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Cold War 2.0 and defence readiness

d'Artis Kancs^{1*}

Abstract

In the context of simultaneous rise of external threats through CRINK and the reprioritisation of transatlantic ally's global posture, we study how a protracted low intensity conflict with CRINK would affect European allies' preparedness to protect the security of the citizens and the integrity of the territory. As a worst case, we investigate the trade channel of geo-economic fragmentation in a Cold War 2.0 implying a complete cessation of trade with CRINK and a full blockade of Taiwan in an international multi-sectoral macroeconomic model featuring the defence sector and interlinking countries via global supply chains. Even this less kinetic conflict will create challenges for Europe's security—challenges that will only grow more acute as the crisis worsens. By quantifying the cost of unpreparedness, we provide an evidence-based rationale for European allies to embark on a gradual de-risking of trade trajectory rather than waiting for a much more costly “abrupt shock” trigger dictated by strategic challengers.

Keywords Cold War 2.0, CRINK, NATO, Defence, Preparedness, Readiness

JEL H56, H57, L11

Introduction

The three decades of the ‘relative’ post-Cold War peace period in Europe¹ have ended abruptly with the Russia's full-scale war against Ukraine. Not just this one military's aggression challenge, but through multiple, security-political-economic-environmental challenges NATO allies are increasingly facing multi-dimensional, complex and cross-border threats and attacks [1]. As noted by Polyakova et al. [2], security threats coming from state and non-state actors abroad in the form of hybrid warfare blur the lines between conventional and unconventional forms of conflict, the lines between civilian and military, state and non-state, peace and war are increasingly

blurred. The entire nature of hybrid warfare on allies is changing. In addition to cyber-attacks, increasingly also physical and brazen attacks, as with sabotage, electronic signals jamming, drone incursions, parcel bombs on airplanes, damage of critical energy infrastructure such as underwater cables, and assassinations using chemical/biological agents [3]. It is an uncomfortable shift for a community that started out as a peace project in the ashes of World War II to acknowledging that *Europe is at war* and *Europe must fight* [3], von der Leyen [4]).²

“The reality is that we are not engaged in strategic competition; rather we are already in Phase Zero of a protracted conflict with Russia and China” [5]. Indeed, there is a growing evidence suggesting that democracies around the world are facing early stages of a system-transforming war by a newly formed “axis of upheaval” [3, 6]. While Russia and China are setting a new global agenda, Iran and North Korea work to dismantle what's left of their regional power balances. Indeed, the new informal alliance of China, Russia, Iran and North Korea

¹ Throughout the paper, terms European allies, Europe and Alliance are used interchangeably. They refer to 28 member states of NATO, except the two transatlantic and two Aegean members.

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² https://ec.europa.eu/commission/presscorner/detail/en/speech_25_2053

(CRINK) accelerates to consolidate and is preparing for a long-term confrontation. The threats originating from CRINK to allies' freedom and security are just as big as during the Cold War – if not bigger [6].

While the threat is coordinated, Alliance's response so far is not. Although declaring itself united, the Alliance remains fractured politically, militarily and economically. Allies are often divided when it comes to their economic interests and they lack a shared threat assessment, as recently exemplified by the failure to agree on a common defence spending target within the Alliance [7]. While during the Cold War NATO's European members spent on average about 4.1 percent of GDP on defence, the European allies' defence expenditure was 1.8% in 2024 [8]. Obscured by nostalgia, some political and strategic leaders in Europe are still struggling with accepting that the good old days of post-Cold War peace have passed and the rules-based international order is changing. Indeed, battle lines for a new world order based on power are being drawn right now (von der Leyen 2025).

A renewed urgency to boosting defence preparedness and readiness in Europe is added by two developments in the contemporary external security environment. The first concerns the emerging consensus among European intelligence services that Russia may, within approximately three to five years, regenerate sufficient conventional military capacity to mount a large-scale campaign against European allies. This projection resonates with scholarly analyses of Russia's enduring revisionist posture and its long-term strategy of contesting the post-Cold War European security order [2, 9]. It also connects to the literature on deterrence and reassurance within NATO, which has been increasingly concerned with developments in the Indo-Pacific. Especially, concerns are growing about the threat to Taiwan's security from China. Contingency over Taiwan would not only have a devastating impact on the global economy, but also have the potential to involve the principal transatlantic ally in a direct conflict with a near-peer (and nuclear-armed) strategic competitor [10].

The second development pertains to the evolving reorientation of NATO's principal transatlantic ally, whose foreign and security policy is increasingly marked by isolationist tendencies and a recalibration of global commitments. By distancing itself from the institutional and defence frameworks of the post-war European order, this shift reflects broader concerns of European allies within asymmetric security [11]. As a result of shifting priorities of the U.S. toward the Indo-Pacific or the U.S. choosing to reduce its presence in Europe overall, gaps would emerge in Europe that would likely erode allies' ability to deter and defend against Russian aggression. The trajectory also engages with increasing demands for European strategic autonomy, which interrogates both the

feasibility and desirability of reducing reliance on the U.S. while preserving the transatlantic solidarity [12]. For Europe, the prospect of attenuated U.S. engagement raises questions about the credibility of extended deterrence against Russia, the sustainability of NATO burden-sharing arrangements in a protracted conflict and war, and the necessity of greater intra-European defence integration and strengthening [13].

In the context of this dual challenge – the simultaneous rise of external threat (balancing against revisionist powers) and internal reprioritisation (managing the Alliance's cohesion against global posture) – we study how a protracted low intensity conflict with CRINK would affect Europe's preparedness to ensure the security of its citizens and the integrity of its territory. Specifically, we investigate how a geo-economic fragmentation affects the defence preparedness of European allies' through trade channel. The rationale of studying a Cold War 2.0 scenario, rather than a full-scale conventional war, is to underscore that even this less kinetic conflict will create challenges that affect Europe's security—challenges that would only grow more acute as the crisis worsens. The compression of timelines for such possible changes in boundary conditions triggered by CRINK additionally challenges Europe's ability to reconcile political will, fiscal constraints, and institutional coordination in order to enhance deterrence credibility. Our study aims to improve how Europe identifies vulnerabilities, evaluates its preparedness, converts the political will into capabilities, and enhances its preparedness and readiness.

The empirical analysis consists of two complementary parts. First, by applying an international multi-sectoral macroeconomic model featuring the defence sector and interlinking countries via supply chains in a global economy we simulate Cold War 2.0 as one possible worst-case scenario. The Cold War 2.0 scenario is composed of two trade-shock components: a complete cessation of trade between the Alliance and CRINK (global) and China imposing a complete air and maritime blockade on Taiwan (local). By looking through the lens of a global cold war economy networked through trade flows in raw materials, intermediate inputs and final demand goods we study the propagation of geo-economic fragmentation shocks through global supply chains and their impact on defence preparedness in Europe.

In a second step, the impacts of the simulated protracted low intensity conflict with CRINK on the European allies' preparedness are evaluated. We stress-test the defence industrial mobilisation, force mobility, and sustained whole-of-society resilience under a global geo-economic fragmentation shock in order to identify fields of action for strategic decision makers. To assess the defence industrial mobilisation in Europe in such a contested trade environment, we calculate the ability of

existing and surge production capabilities to replace U.S. military assets that are redeployed into the Indo-Pacific, creating gaps and vulnerabilities in NATO's conventional forces in Europe. To evaluate the force mobility, we compute the movement time represented by the effective average speed of force element operational mobility, i.e. the time it takes the force elements to reach its destination. The whole-of-society sustained resilience of European allies under a global geo-economic fragmentation is assessed via a composite resilience indicator.

Our results suggest that even this less kinetic conflict will create challenges additionally contesting Europe's security—challenges that would only grow more acute as the crisis worsens. By quantifying the cost of unpreparedness, we provide an evidence-based rationale for European allies to embark on a gradual de-risking trajectory rather than waiting for a much more costly “abrupt shock” trigger dictated by geopolitical events. Our worst-case scenario analysis results highlight the need to think beyond the current Russia's war in Ukraine and accelerate making plans and investments now to prevent a Russian opportunistic aggression later.

Cold War 2.0 scenario simulation

We start the analysis with application of an international multi-sectoral macroeconomic model featuring the defence sector and interlinking countries via supply chains to the global economy, and simulate the Cold War 2.0 scenario as one possible worst-case scenario. The Cold War 2.0 scenario consists of two trade-shock components one global and one local. Only the global CRINK trade policy shock is modelled explicitly in this section, though both global and local shocks have implications for the European allies' preparedness and readiness to deter and defend. By looking through the lens of a cold war economy featuring global value chains, we simulate the full pattern of intermediate input sourcing and final-use expenditures as measured in data. The section outlines the underlying analytical model, details the Cold War 2.0 scenario construction, and presents key simulation results.

The EU-EMS model

To study how systemic shocks are transmitted to countries' prices, production, consumption, trade and welfare in presence of global cross-border multi-stage production networks, we rely on an empirically parameterised and validated model of Kancs [14] that is adopted to capture general equilibrium effects of global value chains, including the defence sector. Sectoral heterogeneity is an important dimension in our analysis as impacts of bilateral trade cost changes differ across countries depending on the sectoral composition of their economies and the relative dependency on different foreign markets. This

modelling framework allows us to explore the long-run impacts of trade policy changes on prices, production, consumption and welfare of countries through the reorganisation of the GSCs they are involved in.

The world economy we consider is perfectly competitive consisting of J countries, indexed $j = 1, \dots, J$ and S sectors, indexed $s = 1, \dots, S$. Country j 's consumers and firms source sector s 's final and intermediate goods from the lowest price supplier across all countries. Consumer preferences in country j are characterised by the utility function:

$$u(C_j) = \prod_{s=1}^S (C_j^s)^{\alpha_j^s}$$

where C_j^s is the consumption of good j supplied by sector s and α_j^s is the sector's share in expenditure with $\sum_{s=1}^S \alpha_j^s = 1$. In sector s of country j , good ω^s is produced according to the Cobb–Douglas production function:

$$y_j^s(\omega^s) = z_j^s(\omega^s) (l_j^s(\omega^s))^{1-\sum_{r=1}^S \gamma_j^{rs}} \prod_{r=1}^S (M_j^{rs}(\omega^s))^{\gamma_j^{rs}}$$

where $y_j^s(\omega^s)$ is output, $z_j^s(\omega^s)$ is total factor productivity capturing firm technology, $l_j^s(\omega^s)$ is labour input, and $M_j^{rs}(\omega^s)$ is a Cobb–Douglas composite of intermediate inputs from all sectors with shares γ_j^{rs} for $r = 1, \dots, M$ such that $\sum_{r=1}^S \gamma_j^{rs} = 1$. Technology $z_j^s(\omega^s)$ is an i.i.d. draw from a Frechet distribution with cumulative density function $exp(-T_j^s z^{-\theta^s})$. In this distribution $-T_j^s$ governs the state of technology of country j in sector s , while $\theta^s > 1$ is an inverse measure of the dispersion of productivity in sector s across producers, thereby shaping comparative advantage. This randomness makes consumers' and firms' optimal sourcing decisions the solutions to the discrete choice problem with random parameters of choosing the lowest price source country.

Sector s 's composite product Q_j^s is a CES aggregate of its goods over the unit interval:

$$Q_j^s = \left(\int_0^1 q_j^s(\omega^s)^{1-1/\sigma^s} d\omega^s \right)^{\sigma^s/(\sigma^s-1)}$$

where σ^s is the elasticity of substitution between sector s 's goods and $q_j^s(\omega^s)$ denotes the quantity of product ω^s that is ultimately purchased from the lowest price source country. The equilibrium of the model can be found by maximising utility subject to the unit cost function, c_j^s , associated with 1:

$$c_j^s = \Upsilon_j^s w_j^{1 - \sum_{r=1}^S \gamma_j^{rs}} \prod_{r=1}^S (P_j^{rs})^{\gamma_j^{rs}}$$

where Υ is a constant that depends only on γ_j^{rs} for $r = 1, \dots, M$, w_j is the wage rate of labour, and P_j^{rs} is the price index of intermediate inputs:

$$P_j^{rs} = A^r \left[\sum_{i=1}^J T_j^r (\gamma_i^r \tau_{ij}^{rs})^{-\theta^r} \right]^{-1/\theta^r}$$

Analogously, the price index of final goods, F , can be expressed as:

$$P_j^{r,F} = \prod_{s=1}^S \frac{1}{\alpha_j^s} A^r \left[\sum_{i=1}^J T_i^r (c_i^r \tau_{ij}^{r,F})^{-\theta^r} \right]^{-\alpha_j^s/\theta^r}$$

These price indices depend on technologies, T_j^s , unit costs, c_i^r , and trade costs τ_{ij}^{rs} between origin country i and destination country j . Trade costs are of the iceberg type with $\tau_{ij}^{rs} \geq 1$ measuring the number of units of a good produced by sector r for use in sector s that have to be shipped from country i to country j for one unit to arrive in destination. Fraction $\tau_{ij}^{rs} - 1$ of the transported good is used to pay for transportation. The price indices also depend on sector-specific productivity dispersion parameter, θ^r .

In equilibrium, the shares of intermediate goods sector s in country j sources from sector r in country i are given by:

$$\pi_{ij}^{rs} = \frac{T_i^r (c_i^r \tau_{ij}^{rs})^{-\theta^r}}{\sum_{k=1}^J T_i^r (c_i^k \tau_{kj}^{rs})^{-\theta^r}}$$

and the corresponding shares of final products sector F in country j sources from sector r in country i are given by:

$$\pi_{ij}^{r,F} = \frac{T_i^r (c_i^r \tau_{ij}^{r,F})^{-\theta^r}}{\sum_{k=1}^J T_i^r (c_i^k \tau_{kj}^{r,F})^{-\theta^r}}$$

which themselves depend on technologies, T_j^s , unit costs, c_j^s , and trade costs, trade costs τ_{ij}^{rs} between countries i and j . They also depend on the productivity dispersion, θ^r . These parameters can be interpreted as sector-specific trade elasticities as they measure (in absolute value) the percentage fall in a sector's bilateral trade due to a 1% increase in the bilateral iceberg trade cost.

The model is closed by two sets of market clearing conditions and a trade balance condition. The first requires that for each country j the total expenditure, X_j^s , satisfies:

$$X_j^s = \sum_{r=1}^S \gamma_j^{sr} Y_j^r + \alpha_j^s (w_j L_j + D_j)$$

where D_j denotes the trade deficit so that the two terms on the right hand side correspond to total expenditures on the country's intermediate and final products respectively. The second market clearing condition requires that the total output, Y_j^r , satisfies:

$$Y_j^s = \sum_{r=1}^S \sum_{k=1}^J \pi_{jk}^{sr} \gamma_k^{sr} Y_k^r + \sum_{k=1}^J \pi_{jk}^{s,F} \alpha_k^s (w_k L_k + D_k)$$

where the two terms on the right hand side correspond to the country's total output levels of intermediate and final products respectively.

The trade balance condition requires that country j 's aggregate imports equal the aggregate exports plus its trade deficit, D_j :

$$\begin{aligned} & \sum_{i=1}^J \sum_{r=1}^S \sum_{s=1}^S \pi_{ij}^{sr} \gamma_j^{sr} Y_j^r + w_j L_j \\ &= \sum_{i=1}^J \sum_{r=1}^S \sum_{s=1}^S \pi_{ji}^{sr} \gamma_i^{sr} Y_i^r + \sum_{s=1}^J \sum_{i=1}^J \pi_{ji}^{s,F} \alpha_i^s (w_i L_i + D_i) \end{aligned}$$

Finally, the equilibrium is defined by the following system of equations: $J \times S$ equations of the unit cost function, $c_j^s, J \times (J - 1) \times S$ equations of the price index of intermediate inputs, P_j^{rs} , $J \times S$ equations of the price index of final demand goods, $P_j^{r,F}$, $J \times (J - 1) \times S \times S$ equations of the shares of intermediate inputs, π_{ij}^{rs} , $J \times (J - 1) \times S$ equations of the shares of final demand goods, $\pi_{ij}^{r,F}$, $J \times S - 1$ equations of the total output, Y_j^r , and J equations of the trade balance condition. In this system of equations we seek to solve for the following unknown variables: $J \times (J - 1) \times S \times S$ independent intermediate goods trade shares, $\pi_{ij}^{sr}, J \times (J - 1) \times S$ independent final goods trade shares, $\pi_{ij}^{r,F}$, $J \times S$ unit production costs, c_j^s , $J \times S \times S$ intermediate goods price indices, P_j^{rs} , $J \times S$ final goods price indices, $P_j^{r,F}$, $J - 1$ wage levels, w_j , (one is a numeraire), and $J \times S$ gross output levels, Y_j^s .

$$\begin{aligned}
 & [J \times S] + [J \times (J - 1) \times S] + [J \times S] \\
 & + [J \times (J - 1) \times S \times S] + [J \times (J - 1) \times S] \\
 & + [J \times S - 1] + [J]
 \end{aligned}$$

equilibrium equations need to be solved simultaneously – implies that solving the model is computationally demanding. To reduce the computational burden, we solve the system of equilibrium equations for the effects of a change in trade costs on wages, output and prices in differences. By applying goods market-clearing and trade balance conditions, allows us deriving results for changes in the variables of interest, without knowing the initial levels of the target variables. In this "hat algebra" approach we only need data on the intermediate input and final demand goods trade shares, $\pi_{ij}^{r,s}$ and $\pi_{ij}^{r,F}$, and the intermediate input and final demand goods expenditure shares, $\gamma_j^{r,s}$ and α_j^s . Further, for parameterising the model, we need values for trade elasticities, θ^r , and for operationalising the trade policy shock in the model, information on changes in trade costs is required.

The intermediate input and final demand goods trade shares, $\pi_{ij}^{r,s}$ and $\pi_{ij}^{r,F}$, and the intermediate input and final demand goods expenditure shares, $\gamma_j^{r,s}$ and α_j^s , are computed from the World Input–Output Tables (WIOT) and Inter-Country Input–Output (ICIO) data. Each entry of the World Input–Output matrix represents a country-sector pair, e.g. how much each sector in Italy spends on intermediate input and final demand goods from each sector in China. To illustrate the type of bilateral trade data detailed in the model, we can think of an input–output table of a simplified world economy. The table consists of two panels for intermediate inputs and final goods. This distinction is crucial for both (i) computing the actual trade costs including tariffs and (ii) mapping

the observed input–output linkages into the model. This richness of the World Input–Output trade data allows us to determine the impact of systemic shocks on each sector within each country.

The most influential parameter in this model (like most trade models) is the trade elasticity, θ^r , that determines substitution within each sector across goods from different origin countries. Therefore, elasticity estimates are drawn from the econometric literature [15]. In line with the importance of this elasticity in the trade literature, assumptions about the trade elasticity have the largest impact on the underlying model estimates. The elasticity of substitution of traded goods from different origin determines the ease and speed with which trade can be reorganised, for example, away from countries which have increased import tariffs. If trade elasticity is low, it is hard to find alternatives for existing imported goods and the welfare loss of cutting the trade link is high. If the elasticity is higher, substitution is easier and welfare costs are much lower. In line with literature estimates (Fig. 1), it seems plausible to assume, however, that the relevant trade elasticities, are larger in the medium and long run, and smaller in the very short run. This time-dependency of trade elasticities implies that the size of economic losses stemming from a sharp increase in trade costs with certain trading partners and the following reduction in trade flows depends crucially on the time frame over which adjustments take place and is the key why our model predicts smaller economic costs in the long run than in the short run.

Cold War 2.0 scenario construction

In view of our objective – to assess how the trade channel of geo-economic fragmentation affects the defence preparedness of European allies under changed boundary

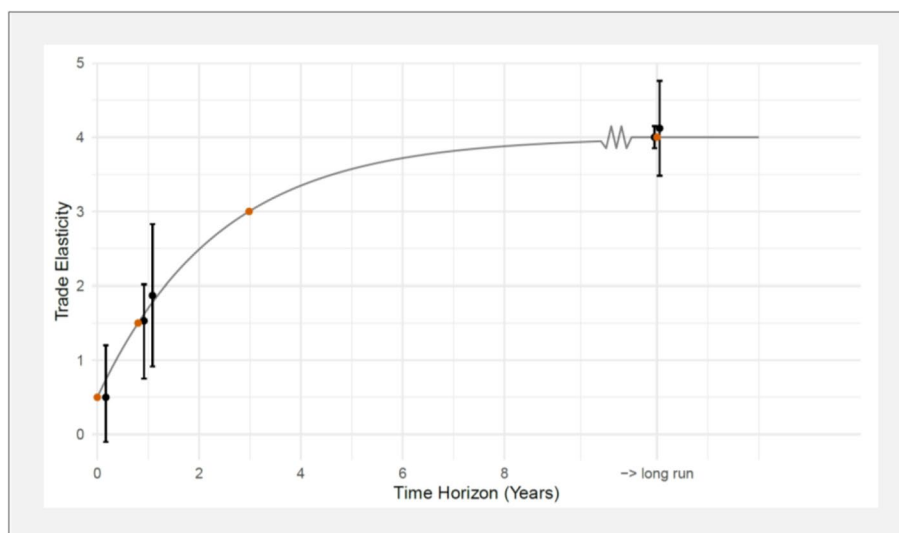


Fig. 1 Estimates of the elasticity of substitution of traded goods from different origin for different time horizons; Source: Based on Imbs, and Mejean [15]

conditions vis-à-vis CRINK – we set up a worst-case scenario. The worst-case scenario is constructed based on scenarios generated in the NATO's Strategic Foresight Analysis 2023 (SFA23) and Future Operating Environment [16] (FOE24) exercises. Aligned with the SFA23 and FOE24 systemic shock scenarios, we examine possible changes in future boundary conditions by selecting a subset of representative scenarios that we investigate deeper in the European context. In this study, which is inherently limited in scope, we do not analyse every potential strategic shock identified in SFA23 and FOE24. Instead, we select few distinct potential shocks that are scoring high on both likelihood and potential impacts and illustrate how mobilisation readiness, force mobility and resilience readiness perform in these scenarios of systemic shocks. Due to space constraints, we present simulations of one compound systemic shock scenario – “Cold War 2.0” – that assembles changing boundary conditions from several SFA23/FOE24 scenarios: *‘Isolated states conducting disruptive strikes against digital and economic global systems causing global shock in telecommunication, supply flows and industrial activity’*; *‘Confrontation over limited resources (‘resource wars’) expanding to regional and global levels, attracting major powers or security coalitions’*; *‘Major supply chain shock resulting from regional conflict, denied access to resource nodes, or severe trade prohibitions’*; and *‘Formation of a military alliance, openly adversarial to NATO’*.

In our analysis, the Cold War 2.0 scenario consists of two trade-shock components one of which is global and one local: a complete cessation of trade between the Alliance and CRINK [17, 18], and China imposing a complete air and maritime blockade on Taiwan [10, 11]. Whereas the cessation of global trade between the Alliance and CRINK is modelled explicitly in our study, the local crisis in the Indo-Pacific is considered implicitly as European allies are not directly part of it. Nevertheless, both components of the Cold War 2.0 scenario have direct implications on NATO's preparedness and readiness in Europe, which we assess in detail in the following section. The rationale of using a protracted low intensity conflict [19] in form of geo-economic fragmentation scenario, rather than an invasion, is to underscore that even this less kinetic conflict will create challenges that affect Europe's security—challenges that would only grow more acute as the crisis worsens.

To operationalise the global shock component of the Cold War 2.0 scenario in the EU-EMS model, we simulate a complete cessation of trade between the 32 NATO member countries plus 37 NATO partners and CRINK on the other side. The rest of the world (“ROW” consisting of all other countries) is modelled as ‘neutral’. All trade flows in final demand goods, intermediate goods as well as raw materials with CRINK are disrupted in the

Cold War 2.0 scenario. The formal modelling of the trade blocks follows Bonadio et al. [20]; we implement prohibitively high trade costs between members of the Alliance and partners and CRINK, so that all trade flows between the two opposite trading ‘blocks’ drop to zero. Other bilateral trade costs (e.g. between the Alliance members and with the rest of the world countries) are left unaltered and trade flows between all these trading partners will endogenously adjust.

As regards the local shock component of the Cold War 2.0 scenario, in line with previous studies [10, 11] we assume that even in a lower-intensity crisis in the Indo-Pacific would likely, the U.S. would fulfil some of its force requirements by drawing on capabilities already in Europe and/or those in the U.S. that NATO expects would be used to reinforce Europe in the event of an aggression from Russia, generating gaps in European defence. Hence, even a lower-intensity crisis in the Indo-Pacific, like a blockade, would weaken defence preparedness and readiness of European allies because the U.S. would probably view such a crisis as the opening phase of a larger conflict and would relocate military assets to reinforce the region [10, 11].

Although the capabilities required to defend Indo-Pacific allies are different to the largely land-based forces that are required to bolster European deterrence and defence, there are significant areas of overlap where resources are in short supply, giving rise to challenges particularly in space-based assets and intelligence, surveillance, and reconnaissance (ISR) platforms; strategic enablers; maritime support; ground-based air and missile defence; long-range precision fires; drones; and combat aircraft (Table 1). According to Kendall-Taylor et al. [11], the U.S. redeployment of maritime assets would include attack submarines, Aegis destroyers and cruisers, carrier battle groups, unmanned surface and subsurface vessels, and maritime patrol aircraft. The U.S. redeployment of air and space assets would include combat aircraft like the F-35 and F-16, ISR—both the equipment to gather the data and the personnel to process the data and aid with targeting selection and decision-making—air-to-air refuelling tankers, long-range bombers, airborne early warning and control aircraft, and strategic and tactical lift assets (Table 1).

Independently of how exactly the local trade shock scenario (blockade) unfolds, any U.S. engagement in the Indo-Pacific will involve large air and maritime components, including the use of drones [11]. These force requirements would grow if the crisis were to escalate, especially if China moved to a full-scale amphibious invasion of Taiwan. If the initially local conflict escalated, the U.S. would rapidly expend munitions, especially air and missile defence munitions, as well as reinforce Indo-Pacific partners by drawing in additional land-based

Table 1 Inventory of potential U.S. asset redeployment from Europe into the Indo-Pacific Source: Based on Kendall-Taylor et al. [11]

	Asset type	Asset class/model
Aircraft & Related Systems	Combat aircraft	F-15, F-16, F-22, F-35
Ground Systems	ISR	U-2, RC-135 Rivet
	Air-to-air refuelling tankers	Joint
	Long-range bombers	KC-46
	Airborne early warning and control aircraft	B-52, B-1, B-2, B-21 E-3, E-7
	Strategic & tactical lift	C-5, C-17, C-130 J
	Maritime patrol aircraft	P-8 s
	Air defence	Patriot, THAAD
Missiles & Munitions	Early warning sensors	AGM-86/129
	Mobile ballistic & cruise missiles	
	Air-launched cruise missile	
Navy Ship Systems	Anti-radiation	AGM-88 HARM
	Long-range air-to-surface	AGM-158 JASSM
	Joint standoff weapon	AGM-154 JSOW
	Air-to-air missile	AIM-120 AMRAAM, AIM-9
	Standoff land attack missile	
	Anti-ship missile	AGM-84H/K SLAM-E
	Naval Strike Missile	AGM-84 Harpoon
	Anti-ship cruise missile	AGM-158 LRASM
	Land attack cruise missile	BGM-109 Tomahawk
	Surface-air/anti-ship missile	RIM-66/67
	Rolling airframe missile	SM-1,2MR/ER
	Aegis surface-to-air missile	RIM-116
	Anti-air and anti-surface	RIM-161 Standard
	Ship self-defence missile	SM-3
	Attack submarines	RIM-174 Standard SM-6 RIM-162 Sea Sparrow Virginia
Space Based Systems	Aegis destroyers	Arleigh Burke
	Cruisers	Ticonderoga
	Carrier battle groups	Surface and sub-surface
	Unmanned vessels	
	Assets of repositioning & reprioritisation of satellite	ISR & targeting

resources that are needed in Europe. As the Indo-Pacific crisis would worsen, the military requirements in the Indo-Pacific – and therefore the gaps in Europe's defences – would grow.

A redeployment of U.S. military assets into the Indo-Pacific region would also likely create shortages in the pool of ready forces in Europe, sustainment units, munitions stockpiles, specialist personnel, and special operations forces. Such “low-density, high-demand” assets are defence capabilities that are needed across theatres to deter adversaries or in the event of a conflict, but that are only available in limited quantities in Europe [11]. Should the U.S. prioritise responding to a conflict in the Indo-Pacific (or choose to reduce their presence in Europe overall), gaps would emerge in Europe that would need to be filled by European allies to ensure the ability to

deter and defend against Russian aggression. Moreover, according to Kancs [18], many of these capabilities have long been in short supply in European allies.

A strategic relevance of the outlined Cold War 2.0 scenario with CRINK is given by the accelerated deepening of economic, financial, trade and defence ties among China, Russia, Iran, and North Korea on the one side and a growing dissent within the West on the other side. Snegovaya et al. [21] quantify the accelerating collaboration and integration among CRINK countries, particularly through expanded bilateral agreements, closer energy ties, mutual support in sanctions evasion, and efforts to integrate financial and payment systems. Since 2022, the Russia–China relationship has been defined by growing Chinese support for Russia's wartime economy, as seen by notable increases in energy and electronics trade. Iran and North Korea's lower sensitivity to Western sanctions have enabled them to provide more direct military support to Russia, exemplified by Iran's crucial aid in drone procurement and North Korea's supply of manpower and munitions. In the same time, the U.S. is increasingly prioritising the Indo-Pacific [10, 19], and is signalling to reduce its presence in Europe overall.

We acknowledge that the Cold War 2.0 scenario studied here is both extreme in scope and primarily hypothetical in character. The objective of analysing such a worst-case scenario is not to advance a prediction of future developments, but rather to generate analytical insights into the multidimensional nature of defence industrial preparedness, force mobility and whole-of-society resilience. This encompasses the interaction of civil, military, public, and private actors, as well as the global interdependencies that condition their capacity to withstand and adapt to systemic shocks. Interrogating a scenario situated at the outer bounds of plausibility serves a critical analytical function. It allows for the delineation of the boundaries of potential outcomes and provides a structured framework for considering worst-case contingencies. By subjecting institutions, infrastructures, and societal challenges to the stresses of an extreme hypothetical, decision makers can better identify latent vulnerabilities, adaptive channels of adjustment, and the thresholds at which resilience and readiness may erode or transform [22]. It is important to underscore that this analysis does not rest upon speculation regarding the proximate events or geopolitical dynamics that might precipitate such a scenario. Nor does it imply that the occurrence of the Cold War 2.0 is either probable or normatively desirable. Rather, the exercise is intended as a heuristic device to illuminate the contours of preparedness and readiness under changed boundary conditions and to enrich scholarly and policy debates concerning preparedness, adaptation, and the management of current geopolitical risks.

We further acknowledge that the future is also defined by random shocks that can confound strategic decision makers and lead to abrupt changes in policy direction. A recent example of systemic shocks with a particular relevance to defence in the last few years includes the Covid-19 pandemic. Further, the transition from one conflict to another through time can also be considered as a sequence of shocks on a smaller scale. To model future uncertainty formally, the approach of Ilut and Schneider [23] or Kancs [14] who explicitly model risk and ambiguity could be considered – a promising avenue for future research.

Simulation results

We start with projecting the Alliance's economic resilience, which is a critical determinant of its defence readiness in events when protracted geopolitical tensions give rise to an abrupt cessation of all international trade between the opposing blocks. The Cold War 2.0 scenario, in which the Alliance severs trade ties with CRINK, provides a useful lens through which the economic and security dimensions of geo-economic fragmentation can be evaluated. This section explores the projected impacts of an abrupt decoupling on the Alliance's economic resilience, its implications for defence preparedness, and the robustness of these projections under different assumptions of CRINK goods substitutability. It also investigates the effects on European defence production, particularly through the disruption of intermediate goods and raw material supply chains sourced from CRINK, with a special focus on China supplies' critical role.

We simulate European allies' economic resilience in a worst-case scenario using a macroeconomic proxy the concept of Gross National Expenditure (GNE), which

is central to the projection of economic resilience. GNE is a measure of welfare-relevant economic activity that captures the domestic absorption of resources, defined as the sum of household expenditure, government expenditure, and investment. Unlike Gross Domestic Product (GDP), which incorporates net exports, GNE directly measures the resources available for domestic use, making it a particularly relevant indicator when assessing the welfare costs of disruptions to international trade. GNE is especially relevant in assessing welfare costs because it directly reflects the resources available for domestic use. Unlike GDP, GNE excludes the net export component, thus avoiding distortions that arise from terms-of-trade effects following extreme trade shocks. This makes GNE a critical indicator in modelling the economic resilience in systemic shock scenarios. Conceptually, GNE differs from GDP, but in practice their values tend to be quite similar. In many macroeconomic and trade models, including EU-EMS employed in recent studies, GNE is considered the welfare-relevant quantity.

According to EU-EMS model simulations, the Alliance would face severe short-term welfare losses in the event of an abrupt decoupling from CRINK. Estimates suggest GNE would decline by 5.8–6.9% in the initial years following global supply disruptions (Fig. 2). Over a five-year horizon, the loss would moderate to 4.4–5.7%. In the longer term, as trade and production networks adjust, the costs would fall further, reaching 1.0–4.7% after six to eight years, and stabilising at around 2.2% of GNE permanently. For defence preparedness, these GNE estimates provide a sharper perspective compared to GDP. According to our simulation results, household consumption, government expenditure, investment would fall, implying that the ability of the Alliance to maintain

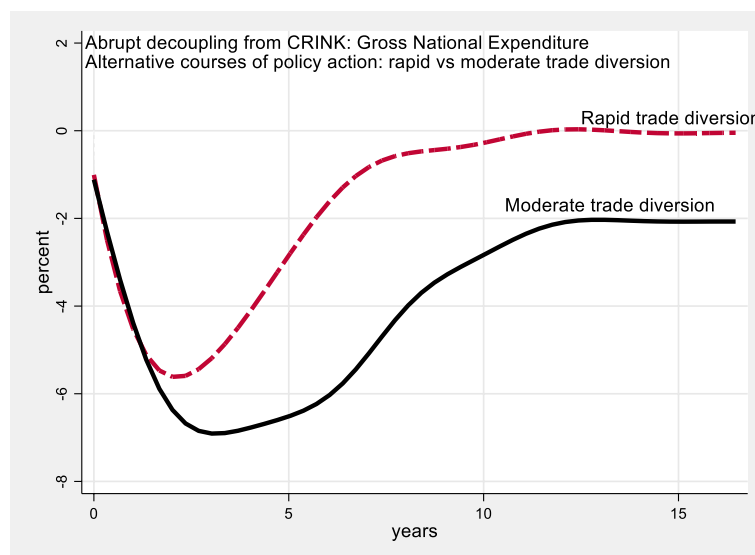


Fig. 2 European Gross National Expenditure (% change) following an abrupt decoupling from CRINK; Source: Simulations based on the EU-EMS model

its defence commitments is directly weakened. In contrast, GDP could remain less affected in the Cold War 2.0 scenario due to net export movements, even though domestic economy deteriorates.

From a macroeconomic standpoint, 5.8–6.9% are significant losses in economic resilience and defence mobilisation. They are comparable in magnitude to the GNE declines experienced during the 2008–2009 global financial crisis and the Covid-19 pandemic. Importantly, part of these losses would be permanent: the Alliance would operate at a structurally lower level of productivity each year relative to a world without Cold War 2.0. Despite their severity, these costs are not insurmountable. Historical precedents suggest that with appropriate policy responses—including targeted fiscal stimulus, industrial policy, and strategic diversification of supply chains—economies can withstand macroeconomic shocks of this scale. Thus, while a complete cessation of trade with CRINK would impose painful adjustments in the short-run, the Alliance could manage them over time.

The robustness of these simulation results depends critically on assumptions about trade substitutability – how easily the Alliance can replace intermediate goods and raw materials previously sourced from CRINK with imports from other partners or domestic production. As evidenced by (Liu and Tsyvinski [24]), firms face costs of adjusting intermediate inputs and raw materials. This means that trade policy of supply shocks to upstream sectors can have long-lasting effects as they ramify downward through the supply chain. In the EU-EMS model, this is captured by the trade elasticity parameter.

Two scenarios with respect to the substitution of CRINK's goods are considered:

- Rapid trade diversion (dashed line in Figs. 2 and 3): Allies quickly reorganise supply chains, redirecting imports from CRINK to allied and 'neutral' countries.
- Moderate trade diversion (solid line in Figs. 2 and 3): Substitution occurs more slowly and less completely.

The visible difference in projections between these two scenarios underscores the importance of strengthening the supply chain resilience. If the Alliance can rapidly diversify sourcing, the adverse impact of a cessation of trade with CRINK shrinks significantly. Conversely, limited substitutability amplifies the geo-economic fragmentation shock, particularly in sectors that rely heavily on CRINK-sourced intermediate goods and raw materials. These model results align closely with other recent research. For example, Baqaee et al. [17] simulate a similar Cold War 2.0 decoupling and estimate short-run GDP losses in Germany of 5.0–5.8%, broadly consistent with the EU-EMS findings. Similar results are obtained by Kancs [25] and Kancs [26]. This convergence across methodologies strengthens confidence in the magnitude of projected impacts.

Next, we consider the impact on the European defence production. In Fig. 3, EU-EMS simulations show that an abrupt decoupling from CRINK would reduce European defence industrial production by 7.3–7.4% annually in the short run (3–4 years). In the medium-to-long term, as supply chains are reorganised, losses would moderate to 2.4–5.2%. As for the GNE, also defence industrial production in Europe recovers faster and approaches closer to the pre-shock levels under the rapid trade diversification scenario. Beyond defence preparedness, the defence

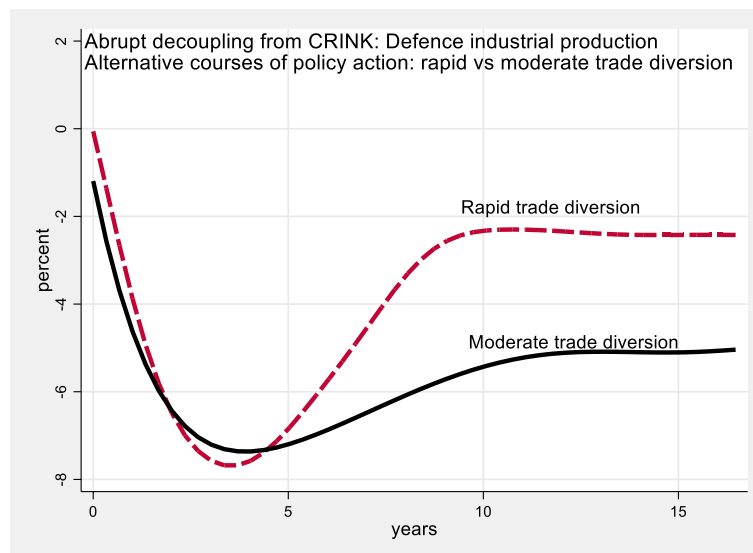


Fig. 3 European defence industrial production (% change) following an abrupt decoupling from CRINK; Source: Simulations based on the EU-EMS model

sector provides a critical case study of how systemic shocks can disrupt industrial production.

The main source of supply disruption is the extensive reliance of European defence manufacturers on imported intermediate goods and raw materials from CRINK. Given that firms face costs of adjusting intermediate inputs and raw materials (Liu and Tsyvinski 2024), trade policy of supply shocks to upstream sectors have long-lasting effects as they ramify downward through the supply chain. According to the underlying world input-output, particularly China plays an outsized role in supplying critical intermediate inputs for the European defence industrial production. These include: electronic and optical components such as sensors for precision-guided missiles and infrared lenses for night-vision equipment; explosive materials such as nitrocellulose for gunpowder; protective fibres for body armour; and raw materials, especially rare earths and metals essential for advanced defence technologies. Overall, China supplies over one-third of all raw materials to European defence manufacturers. Dependence is especially high for rare earths (91%), tungsten (83%), magnesium (81%), germanium (76%), gallium (63%), indium (57%), lead (54%), and vanadium (52%) [27]. Each of these materials has unique applications in defence production. For instance, gallium is used to manufacture high-performance microchips that power advanced military systems, while rare earths such as neodymium and dysprosium are critical for high-performance magnets in aircraft engines and flight control systems. According to our simulation results, the sudden loss of access to these inputs would constitute a negative supply shock, curtailing defence production and weakening the Alliance's military readiness at precisely the moment when heightened preparedness is most needed in the context of a protracted conflict with CRINK.

European defence readiness under Cold War 2.0

In this section, the potential impacts of the above simulated Cold War 2.0 on the European allies' preparedness and readiness are evaluated. We stress-test the defence industrial mobilisation, force mobility, and sustained whole-of-society resilience under a global geo-economic fragmentation – the cessation of global trade between the Alliance and CRINK – in order to identify fields of action for strategic decision makers. To assess the defence industrial mobilisation in Europe in a contested trade environment, we calculate the ability of existing and surge defence production capabilities in Europe to replace U.S. military assets that are redeployed into the Indo-Pacific, creating gaps and vulnerabilities in NATO's conventional forces in Europe. To evaluate force mobility, we compute the movement time represented by the effective average speed of force element movement, i.e. the

time it takes the force elements to reach its destination. The whole-of-society sustained resilience under a global geo-economic fragmentation is assessed via a composite resilience indicator.

Industrial mobilisation

To assess industrial mobilisation under Cold War 2.0, we aim to answer the question what is the ability of existing and surge production capabilities in Europe to fill gaps in European defence that are generated by redeployment of U.S. military assets into the Indo-Pacific region under Cold War 2.0. We follow the methodology of Cancian et al. [28] and JOIN [29], which allows us to compute the defence industrial capacity for replacing all redeployed military assets. The time to replace inventories is used as a metric for the ability of the defence industrial base to meet force demands in a protracted conflict with CRINK. The inventory replacement time, I_w^R , in years can be calculated as [28]:

$$I_w^R = \frac{I_w^O}{Y_w^R} + Y_w^L$$

where I_w^O denotes weapon system w 's inventory objective (filling the gaps and vulnerabilities in NATO's conventional forces in Europe created by the redeployment of U.S. military equipment), Y_w^R is the industrial production rate and Y_w^L denotes production lead time. To compute the replacement time of current weapon inventories in Europe, we need data for defence industry stockpiles and per-unit production rates. We rely on the IISS's [30] The Military Balance inventory data which are cross-verified with defence industry stockpiles from Polyakova et al. [2]. The defence production rates for individual weapon systems are based on U.S. production data from the industrial mobilisation database [28], as no comparable estimates are available for European manufacturers. Note that the U.S. has continuously been spending on defence more than European allies since the Cold War, hence the following calculations represent a lower bound (optimistic), and the real inventory replacement times are likely to be considerably higher in Europe.

To assess the defence industrial readiness in a worst-case scenario, we relate the simulated Cold War 2.0 shortages in intermediate input and raw material supplies to the European defence industrial capacity, as simulated in Sect. 2. Specifically, we use the maximum production rate per weapon system and compute the replacement rates of redeployed U.S. asset inventories (Table 1) with the reduced defence industrial production due to a complete cessation of supplies from CRINK (Fig. 3).

Our results suggest that, if all made-in-China (and the rest of CRINK) parts and components were excluded from the European weapon system manufacturing, on

average, the replacement time of redeployed U.S. asset inventories would be substantial (Table 2). Even under the most optimistic scenario (anticipated trade shock and rapid trade diversion) the average replacement time of redeployed U.S. asset inventories would require from few years (ground systems, 3.3 years) to few decades (space based systems, 19.4 years) with the defence industrial capacity without any CRINK supplies. Comparing columns *unanticipated shock* and *anticipated shock* suggests that the negative effects on European defence manufacturing are dampened, when the shock can be anticipated, i.e. defence manufacturers can anticipate the upcoming trade policy shock one year in advance.

While these results are informative about the channels of adjustment linking the European defence industry to CRINK via global supply chains, when interpreting these results, it has to be kept in mind that we use the simulated average impacts in calculations to circumvent the absence of such detailed information.³ Should such worst-case scenario realise, the actual magnitude of defence production effects will be specific to each manufacturer, weapon system and plant location. Eventually, the defence industrial mobilisation in Europe would be accelerated by drawing resources from other sectors,

Table 2 Average replacement time (years) of current (2024) inventories of U.S. assets redeployed from Europe into the Indo-Pacific; Source: Authors' computations based simulation results (Fig. 3), and data from Cancian et al. [28], IJSS [30], Kendall-Taylor et al. [11]

Shock	Rapid trade diversion		Moderate trade diversion	
	Unanticipated	Anticipated	Unanticipated	Anticipated
Aircraft & Related Systems	13.1	10.6	17.2	14.8
Ground Systems	4.4	3.3	5.9	5.1
Mis-siles & Munitions	5.9	4.1	7.8	6.7
Space Based Systems	23.7	19.4	32.9	26.8
Navy Ship Systems	18.6	16.0	22.7	20.6

³To validate the simulated impacts of an abrupt complete cessation of trade with China on the European defence industrial preparedness, we rely on judgement of experts from the Working Party on preparedness, response capability and resilience to future crises, and a global sensitivity analysis which are available upon request.

hence dampening some of the adverse effects of Cold War 2.0 on defence industrial capacity in Europe.

Our analysis also reveal that to a significant extent the European defence industrial capacity seems to be dependent on strategic competitors including CRINK, which will be challenging to substitute in the short-run [27]. Simulation results suggest that the current structure and capacities of the European defence industry cannot respond effectively and agile to challenges implied by a worst-case scenario of global geo-economic fragmentation, as simulated in Cold War 2.0. Even at maximum production rates, replacement would take many years, though weapon systems with civilian analogues face shorter replacement times. We may conclude that in the case of a complete cessation of intermediate goods and raw material supplies from CRINK (particularly China), it would be challenging for the European defence industrial base to replace the U.S. weapon system inventories with the speed of relevance in a major geopolitical conflict. Global supply chains are all about dependence – who depends on whom and for what. Can Europe that has to rely on its adversary for critical supplies hope to persevere and achieve a strategic advantage against it? As noted by Secretary General Stoltenberg in September 2024: “Russia used gas as a weapon to try to coerce us. We must not make the same mistake with China.”

Force mobility and agility

The ideal future force is one that is able to cope with a world in which both trends and shocks shape the future. The fundamental problem of developing an effective and capable future-proof force structure is one that is constrained by the lack of knowledge of the future environment in which the force is going to have to operate [31]. To better understand potential implications of a protracted geopolitical conflict with CRINK, we stress-test force mobility in the Cold War 2.0 scenario simulated in Sect. 2 and evaluate the military mobility readiness in Europe.

Military mobility is an essential component for deterrence and defence in Europe (JOIN [32]). The 21st century's military mobility depends above all on technologies, not just railroads and roads, and this tech-dependency will be considerably higher in 15 years from now. Modern dual-use infrastructure means that military mobility is considerably more than traditional engineering. For example, virtualised Radio Access Network (vRAN) not only provides access to digital services at much greater speeds, but also enables smart seaports and intelligent transportation systems relying on V2X communication [33]. When a military equipment arrives in port, containers are unloaded by remote-controlled ship-to-shore cranes and stacked by automated gantry cranes, military equipment is organised with the help of automated

guided vehicles, all relying on vRAN. After being loaded to tracks, military Intelligent Transport System (ITS) uses V2X communication, which employs a system of hard real-time situational awareness of the traffic. ITS not only facilitates tight convoy formation, but also enables the composition of the convoy to change as demanded by traffic conditions, road blockages or other obstructive situations.

A significant share of vRAN in Europe – that is widely used both by civilians and military – relies on Chinese-made telecom equipment [34]. For example, in the Netherlands, 72 percent of vRAN relied on Chinese technology in 2023 [34]. Also Austria (61 percent), Germany (59 percent), Italy (51 percent), Finland (41 percent), Spain (38 percent), Poland (38 percent), and Portugal (34 percent) rely heavily on Chinese suppliers for vRAN equipment [34]. The security of wireless networks, and especially the reliance on a Chinese technology represents a vulnerability that can be exploited in the event of a major geopolitical conflict and war. On the one hand, Chinese telecom equipment could compromise the security of critical infrastructure and enable Chinese cyber-espionage targeting confidential information from the military or disruptive activities. On the other hand, most of the vRAN equipment have the ability to be disabled remotely [33].

We use vRAN as an example of the Alliance's exposure to the Cold War 2.0 with CRINK scenario. To evaluate the impact of decoupling allies' vRAN from CRINK suppliers on force mobility in Europe, we estimate the consequences of a systemic shock China abruptly switching off remotely all of its vRAN infrastructure in Europe. The impact of vRAN decoupling from CRINK on force mobility is assessed using force element-specific mobility metrics (STO [35]). As the key metric to study the impact, we chose the movement time represented by the effective average speed of individual force element movement, i.e. the time it takes the force elements to reach its destination without China-dependent vRAN in relation to the traveling time with full vRAN. This metric reflects the impact of an abrupt decoupling from CRINK, measured by the troop movement speed in Europe.

First, we specify individual force elements as in Gauthier and Archambault [36], and compute their dependency on vRAN in troop movement. Force elements are organisational entities consisting of individual force components (personnel, resource, equipment, infrastructure, etc.). Force elements represent the smallest force entities that can be employed individually and independently. For example, a destroyer (including its crew and some basic equipment) is a force element. A naval task group, on the other hand, is not a force element since the ships that compose it can be deployed individually. Similarly, the crew of a ship is only a component of a force element,

since it generally cannot be employed in isolation. Individual force elements are unambiguously identified, counted and costed. In our study they consist of Naval ships (up to Frigates), Brigades, Fighter jets and Military helicopters.

Second, we evaluate how the individual force element mobility is impacted by the vRAN decoupling from CRINK. We then aggregate the mobility of individual force elements to the joint force mobility. Although the data and quantitative scenario analysis results related to individual force mobility contain classified information and are not publicly releasable, stress-test results reveal that the force mobility in Europe would be seriously challenged in view of the envisaged defence readiness – a steady state of preparedness. Our results imply that despite progress in setting strategies, directions and objectives, there are still many obstacles that are responsible for vulnerabilities in military mobility – as an essential component for deterrence and defence on the European continent. Our findings are consistent with those of Zaborowski and Macko [37], who analyse the military mobility infrastructure on NATO's Eastern flank and come to similar conclusions.

Sustained resilience

To evaluate the impact of decoupling the Alliance's economies from CRINK supplies on sustained resilience readiness, we follow the approach proposed by E-ARC [38], and apply the Enhanced Analytic Resilience Index (EARI). This composite indicator consists of five components: prerequisites of resilience, preparedness, shock resistance, crisis recovery, and risk exposure. EARI framework introduces a dynamic evaluation and weighting measurements of risks and stresses against each state while differentiating between endogenous and exogenous uncertainties. The resilience readiness scores are normalised on 0 to 10 (highly resilient) scale.

The prerequisites of resilience (first column in Table 3) comprise a set of nine variables covering areas like corruption perception, socio-economic development, inclusion, research, and education, they provide an indication of social cohesion and apart from the risk exposure is the lowest resilience readiness score estimated. The preparedness component composes sixteen variables selected to assess the general state of preparedness in case of shocks, covering the most relevant aspects evaluated by NATO civil preparedness criteria. The shock resistance and coping with shocks component reunites three indicators measuring general features contributing to shock resistance and coping with shocks and three groups corresponding to NATO's criteria (continuity of government, resilient food and water resources, ability to deal with mass casualties) and a mix pillar for the rest of four criteria. The crisis recovery, adaptation, and

Table 3 Enhanced Analytic Resilience Index (resilience loss) for Europe, Cold War 2.0 scenario; Source: Author's computations based on E-ARC [38] data

	Prerequisite s of resilience	Preparedne ss for resilience	Shock resistance	Crisis recovery	Risk exposure
Mean	3.73(-44%)	6.05(-15%)	4.32(-45%)	6.01(-19%)	2.25(0%)
Median	3.59	6.22	4.29	5.98	2.20
STD	0.74	0.66	0.47	0.60	0.91
Min	2.50	4.58	3.38	4.79	0.40
Max	5.00	7.50	5.05	7.37	4.20

post-shock thriving component contains three indicators: lack of adaptive capacities, commitment to improve health resilience, and recent societal shocks. The exogenous risk exposure (last column in Table 3) contains ten variables assessing general and specific risks, including climate-driven hazard & exposure, seismic and climate risk exposure. Although we quantify risk exposure, the rapidly changing global environment vis-a-vis the time lag required to collect and process data to derive robust insights for decision makers should be kept in mind when interpreting these results.

As for other readiness components, sustained resilience is stress-tested in the Cold War 2.0 scenario simulated in Sect. 2. To evaluate impacts on sustained whole-of-society resilience, we use the simulation results of losses in the European Gross National Expenditure following an abrupt decoupling from CRINK (reported in Fig. 2). In addition to long lasting effects on Europe's economy, such as supply shortages and inflation, increased unemployment and reduced purchasing power, protracted conflict and war also has important indirect negative consequences on infrastructure, public health provision, and social institutions [39]. All these factors affect sustained whole-of-society resilience which we assess next.

Following Alloush and Carter [40], the loss of resilience, L_i , after a systemic shock, F , can be measured by the size of the expected degradation, d , (probability of failure), over time (that is, time to recovery t_r). Formally, the impact for every resilience component i is defined by:

$$L_i = \int_{t_0}^{t_r} (1 - q_i(t)) dt$$

where t_0 is the time of the systemic shock realisation and t_r is the time when the full system's resilience is restored, i.e. $q_i = 1$. The total impact for the aggregate resilience, L_T , is then a weighted w sum of individual components:

$$L_T = \sum_i w_i L_i$$

Table 3 reports the computed post-shock EARI along with resilience loss in percent. Faced with a severe welfare loss – as simulated in the Cold War 2.0 scenario – the prerequisites of resilience index almost halves from 6.7 to 3.7, as the socio-economic development, societal disparities, economic inequality, inclusion and social cohesion will aggravate. The preparedness component decreases moderately from 7.2 to 6.1 in the Cold War 2.0 scenario, as several variables such as civic space, investment capacities, group grievance, human flight and brain drain, labour force participation rate & female participation are affected. The shock resistance and coping with shocks component drops from 7.9 to 4.3, as global supply chains including energy supplies would be significantly affected. If no policy measures would be undertaken, several NATO resilience criteria could not be sustained. The crisis recovery, adaptation, and post-shock thriving component would decrease from 7.5 to 6.0, as variables such as adaptive capacities and societal shocks would decline in the simulated Cold War 2.0 scenario. The exogenous risk exposure (last column in Table 3) contains ten variables assessing general and specific risks. It is likely that the drivers of general and specific risks, including climate-driven hazard & exposure, seismic and climate risk exposure will accelerate in the years to come, these are not modelled in the underlying EU-EMS model therefore they are not affected in the simulated Cold War 2.0 scenario.

Our stress-test results suggest that the sustained resilience would be severely challenged in view of the envisaged whole-of-society preparedness readiness for a protracted conflict and war if no targeted policies are implemented prior to the crisis or war. Our analysis results are consistent with what we are seeing in Ukraine and learning what a protracted war with CRINK looks like. Beyond the conventional military and civil resilience and readiness, it is also restated to the psychological resilience. Both physical and psychological resilience are key to the nation's will to keep fighting and a successful defence. Physical elements of sustained resilience include energy security, such as access to diverse sources of power and fuel, abundant storage, and flexible demand;

emergency stockpiles: ability to source food, drinking water, healthcare resources, and spare parts; hardened infrastructure, such as public transportation, power grids, natural gas networks, automotive fuel distribution, mobile and fixed-line telephone service, broadcasting, shelters for civilian population. Psychological elements of sustained resilience include information security, such as an educated and resilient population that can distinguish between truth and falsehood, sceptical of hoaxes and scare stories; social cohesion: high levels of societal trust, willingness of a population to make sacrifices and accept inconvenience in pursuit of common goals; leaders' expertise, such as well-trained, well-networked decision-makers used to working outside their professional silos and across the public-private, civil-military, and classified-unclassified divides; culture with institutionalised processes, such as ability to switch smoothly and speedily from a "peace-time" to "major crisis/war" context; threat awareness, such as society's understanding of the nature and extent of current and future threats.

As noted by Monaghan et al. [9], above all, NATO allies will need find the "will to fight," which cannot be taken for granted. Practically, the psychological resilience and economic resilience are rarely being assessed in Europe, Finland and Sweden being great exemptions. This is a promising area for future research.

Feedback for strategic decision makers

The changing geopolitical and security landscape in the world requires strategic adjustments in security and defence policies. Europe must adjust for an era of a fierce geopolitical competition and strategic confrontation, where the rules-based international order is under a constant attack. Europe will have to fight for its place in a world in which other major powers are either ambivalent or openly hostile. In order to protect the security of its citizens and the integrity of its territory, a credible collective deterrence and defence will require not only declaratory commitments but also defence capabilities, rapid force mobilisation, and operational interoperability ensuring a combat-credible, visible, and continuous forward presence on the Eastern border.

Further, it is important to factor in that the external security environment that Europe faces now can get worse. By simulating Cold War 2.0 in form of a global geo-economic fragmentation, we illustrate how the defence preparedness of European allies' might be affected through the supply chain channel, given the current dependencies on CRINK. Our model-based projections underscore the urgent need for the Alliance to address external dependency vulnerabilities and build strategic autonomy into its international trade and defence supply chains. Several policy measures emerge as priorities:

- Strategic diversification of imports: Reducing reliance on CRINK by sourcing critical materials from alternative suppliers, including allied and partner countries.
- Domestic production capacity: Investing in the development of domestic industries for rare earth extraction, processing, and other critical inputs.
- Stockpiling of strategic reserves: Maintaining buffer stocks of essential materials to cushion against short-term disruptions.
- Innovation and substitution: Encouraging research into alternative materials and technologies that reduce dependence on scarce CRINK-sourced inputs.
- Alliance coordination: Enhancing intra-Alliance trade and production cooperation to mitigate shocks collectively rather than individually.

While decoupling from CRINK imposes substantial short-term costs, our analysis also show that proactive measures can mitigate medium- to long-term resilience losses and strengthen defence preparedness. In this sense, the Russia's war on Ukraine should provide an impetus for the Alliance to accelerate structural reforms and reduce strategic vulnerabilities.

In order to enhance sustained whole-of-society resilience, European allies could learn from and build on the experience of the new NATO allies Finland and Sweden, for which the estimated sustained resilience index is the highest in Europe. Finland offers a unique expertise in Europe based on its advanced approaches to the whole-of-society resilience and civil preparedness. The cooperation model of Finnish preparedness is named 'comprehensive security' (kokonaisturvallisuus),⁴ where vital societal functions are handled together by government authorities, businesses, NGOs and citizens. The sever vital societal functions include leadership, international and EU activities, defence capability, internal security, economy, infrastructure and security of supply, functional capacity of the population and services, and psychological resilience. Based on the experience of Finland, leveraging synergies of interdependencies – that range from the reliance of the military on civilian logistical and telecommunication capabilities to the reliance of civil authorities on military capabilities for handling disruptive events – will be a key challenge. In Sweden, the whole-of-society-resilience is referred to as 'total defence'.⁵ The total defence concept involves the whole of society and contains a range of activities required to

⁴<https://turvallisuuskomitea.fi/en/comprehensive-security/>

⁵government.se/government-policy/total-defence/&msb.se/siteassets/dokument/amnesomraden/krisberedskap-och-civilt-forsvar/stod-till-kommuner/krisberedskapsveckan/if-crisis-or-war-comes.pptx

prepare Sweden for war. The total defence consists of two areas of activity – military defence and civil defence – and involved not only of the conventional military and civil resilience, but also psychological resilience and economic resilience.

From an Alliance's deterrence and defence standpoint, a redeployment of U.S. military equipment and personnel to Indo-Pacific would open significant capability gaps in Europe and create vulnerabilities. Our results suggest that it will take time for European allies to ramp up the specific capabilities needed to fill those gaps. As European allies are increasing defence spending, it is critical for allies to invest some of their greater spending on the capabilities the U.S. may have to redeploy if its military is engaged elsewhere. The allies could also consider other approaches to offset the vulnerabilities that would emerge in the event of a crisis in Indo-Pacific, for example, by identifying what more the U.S. could pre-position in Europe to avoid the challenges that would emerge from delays in reinforcement. Our worst-case scenario analysis results suggest that European allies are urged to think beyond the current Russia's war in Ukraine and accelerate making plans and investments now to prevent a Russian opportunistic aggression later.

Limitations

Our analysis features a number of limitations that need to be kept in mind when interpreting the presented results. The modelling framework underlying our empirical analysis allows us to explore the medium- to long-run impacts of trade policy changes on prices, production, consumption and investment of countries through the reorganisation of the GSCs they are involved in. While the employed comparative static analysis captures broad economy-wide linkages, it assumes markets adjust to a new equilibrium – a discrete event, which may not reflect among others wartime disruptions. Moreover, as noted in Sect. " [The EU-EMS model](#)", our modelling framework omits standard short-run business-cycle effects, implying that it does not capture recessionary dynamics like demand shocks or unemployment surges. In this sense, the immediate impact of the simulated systemic shock could be underestimated in our results. A promising area for future research would be to investigate the trade channel of geoeconomic fragmentation by developing a dynamic continuous time model with rational forward-looking agents that would capture wartime disruptions and short-run business-cycle effects.

The second model-related limitation concerns the empirical representation of inter-industry differences in terms of input and output substitutability, particularly in the short- and medium-run. Indeed, input substitution possibilities vary greatly between and within sectors, with some critical components like rare earth metals or

specialised electronics having no ready alternatives outside CRINK in the short-run. While the model captures asymmetry between short- and long-run substitution possibilities (see Fig. 1), investigating inter-sectoral differences in substitution possibilities at a 3 or 4 digit level of trade data is a promising area for future research. Such a disaggregated analysis would reveal the true heterogeneity both in the input and output side and potential reveal critical vulnerabilities. Our modelling choice – to assume a uniform elasticity of substitution within the broader defence sector – is driven entirely by the limited data availability.

Third, the model is calibrated to World Input–Output Tables (WIOT) and Inter-Country Input–Output (ICIO) data from the OECD. While providing consistent and harmonised trade data for all input and output flows globally, these data feature a number of limitations that need to be kept in mind when interpreting the presented simulation results. Notably, global input–output tables are generally available only at a 2-digit level, which masks a great deal of inter-sectoral heterogeneity both on the sourcing-side as well as market-side global interdependencies. Hence, the estimation results presented in this study approximates the overall inter-country upstream and downstream reliance. Disaggregating by individual manufacturer and weapon system offers a promising area for future research and would significantly improve the accuracy and robustness of results.

In order to operationalise the selected NATO's SFA23 and FOE24 scenarios in the model, we assume an abrupt complete decoupling of NATO trade with CRINK. Specifically, all trade flows of final goods, intermediate inputs, and raw materials between CRINK and the Alliance drop to zero. As explained in Sect. " [Cold War 2.0 scenario construction](#)", this worst-case modelling choice is indeed hypothetical and extreme that likely overstates the shock's severity in the short- to medium-run. In reality, even a hostile decoupling tends to be gradual and/or partial, with some re-routing of through neutral trading partners. As a result, the immediate impact of the simulated systemic shock could be overestimated in our results. In the present study, these choices in scenario construction are driven by data paucity and lacking empirical evidence. A promising area for future research would be to estimate or collect empirical evidence of a potential leakage trade leakage through neutral trading partners.

The estimation of the impact of Cold War 2.0 on industrial mobilisation, the defence production rates for individual weapon systems are based on U.S. production data from the industrial mobilisation database [28]. As outlined in Sect. " [Industrial mobilisation](#)", this empirical shortcut is driven entirely by data paucity, as no comparable estimates are available for European manufacturers.

Therefore, when interpreting our estimated inventory replacement times in Table 1, it has to be kept in mind that the U.S. has been spending on defence consistently more than European allies hence the following calculations represent a lower bound (optimistic), the real inventory replacement times are likely to be considerably higher in Europe. Collecting plant-level defence production rates for individual weapon systems of European arms manufacturers would considerably improve the accuracy and robustness of the results, and hence offers a promising avenue for future research.

Conclusions

In the context of the dual challenge – the simultaneous rise of external threat through CRINK and internal reprimatization of principal transatlantic ally's global posture – we studied how a protracted low intensity conflict with CRINK would affect Europe's preparedness to protect the security of its citizens and the integrity of its territory in the case of an aggression from Russia. Specifically, we investigated how a geo-economic fragmentation affects the defence preparedness of European allies' through trade channel.

By applying an international multi-sectoral macroeconomic model featuring the defence sector and interlinking countries via supply chains to the global economy we simulated Cold War 2.0 as one possible worst-case scenario. By looking through the lens of a global cold war economy networked through trade in the raw materials, intermediate inputs and final demand goods we investigated the propagation of geo-economic fragmentation shocks through global supply chains and their impact on defence preparedness. The economic costs of an abrupt decoupling from CRINK, measured through declines in Gross National Expenditure, are severe particularly in the short run and in industries highly dependent on CRINK supplies. Short-term losses of up to 6.9% of GNE and long-term permanent losses of around 2.2% reflect the extensive reliance of raw material and intermediate input supplies from CRINK, particularly China. Defence industrial production in Europe would be hit even harder in the short run, with output declines exceeding 7%, primarily due to disrupted access to intermediate goods and raw materials. While these are enormous shocks to an economy, history shows that economies and alliances can adapt to shocks of comparable scale. With coordinated policies focused on diversification, domestic capacity-building, and innovation the Alliance can mitigate the long-term costs of decoupling from CRINK while enhancing its resilience and security. In this sense, while our projected shocks highlight vulnerabilities, they also present an opportunity for strategic realignment that strengthens both the economic resilience and defence preparedness in the face of geopolitical rising challenges.

Based on simulation results, the potential impacts of a protracted low intensity conflict with CRINK on the European allies' preparedness were evaluated. We stressed the defence industrial mobilisation, force mobility, and sustained whole-of-society resilience under a global geo-economic fragmentation in order to identify fields of action for strategic decision makers. From an Alliance's deterrence and defence standpoint, a redeployment of U.S. military equipment and personnel to Indo-Pacific would create significant capability gaps in Europe. Our results suggest that even this less kinetic conflict will create challenges that weaken Europe's security—challenges that would only grow more acute as the crisis worsens if not addressed timely. It will take time for European allies to ramp up the specific capabilities needed to fill those gaps. Even under the most optimistic scenario (anticipated trade shock and rapid trade diversion) the average replacement time of redeployed U.S. asset inventories would require from few years (ground systems, 3.3 years) to few decades (space based systems, 19.4 years) when having to rely on a defence industrial production without any supplies from CRINK.

Overall, our study aimed at improving how Europe identifies vulnerabilities, evaluates its preparedness, converts the political will into capabilities, and enhances its preparedness and readiness. By quantifying potential future cost of unpreparedness, we provided an evidence-based rationale for European allies to embark on a gradual de-risking trajectory rather than waiting for a much more costly “abrupt shock” trigger dictated by geopolitical events. Our worst-case scenario analysis results suggest that European allies are urged to think beyond the current Russia's war in Ukraine and accelerate making plans and defence investments now to prevent a Russian opportunistic aggression later.

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Authors' contributions

d'Artis Kancs: drafting, conceptualisation, modelling, analysis, proofreading.

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