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Sino-American Competition in Dual-Use AI: Hegemonic Stability Theory in The Digital Era

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Abstract

Recent surges in the salience and magnitude of geopolitical and strategic tensions between the United States and China have propelled the return of great power competition to the forefront of political discourse, leading scholars to apply the theoretical framework developed by Hegemonic Stability Theory to contemporary technological quarrels amongst the two actors. Owing to rising security concerns, Washington has accelerated its attempts at limiting the provision of cutting-edge technological components to its former commercial partner, seeking to curtail Chinese national manufacturing development within a framework of technological and productive decoupling. Amongst the most salient frontiers for confrontation, the promotion of machine-learning capabilities and Artificial Intelligence enhancement undoubtedly embodies – due to its far-reaching and disruptive potentialities – the paramount focus of both countries’ modernization attempts, identifying A.I. as the core of the “4th Industrial Revolution” (4IR), inherently enabling the elaboration and manufacturing of related technologies whose potentialities extend beyond the mere military domain to encompass civilian uses. Hence, attempts at fostering fruitful linkages between the commercial and defence sectors appeared as crucial drivers towards A.I. leadership, organically highlighting the prospects of dual-use A.I. systems. In this work, attention will be drawn to the amount of progress attained in dual-use A.I. by both Beijing and Washington, seeking to ascertain the factors at play within said “*A.I. race*” and how institutional arrangements, structural factors and capacity-building have shaped competitive dynamics. As the United States’ first-adaptor advantage becomes increasingly challenged by the PRC’s renewed capabilities in various A.I.-related domains, the White House has been able to retain global leadership in regards to quality of education in machine-learning, military capabilities – further bolstered by its fruitful relationship with private defence contractors – and the degree of soft power

exerted upon foreign countries; though Beijing's rise towards A.I. supremacy appears to proceed, it is unlikely that this change will bring about a conflict amongst the two, rather resulting in greater global compartmentalization and patterns of regionalization replacing full-fledged globalization.

I. Introduction

The multiplication of tensions within the international system has increasingly succeeded in quaking its foundations, entailing a deep-seated rethinking and subsequent attempts at reconstructing the global landscape (Zhao, 2016). The emergence of rising powers, fuelled by relatively favourable demographic dividends¹, significant economic upturns² and fruitful engagements within a generally favourable and interdependent global system³, has growingly been accompanied by concerted decisiveness on behalf of emerging and developing economies regarding the necessity of easing an international rearrangement more apt at reflecting contemporary power structures and poles of influence, whose composition and degree of influence has profoundly evolved since the turn of the millennium (Eilstrup-Sangiovanni et Hofmann, 2019). Embroiled in a far-encompassing geopolitical and strategic struggle, the juxtaposition of the world's leading power – the United States of America – and its primary challenger – the People's Republic of China – has managed to take several differing forms, ranging from economic disagreements and the imposition of focal barriers to trade seeking to hinder their respective opponent's development and global value chains, to a more abstract form of ideological dissent and thus the voicing of geopolitical points of contestation within traditional liberal multilateral organizations, pointing to how Beijing has increasingly attempted to retain a greater degree of influence and authority within the international order without fundamentally challenging it, but rather by active participation whilst questioning some of its foundational tenets and promoting more frequent resort to regional and minilateral agreements, potentially demonstrating a trend of greater compartmentalization of international areas of influence between Beijing and Washington. In assessing the rupture of several cooperative patterns which had characterized Sino-American relations since the 1970s, leading some scholars to define '*Chimerica*' such extended economic integration, capable of ultimately benefitting both participants in different manners (Zhao, 2014) Nevertheless, mounting popular

¹ See: Harnessing demographic dividend in least developed countries. In UN Trade and Development. September 2021. Retrieved at <https://unctad.org/topic/least-developed-countries/chart-september-2021>

² See: The Foundations of Rapid Economic Growth: The Case of the Four Tigers. Umesh C. Gulati. In The American Journal of Economics and Sociology. 51.2. 161-172. Retrieved at <https://jstor.org/stable/3487387>

³ See: The Liberal international order and the Global South: A view from Latin America. J. L. Rodriguez, C. Thornton. In Cambridge Review of International Affairs. August 2022. Retrieved at <https://www.tandfonline.com/doi/epdf/10.1080/09557571.2022.2107326?needAccess=true>

dissatisfaction in Western countries – fuelled partially by the grievances moved by the “losers” of globalisation, those who most suffered from industrial outsourcing and increased immigration in terms of job loss and wage stagnation – concerning the sustainment of the current liberal international order favoured a comprehensive acknowledgment of the impossibility of maintaining such international arrangements, a concern further exacerbated by territorial conflicts⁴ (i.e., the Russian invasion of Ukraine; the persisting tensions between the PRC and the Republic of China) and their demonstration that institutional and economic interdependence is not entirely capable of accounting for the avoidance of radical disputes, inevitably questioning the validity and maintenance of existing global value chains and linkages (Bateman, 2022). Questions of decoupling have significantly affected the technological domain, owing to the substantial disruptive potentialities demonstrated by cutting-edge developments in Artificial Intelligence and machine learning. Having asserted itself as one of the decisive frontiers for great power confrontation in the 21st century, each state is increasingly concerned with safeguarding its national interests *vis-à-vis* mounting security instability, with governments dedicating an ever-soaring amount of funding and resources to programs designed to enhance technological capacities, both within the commercial and the defence domains. Understanding said pattern of technological decoupling and heightened emphasis on AI – most notably, dual-use technologies, whose employability in the civilian and military domain presents significant opportunities for combined R&D and technological leapfrogging, substantially advancing one state’s economic and operational capacities (Nouwens et Legarda, 2018) – as inherently deriving from security concerns characterising hegemonic cycles within the international order – thus, grounding this analysis upon the theoretical framework of hegemonic stability theory. The emergence of a veritable “AI race” between Beijing and Washington, exacerbated by various overlapping interests, representing a potential pretext for direct military confrontation, as well as a trade war concerning strategic technologies breaking out, do bring us to the question of whether one of the two countries has managed in gaining a considerable edge over the other: the United States first-adaptor advantage and efficient productive and industrial base has appeared increasingly challenged by Beijing’s impressive results in modernising their military and industrial sectors (Ndzendze et Marwala, 2023). In

⁴ See: Multipolarity After Ukraine: Old Wine in New Bottles? After the Ukraine War: Liberal Order Revisited. Zachary Paikin. 13-29. Retrieved at https://www.ispionline.it/wp-content/uploads/2023/02/ISPI-Report-2023_Multipolarity-After-Ukraine.pdf

assessing the contribution made by dual-use AI developments and initiatives to both countries' military and commercial bases – and henceforth assessing the claim regarding the emergence of a new, leading revolutionary AI superpower in the form of China - attempts will be directed towards understanding whether said power dynamics may entail a veritable military showdown, or whether modifications to the international order will take place more organically, contrasting Gilpin's theorisation regarding the hegemonic conflict in periods of systemic disequilibria (Gilpin, 1988). In advancing such effort, attention will be directed primarily towards structural efforts designed to promote technological innovation and strategic advantage over the competitor, taking the form of investment directed towards the digital domain, institutional arrangements meant to promote comprehensive and efficient decision-making patterns, and capacity-building via institutional strengthening and the fostering of a sizeable talent pool. By adapting Gilpin's understanding of relative distributions of power over time as fundamental indicators of hegemonic stability to the amount of AI-related expenditure as a proportion of national GDP, we can expect a greater likelihood of conflict – not necessarily armed, but rather taking the form of strategic competition and proxy confrontations, symbolised by the United States' decision to impede the export of Chinese-manufactured technology to its 'Five Eyes' allies and the ensuing tensions amongst the latter and the PRC⁵. We can thus observe how such a multifaceted, competitive landscape inherently permeates and directly bolsters the security concerns of international actors, acting within an international framework of gradual decoupling and interruption of several global linkages. The following chapter will provide a literature review of foundational notions for this analysis, enabling the reader to approach the methodological asset and the case studies by applying the correct theoretical framework.

⁵ See: China Policy and the Five Eyes. J. Young. In Royal United Services Institute. June 2021. Retrieved at <https://rusi.org/explore-our-research/publications/commentary/china-policy-and-five-eyes>

II. Literature Review

2.1. Great powers competition

Ever since humanity first engaged in the process of community-building, patterns of competition – intertwined with the underlying and somewhat conflicting coordination structures from which groups inherently arose – have characterised human interactions, more often than not catalysing violent confrontations, whose scope and magnitude steadily soared as modernisation processes – not exclusively confined to the industrial field, but similarly in terms of socialisation and association amongst individuals - greatly engendered the capacities enjoyed by state – and non-state – actors, as noted by Meyer et al. (1997). More precisely, over the last few centuries, the new-born discipline of International Relations displayed an attentive fascination with ascertaining excellent power status and how said powers interact in the ever-evolving international system. Hedley Bull, a trailblazing scholar commonly associated as one of the forerunners of the English School of International Relations, identifies great powers as coming about thanks to the collective embrace of a modern hierarchical structure. Within this material, facts – such as relative power and relations with the rest of the international community – appear to acquire more weight than inherited status and maintenance of the *status quo*, as it had previously been due to the inherently dynastic mechanisms which characterised most powers before the Concert of Europe (Bull, 1977). Such displacement was fuelled by violent warfare being waged amongst European states and revolutionary struggles aimed at displacing the status quo and easing the transition towards adopting a nation-state model. As this occurred, the international system – almost naturally – recognised the great powers’ role as its “guardians”, – granting them a predominant position primarily due to incontestable empirical capabilities which render them more potent than what Bull identifies as ‘small powers’, incapable of threatening great powers as effectively as the latter could the former.

Interestingly, Buzan and Cui (2016) identify said managerial dimension of the international system as somewhat overlapping with the diktats of Hegemonic Stability Theory (from now on, referred to as HST), an analytical framework derived from the seminal work of scholar Charles Kindleberger. Within this particular focus is placed upon the presence and interactions entertained by a great power – in such a scheme, a hegemon inevitably holds a greater degree of power than its counterparts. According to such theoretical device, relative peace and stability in the system are obtained exclusively when

a hegemon displays willingness to participate as a ‘benevolent despot actively’ (Kindleberger, 1974) in the system – as its absence would lead to a dispersal of the balance of power similar to the one experienced throughout the Interwar period, when the then-rising United States withdrew from ratifying the Versailles Treaty due to domestic isolationist pressures originating from the Senate, thus impeding the country – which, through its president Woodrow Wilson, represented the primary promoter of the organisation – to actively engage in peace-keeping and mediating endeavours (Johnson, 2001). Whilst said congressional impetus appears as somewhat intriguing – remarking the cruciality of domestic institutions while underlining the gradual erosion of national sovereignty induced by what Robert Keohane and Joseph Nye would define as ‘complex interdependence’ – it also highlights the influence exerted by great powers in such a landscape: identifying the United States’ abstinence from international affairs – apart from regional, Manifest Destiny-inspired interests – for the subsequent two decades as one paramount catalyst of World War II provides credibility to Kindleberger’s theoretical device, whilst glaringly demonstrating that great powers’ retain an asymmetrical position within the international system.

However, additional information regarding the rise of great power competition must be provided before delving into the hegemonic stability theory and its potential application to the contemporary technological security dilemma between the United States and China.

2.1.1. Traditional Declinations

Illustrations of how great powers competition first emerged, both as material fact and as an analytical field from which scholars strive to extract potential explanations surrounding salient global affairs, may be drawn from historical events and customs, progressively solidifying the overarching role of the nation-state in contemporary international affairs. In this regard, Lynch III and Hoffman (2020) underline the utmost relevance of binding international agreements and customs in fostering an increasingly cooperative international community, hence marking a gradual sway from primarily conflictual landscapes such as the ones characterising most of human society up to that point. The year 1648 is perceived as figuratively symbolising the beginning of a watershed *processus* for the entire European geopolitical design via the signature of the Treaty of Westphalia, consequentially influencing the world as a whole system in a manner which would shape the following centuries. The tiring decades of violence and brutality of the Thirty Years’ War (Asch, 1997) and its parallel Eighty Years’ War

represented merely the latest instances of how the entire European continent had been plagued by continuous infighting among major powers since the collapse of the Pax Romana, which, though also plagued by several wars, represented a period of relative equilibrium in terms of governance and balance of power in Europe. Nevertheless, relations among power players were primarily founded upon calculations of respective benefits and advantages within a strongly anarchic global order, characterised by a lack of binding rules and principles to be followed outside of customs, which often failed in correctly addressing states' behaviour in the pre-Westphalian landscape. The settlement placed strong emphasis on two overarching goals to be met by the newborn nation-state, respectively the utmost respect of state sovereignty – inscribed by the principle of non-intervention – and a gradual secularisation of authority by the enforcement of practices separating religion from politics, dramatically weakening religious powers such as the Catholic Church and the Holy Roman Empire and paving the way for their inevitable marginalisation into lesser actors in the regional European system (Valaskakis, 2001). In assessing the nation-state, Grotenhuis (2016) presents its self-reinforcing nature by remarking on the dichotomy between the imaginary, abstract element – that of the national identity shared by citizens and reinforced thanks to the upholding of a common language, religion and customs – and the purely institutional and objective dimension of the state, grounded upon territorial boundaries, institutions and legislations. Despite this apparent contradiction, the nation and the state exist in contemporary times exclusively in symbiosis, rendering it impossible to imagine a state devoid of a nation and vice-versa.

What Westphalia indeed succeeded in putting forth was the reimagining of communal societies in terms of national identity, breaking down what could have been conceived as a singular Medieval community into several nations by building upon the *cuius regio, eius religio* principle inscribed in the Augsburg Settlements of 1555, which prescribed that subjects were to follow the religion practised by the ruler, hence presenting a solution to the religious conflicts which had been – more often than not – the *casus belli* of countless gruesome conflicts which had shaken European society. While the Westphalia Treaty framed a series of tenets which prompted an unprecedented transition of the importance of action from non-state actors – i.e., empires and kingdoms – to entirely dissimilar entities, the establishment of what we commonly define the “Westphalian system” – the model of global governance which we identify as still being enforced in contemporary times – came about at a much slower pace, through the historically material and theoretical honing and alteration of some of its foundational

tenets. As Osiander (2003) notes, blindly assuming the existence of a dichotomous relation between empires and nation-states is erroneous, noting how countless contemporary patterns of international cooperation are similarly featured in past examples of governance. Osiander remarks on the projectionist approach undertaken by a plethora of international lawyers and scholars in attaching the contemporary sense of a ‘Westphalian system’ to seventeenth-century Europe, which did not display several of the system’s underlying tenets as we currently conceive them, such as sovereignty, initially limited to individual sovereigns and rulers. According to the author, the Peace successfully established a mechanism of relations between political units, echoing Krasner’s (1993) understanding of Westphalia as unable to effectively mark a break from previous international affairs. Osiander identifies the process of industrialisation as the primary driving force behind the pre-eminence of the tenet of “*sovereignty*”, as it elevated the notion of statehood by promoting patterns of division of labour and prioritised central – thus, statal – infrastructures. To this extent, it is possible to conceive better said ideational and material transformations through the varying – and often contrasting – lenses of theoretical frameworks, which enable us to apply specific models developed from – while temporarily reinforcing – historical trends and events. The purely economic nationalist and mercantilist outlook, denoted pre-Liberal Europe, was rooted in tenets of military and economic predominance, with the latter condemned to subordinate to the former. As statesmen and policymakers engaged in intense competition with one another, each seeking to edge over its competitors through the accumulation of immense wealth and influence, engagement in constant trade relations with distant territories became a prerogative of what were known as ‘company-states’ as defined by Phillips and Sharman (2020). To put it simply, these were charter companies that were granted the utmost monopoly over some fundamental trade routes by the governmental authority to cut off potential adversaries from pursuing specific objectives which would result in a loss of profit for the original state as well as to maintain some stability in trade relations. This model of European expansionism – regarded by some scholars, such as O’Brien et Williams (2023), as the first wave of globalisation – resulted in the creation of the first, pure kind of international world order, as European actors transposed their regional disagreements and points of conflict to a purely global dimension, all whilst encroaching indigenous communities and their respective economies in a manner which critical theorists now view as the fundamental onset of their underdevelopment, not understood as the opposite of development but rather as a condition of it. Within such landscape,

great powers, such as the United Kingdom, which ruled over the world's most significant colonial Empire and utilised its 'British East India Company' to enhance its sovereignty over large territories – in a way that Vuving (2020) compares to Huawei's efforts in engendering Chinese spheres of influence in the digital world, thus underlining a return to a 'neo-mercantilist' approach that various scholars of international relations have identified as having come back to the forefront of global affairs – and Spain, whose dominion included a large majority of South America and subsequently its incredibly vast amount of natural resources, engaged in fierce competition to emerge as victorious, seeking to prevail in the collection of as much wealth as possible, due to its ultimately finite nature. It thus appears evident, even to untrained eyes, that great power competition naturally exists as an inherent characteristic of great powers, presenting itself as a physiological consequence stemming from the inability of collective actors to adopt strictly cooperative approaches in a landscape lacking international players such as intergovernmental institutions and organisations. In this respect, perceived international authority – defined by Lenz (2017) as the authority demonstrated by international organisations to take collectively binding decisions without being pressured to do so by the institutions' member states – plays a fundamental role in engendering a global system of interactions and behaviour which, in turn, shapes member states' intentions and, subsequently, the organisation's interests.

We could thus conceive international organisations as ultimately lessening the probabilities of conflict and tension between nation-states due to them acting as *fora* for growing interaction and potential compromise, even when intentions strongly clash. Nevertheless, great powers may demonstrate either unwillingness to cooperate – due to the potentially minor payoff from doing so -or excessive influence within specific international organisations, henceforth denoting their inherent capability to behave in a manner autonomous from the standards and customs endorsed by international organisations (Gordenker, 1980). Specifically, this aforementioned apathy or resistance in entirely elevating itself towards the layers of institutional interdependence may constitute a precise behavioural pattern persecuted by revisionist nation-states, which presents the potential of threatening the hegemonic order as previously established by the leading superpower. By avoiding complete commitment or accepting it through a specific framing mechanism, which demonstrates an attempt at delegitimising the existing infrastructure by rallying – via economic and ideological leverages – a “global contestation”, as Schweller et Pu (2011) noted. Within the landscape of a seemingly

unprecedented unipolar global stage, where the balance of power has considerably shifted – following the crumble of the Berlin Wall and the corresponding ideological crippling of socialism – in favour of the neoliberal doctrine promoted by the United States of America, the idea of altering the balance of power thus inherently presents itself as revisionist, condemning each aspiring superpower to the label of threatening force. In associating with the interpretation put forth by Hedley Bull and the English School, Buzan et Cui associate the emergence of the notion of excellent power management – the aforementioned “directorial” role assigned to great powers at the global stage – alongside the idea of balance of power, which in itself is entirely instrumental for the maintenance of order within the global system. Subsequently, it appears evident that excellent power management is fundamentally and profoundly intertwined with the balance of power and the former is primarily tasked with maintaining the latter. To achieve such a goal, Little (2006) draws from Bull’s analysis by noting how practices of institutionalising great powers may effectively reinforce the notion of balance of power, which would ultimately collapse without an organisational backbone. In contemporary global affairs, this understanding reveals how international organisations such as the International Monetary Fund and the World Bank play a pivotal role in sustaining the degree of authority and power held by the leading Western powers. Without them, maintaining the balance of power in favour of the neoliberal world would become far more challenging.

Despite this, practices of contestation of the global order may be carried out even if active participation in international organisations is not sacrificed. As Schweller and Pu noted in their work, the People’s Republic of China (from now on, shortened to PRC) appears as the most credible threat to American hegemony in the current landscape: said capability does not limit itself exclusively to purely material advantages enjoyed by the PRC – including its immense territory and consequential extensive workforce –, but extends towards a more abstract and ideologically-charged dimension. Though having distanced itself from strict adherence to socialist tenets ever since the end of the 1970s, through the form of neo-liberal economic reforms enacted by the Deng Xiaoping-led government, meant to facilitate capital movements and foster FDIs in the country, full-blown privatisation – undoubtedly a defining characteristic of current-day economics – remains a highly controversial and debated topic in a country which has had a hard time thoroughly distancing itself from its ideological and political tenets which lie at the basis of the state’s nature (Ong et Zhang, 2008). Nicholas Jepson (2023) further underlines existing differences amongst the American-backed International Monetary Fund model,

which has commonly come under criticism due to the strenuous conditions imposed on already-fledgling countries to receive conditional lending and the Chinese structure of development finance. The author conceives Chinese negotiators as behaving both within and without the existing system in a way which seems to echo Schweller and Xiu's analysis of revisionist powers.

On the one hand, Beijing strongly advocates for restructuring of the international debt mechanism – indirectly questioning the leadership of the IMF in said affairs and subsequently challenging the United States' leading position – while also retaining the ability to work outside said structures, preferring the establishment of *ad hoc*, bilateral negotiations rather than multilateral agreements such as the ones favoured by the IMF. The employment of a strongly delegitimizing rhetoric meant to frame the United States' leadership as inherently incompetent and ultimately dangerous for the prosperity and growth of global wealth represents one of the initial – though crucial – steps towards a full-blown shift of the balance of power. Henceforth, we could frame this somewhat covert competition as the beginning of a security dilemma between the PRC and the US. Within this situation, the role played by technological developments has become one of paramount relevance, leading us to an unprecedented situation where military competition may be shifted towards a purely technological level. One particular way to frame great powers' competition may be through a security dilemma between adversary states, but can this theoretical model be successfully applied to the PRC-US technological dispute?

2.1.2. Security Dilemma

Liff and Ikenberry (2014) define a security dilemma as a situation in which both countries in question present primarily defensive intentions – aimed at maintaining the status quo as existing – but, due to respective uncertainties about the other's intentions as well as general mistrust, they are unable to avoid costly competition from being established. The countries in question could swiftly avoid any security dilemma if only the latter received assurances concerning the other state's peaceful and defence-oriented endeavours. Subsequently, the detection and identification process of potential threats represents a seminal step towards recognising comprehensive security dilemma-induced conflicts, as noted by Robert Jervis (1978). As the author puts it, the security dilemma occurs when, through its attempts to engender its security, one state inadvertently – or purposely – reduces the security of others: to a certain extent, we could apply this theoretical

framework to the present state of affairs in the Indo-Pacific, where China's Western-backed neighbouring countries – South Korea, Japan and Taiwan – have experienced growing uncertainty surrounding their future due to Chinese revisionism and expansionism. Whilst inherently rooted within a Cold War-inspired analysis – and thus not directly transposable to contemporary tensions between the PRC and the United States, inserted within a considerably more covert framework - Jarvis' analysis correctly identifies two distinguishing variables instrumental in establishing the degree of severity of a security dilemma: firstly, states should be able to differentiate between offensive and defensive capabilities precisely. Nevertheless, the ever-increasing employment of technology in the military sector has considerably shaded the divide between offensive and defensive capabilities, as often said instruments may be employed for both purposes. Henceforth, identifying the threat posed by the PRC represents a grey area for the United States, which cannot assess its intentions and future planning. Secondly, Jarvis shifts its focus towards the degree of intensity of said security dilemma: as states face increasing difficulties in assessing the actual measures enacted by their – potential – competitors, said ambiguity will inevitably reinforce the intensity of the security dilemma existing between the two, ultimately leading to an arms race between the countries. Conveniently, parallels may be drawn between Jarvis' time and current global affairs: as Sandels (2019) supposes, could we be experiencing a new age of arms race, not rooted in pure military competition anymore but shifting towards a different, technological dimension encompassing both civil and military purposes? Nonetheless, our previous analysis explicitly demonstrates the necessary presence of a fundamental aspect for a security dilemma to arise, marking a gradual abandonment of assessments of material capabilities in favour of an increased focus on social interaction amongst nation-states: if we suppose that a security dilemma may emerge exclusively as the consequence of aligning interests shared between great powers, then the identification of China as a "greedy state" – seeking to overthrow the status quo, as defined by Charles Glaser (1997) – poses as problematic for the enablement of a security dilemma, though one potential outcome – that of mutual arming, which we are witnessing in terms of technological progress – remains a possibility within this scheme. Naturally, the constructivist necessity of entertaining constant social interactions and transparent communication between the powers embroiled in a security dilemma represents a paramount objective to be attained, a goal that may demonstrate countless problems deeply tied to the state's ideological and material dimensions. Glaser thus further notes

that states should engage in analyses meant to assess the extent of the competitor's motives beyond security and thorough examinations of the adversary's unit-level capabilities, achievable via sustained intelligence and espionage practices. To successfully bypass this limitation, Liff and Ikenberry adopt a two-fold material analysis meant to distinguish between two notably different typologies of security dilemmas: what is defined as a "type-1 setting", denoted as the most classic version of the security dilemma, in which both countries display aligned intentions meant to preserve the status-quo – hence focusing primarily on the advancement of defensive capabilities rather than offensive ones –, but uncertainty and suspicion concerning the other's intentions still generate a vicious action-reaction cycle whereby improvements in the defensive capacity are followed by offensive enhancements by the adversary, spurring a vicious cycle peacefully solvable exclusively through the reciprocal notification of bargaining intentions. Quite conversely, what Liff and Ikenberry define as a 'type-2 setting' separates itself from the first variant essentially thanks to the different underlying driver, as one – or more – states embroiled in the dilemma display revisionist ambitions, thus seeking to reverse the existing status quo. Within such a structure, conflicting interests effectively foment an action-reaction cycle spurred by the revisionist state(s)' ambitions to subvert the world order by enhancing military instruments. Based on this foundational assumption, Liff and Ikenberry conclude that the traditional declination of arms race brought about by security dilemma dynamics as existing amongst crucial players in the Indo-Pacific region – i.e., Japan, Australia, the United States, Singapore, Taiwan – has not appeared yet, while contemporarily acknowledging that aspects testifying to the influence of security dilemma dynamics in the unfolding processes driving military investments and build-up in the region. Potentially, the radical changes in material capabilities enjoyed by the PRC, whose centrality is further reinforced by the relatively quick pace of said enhancements and the often-ambiguous stance adopted by Beijing, may result in heightened regional tensions and the perception of the threat posed by China. The authors thus advocate for both countries to swiftly recognise the security dilemma-driven impasse in which they are positioned now to foster cooperation and effectively clear up incomprehension and doubts concerning their ambitions while also sharing vital information through incremental communication transparency and improving their diplomatic bargaining systems. Wuthnow (2019) identifies U.S.-led 'minilateralism' practices – the pursuit of cooperative practices amongst a few states – in the Indo-Pacific region as ultimately not conducive to security dilemmas. Interestingly

enough, a substantial number of multilateral agreements have emerged as the result of rising cooperation based on foundational principles – such as transparency and equality – which the PRC recognises as inherently oppositional to what it considers as an ‘old security concept’, a Cold War relic of military alliances, thus implicitly targeting the U.S.’ military campaigns in the region. Quite conversely, the U.S. has adopted practices of unilateralism as ultimately building on top of already pre-existing alliances, aiming to strengthen this system of traditional partnerships with engendered cooperation in new security mechanisms; thus, it appears evident that differences in ideological matters also extend to such a field, inherently juxtaposing the United States to the PRC, excluding each from most of the other’s unilateral duties. Such a problem risks magnifying the common narrative within Chinese public opinion and state policy, pointing towards a progressive American encirclement of Beijing, rendering the possibility of the endurance of an action-reaction cycle even more concrete. A greater amount of U.S.-backed security unilateralism may push the Indo-Pacific region into full-blown military competition. However, this possibility is posited as somewhat remote by Wuthnow, who significantly underlines the persisting political disputes among US allies in the region – one notable example regards the row between South Korea and Japan surrounding the abuse of comfort women in the peninsula during the occupation of the Japanese Empire – as an element of reassurance for China. The latter’s pivotal economic and financial role as an exporter and trade partner in the region also plays a significant part in reinforcing the Chinese belief that the United States will not be able to effectively encircle them, as growing military and security cooperation amongst the United States and its Asian allies may be limited by the latter’s incapacity to disenfranchise themselves from Chinese economic dependence. Nevertheless, Wuthnow recognises that if the current state of affairs between China and the US were to suddenly deteriorate – i.e., due to the decision by China to invade Taiwan – the definitive shift in reasoning from cooperative internationalism to zero-sum competition would finally occur, potentially demonstrating itself through the formation of formal anti-Chinese alliances in the region. This analysis thus demonstrates how, while pure elements of an arms race as induced by the security dilemma are indeed absent from the Indo-Pacific framework, underlying dynamics that may bring about a military confrontation between the parties in question are indeed recognised by a large number of experts and scholars, thus remarking the highly inflammable situation in the region.

2.2. Technological Sovereignty: A Contemporary Frontier for Confrontation

To successfully grasp the factual nature and scope of this renewed U.S.-China competition, it is necessary to denote the defining features characterising the unprecedented nature of such a peculiar form of great power competition. As rightly remarked by Lewis (2018), this twenty-first-century version of great power competition differs from previous renditions by focusing primarily on contestations occurring at what the author defines as ‘modern levers of power’, subsequently including technology and other factors above, such as international institutions and rules. The absolute centrality of technological innovation in power transition is no surprise, as it has been documented by a long tradition of scholars ever since the twentieth century, where particular attention was reserved to Cold War-related technologies, which represented a focal point of conflict amongst the United States and the Soviet Union. The so-called “Sputnik moment” enjoyed by the USSR following its successful satellite launch in 1957 marked just one of several points of tension throughout the Cold War, with both countries trading blows – not just materially, but also in ideological terms – to prevail over the other. Said opposition did not limit itself exclusively to the space race but exceptionally conversely extended to encompass almost all facets of arms competition, ranging from missile systems to the employment of much more complex thermonuclear weapons (Ungar, 2008).

Nevertheless, mirroring such dynamics to the contemporary technological struggle between the United States and the People’s Republic of China appears tricky for various reasons. First and foremost, while the Cold War global landscape was characterised by an open and obvious opposition between the NATO alliance and the Warsaw Pact, contemporary international affairs presuppose a degree of cooperation and friendly interaction to be maintained between China and the US, thus lacking the openly conflictual atmosphere experienced throughout the Cold War. Moreover, several of the applications above demonstrated apparent military capacities – offensive or defensive – hence being inscribed within the compound of purely military innovations. Quite differently, several contentious points disputed between China and the US nowadays concern dual-use technologies, meaning instruments that may be employed interchangeably in the civil and military sectors. Curiously enough, said practice muddies the waters in assessing the full extent of the adversary’s enhancements while also confusing the very practice of determining whether technology may be used for defensive

or offensive – or potentially, both – purposes, engendering a security dilemma in which the states are unable to decide on the other’s intentions correctly. The end of the Cold War struggle propelled the United States towards a predominant position on the international stage, thus inevitably shifting the balance of power unipolarly in Washington’s favour: ever since then, the US agenda has been comprehensibly fixed with the overarching ambition of maintaining said hegemony, with both Republican and Democratic-led executives prioritising the maintenance of the privileged status enjoyed by the United States (Johnson, 2021). In this regard, the author remarks how little literature exists questioning the potential impact of technological enhancements in polarity shifts, indirectly pointing out the inconsistencies and unprecedentedness of such a competition. The gradual intertwining between geopolitical matters and technological advancements – best symbolised by the Taiwanese question – rendered this formulation of excellent power competition extremely challenging to address, drawing from scholarly research due to the lack of literature on such a theme. If we were to apply the tenets of Hegemonic Stability Theory as stipulated by Kindleberger, the identification of the age of neoliberal globalisation endorsed by the United States through the enactment of Washington Consensus-inspired measures would coincide precisely with the unipolar hegemonic position enjoyed by the country, however, the gradual shift towards what scholars define as a post-Washington Consensus (see Biegon, 2017) demonstrates what could be understood as the fragmentation of a ‘cultural hegemonic’ stronghold for the US – borrowing Biegon’s reference to Gramscian cultural hegemony. Notably, framing said the change in terms of Wallerstein’s hegemonic cycle theory would imply that Washington finds itself in a situation of hegemonic decline, losing international level due to the often-negative consequences stemming from the imposition of strict austerity measures advocated by neoliberal financial bodies – i.e., the IMF.

Previously, we briefly mentioned China’s emergence as a pivotal financial actor, gradually expanding its influence from the Indo-Pacific to encompass African states (see China-Africa Business Council, 2022) and European countries, directly undermining American leadership in the region. Nevertheless, this has not come without extreme scepticism and uncertainty: countless European leaders have framed this endeavour as an attempt at achieving the geopolitical goals that Beijing is seeking to acquire, meaning the extension of a condition of economic dominance and relative control over European countries, which even to this day continue to constitute a fundamental support for the United States in maintaining their status quo. Nonetheless, the lack of a comprehensive,

centralised response from Brussels entailed the start of BRI initiatives between countless European states and Beijing, often on a bilateral basis – which Jepsen had defined as a characterising aspect of Chinese financial systems -, thus in a predominantly asymmetric manner – with Beijing’s influence towering over its collaborators – and without the possibility of discussing the implications and effects of such an initiative collectively among European leaders (Skala-Kuhmann, 2019).

Therefore, it is clear that Chinese attempts at overthrowing American hegemony on the global stage include a comprehensively devised program meant to develop Chinese capabilities not just in the technological sphere but also extending to other – paramount – branches of governance. Nevertheless, this research will focus primarily on this renewed technological competition and its potential implications for the balance of power in international affairs: Will China retain supremacy in techno-military capabilities over the US? If so, will this entail a redistribution of power in favour of Beijing, or will the Western model survive this challenge?

2.2.1. History of Digital Sovereignty

This section of the research will place particular emphasis on the notion of ‘digital sovereignty’, first by elucidating how two antithetical concepts – the former deeply rooted in a somewhat “metaphysical” dimension, while the latter remains strongly linked with material and empirical measurements – may interact with one another. Successively, in appraising the impact that technological improvements have had on great powers and their competitive practices, it will be somewhat helpful to briefly recall some paramount evolutionary steps which have led contemporary society towards the embrace of a new paradigm, presenting itself as both concretely rooted in material bases while also acknowledging its nature as a somewhat abstract and detached dimension, which however may entail extremely tangible consequences. Such a renewed interest in innovation has revolutionised society, not just in empirically measurable terms but also lexically and semiotically, giving way to the adoption and ever-soaring usage of specific terminology which, though constantly closely associated with the technological domain, has come to permeate virtually every aspect of everyday life. Picking up from what Benjamin Peters (2015) defined as “*digital keywords*”, we witness how – in line with human developments ever since the Bronze Age – keywords have historically served as powerful socialising and modernising tasks while also displaying normative value based on the meaning ascribed to specific nouns and their subsequent employment. Such a role persists even

within digital keywords, which ultimately “*encode and decode*” our contemporary language. Hence, despite characteristic peculiarities that distance technological enhancements from previously experienced and similarly wide-encompassing evolutions, we recognise the social function that it implies as somewhat comparable to that of the Scientific Revolution and the processes of industrialisation. Nevertheless, the overarching transformative potential enjoyed by technology appears historically unparalleled: to understand why this came about, we need to briefly analyse the creationary moments and the evolutions of current-day technological capabilities.

Naughton (2016) touches upon normative and social practices as profoundly intertwined with the gradual expansion of the internet, serving as the foundational basis for the future technological enhancements which led to the future adoption of instruments such as artificial intelligence, virtual and augmented reality and blockchain technologies. These latter elements represent what may be defined as ‘*frontier technologies*’, thus denoting their remarkable character, presented at the forefront of the intersection between scientific developments and real-life applications (WIPO, 2022). Notably, the WIPO carries out a three-fold distinction between different – but coexisting and potentially interactive – frontier technologies, separated between digital, physical, and biological technologies. For our research, the focus will be primarily placed on digital technologies – notably, dual-use Artificial Intelligence (AI), which will be analysed in greater depth in the following chapters – with a reduced interest in physical technologies – in our case, semiconductors – and how said technologies may interact within a broader perspective of geopolitical and great power competition. Instead, this section will predominantly focus on the military derivations of internet developments, providing an effective starting point to consider the competitive facet that defines technological sovereignty nowadays. The gradual development of commercial networks on a global scale – advantaged by the progressive freeing-up of capital movement across state boundaries, which characterised the collapse of the Bretton Woods system in the 1970s – favoured the creation of what we know today as the internet, but as Campbell-Kelly et Garcia-Swartz (2013) point out, unreasonably over-simplifying such a protracted and gradual process through the attribution of excessive weight to certain seminal events – i.e., the creation of ARPANET by the United States Defence Advanced Research Projects Agency (DARPA from now on) – risks confusing readers and experts, whilst impeding a correct interpretation of historical events. While the elaboration of this instrument undoubtedly fostered the progressive popularisation of what we now know as the Internet due to it being the first

computer network to incorporate the TCP – Transmission Control Protocol – and IP – Internet Protocol – protocol suites into its workings, the evolution from this rudimentary networking mechanism towards contemporary Internet is one characterised by extreme complexity between countless components and actors – what Greenstein (2010) defines as a “collective invention” –, not a linear one as simplistically perceived.

Nevertheless, what truly captures our attention is the inherently militaristic origin of the internet, initially emerging from extensive military defence spending by countries such as the United States through its SAGE air defence program, first displayed in 1962. This unprecedented instrument enabled the U.S. government to employ computers to control and integrate several data sources in real-time, serving as the basis for the technological dominance that Washington still retains. Whilst the civil sector gradually integrated said technology within its industries and services, its principal infrastructural and economic sustainment remained tied to the military and defence sector, remarking how technological enhancements and developments primarily serve the purposes and requests of the governmental dimension while being, by extension incorporated within the commercial industry as military competition became less pressing in the 1990s. Nevertheless, governmental guidance retained its leading spot as a driver of technological improvements throughout the last decade of the 20th century, as the Clinton administration launched its “*Information Superhighway*” program, seeking to expand the employment of the World Wide Web to every corner of the globe (Xu et Lu, 2021). Said goal was to be obtained through the establishment of a “*National Information Infrastructure*” (NII) in 1993, a project expanded the following year to encompass the entire planet, hence becoming a “*Global Information Infrastructure*” (GII) meant to facilitate the implementation of capabilities eased by the staggering enhancements in technological capabilities (Smith, 1994).

It naturally comes that the Internet continues to retain, even to this day, an inherently political nature: thanks to its virtuous networking capabilities and the ability to connect millions of individuals from all over the globe, governmental policies towards the Internet have emphasised its pivotal democratising impact, rendered possible through the maintenance of a space devoid of excessive governmental interference (Kiggins, 2015). Thus, it is no surprise for Washington and Beijing to become embroiled in such a controversy, owing primarily to their highly different perspective on the degree of statal

influence which should be exerted upon potentially transformative instruments, as well as their opposite stances on civil and military integration in the technological sector.

2.2.2. The technological security dilemma – Beijing v. Washington

Having briefly presented the inherently governmental and defence-oriented purposes which led to the establishment of the Internet, Couture and Toupin (2019) provide a well-detailed account centring on the relationship existing between the digital dimension and the notion of sovereignty, precisely drawing attention to how these two elements intersect with each other within a framework of growing competition and tension between the United States and China. The authors identify the notion of ‘sovereignty’ – conceptualised in recent centuries by multiple seminal scholars such as Hobbes, Bodin and Schmitt – as coinciding with supreme authority over a polity. Referencing Osiander’s analysis, as mentioned earlier, of industrialisation and sovereignty – notably, their interaction – we conceive the latter processes of industrialisation and the subsequent economic and institutional interdependence, which they bred as ultimately and counterintuitively eliding the traditional conception of state sovereignty. This trend can be witnessed by considering the various supranational bodies and organisations that have emerged since the mid-1950s. In this regard, national sovereign authority exerted by traditional post-Westphalian nation-states has become much more limited in scope and authority.

Nevertheless, whilst several scholars have noted such pattern as characteristic of our current digital era, discourses on challenges relating to the establishment of a comprehensive strategy of “*technological sovereignty*” date back to the 1960s, when said endeavours stemmed out of nationalist discourses aimed at supporting national freedom and industrial innovation (Globerman, 1978). Paradoxically, despite Osiander’s elaborations, recent developments in academia and politics have highlighted a framework within which the nation-state can retain its authority and sovereignty, thus enforcing its governance onto the digital dimension (Bonilla, 2017). In this regard, the current tensions between Beijing and Washington have underlined a prominent difference in points of view and policies that both countries want to enact in their management of technological instruments, hence lacking a shared perspective to peacefully foster digital and industrial growth.

As the primary pioneers of technological innovation throughout the 20th century, the United States have attempted to defend their first-mover advantage (Johnson, 2021) in operational technology – i.e., military applications – throughout the post-Cold War period, facing pressing competition from Russia and – primarily – the People’s Republic of China, which investments in the digital sector, alongside its steady industrialisation, have rendered the country the U.S.’ most credible contender for digital leadership. Notwithstanding the purely cyber-dimensional nature of some of these enhancements, their material applications – empirically explorable – represent some of the most salient features of this new ‘*tech competition*’. Namely, great emphasis has been placed on the potential transformative and disruptive consequences of incorporating cutting-edge technologies within the military sector. China’s sudden rise as a significant actor in global affairs through its investments in AI and cloud infrastructures has prompted a sense of preoccupation among Washington’s defence analysts, who perceive that such a pattern could potentially represent a tipping point for the already-unstable balance of power in the Indo-Pacific. Whilst the United States’ scholarly research and development on AI continue to maintain qualitative advantages over their Asian counterparts, Beijing has undertaken a considerable effort at enhancing its capabilities, remaining, however, strictly reliant on Western AI models due to several hurdles entailed by the creation of brand-new and autonomous AI structures (Mozur et al., 2024). Thus, as China approaches Western open-source AI models as the basis for their projects, the matter becomes increasingly intertwined with national security questions and the protection of sovereignty in the digital sphere. This process is advanced by reports alleging the incremental practices of Chinese employment of spies and hackers to obtain classified information and data relating to the technological domain, notwithstanding the many sanctions and obstacles put forth by Washington to curb this cyberespionage trend. Thus, the dimension of conflict management – defined by Winham (1998) as relating to the adoption of measures seeking to reduce the likelihood of a conflict between two or more states – becomes transposed to a digital dimension, entailing a lower degree of awareness by the general public regarding the potential damages of said confrontation due to the ‘*abstract*’ facet in which the conflict becomes localised. Nevertheless, downplaying the prospective consequences that said tensions might imply at the global level would represent a grave mistake, one failing to take into sufficient consideration the paramount reach that technological means have acquired throughout the last decades.

In this regard, Beijing has come under fierce criticism from the United States government for being allegedly involved in cyberespionage activities against Washington as well as neighbouring countries in Southeast Asia and Latin American countries, primarily aiming to acquire individuals and businesses' data and intellectual property to provide additional impetus to its high-tech industry growth (McNeil, 2023). Furthermore, fears about widely differing conceptions and understandings of internet regulations and normative frameworks have risen to the forefront of public discourse in the Western world. The “*information warfare*” identified by Qiao Liang and Wang Xiangsui in their 1999 book “*Unrestricted Warfare*” and understood by scholars as the practice of instrumentalising and weaponising information encompasses the radically differing understandings of Internet usage: while the United States firmly advocate for internet freedom – in the words of former Secretary of State Hillary Clinton – grounded upon tenets guaranteeing the free flow of information devoid of excessive state intervention, the PRC has enacted countless measures aimed at regulating and managing potential national security threats that the social dimension of the internet may entail. Instilled within a framework of state-prompted growth – similar to other facets of industrial activity in the country – access to the web in the country remains limited; similarly, the breadth of accessible content appears visibly limited if compared to Western states, where virtually no limitations exist on the internet potentialities. Zheng (2013) provides a detailed historical account of normative measures adopted by the Chinese Communist Party (from now on, CCP). Without delving into excessive details, it is simply worth noting that the Chinese State Council has continuously adopted – ever since the 1990s – numerous regulations prohibiting the transmission of information potentially harmful to national security and threatening to social stability, leading to a passive acceptance by the Chinese public, whose access to the internet is also controlled by the central government, either via its lion's shares in the nine nationally-licensed Internet Access Providers or through its control over personal computers, mobile phones and internet cafés, the latter continuing to represent a primary source of access for Chinese citizens (CINIC, 2009). Thus, it is no surprise that this ideological row may extend itself to encompass veritable points of conflict between Beijing and Washington, such as the aforementioned cyber espionage practice. In this regard, the United States has acknowledged China's ever-increasing employment of Artificial Intelligence in organising and scheduling retrieved data and information and monitoring American spies and persons of interest through the work of the Chinese Ministry of State Security.

Thus, we recognise the paramount relevance of Artificial Intelligence in this contemporary technological security dilemma. Nevertheless, greater attention has to be given to one specific configuration of artificial intelligence: its potential dual-use nature, which will be considered and analysed in greater detail in the following sections.

2.4. Dual-Use AI and its cruciality in the techno-security dilemma

When we briefly touched upon the establishment of ARPANET by Washington's DARPA, focus was placed on the inherently military dimension of this creation, highlighting how said program was extended to serve civil and peaceful purposes. Subsequently, it may be argued that the origins of strategic research and development of dual-use technologies – or DUT – derive precisely from the United States' initial attempts at construing a network to facilitate communications among military officials. As part of the Department of Defence attempts to overcome the perceived Soviet superiority in technological enhancements following the “Sputnik moment” enjoyed by Moscow, the “DARPA model” – seeking to intensify collaborative efforts amongst governmental agencies, scholars and industrial actors – spurred a global movement aiming to replicate such an apparatus in other nations, all of which have thus far been unable to usurp the United States first-adaptor advantage in this field (Ueno, 2023). The author defines the term DUT as referring to devices whose employability extends to both the civil and military sectors, thus exhibiting an ambivalent function of paramount importance in the contemporary international state of affairs, characterised by an ever-growing exchange between improved academic and industrial performances and military employments, giving way to the problematic outcome of DUT research & design products being leaked and exposed to hostile actors who may employ them to develop cutting-edge weapons with tremendous consequences for global stability.

Ueno (2023) argues that DARPA profoundly altered how the development of vanguard technologies is carried out, fomenting a reversal seeking to abandon the mindset which had inspired previous techno-military enhancements from being expanded to the civil sector; by adhering to the DARPA model; it has become more common for purely civil technologies to be employed in the military industry, and not the other way around, eliding the barriers which previously differentiated civil and military technologies and subsequently made them subject to differing dynamics and processes. Such a change was intrinsically propelled by the trend of augmenting funding in civilian R&D at the expense

of military R&D, with the former now benefitting by up to four times what governmental R&D does. Reuven (2023) states that this transition was further favoured by the shift from a model of “closed innovation” towards one of “open innovation” in the R&D of countless countries’ defence sectors, overcoming structural barriers which had limited the potentialities of said developments. The adoption of a model rooted in open innovation eases the access to state-of-the-art technologies which are the result of civilian R&D investments, enabling the defence sector to progress in ways which had been unavailable throughout the closed innovation epoch, though contemporarily eliding the confidential nature of potentially break-through technological developments and exposing them to inter-statal competition, be it via collaborations with leading industries or through questionable practices of cyberespionage as mentioned in the previous sections.

The origins of Artificial Intelligence can be traced back to the Dartmouth Workshop held at Dartmouth College in 1956, two years before the formal creation of DARPA by the U.S. Department of Defence. The United States Department of State defines ‘Artificial Intelligence’ as a ‘machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations or decisions influencing real or virtual environments’ in its 2020 National Artificial Intelligence Act. However, no comprehensively agreed-upon definition of this notion exists (Wang, 2019). The High-Level Expert Group on Artificial Intelligence operating under the European Commission’s *aegis* defines AI as “software – and possibly also hardware – systems designed by humans that, given a complex goal, act in the physical or digital dimension by perceiving their environment through data acquisition, interpreting the collected structured or unstructured data, reasoning on the knowledge, or processing the information, derived from this data and deciding the best action to take to achieve the given goal”⁶.

Such revolutionary transition was promoted by a group of promising experts⁷ who firmly believed that practices of machine learning could be enlarged to include the infusion of elements peculiar to human intelligence to machines, enabling them to use language, solve problems and even improve themselves independently all of which objectives have now been achieved thanks to contemporary findings in Artificial Intelligence. With the financial backing provided by DARPA, as well as renewed interest in AI R&D, findings

⁶ See: A Definition of AI: Main Capabilities and Scientific Disciplines. 2019. High-Level Expert Group on AI.

⁷ See: “A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence”. J. McCarthy; M. L. Minsky; N. Rochester; C.E. Shannon; 1955.

in the field led developers to the creation of what is now known as “classical AI” in the 1980s, based on a growing consensus amongst experts that artificial intelligence should be concerned with identifying the primary patterns of thought-processing peculiar to human beings and then transposing these patterns to machines, which would then be enabled to reproduce them autonomously. While acknowledging the importance of Deep Learning AI – primarily applied to engage in pattern recognition and the subsequent replication of said patterns at the machine level – and Symbolism-based AI – focused predominantly on the processing and manipulation of symbols and concepts – Ueno remarks the potential flexibility in terms of applicability of Agent-based AI, which differentiates itself from types mentioned above of artificial intelligence thanks to the ability to recognise potential modifications and disruptions in the environment in which the machine is placed and adapt itself through the enactment of the optimal course of action; to provide real-world examples of agent-based AI, attention may be given to AI technologies provided with sensors which enable autonomous driving, both in peaceful domains – as with Tesla’s self-piloting functions – as well as autonomous weapon handling, rendering the employment of unmanned weapons and missiles possible. Envisioning the potentialities of autonomously coordinated weapon systems, a trend of progressive AI weaponisation has emerged, paving the way for the adoption of what the American Association for the Advancement of Science⁸ defined as Autonomous Weapon Systems (AWS), a new paradigm of military competition incensed as the third revolution in warfare, one which could potentially disrupt existing legal frameworks prohibiting the employment of weapons of mass destruction such as the Geneva Protocol of the United Nations (Dresp-Langley, 2023). The definition of dual-use technologies – denoted by considerable uncertainty surrounding the scope and magnitude of such applications – provided by the United States Department of Defence is that of “fields of research and development displaying potential application to both defence and commercial use”; similarly, the European Union defines dual-use as items “which can be used for both civil and military purposes”⁹. Forge (2009) contributes to such debate by denoting the necessity of distinguishing between three differing kinds of dual-use elements, namely research, technology and artefacts. As part of a self-reinforcing scheme – through which research produces technology then employed to construct artefacts -drawing boundaries

⁸ See: Reports from the American Association for the Advancement of Science Meeting in Washington DC. The Science Show on ABC. 2019.

⁹ See: Regulation of the European Parliament and of the Council in Setting Up a Union Regime for the Control of Exports, Brokering, Technical Assistance, Transit and Transfer of Dual-Use Items. April 2021. European Union.

between these categories will depend primarily on the value system adopted, a significant point of contention between the CCP and the White House.

2.4. Applications of Dual-Use AI in the defence sector

Having briefly touched upon the matter of how dual-use AI – precisely, agent-based AI models entailing autonomous deployment and control of unmanned weapons, which adapt themselves to continuously evolving environments to pursue the best course of action – may impact future forms of warfare among great powers, we will now turn to considering contemporary applications of such models, and which challenges the international system faces in accommodating said enhancements. Dresch-Langley identifies the potential threats posed by the deployment of sophisticated weapons of mass destruction – including autonomous Chemical, Biological, Radiological, and Nuclear weapons (CBRN) such as nano and insect drones – as inevitably challenging ethical and normative frameworks currently regulating warfare, leading to the necessity of radically widening international legal safeguards to encompass such previously-utopian mechanisms. Whilst Kröger (2016) traced the origins of automated technology to the “*American Wonder*” remote-controlled automobile developed by the Houdini Radio Control Company and tested in 1925 in New York City, subsequent investments in the field elevated this promising, though limited in scope, technology to the degree of innovation it has reached today. Predominantly developed by private actors, thus highlighting the reversal above of importance within the field of AI R&D from the defence to the commercial sector, state actors traditionally at the forefront of technological innovation have found themselves forced to increasingly engage with non-state actors – i.e., venture capital funds and varying sorts of commercial stakeholders – to acquire access to cutting-edge technologies, successively integrated within nation-states’ defence and military sectors. In analysing the innovation brought about by said technologies, this section will focus primarily on how dual-use innovation may be accelerated via the establishment of fruitful partnerships between private and public sector actors¹⁰ while also considering empirically visible dual-use AI military applications, such as unmanned drones and sentry guns.

¹⁰ See: Starburst, The Rise in Dual-Use Technologies: A Paradigm Shift. October 23 2023. Retrieved at <https://starburst.aero/news/the-rise-in-dual-use-technologies/>

The Russian invasion of Ukraine in 2022 inevitably led to a rise of attention towards the use of unconventional weapons to the forefront of international discourse, leading numerous scholars and experts to speculate on the degree to which said technologies may disrupt and alter traditional warfare while also prompting the necessity of expanding investment and collaboration in the R&D of disruptive AI-based technologies. To this extent, the NATO Defence Innovation Accelerator for the North Atlantic (from now on, DIANA) program represents the latest DARPA-like declination of a gradual fusion of the military and civil sectors, such as the one undertaken by China and analysed by Bitzinger (2021), which will be discussed in greater detail in the chapter dedicated to the case study of China's technological growth. DIANA's ambitions to foster interconnectedness at the member states' level and amongst the civil and military sectors prove how technological innovation may also function as inherently disruptive and destabilising in the global geopolitical equilibrium. More precisely, reports analysing the potential results that emerging technologies such as AI-based weapons and Anti-Satellite (ASAT) technologies may have on the international order stress the limitations curtailing their development and deployment; concerning the implementation of Artificial Intelligence in weaponry, scholars identified normative and legal barriers as ultimately limiting the United States' capacity of efficiently employing AI into its weapons systems, while for China impediments are primarily due to the authoritarian stance adopted by the government in AI R&D, an obstacle further augmented by the level of corruption impeding a degree of AI weaponry development comparable to that of the United States. Nevertheless, investments in AI-incorporated weapon systems remain a paramount priority for state agents embroiled in great powers competition due to the widespread conception underlining the unparalleled benefits of such technology in efficiently addressing contemporary geopolitical challenges (IFSH, 2022). Located within said technologically enhanced framework, attention will now be dedicated to two potentially disruptive AI-powered weaponry systems, precisely Lethal Autonomous Weapon Systems (LAWS) and automated drones and swarms, both displaying highly transformative effects which could radically alter how excellent power competition is conceived.

When analysing LAWS, Righetti et al. (2014) define autonomous weapon systems as those capable of autonomously selecting and attacking targets, thus presenting capacities

of decision-making commonly associated with human action¹¹. While in most cases, the initial prompt would remain within the sphere of human action, whilst subsequent actions would become delegated to machines, some national governments have begun testing weapon systems which retain an unprecedented degree of freedom in targeting and deciding whether to employ lethal force, raising doubts over the ethical nature of said weaponry systems. An inherently dual-use technology –based on the same aforementioned guiding principles of agent-based AI enabling systems to adapt their choices based on the evolving environment in which they are found –these mechanisms may be applied to fighter jets, ships or even tanks, permitting them to potentially operate co-ordinately in a fundamentally unmanned and autonomous manner. Often called “*killer robots*”, their fundamentally altering potential has led policymakers and AI think-tanks to advocate for creating more effective legal and normative safeguards, seeking to curtail their transformative potential. Nonetheless, said efforts appear hindered by the incapacity of agreeing on a standard and internationally shared definition of LAWS: if no consensus is found upon the very definition of said technologies, then regulating said matter would remain glaringly strenuous (Afshar et Khorasani, 2020). Dresp-Langley dedicates greater attention to automated drones and swarms, representing a concrete reality whose deployment has already begun in countless areas worldwide. As Kallenborn (2021) remarks, these instruments are perceived as embodying the prototypes of future weapons of mass destruction, being able to provoke diffused harm due to their highly mobile nature while also being devoid of any form of human control in the assessment of their targets’ nature, thus unable to distinguish between civilian and military targets correctly. Due to this extremely dangerous inability, many of the AWS – therefore encompassing also drones and swarms, as well as sentry guns – employed today are limited to targeting objects and vehicles. Nevertheless, the possibility that said technologies might be hacked by non-conventional revisionist forces – i.e., terrorist organisations – and their purpose redirected to the targeting of innocent civilians makes it abundantly clear that greater regulation, both in terms of their employability as well as in cybersecurity in general, represents an absolute priority for democratic states seeking to accompany their development through technological enhancements, without jeopardising global stability. Being inherently more complex than stationary sentry guns – primarily due to their mobile nature, which requires the combination of several

¹¹ See: International Committee of the Red Cross, “Autonomous weapon systems technical, military, legal and humanitarian aspects”. 2014.

components permitting them to attain complete operability and functionality -drones rely on a principle that Kallenborn defines as “*emergent behaviour*”, which is understood as the collective behaviour adopted by drone swarms as a result of the comprehensive aggregation of individual units’ behaviour: this entails that the scope of individual drones’ errors in targeting may be exponentially augmented through the diffusion of said patterns to the collective level, rendering drone swarms potentially dangerous to human life. Having provided a summary of some dual-use technologies whose deployment may be crucial in altering the global balance of power, we will focus on specific national technologies and employments when debating the Chinese and American case studies in subsequent sections.

2.5. Thesis’ Structure

This literature review was primarily aimed at bringing forth fundamental background information on great power competition, considering its most traditional and conventional declination – to efficiently highlight the transformative effect that technological enhancements have had on this paradigm -while also considering how technological development may contribute to the generation of a security dilemma, such as the one we are currently witnessing between the ruling hegemon, the United States of America, and the People’s Republic of China, perceived by a large number of scholars as an inherently-revisionist power seeking to alter the status-quo by actively participating in the global order while also questioning the principles at its fundamentals and contemporarily proposing a “*parallel system*” (Jepson, 2023) both at financial and governance level.

Successively, the topic of technological sovereignty was tackled, presenting its evolution over the twentieth and twenty-first centuries up to the current technological security dilemma. In this sense, greater attention was then placed upon the role played by Artificial Intelligence in this struggle, namely its dual-use nature, presenting how the interconnectedness between civilian and military development and use may appear problematic when tackling issues of national security, as well as raising serious ethical concerns over the nature of said technologies. Subsequently, attention was dedicated to empirically definable applications of dual-use AI in the military and defence sector, presenting some commonly shared implementations and how said technologies may alter the traditional conceptions and regulations defining warfare. The following chapter will focus primarily on the methodology underlying the thesis’ structure, with emphasis placed mainly on policy papers and reports developed by think-tanks as a means of

assessing the degree to which dual-use AI has already been deployed in the current state of affairs, evaluating whether the PRC presents the necessary capabilities for surpassing the United States in terms of technological hegemony. To efficiently do this, the third chapter will be dedicated to a thorough case study of Chinese and American technological policies, analysing the pros and cons of Sino-American technological competition and how this security dilemma may be facilitated through incentivised cooperation and collaboration between these two powers.

III. Methodology

3.1. Identifying the puzzle

The existence of a pivotal forum for great power competition as technological innovation and governance, exhibiting a degree of ambivalence and transformative potential hardly witnessed in precedent declinations of great power competition, has led scholars and researchers to actively undertake the daunting path leading to the construction and operationalisation of an efficient analytical framework meant to assess both the salience of Artificial Intelligence and related notions in agency-level decision-making – i.e., in legislative and executive terms – as well as seeking to understand how this salience may then be empirically transposed into augmented military and commercial capabilities and, ultimately, bolstering one country's hopes of attaining "cyber-hegemony" at the global stage.

Acknowledging a gradual pattern of what great power competition is and how it is defined in academic terms represents the first but seminal step in upholding a fair and equitable assessment of the design of contemporary power struggles amongst leading actors. The inherent influence that material factors impose upon these kinds of tensions makes it inevitable for great power competition to progress in unison with processes of industrialisation and technical innovation, which have progressively raised the bar in terms of power enjoyed and retained by state actors; the *fora* within which tensions have arisen and led to power dispersal and subsequent reconfigurations of the international stage have similarly undergone a massive process of reshaping and alteration. While the initial observed forms of great power competition in the seventeenth and eighteenth century primarily limited themselves to economic and partially compartmentalized military conflicts, the transformative waves brought about by the end of the Second World War and the Cold War confrontation amongst the United States and the Soviet Union rendered what was previously understood as an exclusively high-security-related paradigm an exceptionally broader and more nuanced field, encompassing elements ranging from ideological confrontations - which became increasingly vivid and compelling thanks to the popularization of media of mass communication, strongly reinvigorating the scope and reach of information – as well as military tensions, however inevitably shifting towards a predominantly unmanned and automated system of conflict, hence abandoning what had been considered up to that point the orthodox path of reliance on living beings in favour of the more significant transformative potential displayed by advanced nuclear and biochemical weaponry.

While said trend provided a perspective on how the gradual interlock of technological development and matters of national security may entail consequences on the management of interest-based disputes among pivotal actors, its contemporary *niveau* has undoubtedly proved itself as potentially equally wide-reaching, albeit less glaringly so. Nevertheless, technological devices enabled by dual-use AI software headlining a new frontier for confrontation tucked within a framework of pre-existing security tensions which both the United States and China have found challenging to ease due to fundamental incompatibilities between the two states (Byun, 2024), displayed far greater transformative potentialities rendering its salience relatively more considerable than that of fellow points of contention. The 2017 US National Security Strategy¹² decision to attach the decisional framework of a great power competition to Washington's differences with Beijing reflected an official governmental adherence to a neo-mercantilist-inspired trade protectionist perspective in all facets of commerce, inevitably extending to a sector as vital to American national security as Artificial Intelligence and technological advancements as a whole (Gulo et Dwiastuti, 2022). Former President Trump's administration's agenda regarding foreign policy isolationist attitudes in international cooperation¹³ and the development of furthered economic ties with NATO member states, further alienating Washington from its heightened position within the international standing. Trump's policies resonated primarily with the portion of the electorate typically defined as composed by the *losers* of globalization, those suffering the most from the growing trade and economic global interdependence rendering outsourcing and automatization an extremely concrete threat to their livelihood: a 2016 statistical survey¹⁴ based on the presidential election results pointed towards a 0.5 correlation between what were defined as "old economy" jobs – i.e., agriculture, construction, manufacturing and trade – and their degree of support for Trump, demonstrating a positive relation between stagnating wages and soaring unemployment within the blue-collar working community – complemented by the similarly positive correlation of 0.61 between lack of higher education and voting for Trump – and support for proclaimed protectionist measures seeking to provide relief to disadvantaged sections

¹² See: National Security Strategy of the United States of America. December 2017. The White House. Retrieved at <https://trumpwhitehouse.archives.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf>

¹³ See: U.S. Exits Paris Climate Accord after Trump Stalls Global Warming Action for Four Years. November 2020 Scientific American. Retrieved at <https://www.scientificamerican.com/article/u-s-exits-paris-climate-accord-after-trump-stalls-global-warming-action-for-four-years/>

¹⁴ See: The Geography of Trumpism. March 2016. In The New York Times. Retrieved at <https://www.nytimes.com/2016/03/13/upshot/the-geography-of-trumpism.html>

of the population, which however his administration has been unable to efficiently perform, instead widening the glooming substantial wage gap persisting between the top 20% and the bottom 20% of American populace (Scott, 2020). While the Biden administration refrained from referring to its tension with China as a great power competition in its 2022 National Security Strategy, reference to Beijing as an emerging great power remained, similar to adopting trade barriers meant to curtail Chinese growth in the technological and industrial sector¹⁵. Fostering said a return to a neo-mercantilist-inspired conception of international competition between the two countries has been delicate geopolitical points of contention, particularly salient in the East Asian region but expanding to potentially encroaching American commercial and military influence within the Latin American and African regions. (Gachúz and Urdinez, 2022; Wang, 2022). Additionally, Sino-American disagreements persist within the ideological sphere, wherein the robust growth in Chinese AI development fosters the possibility for the PRC to succeed in promoting an alternative model of governance amongst developing nations while alienating OECD leaders distrustful of Chinese ethical and normative approaches in the context of digital governance (Sullivan, 2021).

Henceforth, numerous elements present in the narrative above seem to point towards the persistence of an internationally polarised state of affairs unless steps are undertaken to promote the adoption of models of ethical and good governance meant to combine the protection of national security concerns and models of interconnectedness without excessively destabilising the international order as is (Nye, 2023). Advocating for more extensive employment of soft power – persuasive rather than inherently conflictual – measures may prove vital in acquiring a degree of cooperation with China sufficient to foster efficient industrialisation and advancement without jeopardising military stability in the region. Nevertheless, Nye observes the current climate as being unable to decouple itself from concerns over security issues, with both states gradually descending into a spiral of constant bickering, likely leaving little room for engendered cooperation. Feelings of anxiety surrounding Beijing’s growth seemed to have struck Washington’s advisers in a manner paralleled by Nye to Thucydides’ accounts of how Spartans had begun to perceive the Athenian economic prowess shortly before the Peloponnesian War. Despite this, more cautious perspectives such as the one provided by scholar David

¹⁵ See: National Security Strategy of the United States of America. October 2022. The White House. Retrieved at <https://www.whitehouse.gov/wp-content/uploads/2022/10/Biden-Harris-Administrations-National-Security-Strategy-10.2022.pdf>

Shambaugh – an analyst of the Chinese armed forces – seek to underline how achieved advancements in the Chinese armed forces’ weaponry and deployment potentialities have not yet been as groundbreaking nor as threatening as perceived within the Western world. This view further explains how misperceptions concerning Beijing’s threat to international security have been misplaced to military factors instead of the more substantial economic power the PRC could employ to ensure its ascendancy within the international order (Tench, 2023).

Nevertheless, what perspires from this stand is that tensions will, at minimum, persist in the medium-term period, as claims highlighting the gradual wane of Washington’s soft power point towards a Chinese economic and political expansion in geopolitically decisive regions (Zreik, 2024). In achieving such a feat, the prospective developments in dual-use AI-enabled technologies and their use as instruments of soft power (Horowitz, 2018) play a crucial role in furthering Beijing’s interests without necessarily resorting to traditional hard power means, which employability has immensely declined due to the vast array of institutional safeguards placed at global level through the practice of international organisations and intergovernmental cooperation. Hence, the possibility of circumventing this obstacle appears feasible if Beijing can efficiently harbour its economic and industrial strength both within and outside the Indo-Pacific whilst investing in digital means applicable in civil and military sectors; despite this, the United States has remained vigilant throughout, seeking to contain what Washington deemed as excessive Chinese demands (Medcalf, 2019).

3.2. Formulation of Research Question

Based on this theoretical framework, positing the United States and China as embroiled in an increasingly contentious relationship embittered by ideological differences and national interest aims, giving way to patterns of security-dilemma-inspired competition within the field of technological innovation, we try to underline whether Beijing will effectively succeed in tipping the scale of global hegemony in its favour or rather fail in supplanting the United States as the leading power of the worldwide system. By engaging with such a theoretical perspective, our analysis will attempt to bring forth a qualitative analysis rooted in theoretical guidelines presented beforehand, as well as providing insights seeking to demonstrate the interconnectedness of geopolitical confrontations persisting amongst Washington and Beijing and the challenging path of renewed manufacturing autarky (Duesterberg, 2020) which both countries – alongside their spheres of influence – seemed to have committed themselves to, primarily as the

culmination of confrontations which, over the last decade, have led complete economic interdependence to come under stark criticism by analysts perceiving it as a potential threat to national security concerns. Whilst this phenomenon is understood by a particular portion of scholars¹⁶ as self-fulfilling, owing its existence to a combination of political and security – i.e., COVID-19 – issues and mainly depending on misplaced feelings of anxiety on behalf of Washington’s officials regarding trade with Beijing, what is undeniable is that in effect, the number of attempts at dialoguing amongst both countries seems to have dwindled over the last years. As an accompanying factor, the analysis will also take into consideration the underlying intentions characterising both countries’ approaches as reflected by Beijing’s civil-military fusion project and Washington’s attempts at attaining renewed collaboration with Silicon Valley leaders, several who had begun to perceive a rift between the political world and their industry, frequently resulting in reduced potentialities for integration amongst a leading-civil sector and government priorities¹⁷. Furthermore, said predominantly descriptive form of analysis will be coupled with an empirically grounded quantitative inquiry seeking to consider the amount of governmental discourse on the notion of “dual-use AI” through the form of legislative proposals, think-tanks and governmental committees reports, relying on websites (e.g. Congress.Gov) to provide an open-access source for what concerns the White House’s policies. Whilst the difficulty of obtaining official Chinese governmental papers will inevitably hinder said approach, scholarly research and open-access sources will similarly be employed to seek a fair comparison. Investments in the technological sector will be put under the spotlight as we strive to determine how much both countries value this field for confrontation as effectively and crucially as we think. The presented analytical framework aims to weigh into the influence exerted by the development of dual-use AI capabilities upon excellent power competition by considering how much relevance the implied shareholders attach to it and what forms of empirical action they have taken to attain this. In doing so, scrutiny will be dedicated to the persisting material differences between Beijing and Washington in the intellectual and industrial facets of technological development, as well as Beijing’s *impasse* amid its process of assertion of dominance

¹⁶ See: The Dangers of Misunderstanding Economic Interdependence. Daniel. W. Drezner. CATO Institute. September 2023. <https://www.cato.org/publications/dangers-misunderstanding-economic-interdependence>

¹⁷ See: Tech in the Trenches: Silicon Valley has shown a remarkable indifference to national defense, depriving the Pentagon of both brains and technological brawn. Amy B. Zegart and Kevin Childs. Hoover Digest. Spring 2019. Retrieved at <https://go.gale.com/ps/i.do?id=GALE%7CA613134743&sid=googleScholar&v=2.1&it=r&linkaccess=abs&issn=10885161&p=AONE&sw=w&userGroupName=anon%7Ef3c380e1&atv=open-web-entry>

over Taiwan, hindered by its dependence on manufacturing capabilities harboured within the island's industrial *stratum*.

Henceforth, the analysis developed throughout the *corpus* of this work seeks to ascertain the relevance of the role played by advancements in the field of dual-use Artificial Intelligence, notably as inscribed within the wider framework of great power competition. This thesis posits that Chinese endeavours to pursue greater autonomy at an industrial and commercial level, thus aiming to reduce Beijing's dependence on Taiwanese manufacturing of semiconductors, whose employment remains crucial throughout the processing and formation of efficient dual-use AI-enabled technologies. Regularly eluding trade restrictions imposed on the Taiwanese industry by the Chinese government, the semiconductor sector remains a leading industry for the islet, upon which large percentages of Western leading IT industries continue to rely on providing fairly cheap and cutting-edge technologies¹⁸. As Beijing remains constrained in this unfavourable position, pursuing manufacturing autarchy to favour a decoupling of some of its most pressing national security issues – i.e., the historical geopolitical confrontation with Taiwan, as well as the technological tension with the United States – would arguably represent Beijing's most efficient choice to combine technological and industrial growth as well as greater political leverage at global level, however potentially resulting in a radical worsening of existing security-dilemma-induced dynamics which have characterised the state of affairs within the Indo-Pacific region- as well as beyond – over the last decade. A foundational principle for Maoist economic and political philosophies, “*autarkist self-sufficiency*” has seemingly returned to the forefront of political discourse amongst top-ranking Beijing officials, with President Xi Jinping remarking the cruciality of assuring safe economic growth – primarily to be attained via improvements in the state's technological manufacturing capabilities – in the 5th Plenum of the Central Committee of the Communist Party in October 2020, laying down the foundations for Beijing's course of action through the country's 14th Five Year Plan, starting in 2021 until 2025, whilst also retaining a foundational role as a guiding long-term economic principle through 2035 (Lam, 2020). Representing an official commitment to an innovative strategy referred to by the CCP administration as “*dual domestic and international circulations*”, the PRC has been perceived as seeking to engender a pattern of safe growth for Beijing, reducing the country's dependence on core technologies produced abroad –

¹⁸ See: Why China is not sanctioning Taiwan's key chip industry. Al Jazeera. August 2022. <https://www.aljazeera.com/economy/2022/8/4/why-china-is-not-sanctioning-taiwans-crucial-tech-industry>

and commonly in Taiwan, thus representing a further limitation for obvious geopolitical reasons – by promoting a renewed form of development focusing on domestic circulation. Nevertheless, decoupling similarly remains a paramount priority for Washington, even as the Biden administration substituted Trump’s into office. Whilst leading White House officials have appeared to employ a milder terminology when referring to the reduction in economic and political interdependence between the two states¹⁹, what is perceived within the global arena is that both countries have seemingly consciously undertaken a path towards decoupling, both aiming to prioritise national security concerns: while Beijing’s decoupling strategy aims to improve its manufacturing capabilities and provide greater freedom of action to the PRC, Washington’s plans are designed to limit Beijing’s rise as much as possible, reducing Chinese companies’ operativity within the country as well as curbing trade relations as a means of offsetting Chinese economic growth at international level. By extension, decoupling practices seem to have extended themselves to the technological sector, which has become crucial for countries’ security concerns and determinant in their efforts to impose assertiveness on the international stage. Bateman’s analysis (2022) rightfully remarks how technological interdependence displays a highly ambivalent nature in contemporary global affairs: whilst Washington benefits from developments attained in the Chinese technological sector, on the other hand, the CCP contemporarily employs enhancements to engender its military buildup, increase societal control – often in a repressive manner, resorting to software enabling facial recognition, making it simpler for the party *cadres* to enact controlling policies seeking to maintain order at the expenses of freedom of action²⁰. Henceforth, a commonly shared belief grounded upon greater technological decoupling emerged amongst American policy advisors and scholars. Still, the degree of separation that should be achieved remains relatively vague. While insufficient decoupling may ultimately result in insufficiently stunting Chinese manufacturing and industrial growth, an excessive effort in attaining said goal may prove counterproductive to American enterprises, constantly relying on Chinese technology to accrue their competitiveness at the international level. The establishment of what has been defined by several observers as “*splinternet*”, a doctrine commanding the division in spheres of digital influence between the United States and China, appeared as a feasible project – upheld by think tanks and policy experts –

¹⁹ See: Measuring the US and China’s conscious decoupling. U. Galani and A. F. Alias. In Reuters. November 2023. <https://www.reuters.com/breakingviews/measuring-us-chinas-conscious-decoupling-2023-11-16/>

²⁰ See: How China uses facial recognition to control human behaviour. In CNET. A. Ng. August 2020. <https://www.cnet.com/news/politics/in-china-facial-recognition-public-shaming-and-control-go-hand-in-hand/>

throughout the first half of the 2010s as a potential consequence of engendered technological regionalisation amongst the two countries, but its realizability seems to have transformed into a mere illusion, predominantly stunted by the enormous costs entailed in repurposing such a cutting-edge infrastructure; furthermore, said approach appears to neglect the dynamics of path dependence commonly implied within technological development (Redding, 2002), rendering said “*Balkanisation*” of the digital sphere relatively improbable²¹.

Hence, reflecting Bateman’s enquiry, we perceive full-blown digital regionalisation as ultimately counterproductive for both Washington and Beijing; nevertheless, what cannot be denied is that both the United States and China have become more committed to embarking on a path towards technological and industrial decoupling, the extent of which remains uncertain, both due to policymakers’ doubts – and in some cases, inexperience – regarding strategic technologies, as well as unwillingness by state leaders’ to publicly declare their course of action in adopting said approach. Having provided a brief overview regarding said neo-realist-inspired return to technological isolationism, the following chapter – dedicated to the American and Chinese case studies – will further analyse how dual-use AI technologies, as strategically vital instruments in the hands of the state, may effectively impact military build-up and security concerns, with the primary focus being placed on the impact that dual-use technologies may have on the global state of affairs, namely on whether Beijing will effectively be able to attain a degree of warfare capable of threatening American global leadership; the methodologies and the scope of the study will be described in greater detail in the following paragraph.

3.3. Scope and Methodology

This research project will be carried out by analysing two case studies – the Chinese and the American – and, hence, a study focused primarily on state- and systemic-level enquiry on governmental interaction and discourse regarding dual-use AI and its employment. Channelling our attention to state actors and their behaviour – domestically and at the international level – will help us understand the national security implications lying beneath the *façade* of mere technological innovation and how – even in democratic countries like the United States – issues related to these processes represent a bipartisan

²¹ See: How tech regionalization could lead to the splinternet. The Economist Intelligence Unit. May 2022. <https://www.eiu.com/n/how-tech-regionalisation-could-lead-to-the-splinternet/>

challenge equally valued by all actors within the political spectrum. Although tempted to enlarge our discourse to encompass other relevant actors within the international order – i.e., Russia, India, and the European Union – doing so would have resulted in a series of superficial and ultimately unfulfilling inquiries. By radically restricting the work’s sphere of action through the adoption of Beijing and Washington as our sole objects of analysis, the work benefits in terms of depth and carefulness, enabling the readers to acquire a meaningful insight into the technological and military capabilities of the two states and eliding additional and extra information which would have solely confused the reader. Furthermore, it becomes possible to identify the United States and China as the leading hegemon and its *princeps* competitor, respectively, leading to the identification of the technological struggle characterising the 4IR as intrinsically deriving from great power competition dynamics, thus allowing for the potential perspective of the hegemonic power’s cycle ceasing as a natural stage of Hegemonic Stability Theory. By moving within a structure predominantly based upon interest-based calculations and decision-making, we can frame technological innovation as equally driven by national security concerns, paradoxically adopting the form of a robust realist conception of a *zero-sum game*, where one country’s advancement represents the other’s loss. In the adoption of such a macro-level of analysis within the field of dual-use AI enhancements, predominantly revolving around interaction amongst traditional state actors at the international level, domestic forces – commonly neglected by scholars upholding Hegemonic Stability Theory, as noted by Aydin (2019) – will be primarily considered: notably, attention will be placed upon the degree of lobbying exerted by leading industries and governmental departments in the process of promoting technological growth, and how this growth has been altered, going from international cooperation and dialogue to an increasingly autarchic view upholding industrial and ideological autonomy, predominantly due to the surge in the salience of high-security concerns stemming from the development of emergent technologies powered by dual-use AI software. Henceforth, this analysis seeks to understand whether the future of great power competition between Beijing and Washington will remain in a “*cold war*” status – lacking confrontations amongst the two actors – or dramatically escalate to a degree of open conflictual for this to occur, we posit that China would require a degree of utmost technological superiority – as well as ideological support – which it currently lacks relatively to the U.S., thus rendering the possibility of a confrontation between the two countries relatively unlikely due to the immense opportunity costs implied by undertaking such a path of action

(Brooks et Wohlforth, 2016). The two aforementioned case studies are built around a comprehensive approach aiming to combine qualitative and quantitative analysis in conducting an overall assessment of each state's capabilities: whilst the qualitative facet will primarily take into consideration historical attempts at integrating private and public technological growth as well as geo-political factors partially impeding Chinese freedom of action within the digital sphere, the thesis' quantitative analysis will take into account statistical data referring to each country's legislative progresses in constructing and enforcing technological innovation – as well as upholding renewed standards of governance meant to constrain the potential threats stemming from this kind of unprecedented capability – and investments dedicated to the technological sector, as well as additional information surrounding patents and entrepreneurial activity meant to provide a meaningful perspective into the degree of national intellectual activity and how this latter element may be stimulated at central level by state apparatus. Following Braumoller et Sartori's (2002) theorisation on the nature of quantitative analysis as commonly employed in International Relation research models, reliance upon statistical data reflecting defence and technology research investment, as well as capacity-building, by both countries will be framed as consistent with structural necessities imposed upon international players by strategic dynamics denoting great power competition, hence serving as the foundational basis upon which both qualitative and statistical analysis are built; the centrality of theories in assessing empirical facts is difficulty overstated, though what the authors perceive as a dangerous practice is that of neglecting the theory-building process, ultimately rendering causal inferences drawn from statistical observations utterly pointless as devoid of any form of substantial normative support. Thus, this work will attempt to provide theoretical and empirical support to its claims as much as possible, with statistical inquiries being carried out depending entirely upon the theoretical framework. In assessing the actors' intentions and patterns of behaviour, attention will be devoted to a quintessential game-theoretic model aiming to weigh the benefits of engendered interstate cooperation with those stemming from the adoption of purely competitive practices; in doing so, determining the players' stakes, their degree of commitment to the proclaimed objectives, the information available to them before taking a specific course of action as well as the relationship existing amongst the various potential choices they may make represents a paramount priority for the social researcher, who becomes actively engaged in the construction of a theoretical structure meant to support its arguments proactively. By constructing said

models and, more importantly, taking into account multiple degrees of variation based on the actor's contingencies and externalities influencing their decision-making procedures, this work strives to encapsulate. The decision to restrict the number of variables to be analysed within our enquiry represents a deliberate choice aiming to provide equal attention to all without excessively enlarging the scope of what would otherwise become a confused scramble at grasping the surface of the issue at stake (Achen, 2003). While the parameters of analysis will be presented and further explained in this section, the following chapter will consist of two separate case studies focusing respectively on the United States and China, permitting a more in-depth survey of whether the identified independent variables interact with each other and may effectively impact the fulfilment of a shift in the power relations characterising Beijing and Washington's engagement with one another.

This work sets out to construct an apt explanatory framework to help readers gain insight into a potential viewpoint within the present ever-growing conflictual stances adopted by both governments, starkly reflected in terms of international governance²² and commercial ties. By having framed said rift as strongly driven by security-dilemma dynamics persisting between the PRC and the US – alongside Beijing's regional competitors, which have similarly intensified military and economic build-up as uncertainty about Chinese intentions and long-standing interest-based disputes seem to have affected multiple states' policies (Liff and Ikenberry, 2014) – we can understand how this same theoretical approach applies to technological manufacturing and its pivotal role in the process of military advancement and defence capabilities enhancement, notably in the form of dual-use AI technologies, adapting themselves to civilian and warfare purposes and serving as a deciding factor in an eventual direct conflict amongst the two actors; nevertheless, the far-reaching potentialities of dual-use AI extend themselves to forms of indirect and proxy combat, augmenting states' capacity to undertake massive cyberespionage operations aiming to radically weaken an adversary's defensive capabilities or acquire classified national security information (Ambrus, 2020). To put it more simply, this work seeks to determine the potential impact that dual-use-enabled AI technologies may have on the current state of affairs and whether their potentialities could effectively serve as the driving force behind a Chinese rise to a

²² See: A Relationship Under Extreme Duress: U.S.-China Relations at a Crossroads. Michael D. Swaine. Carnegie Endowment for International Peace. January 2019. <https://carnegieendowment.org/2019/01/16/relationship-under-extreme-duress-u.s.-china-relations-at-crossroads-pub-78159>

position of power, enabling them to openly challenge Washington's hegemony within the digital dimension, an effort partially supported by the White House's attempts at disengaging tech bases and supply chains with Beijing. While acknowledging the limitations stemming from undertaking such a project, ranging from the relative inability to acquire full access to governmental information and data to the difficulties of testing hypotheses applied to a macro-level analysis affected by a myriad of varying processes, the work seeks to provide a robust foundational basis delineating the tenets and forms of great power competition.

3.4. Why dual-use AI?

The process of selecting which topic to cover in this research appeared as a complicated one immediately from the outset: among the aforementioned strategic technologies being developed, several retain heightened relevance within international discourse; the decision to focus my thesis on the potentialities unleashed by dual-use AI-enabled technologies represents a conscious attempt at delineating the potential security repercussions entailed by greater technological decoupling at Artificial Intelligence level. A vital frontier for national competition in strategic technologies between Washington and Beijing, AI-based technologies retain their role as the pivotal point of contention between the two countries, thus denoting how management of dual-use AI and its inherently ambivalent nature remains a paramount priority for American and Chinese policymakers. Its innate capacity to coordinate economic growth and national security matters through the furtherance of R&D and manufacturing processes – designed to accommodate both commercial and military-focused projects - has undoubtedly contributed to the high degree of salience currently enjoyed by this form of technology, rendering it an absolute priority for Washington and Beijing officials, primarily in terms of governance, with the United States and its allies pushing for more comprehensive and efficient guidelines meant to streamline and limit the large number of potential threats entailed by large-scale diffusion of dual-use AI-enabled technologies. Having already defined dual-use technology in the previous chapter – wherein we remarked on its unprecedented capacity to serve both peaceful and military purposes²³ - we thus observe how instruments powered by this form of technology regularly appear in our everyday

²³ See: Artificial Intelligence as Dual-Use Technology. Research Outreach. October 2023. [https://researchoutreach.org/community-content/artificial-intelligence-dual-use-technology/#:~:text=Dual%2Duse%20technology%20\(DUT\),to%20a%20far%20higher%20level.](https://researchoutreach.org/community-content/artificial-intelligence-dual-use-technology/#:~:text=Dual%2Duse%20technology%20(DUT),to%20a%20far%20higher%20level.)

life, nevertheless potentially extending their range of action to the battlefield, hence exhibiting their strong transformative potential. One clear-cut example of how value-neutral dual-use AI-enabled technologies may be employed for both civilian and military purposes is that of facial recognition software, commonly employed by smartphone manufacturing companies to provide simpler ways to access personal devices; despite this, this technology's potential for military use appears evident to the eyes of scholars and observers, with reports of ever-increasing deployment of face-recognition-powered drones capable of autonomously detecting targetable enemies, as well as potentially enabling the establishment of enormous personal databases on the grounds of its biometric capacities. Whilst this latter employment may appear to the eyes of the average observer as a distant, dystopian eventuality, national governments have increasingly bolstered their development and integration of facial recognition software in their weaponry, primarily as a way of gradually decoupling the necessity of human supervision and final decision-making from a new conception of warfare, rooted in the belief that engendered deployment of unmanned and autonomous systems may bring forth renewed possibilities for state actors, reducing human loss on one side while acquiring far greater disruptive potentialities in terms of military capacities and intentions. With reports confirming the impending utilisation of facial recognition software implemented within the mainframe of combat drones²⁴, numerous cries for heightened regulation and global governance in terms of the development and employment of dual-use AI have propped up, calling upon global leaders to comprehensively subscribe to renewed norms of conduct regarding the potential threats posed by AI to national security and personal well-being and safety. While reported benefits have been lauded as trail-blazing a renewed understanding of warfare – and subsequently, inter-state competition -limitations and deficiencies persist, rendering their deployment a highly questionable matter, often generating controversy surrounding the extent to which face-recognition software may be correct in their autonomous assessments (Hsu et Chen, 2015). Attacks perpetrated by unmanned aerial vehicles – commonly referred to as UAVs – powered by facial recognition software have seemingly multiplied with the unfolding of contemporary conflicts, as testified by their engendered employment both in the Russian invasion of Ukraine, as well as the Israel-Hamas conflict whilst demonstrating that warfare has

²⁴ See: Israel Deploys Expansive Facial Recognition Program in Gaza. The New York Times. March 2024. <https://www.nytimes.com/2024/03/27/technology/israel-facial-recognition-gaza.html>; see also U.S. Air Force's Drones Can Now Recognize Faces. Uh-Oh. Popular Mechanics. February 2023. <https://www.popularmechanics.com/military/a43064899/air-force-drones-facial-recognition/>

undoubtedly begun to undergo a process of profound renovation and transformation if compared to previous declinations, indiscriminate use and uncertainty surrounding their efficacy seem to cast prominent shadows over their nature²⁵. Recently, intelligence forces involved in the Israeli-Palestinian conflict have revealed the extent to which IDF *cadres* rely on AI-powered databases to efficiently scan and detect individuals linked to terrorist groups such as Hamas and Palestinian Islamic Jihad, inevitably furthering the blurring of lines between conventional and advanced warfare. This AI software, called Lavender, enabled the collecting and processing an enormous amount of data, often autonomously and with minimal human contribution – outside of the final deciding say - in the process (McKernan et Davies, 2024). It thus comes as no surprise that global leaders in weapons manufacturing and technological enhancements have identified further developments and adjustments to Artificial Intelligence as a paramount priority for strategic management while contemporarily promoting the adoption of efficient guiding mechanisms and legal safeguards seeking to streamline shortcomings and inadequacies to transform dual-use AI-powered technologies into more ethically accepting – and accepted – instruments: nevertheless, beliefs upholding the development of artificial intelligence as a seminal motor in emerging security-relevant technologies have become widely shared amongst world leaders, with Russian President Vladimir Putin declaring – in 2017 – that whichever country managed to acquire the edge on these cross-cutting technologies would then be facilitated into assuming a position of utter dominance upon the international order²⁶. As world leaders become increasingly conscious of the potential double-edged consequences that excessive reliance upon artificial intelligence may entail – notably for what concerns dual-use technologies, which display an innate predisposition for manifold applications - , national governments as well as supranational organizations – i.e., the European Union – have become more attentive towards correctly addressing consequent risks, with normative efforts such as Brussels’ Ethics Guidelines for Trustworthy AI²⁷ and the White House’s Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence²⁸ representing seminal documents in the construction of a broader

²⁵ See: Gaza: Israel systematically uses quadcopters to kill Palestinians from a close distance. In Euro-Med Monitor. February 2024. <https://reliefweb.int/report/occupied-palestinian-territory/gaza-israel-systematically-uses-quadcopters-kill-palestinians-close-distance-enar>

²⁶ See: Putin says the nation that leads in AI ‘will be the ruler of the world’. In The Verge. September 2017. <https://www.theverge.com/2017/9/4/16251226/russia-ai-putin-rule-the-world>

²⁷ See: Ethics guidelines for trustworthy AI. Publications Office of the European Union. <https://op.europa.eu/en/publication-detail/-/publication/d3988569-0434-11ea-8c1f-01aa75cd71a1>

²⁸ See: Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence. WH.gov. <https://www.whitehouse.gov/briefing-room/presidential-actions/2023/10/30/executive-order-on-the-safe-secure-and-trustworthy-development-and-use-of-artificial-intelligence/>

legal framework designed to promote fair and ethical R&D processes, as well as bolstering state-level attempts at promoting civil-military integration programs meant to enhance the national government's capacity to develop cutting-edge technologies and retain technological – and thus, military, superiority over the opponent. In supporting the growth of normative and legal safeguards, policy advisors from Washington and Beijing have also suggested the cruciality of promoting a trend, as mentioned above, of gradual decoupling of technological development, embarking themselves into what Pecotic (2019) defines as an 'AI arms race', devoid of significant conflicts amongst the actors at play but contrarily beleaguered with ideological and normative points of contention amongst the White House and the National People's Congress, inevitably leading to a freeze in commercial and financial relations. But whilst the pursuit of an actual technological decoupling seems to mandatorily necessitate a more significant division between the White House and Beijing, adopting said stance could eventually result in backfiring consequences for the United States, potentially permitting the PRC to pursue its strategic goals of attaining a fully-automatized army in the medium- and long-term. Enabling technological decoupling risks eroding the long-term advantage that the White House has been able to maintain over Beijing, as noted by Scharre (2023): the imposition of restrictions limiting exports of American semiconductors towards China whilst ensuring a short-term solution impeding Beijing from incorporating latest AI developments within its military sector, contemporarily foments engendered technological autarchy for the PRC by highlighting patterns of overreliance on foreign-produced chips and semiconductors which have served as deterrents for Washington in keeping Beijing in check. Henceforth, suppose the Biden administration continues to pursue the said approach. In that case, its consequences may negatively impact the regional balance of power in the Indo-Pacific region rather than positively, as imagined by Washington policy advisors. Achieving full-blown decoupling, thus indirectly pushing the PRC towards the construction of an advanced and efficient manufacturing and commercial technological industry, may result in the outcome most feared by the White House, one in which Chinese dependence on Taiwanese and Western semiconductors and chips – both of which are of utmost cruciality in the development of Artificial Intelligence technologies – may be completely eroded, eliding the elevated degree of leverage currently enjoyed by the United States upon China. Suppose Washington were to relax recently promulgated trade restrictions on strategic technologies. In that case, it may succeed in maintaining Beijing on a leash, restricting access to critical advancements

when necessary, rather than in an absolute manner. Furthermore, promoting cooperation and coordination between the two states in a dimension as delicate as the digital one could potentially foster renewed and comprehensively agreed-upon ethical and legal normative seeking to address the countless challenges implied by the development of dual-use AI-powered instruments.

Having framed the current competition between Beijing and Washington within a context of mutual decoupling, it comes as no surprise that the emphasis of this research is placed upon what is widely considered to be the most vital point of contention in strategic technologies among the U.S. and China, that of artificial intelligence, with particular focus being placed on dual-use applications potentially extending their range of action to both civilian and military uses. The following chapter will thus be dedicated to two case studies. Emphasising the degree of innovation in AI-related technologies in the United States and China, respectively, grounded upon the assumption of an underlying decoupling of strategic technologies as upheld by both Beijing – whose imports towards American soil have decreased by around 13% subsequently to the introduction of tariffs, however predominantly impacting tariffed goods; interestingly enough, the two countries which acquired the most significant advantage in market shares concerning strategic goods – including technologies such as artificial intelligence-related instruments – are South Korea and Vietnam, two of Beijing's fiercest regional competitors (Freund et al., 2023). These latter countries, whose points of contention with the PRC, have primarily been animated by security-dilemma-induced dynamics owing to rapid Chinese military and economic expansion and growth.

IV. Case Studies

4.1. Introduction

The work conducted in the previous chapters enabled us to contextualise the current tense dynamics in technological capabilities and potentialities persisting amongst Beijing and Washington as fundamentally engrained in a bivalent series of conscious attempts seeking to acquire more significant technological decoupling from each other. This radical reversal in commercial and economic relations, profoundly altering how the Sino-American partnership - both within and outside the tech realm - had been conceived since the turn of the millennium, is identified by scholars as organically stemming from a return to great power competition-induced dynamics, halting the pursuit of globalization-influenced practices which had rendered the White House and the Communist Chinese Party closer than ever (Riecke, 2020). As great power competition returned to the forefront of international discourse following the loss of credibility suffered by neo-liberal policies seeking to augment interconnectedness among national actors, Chinese developmental programs assumed a more malignant form in Washington's eyes, fearing for its position of power within the international order. Extensive and rapid military build-up on behalf of China – alongside far-reaching technological enhancements and aggressive economic policies seeking to expand Beijing's influence upon Washington's traditional trading partners – have led White House policymakers to reconsider private and public interactions with the Chinese state in a series of attempts seeking to streamline Chinese expansion. Whilst the first decade and a half of the 2000s marked a period of almost-symbiotic economic relations between Washington and Beijing – sufficiently comprehensive to inspire British historian Niall Ferguson and German economist Moritz Schularik to coin the term '*Chimerica*' to define the beneficial interactions amongst the two states – a pattern of reciprocal distrust seems to have acquired normative power in dictating Sino-American relationships, liquidating the amount of positive progress which had been obtained in the normalisation of relations amongst two global powers which, together, accounted for one-third of GDP and 50% of global growth over the period 2003-2009²⁹. Ferguson and Schularick (2009) identified how the concept of *Chimerica*, which they understood as a flexible economic order combining Chinese export-led developments with US over-consumptive practices, was questioned throughout the

²⁹ See: 'The End of *Chimerica*'. CIGI. Retrieved at <https://www.cigionline.org/articles/end-chimerica/>

aftermath of the 2008-2009 Wall Street financial crisis. Whilst Chinese policymakers cherished the beneficial potentialities entailed by undertaking such close cooperation – namely, its economic growth prospects being engendered by the demand represented by American consumers –, the Wall Street crash opened up a window for reflection, leading Beijing’s power players to acknowledge the utmost unreliability of massively-indebted American consumers as a foundational basis for export-led industrialisation, as well as the dysfunctionality of pegging the Chinese renminbi to the American dollar, ultimately exposing Chinese investors to volatility in the American economy, effectively marking the turn to the abandonment of patterns of economic and military integration³⁰ in favour of strategic competition within primary key industries (i.e., microelectronics³¹, AI, electric) primarily pursued through the mutual imposition of sanctions and barriers to trade³² as means for the protection of their national interests.

Although at the time of writing their work, the ‘*Chimerica*’ model merely previewed several potential future pitfalls, such pessimistic forecasts became reality – strengthening the idea of self-fulfilling prophecy in public policy – with the election of former US President Donald Trump, who decided to extend hitherto limited trade restrictions to encompass the technological realm, arguably the most decisive frontier for confrontation in modern great power competition. In doing so, the Trump Administration broadened the scope of trade restrictions by targeting Chinese tech-giant Huawei, even going as far as pressuring foreign allied governments not to construct their 5G networks on Huawei technologies, mainly due to shared preoccupations concerning the degree of control that Beijing may exert upon the company’s business³³³⁴. While this decision appeared to mirror a neo-mercantilist perspective on international affairs, predominantly owing to Trump’s understanding of mercantilist policies (Barro, 2019), said approach towards former Chinese partners did not cease with Trump’s loss in the 2020 Presidential

³⁰ See: The Rise and Fall of U.S. Engagement Toward China. Tufts University. August 2020. Retrieved at <https://sites.tufts.edu/css/the-rise-and-fall-of-u-s-engagement-toward-china/>

³¹ See: China’s Semiconductor Industry Advances despite U.S. Export Controls. In CSIS. March 2024. Retrieved at <https://www.csis.org/analysis/chinas-semiconductor-industry-advances-despite-us-export-controls>

³² See: China sanctions defence-related U.S. companies and executives over Russia, Taiwan. ABC News. May 2024. Retrieved at <https://abcnews.go.com/US/wireStory/china-sanctions-defense-related-us-companies-executives-russia-110471394>

³³ See: Trump administration imposes new Huawei restrictions. AP News. Retrieved at <https://apnews.com/article/smartphones-business-china-asia-pacific-us-news-7a01cf8cf13f7681df62094f27b1bcbe>

³⁴ See: Trump admin slams China’s Huawei, halting shipments from Intel, others – sources. Reuters. Retrieved at <https://www.reuters.com/article/idUSKBN29M0KC/>

elections: whilst Joe Biden backtracked on several choices followed by the Trump administration – i.e. the decision to rejoin the Paris Agreements, which the Trump administration had abandoned on claims of threats it posed to the efficiency of the American economy -, the course of action undertaken in regards to China remained somewhat identical to Trump's, demonstrating how Sino-American tensions had gained a key position in the forefront of discourse surrounding national security and interests and had acquired a bipartisan nature, transcending mere party disagreements (Carothers and Sun, 2023). By targeting Huawei and its manufacturing processes through the imposition of commercial bans impeding the Chinese firm from employing Western-produced advanced computing chips, Washington seeks to limit developments in AI capabilities on behalf of China, addressing, in the words of US Secretary of State Antony Blinken, “only the most sensitive technology”, meaning technological capabilities which could endanger U.S. national security interests, rather than comprehensively seeking to cut off trade or hold China back, as American-based companies Intel & Qualcomm maintain their license to sell chips to Chinese firms³⁵. Moreover, Washington has pressured its allies to pursue a comparable tightening of restrictions on Beijing's access to semiconductor technologies to limit the CCP's capacity to develop domestic chip manufacturing capabilities. In promoting such a widespread disentanglement and decoupling at the technological level, the results stemming from this approach may be more counterproductive than beneficial, as Beijing appears incentivised to limit its reliance on foreign technology whilst promoting national value-chains aimed at engendering Chinese chip manufacturing. A recent meeting between Blinken and Chinese President Xi Jinping further reiterated the core differences at the policy level between Washington and Beijing. However, a promising compromise appeared to be reached in Artificial Intelligence, establishing the first-ever U.S.-China intergovernmental dialogue on AI, designed to provide a far-reaching forum within which interaction between policymakers is eased³⁶.

So, while attempts at providing a coordinated approach amongst the two global leading technological powers concerning the transformative potentialities of Artificial Intelligence bring forth a somewhat reassuring picture, one in which Beijing and

³⁵ See: Antony Blinken Says U.S. Chip Ban Doesn't Mean 'Cutting off Trade' or 'Holding Back China'. Retrieved at <https://www.benzinga.com/news/24/04/38475682/antony-blinken-says-us-chip-ban-doesnt-mean-cutting-off-trade-or-holding-back-china>

³⁶ See: U.S., China to hold first AI talks within 'weeks' amid ongoing TikTok stalemate. In NBC New York. Retrieved at <https://www.nbcnewyork.com/news/business/money-report/u-s-china-to-hold-first-ai-talks-within-weeks-amid-ongoing-tiktok-stalemate/5356811/>

Washington accept to put aside their ideological and geopolitical differences to shape a fair and equitable technological dimension, it is likely that points of contention surrounding geopolitical and strategic differences will persist in the short- and medium-term, with Beijing attempting to catch up with Washington's early adoption advantage in AI whilst White House policymakers seek to curtail Chinese technological growth. It appears evident that the end of the '*Chimerica*' model of international affairs – a paradigm which greatly fuelled Chinese economic and industrial growth since the turn of the millennium³⁷ – marked a radical return to great power competition-induced dynamics, pitting Washington and Beijing against each other in a race for technological predominance, undoubtedly the decisive frontier for confrontation in the contemporary world (Zhang and Levine, 2023).

To fairly assess the degree of progress that has been achieved by both countries in the field of Artificial Intelligence – as well as the level of importance that governments in Beijing and Washington confer on this specific facet within the tech realm -, this chapter will be dedicated to two case studies focusing respectively on Chinese and American programs, financing and legislative initiatives meant to fuel domestic technological innovation; eventually, the findings will enable us to consider whether Beijing has – or will have – the capabilities to overcome American predominance in the field of AI, or whether said reversal in the power relation encompasses further elements extending beyond mere technological prowess.

4.2. China and Dual-Use Artificial Intelligence: A Case Study

4.2.1. A Path Towards Technological Revolution: Maoist Transformation (1937-1979)

The work of Raska (2014) is useful in bringing forth a distinction in periods concerning China's defence industry modernisation ever since the establishment of the People's Republic in 1947. Whilst the initial Maoist period saw strong dependence on Soviet assistance in terms of arms sales and technology transfer –evident in the joint project of Chinese industrialisation upheld in the initial half of the 1950s -, the Sino-Soviet split of the 1960s rendered such cooperation unfeasible, forcing Beijing to halt its developments in defence-technology and industrial bases (*DITB*) up until Deng Xiaoping's coming to

³⁷ See: The Financial Crisis, Chimerica and Global Governance. In Science Direct. Retrieved at <https://www.sciencedirect.com/science/article/pii/S1877042813005016/pdf?md5=62f5587a4ec9d53ce0578e0d0d4add61&pid=1-s2.0-S1877042813005016-main.pdf>

power at the end of the 1970s. The enactment of thorough economic and structural reforms advocated by the new leader led Chinese defence enterprises to begin a gradual conversion process, being encouraged to produce a more significant number of dual-use technologies to foster military capacities and manufacturing within the country. Nevertheless, significant advancements continued to lack, as during the 1990s, Chinese military equipment continued to trail Western and Russian capacities. Due to the apparent necessity of fostering a more sustained DITB, the defence industry underwent another wave of reforms, launched in 1997 by Jiang Zemin and vigorously pursued by Hu Jintao. In an attempt to propel DITB developments, the 15th Chinese Communist Party Congress embarked on restructuring and downsizing the Chinese defence industry (Baum, 1998). Eventually, the end of the millennium accompanied a reorganisation of Beijing's five core defence companies – in aviation, space, nuclear, shipbuilding and land warfare – into two entities, a choice motivated by the firm belief that such an arrangement would increase competition while transforming these entities into efficient corporate organisations (Medeiros et al., 2005).

A fundamental guiding doctrine of Mao's Great Leap Forward Program – launched in 1958 following the economic stabilisation attained through heavy industrialisation promoted throughout the first half of the 50s - was represented by the necessity of promoting a '*technical revolution*' throughout the Chinese state, seeking to foster manners throughout which modern technological advancements and science could be mastered without having to foster a corresponding privileged technological intelligentsia, whose existence would inherently question tenets of equalitarianism upon which Chinese socialism rested upon. Overreliance upon Soviet technology gradually became a pressing issue for the CCP, and Mao warned fellow party members about the necessity of fostering a national creative spirit alongside the enhancement of educative programs and institutional capacity-building initiatives; fears about an emerging pattern of political dependence – as naturally entailed by preconditions of technological and industrial dependence – began to be addressed by the Maoist leadership, somewhat echoing contemporary concerns about Chinese reliance upon Western technological bases as imposing limitations in strategic domains³⁸. Understanding the profoundly political-charged nature of technological and scientific advancements, Mao sought to conceive

³⁸ See: The West Did Not Invent Decoupling – China Did. Agathe Demarals. In Foreign Policy. February 2024. Retrieved at <https://foreignpolicy.com/2024/02/01/china-decoupling-derisking-technology-sanctions-trade-us-eu-west/>

manners throughout which the Chinese state could enhance its technological capacities without the corresponding fostering of an intelligentsia whose efficiency – and magnitude in terms of numbers – had been previously analysed by Zhou Enlai³⁹; the Maoist doctrine strongly emphasised the necessity of turning the popular masses into the true masters of technology, in an attempt to parallel China’s national attempts at delinking itself from foreign technologies to the Chinese people’s efforts in attaining technological self-reliance, without the necessity of guidance provided by a technological élite, underlining a pressing challenge of ideological coexistence between the political and scientific spheres which continues to haunt Beijing’s attempts at techno-industrialization. Chairman Mao’s decisiveness in promoting technological and scientific modernisation within the Chinese state – ratified as a guiding priority for a ‘*New China*’ whose emergence loomed over the Indo-Pacific⁴⁰ - prompted a swift incremental increase in the magnitude and scope of advanced technology research and manufacturing in the country, eased by substantial industrial achievements.

The sponsorship provided by high-ranking officials of the Chinese Academy of Engineering and members of the China Association for Science and Technology towards the ‘*Significant Achievements of Engineering Technology in China in the 20th Century*’ – a ballot box reiterating the necessity of developing atomic energy and satellite technology to assist Beijing’s evolution as an economic and political powerhouse. Framed into a broader landscape of consistent geopolitical and strategic confrontations between the United States of America and the Soviet Union – while gradually acquiring equal degrees of separation from both camps (Ringger, 2023) -, CCP cadres swiftly undertook and promoted initiatives aimed at paralleling the countries above’ results in technological advancements, resulting in the April 1970 launch of China’s first satellite, ‘*Dong Fang I*’, rendering a formerly war-torn and staggeringly fragile country into only the fifth global state capable of accomplishing an independent spaceflight launch capability (Ng et al, 2014). Subsequent progress in nuclear power capacities enabled Chinese scientists and engineers to project and construct Beijing’s first nuclear-powered submarine,

³⁹ See: Chinese Intellectuals and Science: A History of the Chinese Academy of Sciences (CAS). September 2008. Cambridge University Press. Retrieved at <https://www.cambridge.org/core/journals/science-in-context/article/abs/chinese-intellectuals-and-science-a-history-of-the-chinese-academy-of-sciences-cas/666E4E105C670B2BE1B3E717504BD71C>

⁴⁰ See also: Formulation of Foreign Policy of New China on the Eve of its Birth. Ministry of Foreign Affairs of the People’s Republic of China. Retrieved at https://www.fmprc.gov.cn/eng/ziliao_665539/3602_665543/3604_665547/200011/t20001117_697897.html

commissioned in August 1971, testifying to China's rapid rise towards an advanced technological sector. Despite this, completing the '*Chang Zheng 1*' proved particularly challenging, primarily due to the difficulties implied by a lack of technical, financial and human resources further augmented by the initiatives enacted as part of the Chinese Cultural Revolution⁴¹. Nevertheless, the project ultimately turned out to embody a promising success for China's technological sector, and the successful launch of the *Chang Zheng 1* prompted the construction of four more submarines, three of which remain active service⁴². Representing the first generation of nuclear-powered submarines of the Chinese navy, the *Chang Zheng 1* efficiently served as a guiding model for later technological developments: The Japan Times reported that the current Chinese state-of-the-art nuclear-powered submarines enjoy the capacity to launch advanced classes of nuclear-tipped-missiles – the JL-2 – with an approximate range of more than 7400km; adhering to its national 'no-first-use' policy, developed following the initial atomic bomb test conducted by China, Beijing officials stressed how such weapons would be employed exclusively for ensuring Chinese self-defence, and never as a means of aggression towards other sovereign countries.

Overall, the vast majority of Maoist policies introduced throughout the 1950s and 60s, while undoubtedly serving as a guiding beacon for Chinese attempts at industrialising a country which had been left in utterly disastrous conditions, contemporarily appeared to beget insurmountable criticism and protests from the civilian population, especially as collectivisation programs in rural areas began to claim an ever-soaring number of casualties. As scholars and observers moved criticism to Chinese political-economic policies due to their inability to efficiently maximise national advancements in heavy industry and technologisation, dissatisfaction with Mao's leadership began to mount – also within the CCP's leadership - throughout the latter half of the 1960s and the 1970s. The Cultural Revolution of 1966 – strongly sponsored by Mao himself as an attempt to further centralise authority into his hands while squashing unwanted centres of contestation, targeting Politburo members who disagreed with Maoist policies – succeeded in effectively fracturing the already quivering equilibrium persisting within the Communist Chinese Party, exerting a significant influence on the outbreak of vicious

⁴¹ See: Education and Innovation: The Long Shadow of the Cultural Revolution. May 2020. Retrieved at https://faculty.tuck.dartmouth.edu/images/uploads/faculty/gordon-phillips/educ_innov_longshadow_cultrrevolution_02270.pdf

⁴² See also: Nuclear Submarines Showcased. Beijing Review. November 2013. Retrieved at http://www.bjreview.com.cn/nation/txt/2013-11/02/content_575743.htm

political infighting characterising the country's political landscape following the Ninth National Congress of the Chinese Communist Party held in April 1969. Rising political figures such as Deng Xiaoping and Liu Shaoqi appeared at odds with Maoist fundamentalism regarding economic policy. They swiftly became the victims of a vicious campaign of delegitimisation in the eyes of the population, forcing them towards retirement and subsequent abandonment of active political engagement (Schoenhals, 1989). The far-encroaching nature of the Cultural Revolution, with its attempts to affect countless domains of Chinese political and social life, goes beyond our analysis' point of interest; as we outline the foundational basis upon which Deng Xiaoping would construct its hybrid state capitalist model, we can infer how Maoism functioned as a much-needed propeller towards economic growth for a war-torn China thanks to the adoption of a heavy-industry-oriented development strategy, though temporarily stunting Beijing's potentialities in terms of industrial expansion due to the inherent limitations of a firmly planned economic model (Singh, 2024).

4.2.2. Deng Xiaoping's Economic Restructuring and Beginning of CMI Programs (1979-1999)

The year 1976 quickly came to represent a time of shared uncertainty among the Chinese people following a power vacuum resulting from Chairman Mao's death. The subsequent infighting between Hua Guofeng, Mao's designed successor, the so-called '*Gang of Four*', comprising of Mao's widow Jiang Qing and her trusted group of radical CCP officials, and Deng Xiaoping, a formerly-reviled subject of Maoist purges who had surprisingly succeeded in retaining his authority within the party's organisation, ultimately saw the latter obtain the reins of power. Adopting a condemnation of Mao's Cultural Revolution policies, whilst engaging in a deep-seated reversal of several foundational doctrines which had guided previous attempts at national economic reforming, Deng clearly understood the untapped potentialities of the Chinese economy, undertaking a thorough process of structural transformation of the country's ideological and empirical approach towards industrialisation and economic reforms *tout-court*, advocating for a strategic rapprochement with Western countries, and the United States of America above all (Xiong, 2022). The years between Mao's demise and implementation of the Reform and Opening Policies⁴³ represented a fundamental crossroad for Beijing's economic and political growth. During this period, Deng

⁴³ Which occurred in 1978, *ed.*

successfully laid the foundations for China's rise towards engendered international status. Henceforth, greater attention was dedicated to the diversion of human capital – as well as other material resources – towards the scientific and technological domains, correctly perceived by Deng as would-be deciding factors in potential great power competition patterns. Undoubtedly swaying away from Mao's strong reliance on the doctrine of '*command economics*'⁴⁴, Deng conceived the necessity of implementing market-based dynamics, which, complemented with a more solid and effective state management, could push China towards a heightened position within the international order. Henceforth, it appears evident that whilst both statesmen sought to achieve similar objectives and approached economic development in a resembling manner – namely, through the production of agricultural surplus and its subsequent employment to fuel industrial advancements -, the operationalisations of this ideal differed quite substantially: Deng's decentralisation occurred as a result of market forces, with greater freedom of action being awarded to private enterprises as well as local authorities, entailing a gradual introduction of radical economic reforms which came about more smoothly than comparable Soviet attempts in moving towards a similar direction (Dehejia, 1996). To attain such an ambitious goal, Deng forcibly engaged in initiatives meant to reverse the Chinese Communist Party's policy, prioritising the modernisation and development of the Chinese state above the dynamics of class struggle which had characterised much of later Maoist programs. The adoption of a "*socialism with Chinese characteristics*" model marked a period of tentative pursuance of economic growth and development; assessing the successes and failures experienced by the Chinese state and its people throughout the '*Age of Deng*' clearly proves how the path towards prosperity was not an even one, but rather characterised by temporary progress invalidated by subsequent digressions; nevertheless, what appears to be undeniable is that Deng's far-reaching policies ultimately propelled a country which had previously only partially reaped the benefits of its programs towards a level of unprecedented development and economic attractiveness (Keo, 2020). In attaining the objectives above, the introduction of a socialist market economy – signalling a partial reduction of patterns of state interventionism in the economy which satisfied several Bretton Woods countries who had long hoped to profit off the substantial human and natural resources the Chinese state had to offer – was posited as a necessary condition for China's path towards the Communist ideal, mainly

⁴⁴ See: China's economic evolution from Deng's vision to Xi's divergence. November 2023. East Asia Forum. Retrieved at <https://eastasiaforum.org/2023/11/30/2333288-2/>

due to the country's semi-colonial and semifeudal character at the time of the Revolution. Attempts are treated carefully regarding implementing a market economy, avoiding excessively limiting the central government's involvement and advocating for introducing a market-induced supply and demand system meant to complement – rather than substitute – economic planning by the government. Partial liberalisation had to be introduced to guarantee an efficient market economy, enabling small and medium-sized companies to operate autonomously while reducing many of the measures implemented to keep state-owned enterprises afloat and avoid their failures. As a guiding light for China's development, the importance of undergoing the 'four modernisations' processes – respectively in agriculture, industry, science and technology, and national defence – became continuously stressed by CCP leaders.

Our analysis will focus primarily on the last two domains, where ambitious programs seeking to foster education – significantly stunted by the Cultural Revolution, resulting in an entire intake of Chinese students being regarded as a 'lost generation'⁴⁵ – and capacity-building became increasingly undertaken by policymakers.

As part of a concerted effort to ensure technological development, adopting the 'National Key Technology Research and Development Program' – the first national S&T program in China – in 1982 represented an ulterior step towards technological growth. The program contained initiatives to foster national technological development while contemporarily sustaining the application and commercialisation of critical technologies and enhancing imported technologies. Among the eight inscribed areas of focus, four of them retained crucial importance, entailing relatively higher investment and capacity-building on behalf of the Chinese government: strategic high-tech research on information technology, agricultural technologies, traditional industries enhancement through informatisation and sustained environmental development gained heightened importance. Assessing the degree of development achieved in these domains points to the observance of how technological advancements had increasingly begun to acquire an inherent dual-use nature, marking a merely conceptualised yet comprehensive initiation towards attempting to foster civil-military integration programs designed to enhance technological developments within the private sector to be then transposed towards the domain of national security (Bitzinger, 2021). Initial defence industry's attempts at enabling patterns

⁴⁵ See: China's Lost Generation: Changes in Beliefs and their Intergenerational Transmission. Gerard Roland and David Y. Yang. In National Bureau of Economic Research. May 2017. Retrieved at <https://www.nber.org/papers/w23441>

of civil-military integration – *CMI* from now on - began in the early 1980s up until the mid-1990s, inscribed within the broader framework of Deng Xiaoping's '*sixteen characters*' slogan, seeking to combine the military and civil domains, giving priority to the former over the latter through an engendered support to the military sector on behalf of civilian and commercial endeavours. *CMI* is "integrated and coordinated development of the defence and civilian technology economies". Although a percentage of the driving push behind *CMI* enhancement stemmed from economic necessities⁴⁶, the requirement for enhancing the available talent and ensuring capacity-building to accommodate the needs of a modernised PLA force. (Hagt, 2016). Nevertheless, developing a modernised national defence industry appeared to be the last amongst the four modernisations, motivated by a relatively peaceful international security environment and placing most emphasis on reconstructing the national economic commercial apparatus. The initial stage of *CMI* implementation throughout the 1990s entailed a thorough attempt aimed at converting military factories to the manufacture of commercial civilian products; commercial production soon became the ideal means of absorbing excess capacity stemming from the production of weaponry, subsequently providing enterprises active in the defence sector with additional revenue meant to compensate their largely-underperforming military product lines, whilst indirectly encouraging directors and managers for them to increasingly align their enterprises with market forces, following Deng's broader agenda of gradually steering the Chinese economy towards a hybridisation of state socialism and free market paradigms.

Henceforth, the central government's emphasis on the implementation of a coherent *CMI* program expanded the defence industry towards the engagement in several civilian manufacturing activities: sectors such as the aviation industry greatly benefitted from such engendered cooperation, with leading Western carriers establishing facilities at several Chinese factories to produce sub-assemblies and components meant for Western civilian aircraft. Quite similarly, Chinese shipyards found extreme success in transforming much of their production to more fruitful civilian endeavours, whilst the national missile industry began engaging in satellite-launching endeavours with the success of the Long March launch vehicles (Bitzinger, 2006). As the undertaking of such a model gained traction in terms of official support provided by Beijing's central government, the number of defence enterprises engaged in commercial ventures often

⁴⁶ See: China's New 2019 Defence White Paper. July 2019. Anthony H. Cordesman. In CSIS. Retrieved at <https://www.csis.org/analysis/chinas-new-2019-defense-white-paper>

extending far beyond their traditional area of operativity soared: by the mid-90s, 70% of all taxicabs and 65% of all motorcycles being produced in China were originating from former weapons factories: by the end of the millennium, a strong 80-90% of the value of China's defence industry output was nonmilitary. Nevertheless, the national defence industry continued to experience considerable distress, reaching its peak in 1998 when 60% of the national defence industry was in deficit, totalling 6.4 billion in losses, failing to efficiently manufacture equipment meeting the demands of a highly advanced global economy and internal needs⁴⁷: initial efforts at promoting CMI proved to be somewhat incapable of fulfilling the promise of greatly enhancing the Chinese military-industrial complex. Often, weapon factories suffered considerable losses in transitioning to civilian products, typically failing in the creation of reliable product lines and being unable to develop a more market-friendly and consumer-savvy – inevitably dictated by the penetration of market forces within the Chinese economic sector – strategies towards the pricing of goods or their quality. Furthermore, the Chinese defence industry failed in acquiring and diffusing potentially useful commercial technologies, meant to be later transposed to the military domain: as Bitzinger rightly points out, the Chinese national approach was characterised by spin-off dynamics – meaning the transfer of military technologies towards their application in the civilian sector – rather than by spin-on patterns – used to refer to the transfer of civilian technologies to the military dimension. Even when considering the chances for direct spin-on of civilian technological instruments to military production, we observe that opportunities remained relatively limited in both scope and magnitude, as exemplified by the acquisition of several advanced numerically controlled machine tools employed in commercial aircraft production which could not be converted to military-use due to end-user restrictions which impeded an efficient conversion. Similarly, the low-technology base enjoyed by the Chinese shipbuilding industry, although largely sufficient for cargo ship manufacturing, failed to provide enough value in the design and construction of warships comparable to those produced in the West.

In spite of this, satisfactory development of dual-use technologies still took place, most notably through launching a fundamental science and technology development initiative, known as the 863 Program, launched during the mid-80s. The Program set forth a long-term plan designed to foster Chinese high-technology bases in several domains, most

⁴⁷ See: Thoughts of Further Reform in Defence Industry. Zhang Yufeng. 1999.

displaying precise military applications, such as aerospace, lasers, optoelectronics, semiconductors and several new materials. Although merely a research program and needing more institutional coordination and funding to facilitate the promotion and diffusion of such technologies for dual-use employment, the Program still succeeded in providing much-needed impetus and emphasis to the national DITB industry. Henceforth, Bitzinger points to how CMI initiatives throughout the initial period of Chinese economic reform provided only indirect support towards the development of Chinese weaponry, as DITB did effectively reap the benefits entailed by overall economic growth fuelled by gradual liberalisation and macroeconomic stimuli; nevertheless, only few linkages between civilian and military production emerged, and more specifically such a concerted effort significantly lacked attempts at developing edge-cutting dual-use technologies or apply modern solutions originating from the civilian domain to military employment.

4.2.3. The Turn of the Millennium and Structural Adjustments in CMI under Hu Jintao: Turn to MCF (2000s - 2017)

While the Fifteenth Congress of the Chinese Communist Party – held in September 1997 – marked a fundamental breaking point in terms of CMI policies and DITB development within China, the relevance of CMI became reiterated with its recognition as a strategic priority for the fostering of national economic growth in the 3rd Plenum of the CCP's Tech Party Congress in 2003; the operationalisation of said belief took form via many policies seeking to promote the development of integrated dual-use industrial systems, thus enabled to manufacture both civilian and defence-oriented goods, inevitably vouching to abandon the precedent doctrine of industrial conversion which had proved largely inefficient in upholding the Chinese DITB industry (Hagt, 2016). Thoroughly comprehensive fiscal, policy, organisational and enterprise reorganisation initiatives represented the focus of the industrial reshaping of 1998-99 orchestrated by the administration led by General Secretary Hu Jintao and Premier Wen Jiabao, with sharp increases in defence and essential R&D funding. Organisational reshaping, occurring via the reorganisation of the Commission on Science, Technology, and Industry for National Defence (COSTIND) – with reduced authority and stronger State Council supervision - as well as that of leading and core Chinese defence companies, united into two coherently composed entities, highlighted the strong national solid focus placed upon the active promotion of joint civil-military technology cooperation, rendering the spin-on of advanced commercial capabilities both to Beijing's military-industrial complex and in

assistance of the People’s Liberation Army modernisation an explicit – and guiding – policy principle. The foundation of the China Electronics Technology Group Corporation (CETC) in 2002 – a defence-electronics company – and the consolidation of the aviation companies AVIC I and AVIC II to form the Aviation Industry Corporation of China in 2008 complemented a picture which sees the current ten defence state-owned enterprises dominating the Chinese DITB industry. (Béraud-Sudreau et Nouwens, 2019). Eliminating degrees of separation hindering coordination amongst R&D and productive processes proved instrumental in enhancing the efficiency of CMI initiatives, fostering fruitful linkages between the different segments composing the R&D chain, and easing the transition of critical technologies from civilian production to the defence sector.

Table 1: Top 20 world defence firms per total personnel number (2016)

| | <i>Company</i> | <i>Country</i> | <i>Personnel</i> |
|-----------|------------------------------------|----------------|------------------|
| <i>1</i> | AVIC | China | 460,000 |
| <i>2</i> | General Electric | United States | 295,000 |
| <i>3</i> | NORINCO | China | 234,771 |
| <i>4</i> | CSGC | China | 232,817 |
| <i>5</i> | Hewlett Packard Enterprise Company | United States | 195,000 |
| <i>6</i> | CASC | China | 170,000 |
| <i>7</i> | CETC | China | 160,000 |
| <i>8</i> | ThyssenKrupp | Germany | 156,490 |
| <i>9</i> | Boeing | United States | 150,500 |
| <i>10</i> | CSIC | China | 150,000 |
| <i>11</i> | CASIC | China | 148,682 |

| | | | |
|----|---------------------------|----------------|---------|
| 12 | Airbus | Trans-European | 133,780 |
| 13 | Almaz-Antey | Russia | 125,000 |
| 14 | NEC Corp. | Japan | 107,730 |
| 15 | General Dynamics Corp. | United States | 98,800 |
| 16 | Lockheed Martin | United States | 97,000 |
| 17 | United Shipbuilding Corp. | Russia | 89,650 |
| 18 | AECOM | United States | 87,000 |
| 19 | Indian Ordnance Factories | India | 85,890 |
| 20 | BAE Systems | United Kingdom | 83,000 |
| \\ | CSSC | China | Unknown |

Source: The Stockholm International Peace Research Institute (SIPRI). 'Top 100 Arms-producing and Military Services Companies, 2016'; excluding Chinese companies

Deeply embedded within the framework set by Beijing's 2006-2020 Medium- and Long-Term Science and Technology Development Plan (MLP) as well as the 2006-2020 Medium- and Long-Term Defence Science and Technology Development Plan (MLDP), intuitional commitment towards accelerated development of dual-use, civil-military application technologies is demonstrated by 50% of the items included in the document presenting prominent dual-use features⁴⁸. Highlighting a belief in the cruciality of

⁴⁸ Hagt, 2016, op. cit.

transferring military technologies to the commercial domain and vice-versa, demanding Chinese arms enterprises not merely to develop dual-use technologies, but rather attempt to foster joint civil-military cooperation within the technological dimension, the enactment of CMI-oriented policies strongly asserted itself as a defining guideline for the Chinese defence industry reforms enacted between 1997 and 2017⁴⁹, as the CCP leadership increasingly recognised its elevated potential easing the shortcutting of R&D procedures regarding advanced weaponry, whilst selecting the most advanced and potentially beneficial civilian procedures in the most cutting-edge high-tech sectors of its commercial productive processes. Despite this, the CCP administration had begun to assess certain limitations which hindered the attainment of the complete potentialities represented by the pursuit of a deep-seated “*military-civil fusion*”, maintaining “*Chinese characteristics*”⁵⁰. Thoroughly framed within the policy programs included in the 2006-2020 National Medium- and Long-Term Program for Science and Technology Development, foundational elements of utmost necessity for the construction of a concerted and reciprocal process of technological innovation appeared as priorities, leading to the resurgence of a “*techno-nationalist*” discourse – defined by Samuels as “the belief that technology is a fundamental element in national security, that it must be indigenized, diffused, and nurtured [...] to make a nation rich and strong” (Samuels, 1994) - which first underscored the necessity of guaranteeing technological subsistence and gradual decoupling from Western partners, which, though initially evident within the sector of renewable energies (Kennedy, 2013), soon embraced the dimension of strategically-crucial technologies and inherently underpinned by realist understandings of global dynamics as amounting to a zero-sum game owing to fears of economic and industrial overreliance on foreign powers awoken by the substantial downturn caused by the 2008 financial crisis (Diegues et Roselino, 2023). Furthermore, the acquisition of dual-use technologies such as space systems meant to be employed in surveillance, communication and navigation and of the vastly latent and untapped potentialities stemming from commercial IT technologies – primarily deriving from domestic manufacturing or exogenously adopted through the promotion of fruitful joint ventures, technology transfers with commercial partners, and even via resort to shady practices like espionage when devoid of alternative options. The establishment of the Ministry of

⁴⁹ See also: Emerging Grand Strategy for China’s Defence Industry Reforms. Eric Hagt. January 2013. In *The PLA At Home and Abroad: Assessing the Operational Capabilities of China’s Military*.

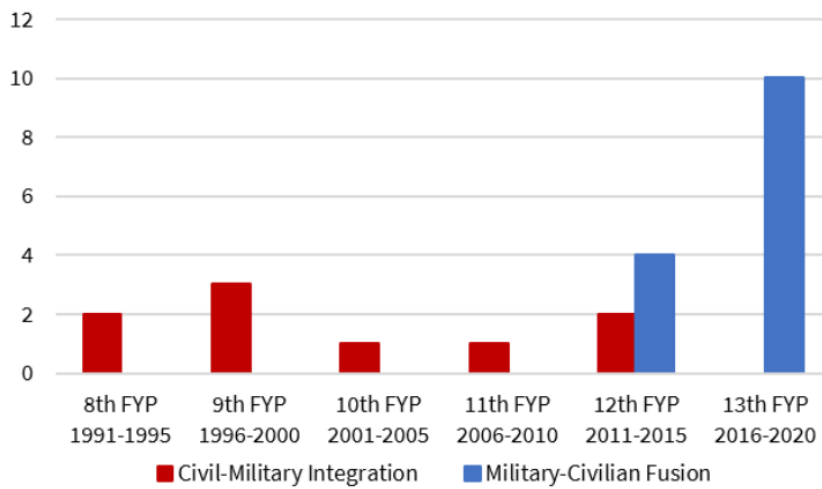
⁵⁰ See: China Daily. Retrieved at https://www.chinadaily.com.cn/china/2007-11/02/content_6225434_4.htm

Industry and Information Technology (MIIT) in March 2008 – encompassing the COSTIND, the National Development and Reform Commission's (NDRC) informatisation responsibilities, the State Council Informatization Office and the State Tobacco Monopoly Administration; thus forcibly backtracking the COSTIND to the benefit of the State Administration for Science, Technology and National Defence (SASTIND), represents an ulterior step towards enhanced coordination of DITB development through the fostering of comprehensive MCF policies. Allowing for enhanced policy coordination and operationalisation and accelerating the exchange of technologies between the military and commercial dimensions, the formation of MIIT will force the defence industry to abandon its competitiveness-shielded position in favour of the embracement of market forces characterising the civilian sector. The creation of the Dual-Use Promotion Office – designed to ease the identification of potential areas for commercial-military convergence and acting as an intermediary seeking to better market dual-use opportunities – demonstrate how attempts at constructing engendered integration between the military and civilian sector have come to the forefront of governmental decision making. However, divisions persist concerning the unfolding of Beijing's industrial policy: the faction composed of the National Development and Reform Commission (NDRC), the State-owned Assets Supervision and Administration Commission (SASAC), alongside local governments and state-owned enterprises, continue to retain authority concerning the amount of funding and operationalisation of plans conceived by the MIIT's conflicting interest groups. Subsequently, several observers and scholars have advocated for the establishment of an even stronger and more centralised leadership designed to direct MCF policies through the indications provided by the Central Military Commission (CMC) and the State Council, hence promoting an institutional transformation which would bring the Chinese system closer to that of the United States, where authority rests in the hands of presidential offices and congressional committees, with differing dedicated agencies and offices within the governmental and military dimensions to guarantee an efficient execution of said initiatives. Nevertheless, the establishment of a hierarchical structure as aforementioned would likely employ a relatively sizeable number of years, a process potentially further hindered by Chinese endogenous challenges curtailing such a development. The period between 2006 and 2020 demonstrated a strong institutional focus regarding the transfer of commercial technologies towards the military domain. It demanded national weapons manufacturers develop dual-use technologies and promote joint civil-military technological cooperation.

Nevertheless, the degree of emphasis placed on the development of dual-use technologies remains undeniable, more precisely when assessed about the subsequent spin-on it exerted upon strategic instruments (i.e., missiles, IT, microelectronics). Overall, the approach adopted by the CCP between 1997 and 2017 seems to have had beneficial consequences for the country's path towards CMI, testified by the progress achieved in the shipbuilding industry – with Chinese shipyards enabled to enhance their manufacturing capabilities, as well as greatly benefitting from technical partnerships with foreign shipbuilding enterprises, providing them access to cutting-edge designs and manufacturing technologies, resulting in more efficient warships being provided to the PLA –, the aircraft domain – where the establishment of the Commercial Aircraft Cooperation of China (COMAC) and the pursuit of the construction of commercial jets displayed considerable spin-on effects towards national defence, primarily concerning the construction of bombers and transport aircraft –, as well as the development of commercial reconnaissance satellites technologies – i.e., multispectral scanners, synthetic aperture radar imagers – which demonstrate an evident spin-on upon military developments (Medeiros et al, 2005).

Despite these significant advancements, much of the progress attained throughout this period of heightened CMI proved once again insufficient to fulfil expectations, with less than 1% of Chinese commercial high-tech firms engaged in defence work, merely “*scratching the surface of the Chinese economy*” (Cheung, 2019). Henceforth, until the beginning of the 2020s, commercial firms remained largely unconcerned in armaments production and disengaged from defence investments.

Table 2: Occurrence of MCF and CMI in FYP’s Documents



Source: People’s Daily

Source: China’s Evolving Conception of Civil-Military Collaboration. CSIS.

4.2.4. Xi Jinping and the Engendered Civil-Military Fusion (2013-)

In 2013, the rise to power of Xi Jinping – the son of one of Deng Xiaoping’s most trusted advisors and the mind behind the creation of the Special Economic Zones which considerably bolstered Chinese economic growth throughout the 1980s and 1990s⁵¹ - propelled a renewed conception of the methods employed to eliminate barriers curtailing the interaction amongst defence and civilian sectors, subsequently leading to the an even deeper commitment towards MCF policies characterized by a strategy seeking to “align civil and defence technology development”⁵², announcing a profound reform of defence-related science, technology, and industry as a means of attaining robust military-civil fusion (Béraud-Sudreau et Nouwens, 2019) by upholding the sharing of new, privately-developed technologies with the PLA (Hille et Waters, 2018), while promoting the training of military personnel and the construction of adequate infrastructure (Jash, 2020).

⁵¹ See: Xi’s Family Ties to Shenzhen Go Back Decades. In The Wall Street Journal. June 2022. Retrieved at <https://www.wsj.com/livecoverage/hong-kong-china-xi-jinping/card/xi-s-family-ties-to-shenzhen-go-back-decades-32iZPICwhAwmcBd4rX9G>

⁵² See: U.S. Department of Defence, Annual Report to Congress: Military and Security Developments Involving the People’s Republic of China. Washington D.C. 2019. Retrieved at https://media.defense.gov/2019/May/02/2002127082/-1/-/1/1/2019_CHINA_MILITARY_POWER_REPORT.pdf

In assessing the differences separating previous CMI from Military-Civil Fusion initiatives, Bitzinger identifies five fundamental points of contention, ranging from advocating the direct sale of civilian-produced technologies to the military to foster a comprehensive integration of the civilian industrial base into the PLA's supply chain, to the utilisation of MCF as a way of aiding Beijing's access to crucial 4IR technologies, most notably AI⁵³.

Institutionally, attempts at fostering AI developments have been supported by the adoption of the 2017 New Generation Artificial Intelligence Development Plan (NGAIDP), seeking to attract foreign-trained talents through commercially successful actors, while contemporarily fostering local know-how and expertise through engendered AI investments, namely in urban areas instrumental for the foundation of sustainable AI ecosystems at play in the furtherance of national S&T enhancements (Chu, 2022). Marking a significant break from previous fragmented attempts at developing AI – whose enhancement became identified as one of several potential tools for development - the AIDP represented the first comprehensive, national-level legislative attempt focusing primarily on developing AI. A fundamental driver for enhanced systemic coordination towards AI development is defined by the substantial economic gains the PRC could derive from such engagement, with an estimated boost in GDP of up to 26% by 2030 (Sizing the Prize, 2017), contemporarily entailing an increase in employment by 12% over the next decades (Net Impact of AI on Jobs in China); the gradual shift from CMI towards MCF has been accompanied by a 500% per cent increase in the number of robotic upgrades since 2012, five times greater than that experienced in Europe (Shoham et al, 2018).

As a guiding component for the PLA's ambitions of achieving "*complete military modernisation*" by 2035 and becoming a "*world-class*" military by 2049, MCF initiatives – more far-reaching than its American counterparts – appear as partially driven by excellent power competition dynamics: the China Academy of Information and Communications Technology (CAICT) – a think-tank active under the *aegis* of the MIIT - identified comparable patterns of MCF within the national systems of the European Union, Japan and the United States, with the CCP leadership being primarily concerned about Washington's 2021 Innovation and Competition Act, prioritising AI and quantum computing as guiding priorities for the White House's security concerns, complemented

⁵³ See: Bitzinger, op. cit. 2021

by heightened security efforts vis-à-vis Beijing's economic activities, curbed through the imposition of tariffs and barriers to trade⁵⁴. The AIDP – representing the State Council's leading guideline in the domain of AI development – prioritised a nation-wide strategy meant to upscale Beijing to a global leading position in specific AI domains by 2025, ultimately envisioning an overall global leadership by 2030. Such a society-wide approach – aiming to bring together commercial giants such as Baidu and Tencent with the PLA – appeared strongly motivated by Beijing's understanding of the necessity of reducing the military-technological gap regarding Western powers. Close collaborations resulted in the provision of sophisticated UAVs, UUV systems, and real-time controllable hypersonic projectiles while fostering a high-level indigenous talent pool reflected by the ever-increasing number of patents produced and AI-related university degrees pursued in national universities. Producing a more significant number of AI-related publications than American, Indian and British scholars combined – as shown in the figure below -, Beijing has also made significant strides in patent applications, making up 41.2% of global patent applications, by far the most remarkable figure in the globe, with the United States at 20.3%.

Nevertheless, whilst at first glance said figures may suggest a landscape of staggering Chinese technological superiority, the percentage of AI-granted patents – which provides us with a more comprehensive analysis of the quality and value of the patents presented – demonstrates that a vast amount of Chinese proposed AI patents is ultimately denied granting, with just 21.3% receiving grants. Within this category, the United States continue to assert their superiority, leading in both granted patents – 32.6% - as well as transnational patents – 39.2% -, underlining the quality and leadership that Washington has been able to retain within the field of AI notwithstanding significant Chinese leapfrogging (Liu et al, 2021). Similarly, the qualitative nature of US AI patents is demonstrated by the substantial percentage of cited AI patents, nearing 70%; quite conversely, China contributes exclusively 2% of the top 10% of most cited patents, contemporarily lacking in the domain of transnational patents despite overtaking both Japan and Germany by 2015. Regarding funding, 2017 marked the beginning of substantial planning and expenditure being diverted towards AI venture entrepreneurship, with Chinese venture capital investors composing about 48% of the entirety of AI venture

⁵⁴ See: Biden sharply hikes US tariffs on an array of Chinese imports. May 2024. In Reuters. Retrieved at <https://www.reuters.com/markets/us/biden-sharply-hikes-us-tariffs-billions-chinese-chips-cars-2024-05-14/>

funding internationally, exceeding the United States for the first instance. Nevertheless, Washington has been able to retain its privileged position as the biggest and most efficient investment market regarding the digital dimension, namely directed towards Silicon Valley, which, according to experts and professionals, has been able to withstand the significant progress achieved by Beijing’s Zhongguancun area through its emergence as a regional leading AI hub⁵⁵.

Table 3: AI Patent Applications by Countries.

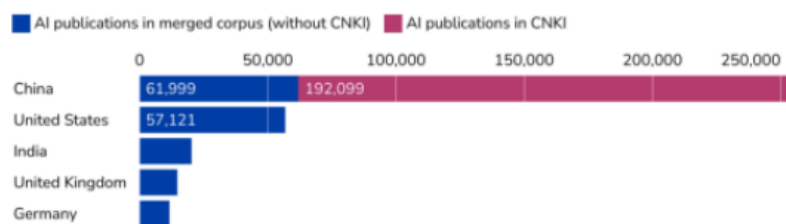
| Country | Patent applications | | | | | | | | | Patent grants | | | |
|-------------|---------------------|-------|---------|-------|---------------|-------|-----------------------|-------|-----------|---------------|-------|---------------|--------------|
| | All | | Pending | | Transnational | | International co-pat. | | | All | | Cited top 10% | |
| | N | % | N | % | N | % | N | % | % of apps | N | % | % All | % 2015-2019* |
| China | 158.0 | 41.2 | 109.9 | 72.6 | 7.7 | 10.1 | 3.2 | 15.7 | 2.0 | 31.5 | 21.3 | 2.1 | 19.2 |
| USA | 77.8 | 20.3 | 16.8 | 11.1 | 29.9 | 39.2 | 14.9 | 73.9 | 19.1 | 48.1 | 32.6 | 69.5 | 56.5 |
| Japan | 78.6 | 20.5 | 8.0 | 5.3 | 10.0 | 13.1 | 1.2 | 5.9 | 1.5 | 30.0 | 20.3 | 9.9 | 2.6 |
| South Korea | 19.6 | 5.1 | 3.8 | 2.5 | 3.3 | 4.3 | 1.0 | 5.1 | 5.2 | 11.7 | 7.9 | 1.2 | 2.2 |
| Germany | 9.0 | 2.3 | 2.5 | 1.7 | 5.2 | 6.8 | 2.7 | 13.3 | 29.9 | 4.4 | 3.0 | 2.1 | 2.1 |
| UK | 4.8 | 1.6 | 1.3 | 0.8 | 3.0 | 3.9 | 2.7 | 13.5 | 56.4 | 2.6 | 1.8 | 2.7 | 2.7 |
| India | 4.5 | 1.2 | 1.5 | 1.0 | 1.6 | 2.1 | 2.8 | 13.9 | 61.9 | 2.2 | 1.5 | 1.0 | 1.9 |
| Canada | 4.5 | 1.2 | 1.1 | 0.7 | 2.0 | 2.7 | 2.4 | 11.7 | 52.5 | 2.4 | 1.6 | 2.7 | 3.0 |
| Taiwan | 4.0 | 1.0 | 0.5 | 0.3 | 0.2 | 0.3 | 0.9 | 4.4 | 21.9 | 2.6 | 1.8 | 0.3 | 0.5 |
| France | 3.6 | 1.0 | 0.7 | 0.5 | 2.3 | 3.1 | 1.4 | 6.8 | 37.5 | 2.4 | 1.6 | 1.4 | 1.2 |
| Total | 383.2 | 100.0 | 151.4 | 100.0 | 76.3 | 100.0 | 20.1 | 100.0 | 5.3 | 147.8 | 100.0 | 100.0 | 100.0 |

Source: Analysis of PatentSight patent documents as of May 7, 2020, using patent search approach (see text). Numbers (N) in thousands.

Note:

* Granted in years 2015-2019.

Table 4: Top Contributing Countries to AI Publications in 2020, with CNKI.



Source: CSET merged corpus.

From a geopolitical perspective, the implications of Beijing’s heightened investments in coordination regarding AI present immense challenges to the United States, presenting

⁵⁵ See: China’s Sputnik Moment and the Sino American Battle for AI Supremacy. May 2017. In Asia Society. Retrieved at <https://asiasociety.org/magazine/article/chinas-sputnik-moment-and-sino-american-battle-ai-supremacy>

itself as a renewed frontier for Sino-American competition. Supported by the aforementioned military advancements, the PLA has become increasingly concerned with retaining an advantageous position in military confrontations with its rivals, dependent on the country's ability to maintain consistent economic growth and overcome structural deficiencies, such as private firms' incapacity of accessing to high-tech facilities and experimental technologies which would further fuel MCF policies (Béraud-Sudreau et Nouwens, 2019). Moreover, potential downturns entailed by the bureaucratic hierarchical arrangement of the PLA, national difficulties in the production of critical strategic technologies such as semiconductors – for which provision Beijing continues to rely upon Western countries and Taiwan -, as well as misguided investments and funding may hinder Chinese attempts at attaining a coherent MCF framework (Kania, 2019). Nevertheless, what appears undeniable is that Beijing is undertaking an ambitious path extending beyond mere public-private integration, leveraging on bettered infrastructure and reduced barriers to enable private firms' provision of drones and cross-sea transport drills whose military spill-over potentialities are apparent even to the untrained observer. As Bitzinger rightly suggests, the path dependence engendered by undertaking such an ambitious program implies resilience on behalf of the CCP leadership in the pursuit of technological superiority. While the outcome is not assured to surpass that of previous CMI initiatives, it possesses the potential to challenge American hegemony within the technological and security domains.

4.3. The United States and Dual-Use Artificial Intelligence: A Case Study

4.3.1 U.S. Defence Industrial Base and Pioneering Efforts in Dual-Use AI (1980s-2000s)

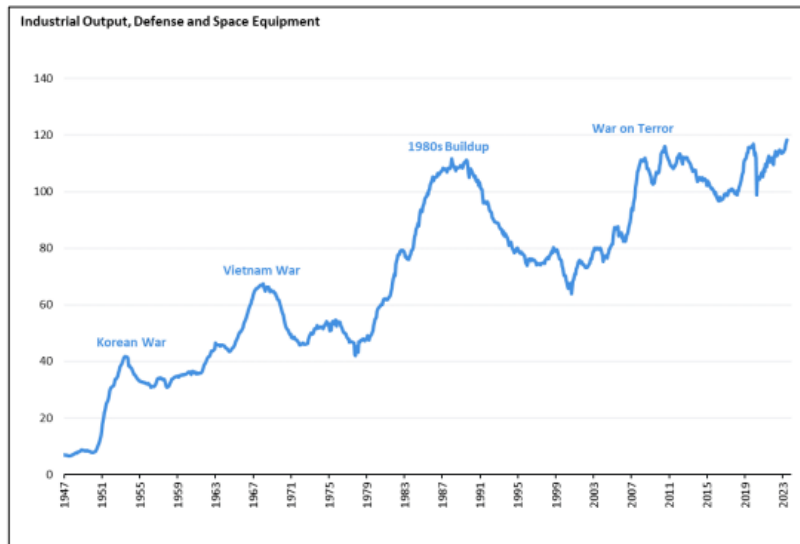
The United States of America have long represented the centre of significant developments and enhancements within the technological domain, seeking to foster a national environment conducive to fruitful developments, though primarily through the endeavours of private, commercial firms. Comparing Washington's industrial and economic approach throughout the second half of the 20th century to Beijing's highlights significantly different starting conditions: whilst the PRC faced immense developmental difficulties due to its backward- and war-torn economic apparatus, the United States – emerging as the paramount victorious power from World War 2 – abandoned the isolationist doctrine which had characterised their stance towards the rest of the globe

throughout the Interwar period by capitalising off their newfound economic superiority, further framed through the creation of a global financial system – the Bretton Woods mechanism – which saw the White House – as well US-backed international institutions such as the International Monetary Fund and the World Bank – retaining a position of dominance within the Western world. Early attempts at fostering technological innovation within the US were primarily fuelled by its tense competition with the Soviet Union and the Warsaw Bloc, seeking to challenge Western leadership in countless domains, including the technological one, with particular attention being dedicated to the dimension of Artificial Intelligence, grounded upon Alan Turing’s pioneering studies on machine learning throughout the 1940s and 1950s (Muggleton, 2014). The Dartmouth Summer Research Project on Artificial Intelligence⁵⁶, building upon Turing’s early studies, represented an embryonic attempt at envisioning a future dominated by machine learning and algorithmic sequences. Although falling short of achieving a comprehensive, society-wide interest towards AI, the Conference succeeded in laying the foundation for future 4IR developments. Employing the term ‘*defence industrial base*’ debuted in social and political discourse throughout the Korean War⁵⁷, the sustainment represented a novelty compared to the previous governmental reliance upon private contractors during periods of distress. Renewed investments and funding towards military capabilities characterised the onset of the Cold War, with an annual increase of 8.4% in annual spending on defence between 1948 to 1963, as well as annual outlays dedicated to research, development, test and evaluation (RDT&E) growing by 19.7% on average. As displayed in Figure 5, the amount of funding directed by the White House towards defence production steadily increased over the course of the second half of the 20th century, experiencing occasional surges motivated by security concerns, initially stemming from traditional great power competition dynamics, whilst following the rupture of the Warsaw Bloc arising from threats posed by non-traditional international actors such as Al-Qaeda

⁵⁶ For more details, see Chapter 1.

⁵⁷ See: House Group Opens Hearing on Weakened Controls Bill. May 1953. The Washington Post. Retrieved at <https://www.proquest.com/docview/152546852>

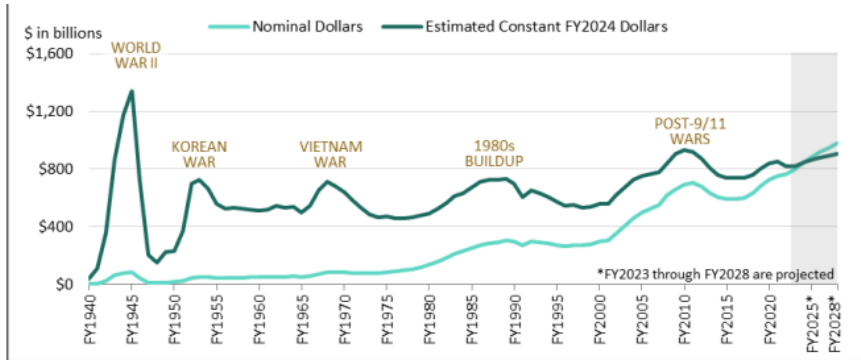
Figure 5: U.S. Defence Production (1947-2023) - Monthly Output of Defence and Space Equipment from January 1947 to June 2023.



Source: CRS graphic based on data from the Board of Governors of the Federal Reserve System, "Industrial Production: Equipment: Defense and Space Equipment," at <https://fred.stlouisfed.org/series/IPB52300S>.

Notes: The Y-axis shows the Federal Reserve's industrial production (IP) index, which measures the monthly output of U.S. based production facilities and expresses that value as a percentage of the average monthly real output for a base year (currently 2017). Thus, if the output for a particular month were to be given as "80," that would indicate the value production was 80% of the 2017 average. For more information, refer to Board of Governors of the Federal Reserve System, "Industrial Production and Capacity Utilization," at <https://www.federalreserve.gov/releases/g17/About.htm>.

Figure 6: U.S. Defence Outlays, FY1940-FY2028 (Projected)



Sources: Figure created by CRS using data from OMB Budget of the United States Government, Fiscal Year 2024, Historical Tables, Table 3.1 and Table 10.1, March 2023; and CBO, Budget and Economic Data, Spending Projections, by Budget Account, February 2023.

Note: Figure originally developed for CRS Report R47582, *FY2024 Defense Budget Request: Context and Selected Issues for Congress*, by Cameron M. Keys and Brendan W. McGarry.

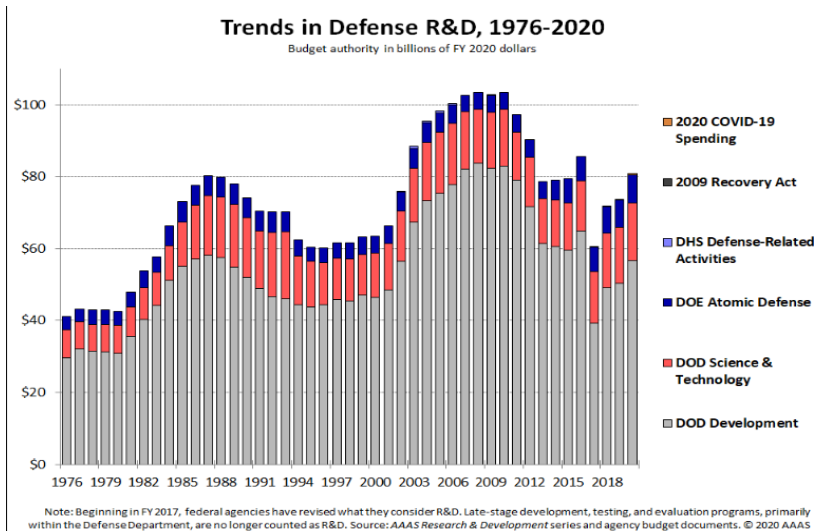
The geopolitical and strategic implications of the Cold War provided impetus to the development of DIB, with production output rising consistently and an ever-growing role played by commercial actors in the manufacturing and provision of weaponry and technologies to the DoD, which complemented such civil engagement with state-owned production facilities, whose relative importance however gradually diminished. As shown by Figure 5, after a period of relative downturn experienced in the 1970s, the aggressive military buildup policies pursued by the Reagan administration – grounded upon the upholding of the ‘*peace through strength*’ doctrine⁵⁸ -led to the creation of the Strategic Defence Initiative under the aegis of the Department of Defence. Harold Brown (1986) mentioned how, owing to substantial reductions in research and development program funding entailed by the approval of the Fletcher Committee Report of 1983, prioritisation of yet-to-be-developed technologies would prove more fruitful than placing emphasis on “sufficiently-demonstrated” technologies, prescribing technological advancements to be achieved in regards to adaptive optics, phase compensation and phase conjugation devices, as well as phased-array lasers and related optical technologies. In light of such engendered military investment, the number of defence-related private employment throughout the United States increased from 1.9 million workers in 1977 to 3.2 million in

⁵⁸ See: Peace Through Strength. Ronald Reagan Presidential Library & Museum. Retrieved at <https://www.reaganlibrary.gov/permanent-exhibits/peace-through-strength>

1985, complemented by an increase in defence-related production across various industrial subsectors.

The overarching investments promoted by the Reagan administration throughout the 1980s resulted in the United States retaining a significant military edge *vis-à-vis* another international actor, primarily stemming from the Reaganian doctrine of military modernisation which included the acquisition of cutting-edge nuclear weaponry such as the Ohio-class ballistic missile submarines, the Trident D-5 and MX Peacekeeper missiles, the B-1B and B-2 bombers, as well as a comprehensive acceleration regarding the development of strategic command-and-control, anti-submarine and anti-ballistic missile systems, as well as advancements in conventional forces and instruments (Gholz et Sapolsky, 2021). The fostering of a close relationship between the United States government and Santa Clara County throughout the 1970s and 1980s resulted in the production of critical technologies and weapon systems for the United States Army, ranging from intercontinental ballistic missiles to countless microelectronic parts (i.e., transistors, integrated circuits, microprocessors) that acted as fundamental components for the correct functioning of cutting-edge weapons systems. During President Reagan's military buildup, Silicon Valley acquired almost \$5 billion annually in military contracts, benefitting from the advanced technological feats that had been attained by leading semiconductors, satellites and space electronics through the constant support and funding provided by the Department of Defence (Heinrich, 2002). Nonetheless, the reduction of security threats entailed by the collapse of the Berlin Wall encouraged Washington to cut its defence spending, with production output of commercial DIB decreasing approximately by 35% throughout the 1990s, temporarily shutting down several government-owned facilities considered to be unnecessary with such a radical reversal of the international balance of power. The pressures exerted by the War on Terror waged by the Bush administration in the wake of the 2000s led to a return to engendered defence spending, with an exciting rise in the utilisation of contractor personnel to support military operations, a trend reiterated at the beginning of the 2020s due to growing competition with China – namely in the technological domain - as well as Russia's invasion of Ukraine in 2020 (Nicastro, 2023).

Figure 7: U.S. Trends in Defence R&D, 1976-2020. Budget authority in billions of FY 2020\$



The above graph demonstrates how the White House has consistently massively invested in R&D activities over four decades: as of 2021, the United States invested more than \$75 billion annually in defence R&D, complemented by an even more significant sum in Department of Energy R&D Investment for nuclear weaponry.

The 1984 Defence Procurement Reform Act prescribes that the Department of Defence employ commercial parts throughout the development of military products. This was reiterated in the 1990, 1991, and 1993 Defence Authorization Acts, all of which contained direct references to CMI policies. In Particular, the 1993 Defence Authorization Act encouraged the DoD to modify its acquisition policy, seeking to foster the integration of DTIB with commercial technology and industrial base (CTIB)⁵⁹.

The fostering of a cooperative and ultimately fruitful relationship between governmental bodies and private actors in the United States has long been in the spotlight of public discourse, owing to socio-political disagreements further augmented by the inherently

⁵⁹ See: Assessing the Potential for Civil-Military Integration: Technologies, Processes and Practices. September 1994. U.S. Congress. Office of Technology Assessment. Retrieved at <https://ota.fas.org/reports/9402.pdf>

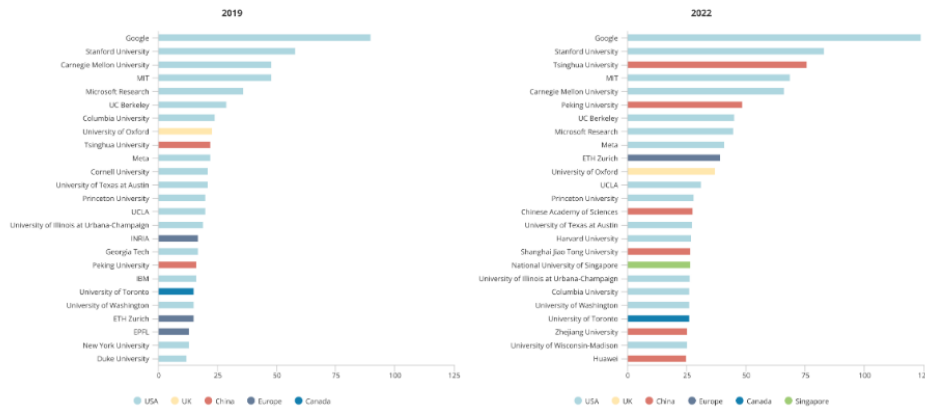
multifaceted – and somewhat controversial – nature of Artificial Intelligence, with serious doubts raised surrounding its ethical and normative consequences (Stockbauer, 2021). Assessing the nature of American institutional developments in dual-use AI technologies reveals many ethical and normative limitations, most of which are absent in Chinese efforts due to its authoritarian nature and strongly centralised approach, forcibly fostering cooperation amongst the commercial and defence domains. Initially primarily fuelled by academic research and scholars’ work – benefitting from an educational sector which Beijing was devoid of -, attempts at fostering AI developments, complemented by varied attempts at pursuing CMI policies, have been the object of significant attention by the American Congress, which interest towards the matter can be traced back to defence-specific DARPA funding and, more recently, in defence acquisition legislation. Former U.S. President Jimmy Carter’s decision to allow the sale of dual-use equipment and technology to the PRC in the wake of the Soviet invasion of Afghanistan, a choice reiterated by the succeeding Reagan administration and normatively framed through the signature of the Export Administration Act (EAA) in 1979, leveraged growing American willingness to expand its business horizons by adopting more benign trade relations with several Communist countries, namely the People’s Republic of China, engrained within a pattern of gradual relaxation of diplomatic ties between the two countries symbolised by President Nixon’s visit to Beijing in 1972⁶⁰. Denoting Beijing’s attempts at enhancing MCF as “an aggressive national strategy of the Chinese Communist Party [...] to enable the PRC to develop the most technologically advanced military in the world”⁶¹, the United States have looked at the PRC’s program as challenging the transparency and shared values upon which global science and technology cooperation is rooted. Nevertheless, the White House has increasingly begun to engender its national degree of engagement amongst commercial actors and the DoD, most notably through Project Maven, a highly controversial initiative sponsored by the United States DoD seeking to employ Artificial Intelligence technologies to automate drone footage analysis.

⁶⁰ See: Nixon’s 1972 Visit to China at 50. February 2022. Wilson Centre. Retrieved at <https://www.wilsoncenter.org/blog-post/nixons-1972-visit-china-50>

⁶¹ See: Military-Civil Fusion and the People’s Republic of China. US Department of State. Retrieved at <https://www.state.gov/wp-content/uploads/2020/05/What-is-MCF-One-Pager.pdf>

4.3.2. Current DIB Developments and Project Maven

Figure 8: Top 25 Institutions for Top-Tier AI Research



Source: Macropolo. The Global AI Talent Tracker 2.0

The salience enjoyed by Artificial Intelligence-powered technologies within American borders – as well as the acknowledgement of their dual-use potentialities – inevitably spilled over the institutional domain and productive arrangements of the White House, seeking to contemporarily promote sustainable and ethical AI development whilst attempting to curtail Beijing’s growth by leveraging on structural deficiencies and weaknesses whose centrality has limited at length comprehensive approached undertaken by the PRC at renovating and modernising its industrial, military and technological apparatuses. As Washington maintains an educational edge over Beijing, with 60% of the most prestigious AI institutions as well as 57% of the international global AI talent operating within the US, the Department of Defence has maintained a policy approach of contributing to the enhancement of its DIB through its linkages with the commercial domain, wherein the federal government has benefitted from a monophonic market by establishing itself as the sole buyer for several contractors’ products and technologies. Thanks to this substantial foundation, the commercial sector retained the largest contribution to the U.S. DIB, both in regards to the numbers and value of the services and the equipment provided; the manufacturing and elaboration of computer, machinery, electronics and related equipment glaringly represents the top sector of industrial activity vis-à-vis its share of the total value of DoD contracting actions. Leading defence contractors (i.e., Lockheed

Martin, Northrop Grumman, RTX), whose efforts in adapting technological advancements to the military domain have been instrumental in favouring a modernisation of the American army, have proved successful in cementing their fruitful engagements with the Department of Defence: the CRS analysis of obligation information provided by OLDCC on the U.S. Defence Spending by State reports between 2019-2022 highlights how Lockheed Martin, RTX, General Dynamics, Boeing Co and Northrop Grumman received around an average of 31,25% of annual DoD contract obligations in the U.S.⁶². whilst featuring as suppliers of 74 of the 78 weapons systems identified by the DoD in 2024 as strategic priorities. The consolidation experienced by the defence industry throughout the 1990s – entailed a substantial reduction of private contractors competing to obtain DoD contracts. going from roughly 51 to the current ‘*Big Five*’ aerospace and defence prime contractors⁶³ - appeared evident concerning the supply of advanced weapon system categories (i.e., tactical missiles, fixed-wing aircraft, satellites); the February 2023 flight of the Lockheed Martin VISTA X-62A by AI in a groundbreaking 17-hour demonstration highlighted the substantial autonomy capabilities enjoyed by the United States Air Force and, more broadly, by the entirety of the United States Army; the VISTA – an acronym standing for Variable In-flight Simulation Test Aircraft – will significantly contribute to the attainment of autonomous, uncrewed platforms and aircrafts⁶⁴, attesting to the amount of investment and attention the Department of Defence has diverted towards the necessity of maintaining a technological edge over the PLA in light of recent ambitious proclamations by Beijing’s State Council. Pressured by the latter’s achievements via technological leapfrogging and overall ability to propel its armed forces and civil-military industrial sectors to a newfound prosperity, the White House has increasingly sought to augment the rate and scope of its AI-related programs and operationalisation projects, most notably through the announcement of

⁶² See: OLDCC, Fiscal Year 2019 https://oldcc.gov/sites/default/files/defense-spending-rpts/OLDCC_DSBS_FY2019_FINAL_WEB.pdf; OLDCC, Fiscal Year 2020 https://oldcc.gov/sites/default/files/defense-spending-rpts/OLDCC_DSBS_FY2020_FINAL_WEB.pdf; OLDCC Fiscal Year 2021 https://oldcc.gov/sites/default/files/OLDCC_DSBS_FY2021_FINAL_WEB.pdf; OLDCC Fiscal Year 2022 https://oldcc.gov/sites/default/files/defense-spending-rpts/OLDCC_DSBS_FY2022_FINAL_WEB_October2023.pdf

⁶³ See: DoD Report: Consolidation of Defence Industrial Base Poses Risks to National Security. February 2022. U.S. Department of Defense. Retrieved at <https://www.defense.gov/News/News-Stories/Article/Article/2937898/dod-report-consolidation-of-defense-industrial-base-poses-risks-to-national-sec/>

⁶⁴ See: VISTA X-62 Advancing Autonomy and Changing the Face of Air Power. February 2023. Lockheed Martin. Retrieved at <https://news.lockheedmartin.com/2023-02-13-VISTA-X-62-Advancing-Autonomy-and-Changing-the-Face-of-Air-Power>

Project Maven in April 2017, an ulterior DoD-sponsored endeavour designed to accelerate the obtainment of AI technology through the assignment of a primary contractor role to Google, leading to a widespread outcry within the company's ranks, culminating in the publication of an open letter on behalf of Google's employees condemning the company's decision to get involved in the "business of war"⁶⁵. Defined as an initial attempt at "*algorithmic warfare*" meant to assess the potentialities of AI and transpose them into fruitful military capacities, Project Maven sought to provide the government with a cutting-edge machine-learning program capable of commanding and controlling the battlefield in real-time, seemingly seeking to harbour closer Silicon Valley-White House cooperation on the grounds of the progress attained by the Obama administration, such as the set-up of the Defence Innovation Unit (DIU) in 2015 by former Secretary of Defence Ash Carter, meant to accelerate the adoption of commercial technologies by the military by promoting closer engagements amongst Silicon Valley actors and the Department of Defence. The DIU has proved successful in fostering the adoption of machine-learning programs by the U.S. Army, with projects such as the provision of long-range detection, identification and tracking mechanisms to the Joint Air Defence Operations Centre and the elaboration of AI software for flight optimisation purposes, hence demonstrating that, despite the significant progress attained by the PRC in upscaling its technological and industrial base, the White House has upheld an equally-sizeable commitment towards the protection of its national interests, framing the loss of global technological leadership as a grave danger to its national security and prosperity (Kennedy, 2024). Hindered by the necessity of modernising existing capabilities – precluded the potentiality of technological and industrial leapfrogging enjoyed by China – the White House needs to renew its institutional commitments and financial support to embryonic projects that may provide Washington with a much-needed competitive edge.

4.3.3. Institutional Efforts: The Chief Digital and Artificial Intelligence Centre

The 2017 New Generation Artificial Intelligence Development Plan (NGAIDP) promoted by the PRC's State Council reiterated the evidence that a coordinated and concerted state approach was being undertaken in China, inevitably entailing the necessity of upholding a comparable degree of institutional protection and engagement within the United States.

⁶⁵ See: Google Employees: we no longer believe the company places values over profits. In CNBC. November 2017. Retrieved at <https://www.cnbc.com/2018/11/27/read-google-employees-open-letter-protesting-project-dragonfly.html>

Concerns about the capacity to retain their leadership within a previously unrivalled dimension led American policymakers and DoD leaders to envision a Third Offset strategy within the technological and digital domain, designed to exploit all major advances in artificial intelligence and automation for them to be transposed into the Department's battle networks. Officially recognised by the White House as a potentially disruptive force due to its inherently transformative nature, the pursuit of AI applications – deriving predominantly from the investments and research conducted by private companies – has been muddled by bitter disagreements between Silicon Valley experts and White House policymakers, owing to the unwillingness of several Big Tech workers to actively participate in R&D contributing to military advancements and potentially fomenting a culture of antagonism and competition perceived as ultimately stunting the elaboration of increasingly complex machine-learning algorithms and AI capabilities. Grounded upon a suggestion moved by the Defence Innovation Board in October 2016, the Defence Department's Joint Artificial Intelligence Centre (JAIC) – created in June 2018 – sought to drive the elaboration and operationalisation of AI-enabled technologies, leading the execution of large-scale AI projects known as the “*National Mission Initiatives*”, designed to address far-reaching and pressing challenges, while fostering the establishment of engendered cooperative patterns and engagement with external actors (i.e., private companies and academic centres). Primarily representing an attempt to ease the coordination in AI integration through greater centralisation and the implementation of standardising core inputs, JAIC's potential for reducing the costs of developing and subsequently deploying AI appeared evident; nevertheless, while efficiency improvements will contribute to assisting Washington's efforts at curbing the security concerns entailed by its limitations in AI ambitions, what seems to represent an even greater necessity for the White House is the fostering of closer and more fruitful linkages with leading AI companies, hence relying on normative respect for ethical guidelines seeking to guarantee a sustainable and fair process towards automation. The issuance of commercial solutions opening (CSOs) – a manner of acquisition pioneered by the Defence Innovation Unit and similar to other transaction agreements, permitting federal agencies to negotiate binding contracts to access critical technologies without having to withstand the orthodox procurement process – in October 2020, meant to assist the research for commercial A.I. prototypes by the JAIC represented merely one instrument through which the DoD sought to emphasise the cultivation of ties between the federal government and commercial technology giants. The centralisation of the Joint Artificial

Intelligence Centre, the Defence Digital Service and the Office of Advancing Analytics into the Chief Digital and Artificial Intelligence Office furthers the understanding that the White House is actively seeking to avoid opportunity and efficiency dispersion by bringing the foremost *locus* of A.I. development under the *aegis* of an individual agency, led by a Chief Digital Officer, a pioneering role instrumental for the adoption and application of analytics and data⁶⁶: structurally impeded from replicating a thoroughly-centralized and closely-interlinked model as the Chinese one, Washington sees itself engaged with ethical requests and transparency measures if it seeks to attain a degree of integration amongst the civil and military sectors comparable to that of Beijing, benefitting however from more advanced manufacturing capabilities, heightened investment and funding as well as higher-quality academic pool and educational centres. Emphasis is being moved from *adoption* towards *integration* of AI, capitalising off the publications elaborated by the JAIC in the past months – i.e., the launch of data cards, instruments designed to control data sets and algorithms and enabling users to identify useful information conducive to more efficient decision-making⁶⁷ – premises upon patterns of interconnection amongst governmental branches and departments, presenting the path towards technological leadership as one of utmost concertedness. The establishment of the AI and Data Acceleration Initiative (AIDA) complements the view underlining the favourability of transparently guaranteeing open access to DoD data on machine learning and A.I., contributing to the advancement of data- and A.I.-related concepts – commonly of inherent dual-use nature, i.e., command-and-control mechanisms – as a driver for the generation of foundational capacities through episodic exercises aiming to guarantee both operational know-how as well as capability to produce data employable by sensor data ultimately. The creation of the National Science Foundation’s Directorate for Technology, Innovation and Partnership – the foundation’s first new Directorate in 30 years – has similarly seen the light of day as a means for incrementing the scope of the support provided to “use-inspired” R&D within the digital realm⁶⁸, though stemming from considerable Congressional controversies surrounding its operating mission: rivalling legislative proposals – the Senate-passed U.S. Innovation and

⁶⁶ See: Artificial Intelligence and the Growing Importance of Chief Digital Officers. April 2024. Chuck Brooks. In Forbes. Retrieved at <https://www.forbes.com/sites/chuckbrooks/2024/04/01/artificial-intelligence-and-the-growing-importance-of-chief-digital-officers/?sh=7ce37d7e100c>

⁶⁷ See: JAIC Chief: AI Is Creating Major Shift Inside DoD. November 2021. Nikki Henderson. In GovCio: Media & Research. Retrieved at <https://govciomedia.com/jaic-chief-ai-is-creating-major-shift-inside-dod/>

⁶⁸ See: NSF Stands Up Directorate for Technology, Innovation and Partnerships. March 2022. Mitch Ambrose. In American Institute of Physics. Retrieved at <https://ww2.aip.org/fyi/2022/nsf-stands-directorate-technology-innovation-and-partnerships>

Competition Act (USICA), proposing the periodic publication of a set of 10 key technology focus areas⁶⁹, and the House-passed America COMPETES Act of 2022⁷⁰, which proposes a broader framework meant to assess societal challenges through the development of key, strategic technologies. The Directorate's establishment, grounded upon a \$20 billion funding provided for the agency over 2023-2027, represents the operationalisation of the framework presented by the 2022 CHIPS and Science Act, seeking to propel U.S. global leadership in science and technology as a direct response to Beijing's Made in China 2025, through which the PRC engendered its investment towards ten developing, high-tech industry potentially instrumental for the attainment of success through the 4IR: among these, A.I. and robotics proved to be essential, acting as enablers for the ulterior enhancement of several other included technologies (i.e., aerospace engineering, electrical equipment, high-tech maritime engineering) (Archer et al., 2023). Complemented in scope by the Infrastructure Investment and Jobs Act⁷¹ and the Inflation Reduction Act⁷², the CHIPS and Science Act's main goal is to assist a comprehensive rejuvenation of American technological R&D while favouring engendered global competition on key technological assets. In particular, the TIP's principal area of focus and operation concerns use-inspired research, seeking a "fundamental understanding of scientific problems while at the same time having a clear and direct use for society" (Anckaert et al., 2020).

As the idea of 'Chimerica' seems to bring back memories of a long-gone past, the United States and the People's Republic of China have increasingly become embroiled in geopolitical and strategic struggles which have contributed to a reshaping of the international order, framed as a defining facet of contemporary dynamics of great power competition⁷³, the idea of network platforms – "*digital services that provide value to their users by aggregating them in large numbers, often at a transnational and global scale*" (Schmidt et al., 2021) being relocated to countries rivalling Washington – exerting considerable influence over its populace and potentially shaping popular discourses and

⁶⁹ See: <https://www.congress.gov/117/bills/s/1260/BILLS-117s1260es.pdf#page=79>

⁷⁰ See: House Passes America COMPETES Act. February 2022. In American Council on Education. Retrieved at <https://www.acenet.edu/News-Room/Pages/House-Passes-America-COMPETES-Act.aspx>

⁷¹ See: H.R.3684 – Infrastructure Investment and Jobs Act. Congress.Gov. Retrieved at <https://www.congress.gov/bill/117th-congress/house-bill/3684>

⁷² See: H.R.5376 – Inflation Reduction Act of 2022. Congress.Gov. Retrieved at <https://www.congress.gov/bill/117th-congress/house-bill/5376>

⁷³ See: Seize the Technological High Ground for Success in Great-Power Competition. April 2023. In Air University. Jonathan Varoli. Retrieved at <https://www.airuniversity.af.edu/JIPA/Display/Article/3371631/seize-the-technological-high-ground-for-success-in-great-power-competition/>

narratives – underlines the paramount need for the White House to foster continuous fruitful partnerships in A.I. and advanced technologies with traditional allies such as the European Union, as well as developing powers such as India. Significant challenges lie ahead of both Washington and Beijing, and decoupling appears to represent the most suitable solution for guaranteeing a thorough and concerted revitalisation of America's productivity in strategic areas while guaranteeing a similar degree of build-up to its allies which may greatly benefit from engendered Sino-American decoupling (Schuller, 2020). Facing considerable pressure exerted by the PRC's radical revision of its developmental policies as well as cumbersome financial capabilities and funding directed towards A.I., the United States must be able to complement the undertaking of rapid and efficient innovative processes nationally while harbouring interaction with like-minded countries on strategic trade control, attempting to leverage off the PRC's techno-nationalist approach regarding semiconductor manufacturing by denying Beijing access to Western- and Taiwan-produced chips whose importance in the manufacturing process and elaboration of innovative technologies and strategic weaponry is paramount. Benefitting from a considerably advanced R&D sector, with leading private companies and commercial actors operating primarily within American soil, as well as high-quality education promoting the teaching and diffusion of machine learning, Washington has the potential to withstand Beijing's rise and successfully retain its global technological leadership, backed by an array of friendly state actors with a long-standing history of cooperation and interaction. Although Beijing may effectively surpass the United States in technological innovation and development, doubts continue to be raised regarding the value-neutrality of Chinese innovations, and concerns about ethics and security seem to disadvantage Chinese companies and products vis-à-vis Western ones continuously.

V. Conclusion

The paths undertaken by Washington and Beijing towards attaining a technological advantage within A.I. through a comprehensive fostering of national manufacturing capacities and capacity-building have entailed repeated attempts at combining commercial and military efforts. However, defining results are yet to be observed due to the inherently contemporary nature of said endeavours. It undoubtedly emerges that both actors have engendered their respective degrees of commitment and investment directed towards the formulation of machine-learning capabilities and subsequent adaptation of cutting-edge technologies to the military sector, ensuring a strategic, operational edge over the opponent. While Beijing's CMI integration programs achieved considerable success in accelerating development, the degree of capacity-building attained by MCF programs via the centralization of decision-making processes and the establishment of significant linkages between the commercial and defence sector, whilst cultivating a significant local talent pool backed by leading educational centres attracting scholars from over the globe has proved to represent a far greater threat to Washington's plans of retaining technological dominance, as Beijing's pressure has increasingly mounted over the past decade, fuelled by an institutional adherence to techno-nationalist doctrines strongly relying on the establishment of indigenous, national productive and manufacturing capacities, ultimately motivated the organic interdependence between national security and technological advancements⁷⁴; the United States similarly embraced a techno-nationalist approach, – though limited in scope and magnitude, primarily due to institutional constraints rendering concerted coordination of commercial and military integrative dynamics arduous -, increasingly targeting Chinese strategic businesses and sectors in order to hinder and curtail Beijing's ambitions. Falling behind in indexes referring to the number of A.I.-related papers and advancements in A.I. face recognition, speech tech, and drone manufacturing (Allison et Schmidt, 2020), Washington has struggled to further its advancements at the same pace of Beijing, the latter benefitting from the significant potentialities of endorsing a thorough technological leapfrogging. Nevertheless, a bipartisan consensus has emerged amongst the American populace and policymakers, highlighting the salience of potential conflictual dynamics with China and

⁷⁴ See: Techno-nationalism or building a global science and technology commons? (but what about China?). L. Lynn, H. Salzman. In *Global Policy*. August 2023. Retrieved at <https://onlinelibrary.wiley.com/doi/full/10.1111/1758-5899.13258>

their potential disruptive consequences for global order and value chains. Understanding this with an HST-based framework allows us to comprehend how a period of decrease in relative power differentials between the U.S. and China⁷⁵ has coincided with heightened tensions and stronger juxtaposition concerning various facets of international governance, reflecting the contesting nature of the power seeking to reverse – or at least alter to its benefit – the status quo. Amongst persisting significant challenges for the United States - China will inevitably have access to the world’s biggest domestic consumer market, leading Allison and Schmidt to envision a potential Chinese overtaking by 2030, as declared in its 2017 NGAIDP (Wu et al., 2020) – comparable efforts have been undertaken by the White House, signalling a significant commitment “to ensure [...] maintain[ment] of U.S. global leadership”⁷⁶. In its efforts to compete with Beijing’s staggering numerical power, the White House should concentrate its efforts towards maintaining its educational edge and prestige, leveraging its relationships with Western and global allies to attract an even greater number of scholars to continue upholding the cutting-edge quality of U.S.-produced A.I. papers and R&D. Fostering engendered cooperation within multinational consortiums – whilst favouring the maintenance of traditional alliances and avoiding the exertion of even greater Chinese influence over strategic regions -, potentially providing for spill-over programs with European allies to contemporarily build cooperativeness as well as address their respective national security concerns, promoting the acknowledgement of common security threats needing to be addressed, as previewed by the announcement of shared research alliances grounded upon the threats posed by Moscow and Beijing to global stability⁷⁷. Furthermore, the lack of Chinese national manufacturing capacities of semiconductors and operating systems, domains where the United States retains a significant advantage thanks to its first-mover status⁷⁸, poses an ulterior barrier to Chinese short-term ambitions, entailing mandatory reliance on Western- and Taiwan-produced chips inevitably curtailing indigenous industrial endeavours. Nye (2024) notes the paramount relevance of American soft power as an ulterior element contributing to the reinforcement of its hegemonic status, with a survey conducted with 24 countries demonstrating that the vast majority of the

⁷⁵ See: Ndzendze, B., Marwala, T., (2023) op. cit.

⁷⁶ See: National Security Commission on Artificial Intelligence. Final Report. <https://cybercemetery.unt.edu/nscai/20211005220330/https://www.nscai.gov/>

⁷⁷ See: US, EU update shared taxonomy, unveil new research alliance. A. Kelley. April 2024. In NextGov. Retrieved at <https://www.nextgov.com/artificial-intelligence/2024/04/us-eu-update-shared-ai-taxonomy-unveil-new-research-alliance/395526/>

⁷⁸ See: Allison, G., Schmidt, E., (2020). Op. cit

participants conceive Washington in a very positive light, whilst Beijing is increasingly perceived with suspicion due to its revisionist claims and ambitions⁷⁹, notably amidst the resurgence of long-lasting territorial claims with the Republic of China⁸⁰.

Whilst China may effectively succeed in attaining the medium- and long-term ambitions outlined in its policy programs, Washington is well-positioned to defend its national interests against mounting security concerns, owing to significant capacity-building, elevated quality in terms of educational output and commercial enterprises for what concerns the development of commercial technologies, with an inherent spin-on towards the adoption of said technology in the military domain, a process complemented by the strict relationship with private defence contractors supplying the armed forces with trail-blazing A.I.-powered instruments⁸¹. The techno-nationalist-induced process of decoupling characterising global affairs, motivated by the unbearable consequences entailed by armed conflict, may ultimately culminate in the formation of a new, multipolar international order, rupturing the cycle of hegemonic conflict predicted by Gilpin (Schweller, 2014). A reduction on behalf of the United States may be necessary, advocated for by Ross (2023) as benefitting the promotion of thorough industrial production and the modernisation of military capabilities, reducing the degree of military control over the East Asian region as means of combating techno-nationalism at its very core, denying an encirclement against China. By engendering cooperative patterns – already prominent in renewable energies and environmental practices – the White House and the PRC can successfully and peacefully sail to a new hegemonic cycle, one within which the distribution of power acquires a bipolar nature, leading to the emergence of two principal areas of influence, a move supported by an incremental turn towards regional and minilateral agreements, turning away from globalisation in favour of stronger regionalisation.

⁷⁹ See: Comparing Views of the U.S. and China in 24 Countries. Pew Research Centre. November 2023. Retrieved at <https://www.pewresearch.org/global/2023/11/06/comparing-views-of-the-us-and-china-in-24-countries/>

⁸⁰ See: China has launched new drills encircling Taiwan. Why now? In CNN World. May 2024. Retrieved at <https://edition.cnn.com/2024/05/23/asia/china-taiwan-drills-explainer-intl-hnk/index.html>

⁸¹ See: Lockheed Martin in Artificial Intelligence: theme innovation strategy. In Army Technology. February 2024. Retrieved at <https://www.army-technology.com/data-insights/lockheed-martin-in-artificial-intelligence-theme-innovation-strategy/>

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