the United Kingdom, the European Economic Community (EEC), Canada, and more recently the United Arab Emirates (in defence of its own invocation of the security exceptions against Qatar in a WTO dispute[120]) were perfectly happy to argue that the GATT security exceptions were self-judging and thus not subject to review by a panel.[121] However, in today's environment, seeing the perils of continued adherence to this approach, a number of members that participated as third parties in the case brought by Ukraine against Russia argued at great length that the security exceptions could not be construed as self-judging.[122] This leads the author to conclude that either those countries that previously invoked the self-judging nature of the security exceptions only to argue the opposite today are cynically opportunistic, or, something profound has changed in international economic relations, such as an erosion of trust or a heightened perception of the need for multilateral oversight to uphold the integrity of the rules based system, or perhaps some combination of both. Boklan and Bahri conclude that the panel employed a combination of subjective and objective approaches, upholding the judiciable (non-self-judging) nature of the security exceptions (and thereby their own jurisdictional competence to arbitrate the case) while at the same time affording the invoking member some degree of subjective autonomy to determine what is necessary to safeguard its own essential security interests, subject to the caveat that such a determination must be both plausible and compatible with the principle of good faith.[123]

[116] Ibid, p. 472.
[117] *Russia – Measures Concerning Traffic in Transit* (WT/DS512/R).
[118] Boklan and Bahri (2020), p. 127.
[119] Ibid. p. 127.
[120] *United Arab Emirates — Measures Relating to Trade in Goods and Services, and Trade-Related Aspects of Intellectual Property Rights* (DS526).
[121] Ibid, p. 128.
[122] See for example the third party written submission by the European Union in this case dated 8 November 2017.
[123] Loc. cit., p. 134.

Select Literature on Security and Technology

The final section of this literature review surveys historical and contemporary contributions to the current state of research on the linkages between security and technology. Similar to the approach taken until now, our aim is not to be all-encompassing, but instead more targeted and thus below we provide a limited review of some of the more poignant contributions to this area of exploration in light of the specific questions we seek to address under this research agenda.

Feigenbaum (1999), explores the question of the people and institutions behind China's emergence as a technological power. In doing so he examines the linkages between China's technology and industry policies on the one hand and its approach to security and development on the other. Feigenbaum, who went on to publish his research on the links between the Chinese science and technology world and its military and security establishment in a book (Feigenbaum [2003]) benefitted from unprecedented access, in the years 1993 to 1999 to a group of people he describes as "specialists in the Chinese People's Liberation Army, China's military industrial system, the Chinese defence science and engineering complex, and some civilian technicians".[124] This astonishing admission means Feigenbaum is uniquely placed, as a Western intellectual and observer -who subsequently went on to play a role in U.S. government policy in the administration of George W. Bush- to shine a light on these important linkages. Feigenbaum begins by outlining the five pillars which form the basis of China's drive to become a global technological leader and then gives four reasons why the pillar he explores in more detail - namely "the formulation of national investment priorities in areas that the central government and its technical advisers have deemed to be of strategic importance to China's national security and economic competitiveness" or "strategic technology programs" for short, are crucial to helping China achieve this objective.[125]

The first reason is because they form a critical link between both the domestic growth ambitions of China's leaders and their overall geopolitical objectives. Secondly, they absorb the lion's share of government spending on R&D. Thirdly, these programs focus on applied research and achieving medium-term goals and thus serve as a useful focal point for deciphering what China's objectives really are. Finally, these programs are crucial because they are what China's most prominent and influential scientists and industrial planners are working on. Feigenbaum makes three main arguments. The first is that it was what he describes as "leading technical elites" that were behind a shift in focus away from purely military or weapons-driven innovation programs to encompass a broader remit to what Feigenbaum refers to as "more comprehensive technology efforts". Secondly, Feigenbaum argues that (at the time of his writing at the end of the 1990s), the program known as the "863 program" was " China's top-priority critical technologies effort". Thirdly, Feigenbaum argues that although the 863 program (and by association the entire approach of the Chinese leadership to innovation) held some promise, it was ultimately doomed to fall short of its overarching objectives because, as Feigenbaum states, "863 represents the persistence of state-centric, highly nationalistic approaches to technology indigenisation that contrast starkly with entrepreneurship and the globalisation of technological knowledge".[126] Feigenbaum's finding in this regard is of great interest to our research, since fundamentally the Chinese approach to achieving breakthrough innovation has not changed since Feigenbaum did his original research, and persisted through the indigenous innovation era (starting in 2006) and was reaffirmed in the latest iteration of what McGregor calls the "mega projects" approach, namely the 2015 China Manufacturing 2025 program.[127]

Weiss (2014) similar to but in much more detail than **Mezzucato (2015)** provides an in-depth and fascinating exposé of the degree to which the U.S. technology sector is joined at the hip with what she describes as the "national security state". Although the extent to which the U.S.'s early (post WWII) drive to achieve technological supremacy in areas such as rocket propulsion, missile guidance systems, and mobile radio communications involved a State-led effort, working with some of America's leading technology companies such as IBM, Fairchild Semiconductor and AT&T's Bell Labs, is well understood, Weiss (and Mezzucato) make a unique contribution in showing that even today, many of the technologies we take for granted as consumers and end-users originated as U.S. Department of Defense problem-sets that were taken up by entrepreneurs and originally funded through a complex web of State and private-backed finance and venture capital. Wyss documents how, faced with myriad problems, starting in the 1970 and 80s, when government procurement and funding programs were deemed too slow and administratively burdensome to continue enticing participation from some of the most innovative technology start-ups, the national security state adapted by coming up with more flexible ways of promoting and financing the innovative breakthroughs it was seeking. One such way was through patent reform, allowing the national science and technology institutions to transfer some of the IP they had acquired through government funded research to companies working in the private sector. Another was by establishing their own venture capital funds, something done by both the CIA and the U.S. Army. Weiss reveals that the extent to which the U.S. government maintains a strong presence in its technology industry remains as strong today as it ever was. This is relevant for our research since allegations of secretive civilian-military fusion figure strongly in U.S. arguments for the need to constrain the advance of Chinese technology companies. The reality is that whether or not these links are as strong in China as U.S. defence experts allege, they are certainly alive and well and a defining characteristic of America's technology sector today, despite protestations by U.S.

[124] Feigenbaum (1999), p. 95.

[125] Feigenbaum (1999), p. 96. The four pillars in addition to strategic technology programs are: "(1) acquisition of foreign systems through technology transfer in joint venture, licensing, and coproduction arrangements; (2) promotion of commercial initiative in scientific laboratories; (3) creation of a budding venture capital industry to steer equity investment toward innovative technology start-ups; and (4) promotion of a greater role for industrial enterprises in research and development (R&D)." p. 96, footnote 2.

[126] Ibid, p. 97.

[127] See European Union Chamber of Commerce in China (2017) for a discussion of China Manufacturing 2025.

political figures and policy elites that the U.S. technology sector is first and foremost a private-sector affair and subject primarily to the dictates of the market.

Brown and Singh (2017) offer an eye-opening analysis of China's efforts to participate in and capture scientific and technology innovations taking place in the United States. The publication of this research in early 2017 resulted in far-reaching legislative and policy changes that drastically constricted the degree of openness which Chinese interests had hitherto enjoyed in the United States in these areas of activity. Brown and Singh essentially argue that Chinese-backed financing in early stage technology companies and basic research was increasing rapidly and that this was taking place, *inter alia*, in areas of key strategic interest to the United States, including in areas of technology which were pivotal to U.S. military superiority. Furthermore, Brown and Singh argue that the existing tools that were used to safeguard American national security interests in this space, namely the Committee on Foreign Investment in the United States (CFIUS) and the extensive system of complex export controls operated by the U.S., were simply not adequate or sufficient to respond to these efforts. The authors of this study conclude that

> *To respond to this strategic competitive threat requires reforming CFIUS as well as a long-term and consistent government-wide plan and, more likely, a national strategy to engage the private sector and academia to prevent the transfer of sensitive technology.*[128]

This report, which was highly influential in U.S. policy circles, is one explanation behind the subsequent Section 301 investigation into alleged Chinese intellectual property theft, as well as the narrowing space for Chinese researchers to participate in scientific activities in the United States, and for the reform of CFIUS two years later. It served as a somewhat alarmist wake-up call for American political and military decision-makers and provided the impetus for a more assertive antagonism between the Trump administration and Chinese technology companies from Huawei to Tik-Tok, that had already been a feature of the Trump's position towards China, thanks to the presence of advisors such as Peter Navarro and his USTR Robert Lighthizer.[129]

Botton and Lee-Makiyama (2018) provide an impressive and timely analysis of Australia's Telecom Sector Security Review and the resulting decision to implicitly ban Chinese equipment vendors from the roll-out of Australia's 5G mobile telecommunications network. Botton and Lee-Makiyama argue that such restrictions – which place the home-country government of the vendor in the foreground and not the vendor itself – represent a "break with the openness, inclusiveness and global competition of the rule based free trade order" and attribute this to "the unavoidable emergence of China as a strategic power, and the reactions this has incited from the rest of the world"[130] The authors posit that while some of the restrictions being faced by Chinese technology companies as they expand overseas are little more than "the same run-of-the-mill economic protectionism that other Asian exporters had to face in the 1970s and 80s" they also concede that "Australia's decision has many underlying technical and legal arguments" before concluding that ultimately the central problem is one of trust, namely that Australia, like several other important markets for Chinese technology exports, simply lacks trust in the overarching strategic, legislative and regulatory frameworks that currently define China's economic and political governance and thus the efforts of its firms to expand globally in strategically sensitive technologies. Importantly, Botton and Lee-Makiyama point out that the distrust that many in the West harbour against China, also runs the other way:

> *It bears reminding that this distrust is reciprocal: China also perceives its risks in network security to be of such magnitude that they justify the most safeguards in the world. Rather than a risk-based or case-by-case approach to network security, China carves out the broadest possible safety margins in its procurement laws. Central policies in China are often black and white, with positive lists that names explicitly a few permitted firms, as more subjective and risk-based criteria may not be uniformly applied throughout all the provinces or branches of government.*[131]

This is significant for the current research because it highlights that finding ways to raise the level of mutual trust between the West on one hand and China on the other will be key to avoiding (if this is at all possible) further system fragmentation, as well as technological and possibly even economic decoupling.

[128] Brown and Singh (2017), p. 4.
[129] Davis and Wei (2020).
[130] Botton and Lee-Makiyama (2018), p. 2.
[131] Ibid. p. 10.

Methodology

Preliminary Remarks

Because this research agenda seeks to tackle three separate research questions, a variety of research methods will be employed, relying on a combination of both quantitative and qualitative approaches (mixed methods), with the preponderance of one approach over the other depending on the specific research question being examined and the ease with which reliable and relevant data can be sourced. The rest of this chapter discusses the various data sources and research methods to be used in answering the specific research questions under separate subheadings.

Methodological Approaches for Research Question One

The first research question asks "what activities do technology firms pursue on foreign markets and how do restrictions imposed by governments for national security reasons circumscribe either these firms' market access or freedom of action in a way that prejudices their relative competitive position on these markets?". It thus aims to first identify the activities typically pursued by firm operating in the innovation and technology spaces and then infer what impact on these activities different government measures, enacted with the purported objective of safeguarding national security, have had on either these firms' market access, regulatory freedom of action and thus their relative competitive positioning on the domestic market of the invoking government.

The first methodological step in answering this question is to observe and catalogue the cross-border or foreign market activities and objectives of a representative sample of private sector firms that are at the forefront of technological innovation in their respective fields (semiconductors, telecommunications network equipment, electronic commerce, consumer electronics, the online app economy, etc.). This requires some analysis of what kinds of cross-border or foreign market activities they perform in order to achieve their core missions (sales, research and development, strategic positioning) and what their objectives are beyond simply surviving as corporate entities and making profits for their owners or shareholders.

The activities and objectives of these firms can be observed by studying the publications they issue to investors (annual reports and quarterly earnings updates) as well as their regulatory filings (for publicly listed companies). This information can also be obtained from media reporting on the foreign market activities of these companies (both mass media publications and the specialised trade press). Some of the larger technology firms convene regular meetings where they invite technology analysts, and the publicly available information on these meetings can be a rich source of information on both their current activities and future planning, with the latter being a data point from which their strategic objectives can be inferred. Another source of data on the activities and objectives of technology firms is structured conversations in the course of scheduled interviews with both serving and previous employees of these firms, as well as with the technology analysts who make a living covering and reporting on these firms to the public.

A second step will be to catalogue the various government policies and measures that have an impact (positive or negative) on the activities of the foreign technology firms identified in the first step, in supporting or hindering the conduct of these firms' cross-border or foreign market activities or the attainment of their objectives on foreign markets. From a methodological standpoint, this can be observed by identifying tangible correlations between government policies and actions on the one hand, and the impact they can be observed to have had on foreign technology firms operating in these markets on the other hand.

With regard the task of cataloguing various government trade and investment policies and measures that have impacted technology firms, these can be observed from a number of sources including databases that already track the negative impact these policies have, such as the Digital Trade Estimates database compiled and managed by the European Centre for International Political Economy (ECIPE).[132]

Another database is that compiled and managed by the Global Trade Alert (GTA), which although very broad in terms of the trade and investment measures it captures (including both liberalising and trade restricting measures) and despite the fact that the database collects measures regardless of their sectoral impact, it allows users to narrow their search for measures that have impacted specific categories of goods and services.[133] Because our observations and findings in the first part of this question will inform us as to the goods and services markets technology firms operate in, we will likewise be able to use this information to narrow our search parameters on the GTA database.

Another database that we can avail ourselves of in identifying relevant trade and investment policy measures that (negatively) affect technology companies providing services internationally is the Services Trade Restrictiveness Index of the Organization for International Cooperation and Development (OECD).[134] As was the case with the GTA, our findings on the activities of technology companies will allow us to configure search parameters and focus in on those parts of the OECD's work in this area that are of relevance to our research.

The recurring Trade Policy Reviews performed by the World Trade Organization[135] and minutes of the meetings of bodies such as

[132] https://ecipe.org/dte/.

[133] https://www.globaltradealert.org/.

[134] https://www.oecd.org/trade/topics/services-trade/#:~:text=The%20OECD%20Digital%20Services%20Trade,comparable%20information%20from%2046%20countries.

[135] https://www.wto.org/english/tratop_e/tpr_e/tpr_e.htm.

the Committee on Technical Barriers to Trade[136] (particularly those sections of these minutes that address Members' Specific Trade Concerns) will also shed light on some of the policy measures that have impacted traded sectors of interest to technology companies and thereby the subjects of this first research question. The same is true of the WTO database comprising all formal disputes initiated under the organisation's dispute settlement system.[137] By using specific search terms the scope of the disputes that are relevant to this research question can be narrowed. From those disputes that involve the countries and traded sectors of interest to our research it will be possible to extrapolate relevant details about the underlying policies and measures that gave rise in the first place to the dispute in question.

Another valuable source to answering this research question, particularly the policies and measures that have a (negative) impact on the interests of technology firms is the annual reporting carried out by the United States Trade Representative (USTR) under the auspices of the annual National Trade Estimate Report on Foreign Trade Barriers. Although the focus of this report is narrowly attuned to the export interests of U.S. firms only, it nevertheless has broad geographic coverage and captures a very wide array of trade and investment policy restrictions, many of which have a tangible impact on technology firms from other countries as well. Our task here is to extract any valuable data points from this reporting as it relates to the countries and the economic sectors of interest to this research question. Where possible, the measures identified in the USTR report will be cross-referenced with similar reporting mechanisms and databases maintained by the EU and Japan.

The final source of information on trade and investment policies that could or has impacted technology firms will be policy advocacy documents issued by the major trade associations and other collective representative bodies in support of the interests of technology firms vis-à-vis governments when policy or legislative changes are announced. This will provide researchers with reference points for what policy outcomes are favoured by private sector firms. In the same vein, submissions to public consultation procedures by technology companies or their representative bodies prior to announced regulatory action or legal changes in some countries with so-called "notice and comment" procedures in place will likewise serve as important sources of information in addressing this first research question.

Harnessing information gleaned from all of these sources will provide an extensive overview and detailed understanding of both the activities and objectives of private sector technology firms on the one hand, while also identifying the trade and investment policies that are the most likely to impact these firms both negatively and positively, thereby answering the first research question. These findings will help governments to better understand the underlying corporate and market dynamics that govern the technology sector, but also the impact different government policies and measures have on these firms' market access interests, freedom of action and the competitive realities they must contend with.

Methodological Approaches for Research Question Two

The second research question asks "what obligations are incumbent upon governments by virtue of international trade and investment treaty commitments to permit the entry and operation on their domestic markets of foreign technology firms and to what extent do national security exceptions as formulated in these same treaties allow governments to set aside these obligations?"

As framed, this question requires a legal analysis of the governments' obligations towards foreign firms, service suppliers and investors in the area of technology, specifically with regard to allowing these actors to enter and operate on the domestic markets of said governments.

By the same token, answering this research question requires a legal analysis of a representative sample of the restrictions imposed for national security reasons on foreign technology firms that have been identified in the course of our response to research question one.

Both these analyses must take place in light of governments' international treaty obligations under the WTO Agreements, as well as under any free trade agreements or bilateral investment treaties they are signatories to.

When examining the different multilateral, plurilateral and bilateral treaty instruments in force between the countries subject to our research focus, responding to this question requires identifying what legal obligations explicitly or implicitly flow from these instruments in terms of safeguarding the market access interests, freedom of action, or competitive positions of foreign technology firms operating on signatory countries' markets.

Subsequently, our analysis here must seek to determine if there is a prima facie case that the measures identified are likely to have given rise to a claim by the impacted technology firms, service providers, or investors, of violation under any of their rights under the relevant legal texts.

The final step, in the event that a possible treaty violation is identified, is to determine whether it is likely to be covered by one or more of the various national security exceptions contained in the relevant trade agreements and investment treaties. This step essentially requires an exploration of the limits (if any exist at all) placed on government action by these national security exceptions.

Although the scope and meaning of the national security exception as a treaty instrument has been explored by many authors over many decades (see literature review above), doing so anew under this research agenda offers an opportunity to make some fresh findings and explore some new thinking on what these limits could and should be. This is because, today, we have both new jurisprudence on this very question from the WTO, as well as a general recognition by many observers, of the urgency of answering this question now that the high degree of self-restraint that used to characterise governments' reluctance to use this exception in the past, has largely been set aside.

Examining the treaty language in question requires both an analysis of its interpretation and application over the years, as well as its negotiating history.

[136] https://www.wto.org/english/tratop_e/tbt_e/tbt_e.htm.
[137] https://www.wto.org/english/tratop_e/dispu_e/find_dispu_cases_e.htm.

Likewise relevant from a methodological standpoint when conducting this analysis will be the language governments have chosen when formulating the restrictive measures identified as relevant when responding to research question one. This is because such language can illuminate how enacting governments understood any limits placed on their actions by international treaty obligations, or – conversely - the legislative freedom of action conferred upon them when acting to uphold national security interests.

Many governments are of course aware of the limits placed on them by international treaty obligations, particularly when legislating or regulating in ways that are likely to have an impact on foreign firms, service providers or investors. As such, cognisant governments tend to formulate such restrictive legislation or regulations in a way that – for the equally cognisant observer – can provide insights into how these governments understood the limits they were subject to or - expressed somewhat differently - the litigation risks they potentially faced under international trade agreements and/or investment treaties. This in turn can provide insights into what may be inferred to constitute internationally recognised practices or norms for the conduct of States in this area and thus can support our attempts to answer this research question.

Returning to the methodological approach required to complete this analysis, the author proposes to select a number of the underlying legal or regulatory instruments used to impose restrictions of the kind being analysed here, and to examine them for language that would point to an effort – implicit or explicit – by the enacting government to signal or articulate compliance with its international trade or investment obligations. In a next step, this analysis requires an examination of whether the thus signalled or articulated effort at compliance stands up to a reasonable interpretation of the legal standard imposed under the relevant treaty provisions.

The findings revealed when addressing this research question are likely to be of heightened importance in the current climate in terms of better informing both firms and governments of their rights and obligations and can contribute to providing greater predictability on international markets.

Methodological Approaches for Research Question Three

This question asks "what are some solutions to balancing the need for an open and non-discriminatory trading system with the imperative of upholding national security where these policy priorities collide in the area of trade and technology, and what role do different actors (States, firms, others) have to play?".

In terms of a methodological approach, answering this question builds on findings already obtained when answering the previous two questions and converting them into policy and other forms of practical advice that proposes avenues for reformulating trade and investment measures taken by various governments against foreign technology firms in the name of national security. By answering this question, we seek to offer a more nuanced and proportionate response to the valid concerns governments have expressed in the area of upholding national security.

The proposals produced in the course of answering this research question will provide governments with sound policy pathways for recalibrating existing measures or better aligning future measures so that they can achieve their various policy objectives without violating international trade and investment obligations and without compromising genuine and appropriate national security concerns.

By the same token, responding to this question will provide firms and other stakeholders with skin in the game with a more nuanced understanding of what actions they can take in furtherance of their own respective interests without fear of violating the various red lines posed by national security concerns.

In doing so, it relies on a historical review of what strategies have been employed by firms in similar situations in the past and assesses how likely these are to work in future, thereby employing a case study method and combining this with some calculated projections on the likelihood of these strategies succeeding. This chapter will also propose flanking measures that firms can take to increase their chances of success, again based on historical precedents.

Similar to providing greater clarity to governments on the limits international legal obligations place on their ability to restrict the market access or regulatory freedom of action of foreign technology firms, service providers or investors, the strategies proposed in response to this last research question will likewise offer guidance to firms and their representative trade associations when advocating policy solutions that allow governments to take a more informed approach to the weighing and balancing of interests that must ensue when important policy decisions have to be made that require trade-offs between two or more sets of public policy objectives.

Knowledge Gaps and Primary Questions

Recall that **Question One** asks "what activities do technology firms pursue on foreign markets and how do restrictions imposed by governments for national security reasons circumscribe either these firms' market access or freedom of action in a way that prejudices their relative competitive position on these markets?" Clearly technology firms viewed as an entire sector pursue a range of activities from early-stage research to applied product development, to sales, marketing and after-sales service on markets beyond their home market. In fact, even firms that do not operate in what we would narrowly define as "the technology sector" nevertheless employ considerable resources in multiple countries in areas such as product R&D or market research. This is true in sectors such as automotive, or processed food. As the literature on Global Innovation Networks (GINs) discussed above reveals, companies that do research, manufacturing or that sell beyond their home markets, require a minimum degree of market access and regulatory freedom of action to organise themselves in ways that allow them to maximise the value they offer to customers, shareholders and other stakeholders.

Government policies and laws that impose restrictions on national security grounds that effectively close off entire markets to the firms supplying these products, or that stipulate how these companies must store and process customer or employee data, or that specify how they recruit and populate key workforce roles, or that limit their access to key production inputs or components, as well as a host of other constraints are likely to negatively impact the ability of technology firms to operate and may very well be articulated or applied in a way that discriminates between or against foreign firms. Likewise, such restrictions may be articulated or applied in a way that abrogates the careful weighing and balancing of different rights and obligations, or that fails to strike the necessary balance between the market openness needed to underpin innovation and economic growth on the one hand,

and the restrictions on some forms of commercial activity by some actors that national security concerns demand on the other.

Question Two asks "what obligations are incumbent upon governments by virtue of international trade and investment treaty commitments to permit the entry and operation on their domestic markets of foreign technology firms, and to what extent do national security exceptions as formulated in these same treaties allow governments to set aside these obligations?".

With case law starting to emerge from the WTO on the scope and interpretation of the national security exceptions and with an increasing number of companies running into these kinds of bans, it is only a question of time before a case is brought against an enacting State under either a bilateral investment agreement or one or several of the WTO Agreements. Although the reality is that neither a WTO panel nor an ISDS arbitration tribunal is likely to compel a sovereign nation to reverse such a ban, or to try and dictate what vendors and technology providers a government may or may not refuse market access to, it is equally true that the same WTO panel or ISDS arbitration tribunal is more than likely to examine any discriminatory measures taken and to determine on the basis of objective evidence whether or not they make any kind of material contribution to improving national security.

In addition to this, an exploration is warranted as to the degree to which even the national security exception as a treaty instrument, is or should be subject to generally recognised and applicable principles of customary international law, such as proportionality or necessity and how the application of such principles could potentially curtail the regulatory sovereignty of States to legislate or regulate in a way that restricts the market access, regulatory freedom of action or relative competitive position of foreign technology companies.

Question Three asks "what are some solutions to balancing the need for an open and non-discriminatory trading system with the imperative of upholding national security where these policy priorities collide in the area of trade and technology, and what role do different actors (States, firms, others) have to play?".

This question goes to the heart of what the correct weighing and balancing of interests may be and requires first governments to clearly articulate what threat that they perceive that a given foreign technology company may represent, and to then assess these statements in light of what experts say about these threats and how they can best be mitigated. If the threat is perceived narrowly as cybersecurity or network integrity, then it is conceivable that less sweeping mitigation strategies together with other flanking measures would be sufficient to counter these risks to an acceptable extent. However, if the risk is something greater, then it may actually be possible that a less trade restrictive measure than an absolute ban simply does not exist.

Ultimately, the most important questions this research agenda will address are arguably 1) what are the national security risks governments fear from foreign technology companies and 2) how can these risks be mitigated without unwinding the global value chains and innovation networks that companies and governments have spent the last seven decades laboriously constructing?

The trade and investment openness we have seen evolve over the last seventy years has produced many positive results as well as generating some negative externalities. To what extent do we want a return to the status quo of ever deepening international economic integration, or has this trend reached its practical limits? Are the tensions that have arisen in the area of global technology in any way linked to some of the aforementioned negative externalities we have seen produced by globalisation, so that resolving these tensions might by the same token address other imbalances?

About the author

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Clearly the current research agenda as envisaged can contribute to a better understanding of how to properly tackle a broad range of related and equally important issues.

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