

**Nijmegen School of Management**  
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# **The resurgence of security as public good in Europe**

a supply and demand analysis

By Simon Swelsen (s1010515)

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Supervisor: dr. V. Delabastita

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## Introduction

Since the war on Ukraine, initiated by Russia, discussions about Europe's security started to become prominent again in Europe. After the end of the Cold War European defence spending declined, likewise it changed to be applicable to specialised foreign operations instead of large-scale warfare (Bove & Cavetorta, 2012; Bruce, 1995). Another lens through which some perceive this transformation in defence spending is that of an exploited peace dividend by European governments, depending on NATO partners to defend them. While, they themselves keep up with the demands of the welfare state throughout crises (Dorn et al., 2024; Mearsheimer, 1990). European governments managed themselves financially through the Euro crisis and the Covid-19 pandemic. However in a demilitarized Europe, governments are now faced with a security matter that calls for a military response. Consequently, under serious threat of Putin's Russia and volatile commitment of the largest partner in the NATO alliance, European governments seem to progressively initiate providing the public good of defence for themselves. Which raises questions regarding the costs of re-militarization for European governments.

Europe's security has mostly been analysed as a subset of the US-Soviet relations up until the end of the Cold War (Howard, 1982; Mearsheimer, 1990; Sloan, 1990; Van Evera, 1990). Whereby the public good was supplied to a large extent by the US. Because it opposed European defence initiatives, over which internal disagreements existed between France and the United Kingdom (Howorth, 2012; Menon et al., 1992). After the Cold War, beginning with the Maastricht Treaty in 1991, several initiatives to Europeanize defence gained traction. The Atlantic cooperation remained dominant but European initiatives have attracted substantial academic debate. For example the initiation of a Common Security and Defence Policy (CSDP) by the EU. The lion's share of academic literature on European defence focuses on such top down initiatives, as objective European integration studies with a focus on the role of institutions such as Bickerton et al. (2011), Menon (2011) and Méran (2008). Neo-functionalists are optimists, based on a 'failing forward' argument formulated by Jones et al. (2016) suggesting the management machine of the EU and its agencies will be propelled by the current crisis (Bergmann and Müller, 2021; Fiott, 2023; Haroche, 2020; Håkansson, 2021). Critical scholars, mostly realists, have been suggesting that the EU lacks political hard power to provide a common European defence within a strongly national oriented framework (Meijer & Wyss, 2018; Rynning, 2013; Sangiovanni, 2003; Tardy, 2018).

However the reality of events seems have overtaken the debate. In response to the war in Ukraine, the long term political will is stressed by the European Commission to build European defence capabilities exemplified by the German 'zeitenwende' and EU's Defence Industrial Strategy (European Commission, 2024). Despite EU level ambition, most effort thus far remains national (Biscop, 2024). Across European governments a positive shock to defence expenditures occurred. The European

Defence Agency (EDA, 2023) has calculated that the European Union (EU) member states spend 240 billion euros on defence in 2022, a 6% increase to the previous year and most likely expected to grow even further in the coming years. This study begins with this shock to the demand for the defence, to take a practical economics perspective on the provision of the public good within a multilevel framework like the EU, where strong national defence organization, to date, prevails.

Although defence budgets of European governments have risen, the response to the war has so far been mainly monetary, by assisting Ukraine financially in their defence against Russian forces. Military aid in the form of weapons, especially ammunition came predominantly from the United States (BBC, 2024). That observation fits within the past trend of downsized European national militaries. Thereby without much inventory or production capacity it clarifies why Europe has again depended on the US, within NATO. The lowest level of European NATO defence expenditure was observed in 2014, after which it steadily increased across European governments (NATO, 2023). Though budgets have increase, the supply of defence, after two years of war in Ukraine, still hasn't met half of the one million artillery shells that the EU had promised. While it promises production capacity of another million in the year 2024 (European Commission, 2024; Tidey, 2024). Other defence initiatives such as the European Sky Shield faced traditional problems addressed in the literature, namely diverging national interests (Calcera, 2017; Guay & Callum, 2002). The project is dependent upon US suppliers, hence France and Italy decided to develop their own (Biscop, 2024). The economic analysis of this problem lies in the fact that defence is a public good and thus free market logic is less applicable. Smooth supply needs strong state demand, leading to national divergent preferences (Dunne, 2015).

In response to threat European governments must now increase their defence expenditures, while still lacking the much debated lack of unity and hard power. Furthermore based on different scenario's, some defence specialists argue that the NATO norm of two percent spending might not be enough to avert the Eastern threat from attacking more countries like Georgia or even the Baltics which would be an attack to NATO territory and trigger article five (Betschka et al., 2024). Which most likely provokes an even bigger demand shock to defence, with potentially serious economic implications. While Russia's war economy is already in for stretch, with military spending up 57% since the annexation of Crimea in 2014 and yet only about 6% of GDP (Cooper, 2023; Luzin & Prokopenko, 2023, Sipri, 2024). For Europe the war in Ukraine comes at a time where it has faced many economic crises. In particular the Euro crisis and Covid-19 pandemic, but now also a war directly affecting the energy prices (Bressanelli & Natali, 2023).

Europe's economic power has now also weakened relatively to the US (Karma, 2024). According to the Centre for European Reform this is a reversible trend caused by favourable demographics, energy prices and fiscal stimulation in the US (Berg, 2023). Future concerns for the advanced European

economies do exist in academia, relating to the concept of secular stagnation, involving the ageing population, declining productivity growth and structural changes with respect to climate change. Germany exemplifies the economic despair of the European continent with a business model no longer applicable to the whims of the day (Chazan & Nilsson, 2022). Thus, against the backdrop of inflation with high interest rates, already high public debt in several European countries and the urgent need for economic reform through innovation, freeing up financial resources for defence spending seems rather problematic (Di Bucchianico, 2021; Eggertson et al., 2019; Eichengreen, 2014; Fontana & Sawyer, 2024; IMF, 2023, 2024; Tomeczek, 2020). Concluding this situational sketch, one must recognize the economic challenge Europe is facing in case of bigger shocks to the demand for public defence. Aside from Hartley (2003, 2008) the literature does little to provide specific economic efficiency gains Europe could exploit when needing to supply the public good of defence.

This provides us with the rationale to investigate the European demand for and supply of security as public good, in response to the contemporary threat. Leading to the main research question; *What will be the economic costs for European governments when they will increasingly provide their own public good of security, in response to threat?* As mentioned, demand for security spending faces competition from other spending needs. While supply has been mostly written about in relation to peacekeeping operation, but is rather under investigated in relation to direct threat on the continent. Nevertheless, one could say, Europe to a large degree ‘rebuilds’ their defence capabilities and thus opportunities for the more efficient provision of security arise (Hartley, 2023 ;Liberti, 2011). As the standard saying goes; in every crisis lies an opportunity (Fiott, 2023).

## Theoretical Framework

To answer this question in relation to the aforementioned societal context, a conceptual framework must be specified to supply and demand characteristics of security in Europe. With governments as the main providing actors of the public good, in democratic political context and direct threat as the main driver of European demand. While governments operate in a multilevel framework with the EU and NATO as actors, binding most European governments together.

### Security as public good

Security from other states is regarded as a pure public good in the economics literature, a notion that goes as far back as Adam Smith himself (Brauer, 2017; Coulomb, 1998). A stable economy needs security to be predictable for economic decision making and financial risk assessing, hence European countries have a professional army with some of the most advanced individual weapons and soldiers in the world. At times of endured peace the demand for such an army might become obsolete in the eyes of the public and politicians. In many studies defence expenditure and the NATO two percent norm are referred to as a burden relative to national income. However when security is significantly threatened it provides democratic political leaders with an economic argument to invest in defence.

A pure public good is completely non-rival and non-excludable, which will be explained later on. Originally its theory has been formalized at the state level by Samuelson (1954). Theoretically, the efficient supply of a public good is derived from the vertical summation of the individual demand curves (demanded quantities) and intersect them with the marginal cost curve. This contrasts to the optimisation for private goods, for which horizontal summation is applied. In other words, adding up the prices that people pay for a particular quantity, a price mechanism. The market for pure public goods exhibits no such price mechanism, but a collective action problem and cannot be provided by commercial parties. Normally the process of overcoming the collective action problem of a public good is fought out between groups in the domestic political arena with the government supplying and the public demanding the good (Ostrom & Olson, 2002). For example healthcare and education which are subject to democratic control. In the case of military defence, the amount demanded within the democratic political arena is to a large extent dependent upon the public's perceptions of external threat, which have been very low in Europe, but are on the rise again. Governments can thus tax to pay for the supply of defence, but how much remains an estimate and depends on the state's own considerations with regards to the threat (Engerer, 2011, p.136-137; Huseraş, & Balteş, 2023).

### Response to Threat

Realist theory provides the prediction that military defence will become a prominent factor again after years of austerity, as a response to threat stemming from geopolitical competition. Mearsheimer (1990, 14-17) argued among many others that the equal power distribution (duo polarity) of US-Soviet relations worked as stabilizer. Multipolarity, increasingly defining the current world order, has more

complicated power dynamics thus increases the risk of crucial mistakes (i.e. Ikenberry, 2011; Kagan, 2007).

In similar line of thought, Markowitz and Fariss (2018) combine defensive realism (Waltz, 1979) and democratic peace theory to explain three relative perceptions that lead to the increased geopolitical competition. Thus the need to deter and defend in terms of military power projection capabilities. The economic power, the geographic proximity and compatibility of political interests compose a function that explains the level of geopolitical competition.

Firstly the increased economic capacities of other states, allow them to become potential security threat. Secondly the threat depends on the proximity of those states, the geographically closer they are the more competition they create. Lastly, the compatibility of political interests defined as the degree to which states possess interests that are not inherently threatening to one another. Democratic peace theory, provides that the political system is a very important measure for the compatibility.

Democracies have more compatible interests relative to autocracies (Markowitz & Fariss, 2018) Important to note here is that for democratic states, even if they are economically powerful and proximate they will not invest much in power projection as it is a costly burden when interest are compatible and coercive bargaining is not necessary.

In the case of Russia, it is clear its political interest is not compatible with the Western Europe's democratic interest and as Ukraine as democracy is being attacked this damages Europe's political interest. Furthermore economic sanctions on Russia have not been enough to tame its export oriented economic power. To a certain extent because of enhanced economic cooperation between Russia and other authoritarian states like Iran and especially China. This empirical sketch fits the theoretical prediction, thus clarifies why Western Europe takes steps to increase their defence capabilities.

In peace loving, democratic states, which European states have shown to be for about 75 years, policy for security is economically rational and optimal if is achieved by minimum deterrence. In accordance with Waltz (1979) his idea on the international political system, defence is the favoured strategy to achieve security. Strictly defined, a policy of minimum deterrence, is the most effective power projection deterring the given threat – in geopolitical competition – from attack. It is optimal when the determined capabilities are procured and operated at the lowest possible cost (Katoch, 2006; p. 283). A defensive strategy implies, deterring by means of balancing against others to survive. Not seeking maximization of one's power (Waltz, 1979, p.120-128). Defence is the act of survival occurring when deterrence fails and will be explained in the next section.

### Conceptualization

In Figure 1 security as a public good is conceptualized at the European government level. Demand and supply run through several channels in separate spheres connecting the actors in this framework; public, governments and the defence industry. The *external threat arrow* is an exogenous actor and

represents Putin’s Russia, triggering a demand shock (*upper left arrow*) for governments in Europe via the sphere of the political arena. Governments in Europe have a military under their command that can supply some defence directly (*lower left arrow*), entailing personnel and operational costs. Based on the liberal democratic order in Europe the main driver of the supply and demand dynamics in this sphere are defensive in nature, the public demands safety via politicians and the government must supply with its military capabilities. Both have little to no incentive to be aggressors (Gartzke; 2005; Owen, 2014; Russet, 1994). When more defence is needed they can recruit soldiers from the public and demand military goods from the defence industry (*upper right arrow*), in the market sphere. In this sphere the main driver of the dynamics is the needs of government and its military, being the only buyer. The market structure, thus closely resembles a monopsony (Dunne, 2015). *The lower right arrow* represent the supply capacity of the national defence industry. To conclude the cycle, *the lower left arrow* is the resupplied capacity of the operational military to defend the public.

Together these represent the government provision cycle of the public good of security. The government as actor decides over the *lower left* and *upper right arrow*, which it bases on the exogenous *threat* arrow entering influencing their domain. Within the political arena, the public is capable of influencing the *upper left arrow*, demanding defence. In practice the defence budget is subject to democratic bargaining. While in the market for military goods, industry can influence the supply (*lower right arrow*). To reduce complexity, the defence industrial complex is excluded from the framework, with the assumption that industry does not influence the demand for military goods. Their supply is subject to a production function based costs of inputs.

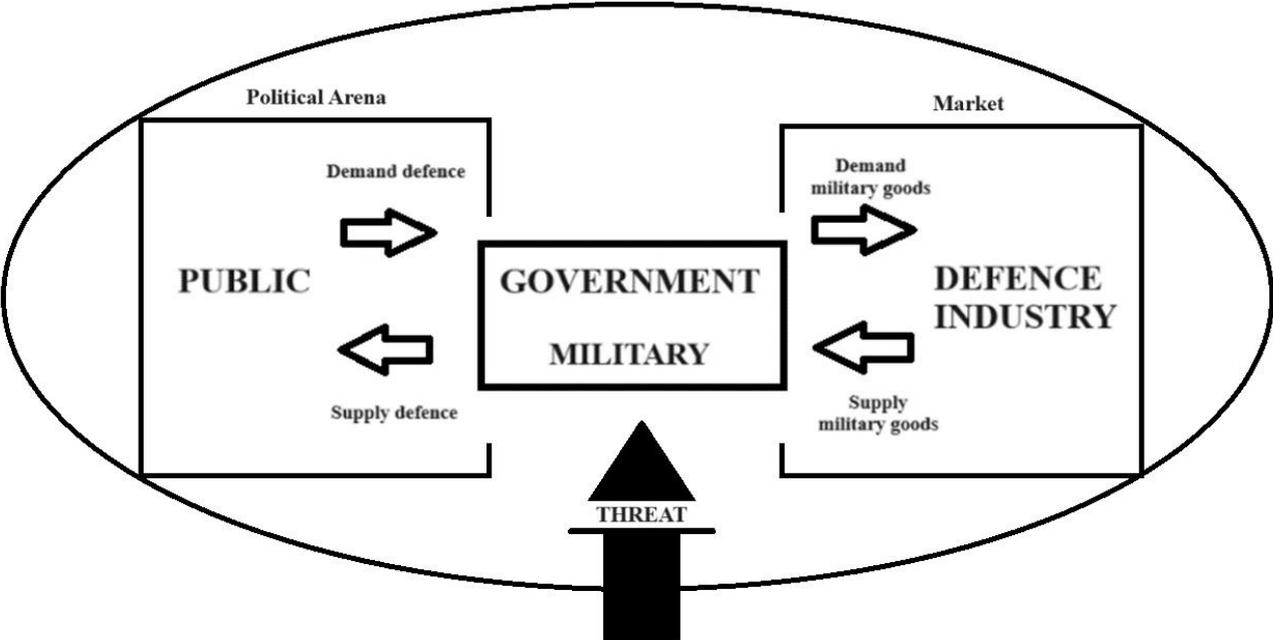
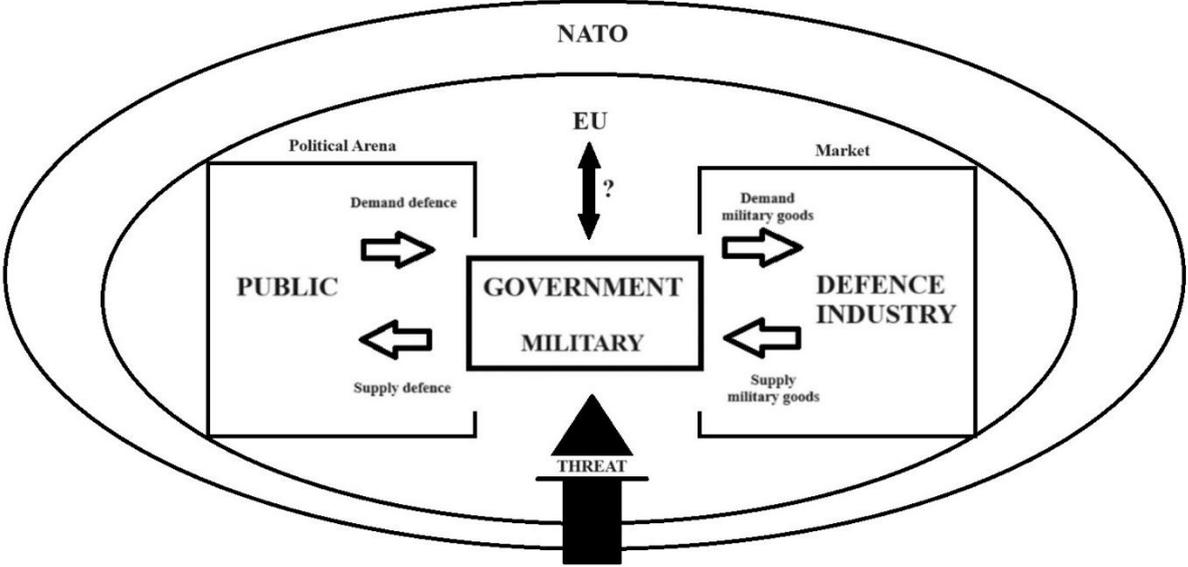


Figure 1: Conceptualization of Defence as public good at the state level

**International collective good**

In Figure 1 the public good of security is conceptualized at the state level, however the borders of the independent European nation states are no longer the only object to be provided with security. To say an economy needs protection in the contemporary globalized world, is to say the world needs to be safe. *Mare liberum* is probably the most famous global collective good. A state cannot deter or defend all of its interests – economic and political – alone. A collective is necessary to provide such good. Both NATO and the EU take part in the resistance against Russia, however NATO has clear longstanding defence arrangements with the nation states regarding defence and the EU does not. Its role is undetermined but it cannot protect an EU border without such arrangements, though it does have a political and economic relationship to the EU nation states by which it can provide overarching policies that affect the political arena or market sphere. Which results in the following multilevel conceptualization in Figure 2. Note; Austria, Ireland, Cyprus and Malta are not part of the NATO alliance and thus technically do not fall within the borders.



*Figure 2: Conceptualization of Defence as public good in a multilevel framework*

The NATO alliance is assumed to be defensive in nature, in accordance with the dominance of democratic states within the alliance and Waltz (1979) his structural perspective on world politics.<sup>1</sup> NATO provides a collective good to all within its border. It insures nation states in the form of the article five clause, stating all provide defence if ones is being attacked. In essence the alliance is providing a club good, since some states are excluded from the alliance, just like Ukraine is (Kaul et al., 1999). States within the alliance share the risks of needing to spend an unsustainable amount of resources on their own military in the case of threat. Besides, collectivising defence effort, could imply

<sup>1</sup> The defensive nature of NATO is highly debated among scholars of international politics, see i.e. Chomsky, 2004; Ikenberry & Mearsheimer, 2001; Sakwa, 2017.

relatively lower cost for each individual members (Olson & Zeckhauser, 1966, p.273). Regarding the EU's role, to be able to share the risks and resources in providing the good, it is first necessary that preferences and capacities within the alliance are similar (Kaul et al., p. 142-143). Despite NATO's clear defence arrangements – contractually established by article five – preferences and capabilities across the alliance have never been similar. The US has always been the most capable and preferred to be so, while Europe might have preferred the same. Currently that seems to be changing. Moreover theoretical studies with this view already interpreted weak spots in the supply of defence at the European level.

As the framework depicts a threat must puncture through two borders, a national and international border. This creates deterrence and has been the main strategy of NATO. Deterrence as described is rational and minimum deterrence is rational and optimal. Conceptual studies have, however distinguished deterrence from defence, whereby the former is a pure public good and the latter an impure one (Sandler & Hartley, 2001; p. 875-878, Oneal, 1990). Deterrence is non-rival and non-excludable, however the actual military action when a threat punctures through one border, could be rival. For example in case of multiple fronts with multiple governments, noting limited and heavily centralized capabilities within NATO. Certain defence capabilities are from the US and can be excludable depending on their military strategic considerations. Most notably the nuclear bomb, which is likely not used in case of every article five situation. Similarly the intensity of the defensive effort can range from limited force deployment to full scale war, with various considerations for the deployment of weapon and detection systems.

Europe thus benefits from the collective character of NATO deterrence, however it is no secret that Europe contributes far less to the alliance than does the US. Defensive benefits are thus less certain and depend upon the effort of the US. Hence the provision of a European public good of defence needs a European defence effort. As mentioned in the introduction this realisation came about at the EU level and at the level of its member states when Russia attacked Ukraine.

### Multilevel Framework

Concluding the theoretical section Figure 2 displays the updated framework in which European governments operate to provide the public good security with deterrence and defence capabilities. As in Figure 1 the threat starts the provision cycle.

The threat depends upon the function of geopolitical competition laid out by Markowitz and Fariss (2018); Economic capabilities that can directly translate in to military power, geographic proximity and compatibility of political interests. Demand for security is in essence defensive in accordance with Waltz (1979) as means to survive in the international political system. Balancing against the *threat* arrow comes first from deterrence then from defence and is ultimately optimal if all procured at the lowest possible cost. This happens in a multilevel framework where NATO provides deterrence and an

uncertain amount of European defence. For the purpose of this study, because of the theoretical gap in defence that Europe faces, deterrence remains object of NATO. European governments provide the public good defence, by balancing against the threat, while dealing with their political arena and market for military goods as prescribed by Figure 1. The EU has the capacity the smooth the process of collective defence through policy, but it has no determined role.

## Literature Analysis

The main actor in the framework of Figure 2 is the state – European governments – which ultimately decides over the strategy of balancing against threat. From an economic cost perspective this literature review analyses the provision of the public good defence. Thereby it takes note of three levels of analysis extracted from the literature overview by defence economist Katoch (2006, p. 283-288). Firstly, the quantity of resources available now and in the future, secondly the proportion of those resources devoted to deterrence and defence and lastly the efficient use of those allocated resources.

These levels of analysis act as guiding principles for this literature review of; The relationship between defence and GDP, which is relevant for all three actors. The choice for the proportion of GDP devoted to defence – popularized as the guns versus butter debate – which takes place in the political arena with the Public as additional actor. Lastly the efficient use of those devoted resources in relation to given threat; Putin's Russia. Whereby the Industry has a crucial role regarding efficiency.

### GDP and Defence Spending

The European countries are among the wealthiest in the world and known for their extensive welfare system. On account of that wealth governments provide their public with an array of public goods, ranging from education to healthcare. The literature is quite clear that there is a positive correlation between the provision of those public goods and the size of the economy (Becker, 2009; Bloom & Canning, 2000; Sen, 2001).

However the public good of defence seems to be decoupled from GDP in most of the European countries as Figure 3 depicts. While earlier mentioned research by Olson and Zeckhauser (1966) suggested a direct correlation between a nation's GDP and defence effort in the NATO alliance. Sandler and Forbes (1980) showed that after 1966 such correlations didn't hold anymore, especially for the European countries. A possible explanation given by Oneal (1990, p. 387-389) is the use of military spending for private goods, by Greece, Turkey and Portugal which after 1974 dramatically increased their military expenditure. This had to do with the conflict over Cyprus, and foreign military operations by Portugal in Angola and Mozambique. Excluding them yielded a significant positive correlation still, also when the US was excluded which spends on the military out of line with GDP for deterrence. Another explanation proved by Oneil (1990, p.389-400) was that the European countries started to increasingly converge their individual military to GDP budgets to more similar ratios. The European defence budgets relative to GDP declined across the board since the 1990's, leading up the joint NATO decision in 2006, to set a spending target of two percent of national income.

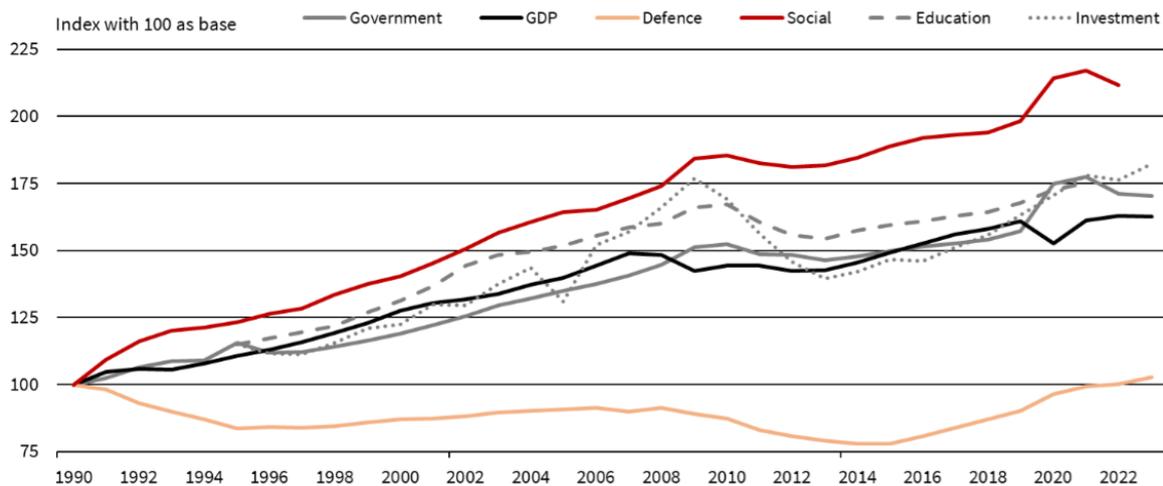


Figure 3: Development of GDP-Weighted Average for European NATO members joined before 199, Price Adjusted 2023. Source: Dorn, F., Potrafke, N., & Schlepper, M. (2024). *European Defence Spending in 2024 and Beyond: How to Provide Security in an Economically Challenging Environment (No. 45)*. ifo Institute-Leibniz Institute for Economic Research at the University of Munich.

## War Economy

In Europe GDP and defence spending are rather decoupled, however in Russia defence spending has been ramped up to a so called war economy. Initially a sharp upward push of interest rates was necessary to stabilise the Ruble and prevent Russian from withdrawing all their money. Hereafter subsidies landed in various places of the Russian economy, a 60 percent increase in production of war related items and continued high revenues from energy exports are now Putin's economic backbone. After a few Bear in mind that poorer regions in Russia have gained significantly from the war in monetary terms, though a lot of lives are lost especially from those regions (Gorodnichenko et al., 2024). Despite it being difficult to actually asses to future of Russia's economy, it raises the question; What the effects of defence spending are on economic size and growth?

Most European governments are part of the defensive NATO alliance, implying that military capabilities are used only in response to attack. Confiscation of economic resources is no viable strategy from their perspective. A cost perspective would, nevertheless, benefit hugely from economic gains. The idea that it can be beneficial to growth without aggressive confiscation of resources has been extensively researched. Benoit (1973, 1978) has been the first to provide controversial econometric evidence for the positive effects of military spending on GDP growth rates. His focus lies with externalities, such as innovation and infrastructure on creating productivity growth in the private sector. If military spending promotes growth it would likely stimulate demand among the public and government, while cycling via the defence industry through to the rest of the economy. However, Benoit's results do not appear to be robust, especially not for developed countries (Grobar & Porter, 1989). Ever since, this claim researchers sophisticated their statistical models to test the relationship. Whereby a broad literature emerged with different theoretical foundations and ambiguous results

depending on the type of model and theoretical consideration (Dunne et al., 2004, Herrera & Gentilucci, 2013).

Let us summarize the standard economic reasoning, noting that empirical evidence is all but robust. Neoclassical scholars would focus on supply side reasoning, generally assuming negative effects of military spending, through the crowding out of investments. From supposedly more productive investments arising in the private sector or non-defence sector. Inflationary pressures might also arise as a consequence of overconsumption by government, creating heated demand with defence industry competing over resources and driving up the prices. This in turn would lead to higher interest rates and slower productivity growth. Inflation and high interest rate are notorious among the public and governments with high debt similarly would likely refrain from too much military spending if this reasoning holds. However, Keynesian scholars would generally assume positive effects on the demand side during economic downturn, through the increased rate of capital utilization and production capacity in the defence industry. Soldiers could also lift people out of unemployment creating demand, through considerable salaries. This might also lead to considerably more positive attitudes from at least part of the public. If these effects also increase the profit rate a multiplier might become relevant as well (Herrera & Gentilucci, 2013, p. 16-18; Kollias et al., 2007).

The latter reasoning touches upon the findings in a comparative model study of Germany and Poland by Krajewski and Pilat (2023, p. 36-40). They found that employment is the main channel of increased GDP and thus a boost in consumption. In this study the type of household is crucial to distinguish the main arguments. The Ricardian household, more prevalent in the most developed countries (Germany), makes decisions based on permanent income and thus optimises their income over a longer horizon. Polish households, non-Ricardian, make decisions mostly based on current income with a shorter horizon. Hence they estimated a short to medium term multiplier for Poland of 0.75, while in Germany it was only 0.46. In Poland the initial income boost is spent faster. While in Germany the income boost is spread over a longer period of time. To this they add that the crowding out effect of defence spending with respect to private consumption is weaker relative to other public spending (Christiano and Eichenbaum 1992). For these effects to be robust one needs to assume most defence spending ends up in national households via a large defence industrial base or military employment. Looking beyond the short to medium term, a longitudinal empirical panel study by Becker and Dunne (2023) suggest that spending on military personnel has been the most consistent driver of reduced economic growth in the long run. Their study however does not distinguish between the different types of households between NATO countries.

All economic reasoning considered, empirically defence, spending and its effects are depended on the where it is spend whether short or long run growth effects are considered. Dunne et al. (2004) conclude that generalizations across time and space are very difficult or impossible due to the

dependence of the relationship on many internal economic and political factors. Long run studies do exist but are at best estimated significantly after the ending of World War II. d'Agostino et al.(2017), in a panel series between 1970-2014, find a long run negative effect of military spending on GDP. It is important to note that war and technology coincide with each other and reinforced each other's development throughout human history, especially in the age of capitalism (Roland, 2016; Van Creveld, 2010). Making it extremely difficult to say anything about the causality of the effect in the very long run, or robustness for that matter.

### Guns or Butter or Both

Knowing the ambiguity of defence spending effects on GDP, it becomes rather interesting to decide how much economic resources will be devoted to defence. Assuming democratic defensive state have little to gain politically and developed economies little to gain economically from increasing their defence to GDP ratio, it intuitively holds that such states – most European governments – spend less when secure. Holding the governments perception constant for the public, they little extra defence. Industry depends on governments for a demand increase. This makes the governments defence budget subject to economic austerity, implying that a demand shock in response to external threat usually requires more spending. From a policy perspective this means cuts in public spending, increased taxes, acquiring debt or expansion of the money supply via the central bank (Carter et al., 2021). This is the second level of analysis and it relates to the more political guns versus butter debate.

Evidence from Huber et al. (1993) on the welfare state effort of different countries indicates that over time budgets in democracies accommodate both spendings, but across countries there is a negative relation between defence and social spending. To understand this debate one must recognize its political nature. In the study they find that Social and Christian democratic parties in government tend to increase the social welfare expenditure and overall size of government expenditure (Hubert et al., 1993, p. 738-743). In Europe where such democracies have dominated since the end of world war two, the welfare state has expanded immensely. A democratically chosen politician can rarely decrease social spending significantly in favour of military spending to the public, only during times of immediate threat (Domke et al. 1983). More autocratic elitist politicians tend to get away with this much easier. Moreover they empirically spend more on the military (Brauner, 2015, p. 410-411; Nordhaus et al. 2009).

Internal political reasoning could thus help to predict what European governments might do when faced with the need for increased military spending due to threat. Generally ascribing economic ideologies to the left and right. It follows that the left is more keen on government spending influenced by Keynes. The left allows debt accumulation, while the fiscal austerity of the right leads them to be more likely to increase taxes as a matter of financing defence (Narizny, 2003, p. 203-205). Bove et al. (2017) study political cycles in a postmodern era 1981-2009. Generally studies show that the

(nationalistic) right is more likely to spend on defence in this timeframe (Kuokštūtė et al., 2021; Whitten & Williams, 2011). Bove et al. (2017) find empirical evidence for increased social spending by the left-wing governments during times of election, relative to right-wing governments, but involvement in international conflict reduces this tendency. Suggesting conflict creates consensus. While Narizny (2003) studies several cases in an earlier time frame, when economic class conflict was much more prevalent (1895-1960) and finds contradictory results. He finds that, opposed to the right, leftist governments were much more likely to undertake big spending increases in defence accompanied with progressive tax reforms when faced with threat. Furthermore throughout the last centuries during economic downturn, a state could use expansion of its military personnel as a Keynesian style of providing social welfare to parts of the population who might otherwise be unemployed, through wages and employment benefits (Gifford, 2006, p. 475, 477-479; Lin et al., 2015).

This differences between time frames highlight an important point of military development having effect on the guns versus butter debate. Namely, when expressed in economic terms, during much of history armies waged war with labour as its main input. As mentioned earlier the main inputs of armies developed to be very capital intensive. With the movement from conscription to an all-volunteer force (AVF) in most of Europe this has accelerated (Bove & Cavatorta, 2011). This type of development would diminish the explanatory power of the Keynesian reasoning. Nevertheless the war in Ukraine has shown that large scale mobilization is also still a part of modern day warfare with a death toll after two years, likely within six figures (Tharoor, 2024). Regarding the guns versus butter debate Narizny's (2003, p. 205) class perspective becomes more relevant when larger armies are needed in response to threat and thus the demand shock is bigger. The owners of capital are disproportionately affected by inflationary pressures that arise from large rearmament programs which, unless paid by taxes, divert resources from the civilian to military production lines. Furthermore if military production does not scale up fast enough, governments might nationalize certain industries. Other interventions of government could be price restrictions or restricted access to raw materials for firms. The decision to spend on defence thus depends very much on the type of political power in government. Less democratic governments, more oriented to elites also tend to spend more on the military (Brauner, 2015)

### Budgetary Constraints

Understanding the inherently case specific nature of defence expenditure, thus leads us to examine the current European budgetary constraints. In a policy report by the Centre for Economic Studies (CES) together with the Information and Forschung (ifo) institute an estimate has been made of the peace dividend resulting from lower military investments in Europe after the cold war. The valuation is 1.8 trillion relative to the two percent NATO threshold for defence spending (Dorn et al., 2024, p. 7-9). The report also stresses that financing military expenditures through public debt is only a short

term transitional possibility and especially challenging for a list of countries with already high debt to GDP ratios. Because of the interest rate costs associated with high debt. For taxation similar reasoning goes. Europe already has quite a high tax burden in comparison with other OECD countries. In 2021, tax revenue in European NATO members was on average 38% relative to GDP. The highest among other continental regions. In conclusion of the debate; relative to 1990 social spending in European NATO has doubled, exceeding even GDP growth (Dorn et al., 2024, p. 16-19). Clearly as Figure 1 showed, ‘butter’ has been the main demand in Europe since the end of the cold war, while ‘guns’ were not so much on top of their heads.

## Efficient European Defence Spending

Bearing in mind the tough political choices to be made by governments, on the proportional allocation of resources to defence, the question arises; What specific inputs does a state need, to defend against the given threat? GDP does not accurately provide a measure for those resources, hence, looking beyond GDP, what can the literature say about the inputs European militaries and defence industries need to develop cost efficient defence capabilities to their public in a contemporary competitive geopolitical environment?

### Inputs of Contemporary Defence

The most notable input of defence for government is probably manpower. Soldiers, direct supporting military personnel and the rest of the population. Classical scholars of war, Clausewitz and Sun Tzu, emphasize the importance of morale during war. An important intangible resource, maybe the most important, is a resilient population and army. In his 1883 work ‘On War’ Clausewitz quotes Napoleon: “In war, the moral is to the physical as three is to one.” (Clausewitz, 2003). Furthermore, regarding the political economy approach of this study the importance of civil-military relations in defence are not be underestimated. In Huntington’s work ‘The Soldier and The State’ (1957) two systems for such relations are distinguished, one with objective and one with subjective control over the military. Within the former system, a professionalized military, operates in an autonomous sphere but under civilian authority via the state apparatus. This system is more likely in a liberal democracy where clear boundaries and broad strategic goals are set by the public, in the political arena. On the contrary there is a subjective interwoven system with no such distinct spheres. Potentially politicizing the military as a tool for political leaders. Huntington ought this latter system to be more prone to authoritarian political regimes (Huntington, 1981). The former system intuitively provides more support for a cost minimizing perspective, as when power is spread out across society. The public experiencing negative outcomes from military activity has a voice

The literature furthermore highlights the difference between conscription forces and professional forces, the latter being the standard in Europe and NATO. Such a transition has been accompanied by increased training and technology per soldier, allowing to fight more complicated battles. Nevertheless this development had its downsides, pay per soldier increased substantially, over time forces aged as

people started working for the military as a career and difficulties to fill increasingly demanded technician vacancies arose (Williams, 2005, p.44-46).

Perhaps the second most important input are the weapons with which soldiers fight. In modern warfare this input has taken on increasingly technological and capital intensive embodiment. Apart from nuclear bombs, a non-exhaustive list of recent developments should include missiles alongside sensor technology and more recently also cyber (O'Hanlon, 2018). A capable defence industry is necessary to supply such weapons systems and therefore it needs, in the basis, a wide variety of critical raw materials. Europe is not known for its mining industry, thus they must trade, which brings risk in geopolitical competitive environment. Aluminium and natural graphite are the most exposed to trade risk and would have the biggest impact on the supply of the defence industry according to the Hague Centre for Strategic Studies (2023, p. 7). Due to their wide application across defence capabilities and high likelihood of suffering from supply chain disruptions. China supplies both, dominating world aluminium supply by a market share of 46 percent and 69 percent for natural graphite. Russia is the second biggest producer of aluminium and China the world's top supplier of synthetic graphite (a man made replacement). A much longer list of materials is subject to high trade risk for Europe, but would have less impact due to its less widespread application across weapon systems. Again China's supply dominance is the main factor of risk to defence industries and ultimately governments regarding most of these materials (*Ibid.*, p. 8-9).

Related to raw materials, though a more advanced critical input of defence capabilities, is the semiconductor. Noting that (natural) graphite is used to produce it. Maintaining an autonomous, cutting edge semiconductor industry and or trade supply is vital for providing contemporary defence. Taiwan and South-Korea lead the world production in highly advanced micro-chips that the US designs. Respectively from TSMC and Samsung, with machines provided by the Dutch company ASML (Li & Nauta, 2023; Poitiers & Weil, 2021). These chips are crucial for the most recent technological change making entry into the battlefield is that of (unmanned) robotics, such as aerial drones that are already being extensively used in Ukraine. Singer (2009) provided the literature with one of the first encompassing works related to these types of weapons. In chapter 12 he explains the psychology of these weapons and how that could affect soldiers' morale. Furthermore the book stresses how it might change tactics, as autonomous robotics can work together in swarms and the need for countermeasures, such as jamming and hacking. Potentially these autonomous systems are much cheaper than missiles and fighter jets, whereby large quantities of cheap autonomous weapons will eventually overrule qualitative superiority of expensive weapons systems. As only so much quality can compensate quantity in warfare, referring to of Lanchester's Law (Scharre, 2014, p. 16-18). At last, less advanced semiconductors are potentially as important due to their wide spread use in basic electronics and communications technology. Similarly for these chips Europe relies heavily on countries as Taiwan and South-Korea (Li & Nauta, 2023; Poitiers & Weil, 2021).

Concluding the literature on the necessary resources for contemporary defence, it must be noted that when deterrence fails and defence becomes reality costs could increase dramatically. Due to presence of large arsenals of long range rockets, missile and drones, defending critical infrastructures by means of 'iron dome' type air defence is a very important input for militaries and governments. The war in Ukraine has shown that critical infrastructures are favoured objects for modern missiles and cheaper drones that can fire up to 800 km (Coi, 2024; Coles, 2024). Besides having air defence, surveillance of; internet cables, nuclear power plants, government buildings and cities is necessary to monitor incoming threats to these vulnerable targets. This is very costly, for example, Israels iron dome air defence 'Tamir' missiles cost 50.000 dollars per piece. Which is low compared to a superior patriot air defence missile costing a about 4 million. Functional air defence needs to have several types of missiles guarding critical infrastructure for all varieties of incoming threats, but offensive projectiles are generally cheaper. A recent attack by Iran on Israel with over 300 projectiles, showed that large quantities might drain the system, leading to choices for the defensive party (Doyle et al., 2024; Rumbaugh, 2024). Another major cost of war would be energy use, mainly fossil energy which Europe does not have in abundance. It is difficult to assess how much energy is needed, but an indication could be provided by the US military, post 2001, which consistently used about 80 percent of government energy use. The figure accounts mainly for energy in the form of jet fuel, but also diesel and electricity. There is an important research agenda with regards to greenhouse gas emissions that might follow from an increased demand for defence in Europe. As estimates show that post 9/11 annual military emissions amount to double the amount annually produced by cars in the US (Crawford, 2019).

## Methodological approach

Combining the theoretical framework and the literature review, three sub questions can be deducted to answer the main research question; *What will be the economic costs for European governments when they will increasingly provide their own public good of security?* In answering this question it is assumed that European governments would heavily benefit from a cost minimizing perspective. This perspective is derived from the current internal economic situation which has been described in the introduction as having little space for unproductive spending. While the theoretical framework has provided that European governments and the public operate from a defensive point of view minimizing their deterrence and defence relative to threat. At last, from the literature review it can be deducted that defence spending has a negative effect on the economy in the long run, triggers political debate and potentially trade-offs. Moreover people and material inputs of defence could become very economically costly. In a tight labour market and under high trade risks.

### Assumptions

The first assumption regards the exclusion of nuclear capabilities. Note that the public good security, as theorized, depends on deterrence and defence. Deterrence is largely provided by nuclear weapons which come from the US, UK and France. In 2022, France and the UK respectively spend an estimated 5.6 and 6.8 billion dollars on their nuclear arsenal, nothing compared to the US's 43.7 billion (ICAN, 2023). Economic size is a prerequisite for having a nuclear arsenal, many European governments do not have this capacity alone. Moreover due to political treaty agreements it is impossible to build up an nuclear arsenal, without creating much geopolitical chaos. Hence the assumption is made that Europe's nuclear deterrence capabilities are in hands of France and the UK and rather fixed. This does not apply to Russian nuclear capabilities as the threat is exogenous. The focus is on military capabilities, which contribute to defence and deterrence. Balancing is ought to be the process of acquire equality in military capabilities while, deterring is the process of increasing one's own capabilities relative to the threat.

The second assumption regards the grouping of governments to their political interests in relation to the threat of Putin's Russia. The European governments within NATO and EU are ought to be against Russian involvement. Thus fall within the borders of the framework in Figure 2, along with their respective public and industry. Outside these alliances some European countries have close ties with Russia due to energy dependency or other economic and historical ties. These states are; Belarus, Bosnia and Herzegovina, Georgia, Moldova, Serbia (Antenijevic, 2024; Coakley, 2022; de Waal et al., 2024). These are conceptualized as in-betweeners and are similarly to all states assumed to pursuit self-interest, thus self-preservation according aligning themselves accordingly in line with Waltz (1979). Most countries in Western Europe have cut ties with Russia but these in-betweeners have ties to both Western as Eastern Europe, their interests lies somewhere in between. To date it remains difficult to predict their behaviour. An ambiguous case is Hungary which is heavily dependent upon

Russian energy (Brzozowski & Kozlov, 2024). It is categorized as in-betweener despite being both EU and NATO member. Lastly, due to immediate threat, Ukraine developed close relations with most European governments in the alliances and falls within its borders. These choices are assumed upon the current state of relations between these governments, but give no prescription of geopolitical relations in the future.

### Supply operationalization

The first two sub questions relate to the cost on the supply side;

- What are the aggregated military capabilities of European governments ready to defend the public against Russian threat (*bottom left arrow*)?

By answering this question in a relative approach to the threat of Putin's Russia a grasp of the discrepancy – if any – between defence capabilities can be made. Thus a grasp of the cost it takes governments to balance out such discrepancy by increasing inputs.

In this study *military capabilities* supplied by governments are defined in coherence with the resources that have been mentioned in the last section of the literature analysis, in broad terms; the people and material of a defence supplying unit. Due to the economic nature of this study those semantics now change to the labour and capital of a defence supplying unit.

The second supply side question;

- To what extent is the European defence industry suited to cost efficiently supply (*bottom right arrow*) the demanded military goods to European governments in case of demand shocks to military capabilities?

By answering this question, a grasp of the military goods the industry cannot supply, but are necessary, can be made. Hence, providing knowledge useful for estimating the cost of achieving that supply.

The extents to which suitability is measured is defined respectively by size, type of production and supply elasticity. Whereby the larger the size by revenue, more diversified in type of production and faster supply can meet government demand the better. Efficiency will be assessed based on cost, the lower the better.

### Demand Operationalization

The last sub question relates to the demand side (*upper left and right arrows*). The magnitude of potential demand shocks depends on the exogenous factor of threat, which triggers the public to demand security. Ultimately the government decides over the supply of defence capabilities, based on their internal situation and their perception of external threat. The function of geopolitical competition by Markowitz and Fariss (2018) serves as guidance for how governments perceive external threat.

From an internal perspective, the literature highlights that democracies with developed economies – especially European – on average tend to spend less on military and that there are budgetary constraints. While autocracies spend more on the military (Brauner, 2015; Lin et al., 2015; Markowitz and Fariss, 2018).

Aiming to get an idea on shocks to the demand for military capabilities, a regression function will be estimated using several predictors. Internal economic and political predictors are derived from the literature. The most familiar geopolitical threats from the past, with implications for Europe, are described and added. Hence, the following two sub question are formulated;

- Which internal economic and political factors, affecting European governments, significantly increased demand shocks to military capabilities? And;
- Based on past geopolitical competition which external threats to European governments significantly increased the magnitude of demand shocks to military capabilities?

### Demand shocks

The demand for security from the public (*upper left arrow*) depends upon the vertical summation of individual demand curves, however those are unknown. The demand for military goods is related to the public's demand for security via a translation by the military, of its needs for capabilities to provide the public good defence. The military approximates its needs for labour and capital, which the government provides them with by recruiting soldiers and demanding military goods from the industry. This is combined in a nation's defence budget and can thus provide a proxy for the demand for military capabilities that provide defence, when balanced with threat and deterrence when overbalanced.

Notably this does not per definition resemble the public's demand for it. The aforementioned reasoning only holds in democracies, where theoretically and empirically governments have little incentive to spend more than needed in the long run (D'Agostino, 1993; Katoch, 2006). However the effects of bipartisan politics on defence spending, provide the public is likely not completely coherent in its demand (Narizny, 2003). Moreover, European democracies have developed throughout the second half of the 20th century. The assumption that the defence budget represents demand for security as a public good is not the strongest and needs some control. A variable that captures democratic development in relation to the provision of public goods must be added. Clientelism is an aspect of a political system that can exist in many settings, from autocracies to democracies (Hicken, 2011). However a rather autocratic operationalization is chosen for this study from the V-Dem database. Clientelism is defined as the distribution of resources in exchange for political support, the less this is happens the higher the democratic score of a country and consequently the more a country is ought to provide defence as a public good. The index exists of four survey questions which can be found in the appendix (C). To paraphrase one noteworthy survey question from the index; How

'particularistic' or 'public goods' are most expenditures from the national budget? A score that tends towards 'particularistic' suggests that defence spending can be considered less of a public good and more of a private good for government and associates. This would enlarge the gap between defence spending and the demand for security by the public.

Furthermore, within defence economics few empirical studies test the determinants of demand for defence expenditure in a European panel setting. Nevertheless examples are Nikalaidou (2008), Kollias and Paleologou (2010) and Kuokšytė, Kuokštis and Miklaševskaja (2021). Some study specific countries such as France (Josselin and Malizard, 2022) or Greece (Kollias and Paleologou, 2003). The dependent variable is either defined as percentage of GDP, in levels or logarithms. In this study the annual percentage changes of the level value are taken as the dependent variable with the aim to identify determinants of demand shocks. Higher percentage changes indicate a higher shock both in a positive and negative direction.

## Empirical Analysis

Throughout the study it has been made clear that security is always a relative to a given threat. In Figure 2 the threat arrow can represent various threats, but in this study the given threat is operationalized as Putin's contemporary Russia. Firstly an empirical estimation of the economic and military capabilities, in other words power of this threat is given. Hereafter the sub questions will be answered in relation to this threat.

### Threat

An illustration of the threat that Russia poses to Europe is given by the joint declaration of Vladimir Putin and Chinese leader Xi Jinping, at the eve of the Beijing Olympics and invasion of Ukraine on February 24 (Kremlin, 2022). In which the ways of the west are challenged and a call to actively pursue a new world order is spoken out. In such order Taiwan is part of China says the statement, furthermore they reject the 'abuse' of democratic values and human rights by the West. Clearly a diverging of interests is at play and both countries are increasingly militarized and support militarization across the globe (IISS, 20124, p. 240; Kurlantzick, 2023).

The public good of security is primarily focused with safety of a government's own borders, hence China is of less direct interest, although their threat to international trade and democratic values can be part of the public good provision. In this case study we will focus on Russian threat. In case deterrence fails European governments must defend, given Russia's strength; Russia is half the economic size of Germany, by GDP. As of 2022 it was 4 trillion US dollars with a public debt level of 21 percent. The IMF calculated Russian economic growth at 3.8 percent, with an expected 3.1 in 2024 after which it is expected to stabilize at just above 1 (IMF, 2024). Their population size is about 141 million, of which 65 percent is between 15 and 64 and a growth rate of negative a half percent. Consideration military defence, geographically, Russia's landscapes equates 17.098.242 km<sup>2</sup>, which borders Finland (1309km), Estonia (324km), Latvia (332km), Lithuania (261km), Poland (209km), Ukraine (1944 km) and Georgia(894km) on the European side. (CIA, 2024).

The Kremlin aspires to increase their total military manpower to 1.5 million, but as of 2024 the Russian military personnel is estimated at 1.1 million this not has been realised (IISS, 2024, p.158). The Royal United Services Institute (RUSI) approximated the Russian military equipment as follows; 4780 Artillery pieces, 2060 tanks, 7080 other armoured vehicles, 290 helicopters and 310 fast jets. Putin's Russia owns a variety of missiles capable to strike many targets even in the US, a list is

Russia planned to renew its intercontinental ballistic missile arsenal with 22 new ones (Watling & Reynolds, 2024). For verification, in Figure 4 the Military Balance count is depicted. It is uncertain how many Unmanned Aerial Vehicles (UAV) Russia possesses, at least several models varying from short to long range (IISS, 2024).

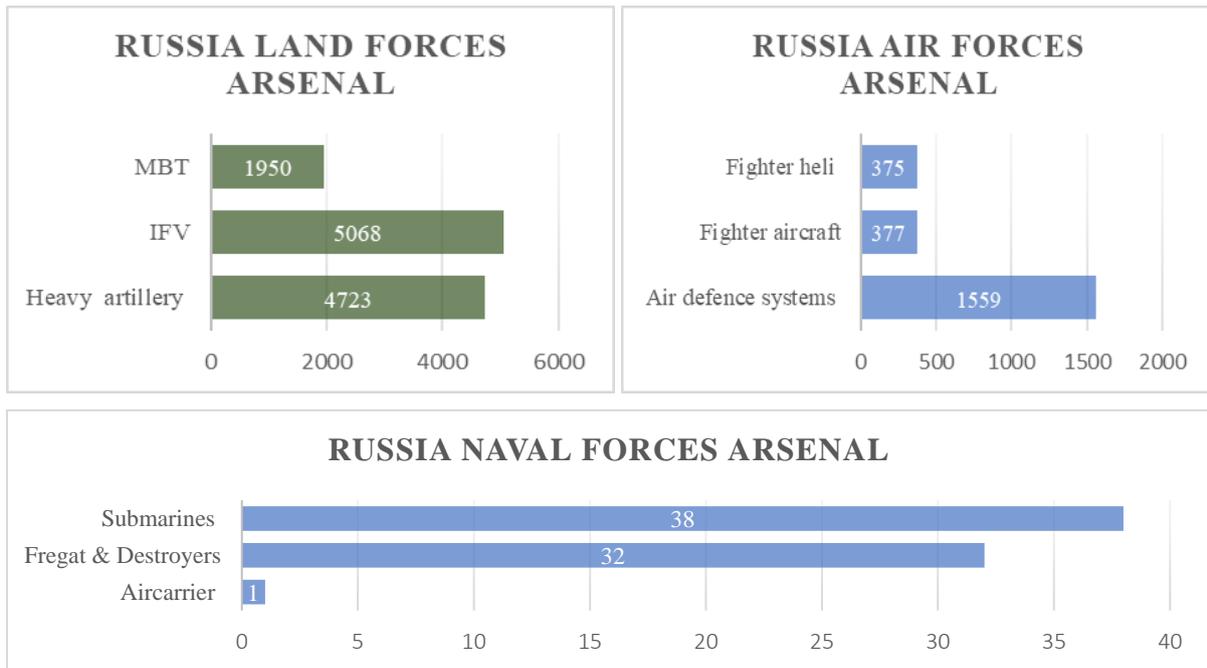


Figure 4: Russia Land, Air and Naval Forces Arsenal 2024  
 Source: International Institute for Strategic Studies. (2024). *The military balance* (Vol. 124, Issue 1). Routledge.

Furthermore its ammunition stock consists of various air and ground missiles, as well as naval missiles. At least 7 different types of intercontinental ballistic missiles (ICBM) with a nuclear warhead, capable to strike above 10.000km. Furthermore short and intermediate range ballistic missiles, as well as cruise missiles are within Russian capabilities.

Another important aspect of modern warfare rests upon the ability to communicate, provide reconnaissance and to have radar and positioning technology. The Russian Federation therefore has a wide variety of satellites, 93 of which a third communications, another positioning and a variety of espionage and reconnaissance systems (IISS, 2024, p. 190-206).

Russia's industrial capacity is strong enough to replace about 1500 Tanks and 3000 Armoured vehicles annually, to a large extent refurbished rather than newly produced. How long depends on their economic growth. Its production of ballistic missiles has been about 6 per month. Important to highlight is that Russia is dependent on Western components for their missiles. Furthermore Russia imports weapons from Iran and North Korea (Watling & Reynolds, 2024).

### European Governmental Supply of Defence

- What are the aggregated military capabilities of European governments ready to defend the public against Russian threat (*bottom left arrow*)?

### Labour

The EU's population is about 450 million and the UK about 68 million, Norway is about 5 million. Furthermore the EU has a about a similar age structure as Russia, 63 percent is between 15-64. The population growth is only about 0.1 percent. With birth rates between Europe and Russia being similar

at about 8 percent per 1000 population. The death rate is relatively lower in Europe while there is a net negative migration rate. Population differences thus likely stay similar the coming years.

In 1995 the EU counted about 3.5 million soldiers, while in 2023 this figure was down to 1.34 million active duty troops (CIA, 2024; World Bank, 2024). The NATO allies on the continent; the UK add, Turkey and Norway, add respectively 144, 355 and 27 thousand troops (CIA, 2024; IISS, 2024). Modern professional militaries such as in Europe, require more training and equipment per soldier. Scaling the EU force back up to 1995 levels would mean the recruitment of a million extra soldiers and a need for much extra equipment putting more pressure on productive capital and labour in a given European country (Hartley, 2008, p. 39-41). European, especially Western, armies keep struggling to recruit new soldiers. As a result the forces shrink rather than expand in response to the Ukraine war. In 2023 the UK army lost 5800 people and Germany lost 1500. Europe has about four times more people than Russia, thus much more potential to hire recruits, despite the difficulty to do so.

This touches upon the morale of the European public. The moral resilience with respect to war seems to diverge between East and West, despite support for Ukraine being the norm within most European countries (Demertzis et al., 2023). The intensity with which the public in Eastern countries, the Baltics, Finland and Poland feel the threat of Russia is to a large degree absent in Western Europe. On Polish schools soldiers now give children lessons on emergency preparedness and the military. Such thing seems unthinkable in the West of Europe (Nowak, 2024). Furthermore 27 million euro's are devoted to increasing the emergency preparedness in Warsaw including money for shelters (Martin, 2024). Finland has even stocked fuel and grain for their population to last at least six months, among various other measures to ready its economy in case of Russian attack (Milne, 2024).

Many officials in Western European governments warn for war within this decade (Ruffino, 2023; Szumski, 2024). Such as the defence ministers of Germany, Sweden and most notably president Emmanuel Macron who has urged on many occasions his views on deterring Russia. Furthermore he is hawk in the debate about European involvement in Ukraine (Economist, 2024). Other public figures like, head of the NATO military committee, Bauer, has alarmed people to store several emergency goods, such as water and batteries. Despite warnings, Western European citizens do not seem to think that war is knocking on their front door. A recent political poll by the European Council on Foreign Relations (ECFR) asked citizens what crisis has changed their perspective on their future. Citizens in France, Germany, Italy, Spain, and the UK chose migration, climate change and the Covid-19 pandemic as more important to them than Russia's invasion of Ukraine (Krastev & Leonard, 2024). Such polls remain difficult to interpret but clearly Estonians and Polish respondents indicate the invasion has altered their future above all else. Another poll by the ECFR asked the European people whether they think Ukraine can still win. The results suggests that only about ten percent of people

think the Ukraine military can win. Most think a compromise settlement will be the most likely (Henly, 2024).

**Capital**

The material strength of Europe with regards to providing the public good of defence rests upon the current military arsenal and production capacity.

*European Military Arsenal*

Firstly the aggregated European Land forces (Figure 5) have about 7300 main battle tanks (MBT) and 8100 infantry fighting vehicles (IFV). Other smaller land vehicles and logistics vehicles are excluded from this count, but are present. Furthermore the heavy artillery pieces amount to about 8600, including many howitzer variants of Soviet 152mm and NATO standard 155mm, both self-mobile and towed. These exclude mortar systems because their range is generally much less. In aggregate that is more tanks, more infantry fighting vehicles and more artillery pieces than Russia.

Noteworthy is the concentration of artillery pieces in countries such as Greece and Turkey which are in ‘cold’ conflict over Cyprus. Furthermore, Ukraine has a lot compared to most European nations to hold off the Russians. Similarly other countries on the Eastern flank, have a lot. Finland has about 850, Romania 690 and the Baltics together 160. These latter three countries, however, have zero main battle tanks and only 130 IFV’s, if an invasion of these NATO areas occurs the alliance will try to rapidly deploy there. To provide deterrence, NATO already has so called ‘forward presence’ in Bulgaria, Estonia, Hungary, Latvia, Lithuania, Poland, Romania and Slovakia (NATO, 2023).

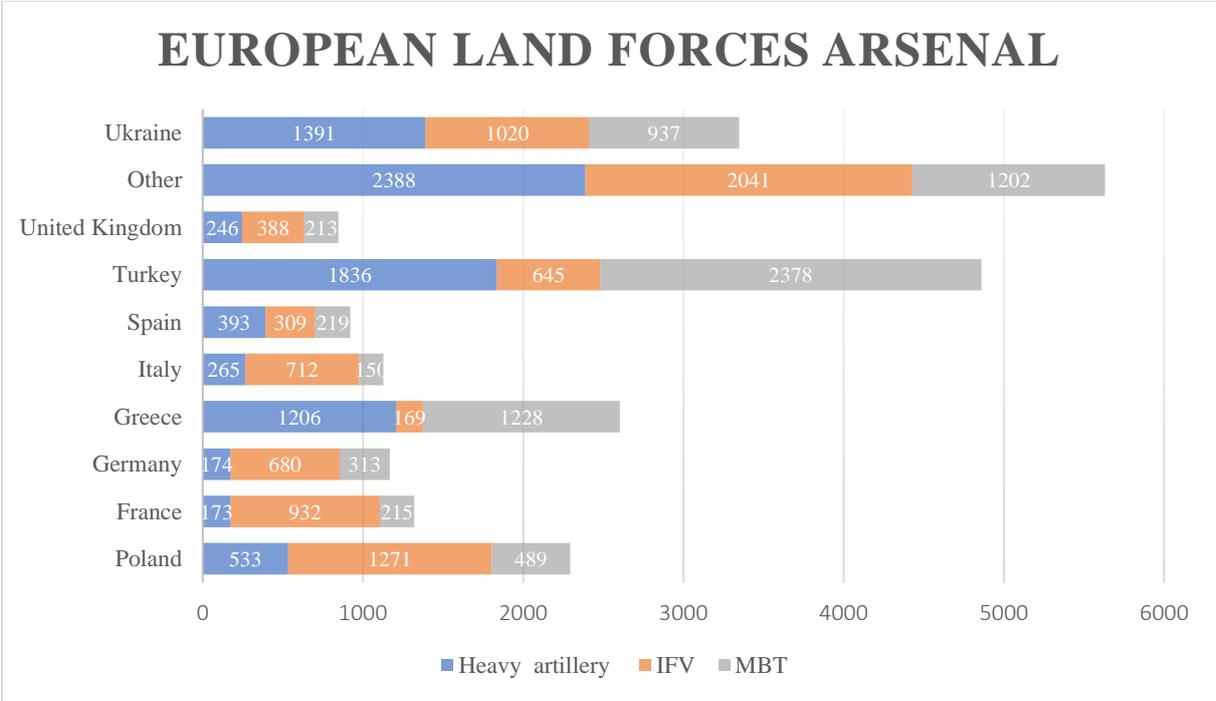


Figure 5: European Land Forces Arsenal 2024  
 Source: International Institute for Strategic Studies. (2024). The military balance (Vol. 124, Issue 1). Routledge.

Secondly the aggregated European Airforce (Figure 6) has about 2300 combat ready fighter aircraft, of which many variants of fighter jets and ground attack aircraft. Fighter helicopters amount to about 500. For both type air systems transport systems are excluded. One of the few European collaborative weapon development projects resulted in the Eurofighter Typhoon fighter aircraft. In Europe, Austria has 13, Germany 138, Italy 93 and Spain 69. Other modern European fighters are the Rafale and Gripen.

Europe has about 800 surface to air defence systems, of which the bulk is in Ukraine. Air defence guns and point air defence – advanced portable rocket launchers – are excluded as their range is not sufficient to defend critical infrastructure from fighter jets or projectiles. Russia is far superior in quantity in this military domain. As mentioned earlier air defence systems are needed to prevent enemy – Russian – rockets, missiles or drones from striking critical infrastructure. Despite Ukraine has relatively many of these systems, it struggles for instance to protect its energy infrastructure and cities. Clearly Europe needs more quantity with regards to its air defence in case of serious threat. Notably, Poland has even more air defence systems than Ukraine. Czechia, Finland and Romania each have just more than 40 air defence systems. The most advanced and far reaching – 20km up and 60km far – air defence systems Europe has are fabricated by a US companies, namely the Patriot system developed by Raytheon. Lockheed Martin also developed one of the missile options (PAC 3). Similarly the Patriot is the one of the most expensive systems at 400 million euros, with estimated missile costs at about 4 million per PAC 3 and half per PAC 2 (Cancian & Karako, 2022). Germany has 30 Patriot systems, Greece 36, the Netherlands 18, Poland 2, Romania 4, Spain 18 and Sweden 12. About similar quality to the Patriot is the European SAMP/T jointly produced by MBDA and Thales, it is operated by the French (40) and Italian (16) army. The cost of a missile (Aster 30) is about 2 million euros (MDAA, 2024). The UK operates its own system, the Sky Sabre at an unknown amount.

Shorter range systems such as the NASAM are widely operated in Europe; Finland (24), Lithuania (6), the Netherlands (6), Norway (6) and Spain (8). The missiles used (NASAM AMRAAM 120) cost about 1 million (MDAA, 2024).

At last, Unmanned Aerial Vehicles (UAV) are extremely important and cost effective for gathering information about enemy positions, some, like the US made MQ9 Reaper or Turkish Bayraktar TB2, can be armed with missiles to strike enemy targets. The MQ9 Reaper UAV being far superior in quality, due to its ability to fly higher altitudes with longer endurance and more firepower. France has 12, Italy 6 (unarmed), Spain 4, (unarmed), Netherlands 4 (unarmed) and the UK 11.

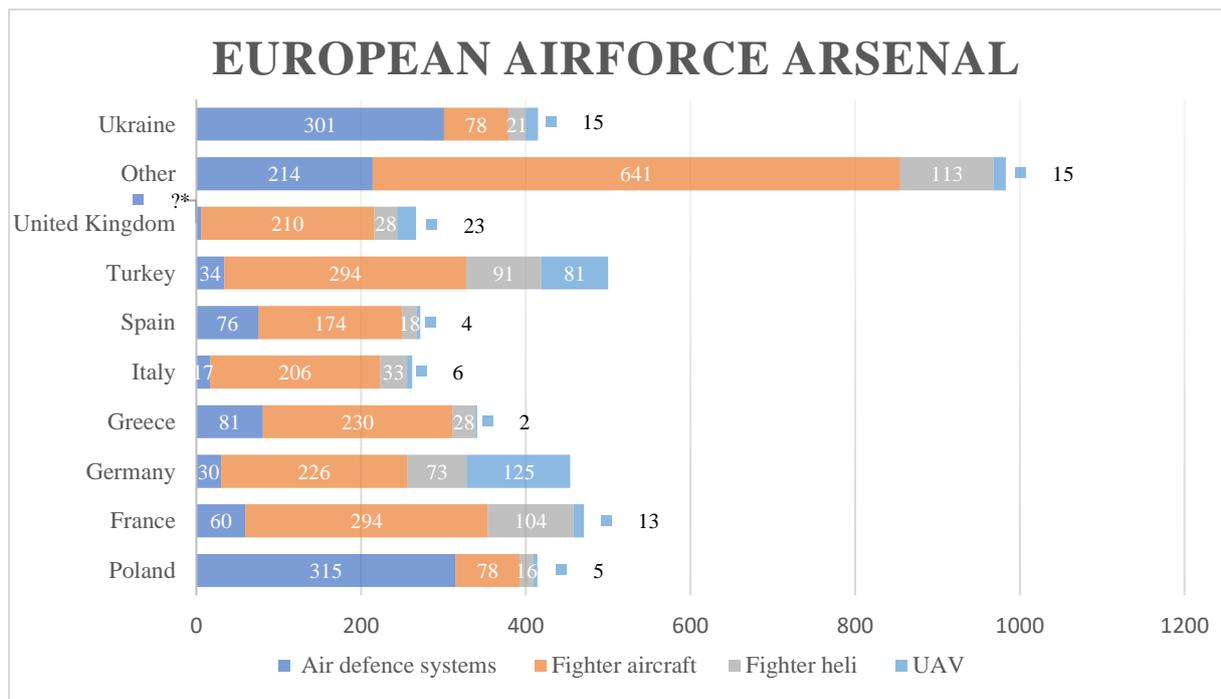


Figure 6: European Airforce Arsenal 2024

Source: International Institute for Strategic Studies. (2024). *The military balance* (Vol. 124, Issue 1). Routledge.

\*The Military Balance does not provide the amount of air defence systems for the UK.

UAV's are important for reconnaissance and gathering intelligence in specific areas. Moreover they are crucial for communication on and of the battlefield. Satellites provide more advanced capabilities in these domains. With regards to military aerospace France is superior in Europe with 5 communications, 6 imagery intelligence and 3 signals intelligence. Their space program expanded in the last decade with CSO 1 and 2, high resolution imagery intelligence satellites and 3 CERES signals intelligence satellites (IISS, 2024, p. 90-91). Germany and Italy follow with respectively 6 and 7 intelligence satellites. The rest are communications satellites. Germany's 5 SAR-Lupe systems already exceeded their planned service life but still function. The first of 3 updated SARah systems was launched in 2022 (Bausch, 2023). Italy's second generation satellites has already been successfully launched, the COSME-SkyMed radar systems and a high resolution imaging OPSTAT-3000 (Thales, 2022; Leonardo, 2017). The main problem for Europe is launching their satellites into space, this has been done from bases in either the US or Europe's Spaceport in French-Guyana. With rockets from the French-German Arianespace for heavy and small cargo. Medium sized satellites could be launched with Russian Soyuz 2 rockets till the invasion of Ukraine and following imposed European sanctions on the Russians. The Ariane 5 rocket was very reliable and cost effective to launch, but is now retired and a the new Ariana 6 rocket, financed by the European Space Agency (ESA), is not finished yet (Nicoli et al., 2023). Development cost amount to about 4 billion euros, launch cost is intended to be 40 percent cheaper than the Ariana 5. The first launch of the Ariance 6 is scheduled at July 9, 2024 (ESA, 2024). Optionally the reusable Falcon-9 from Space-X – Elon Musks company – will be very cost competitive (Amos, 2023).

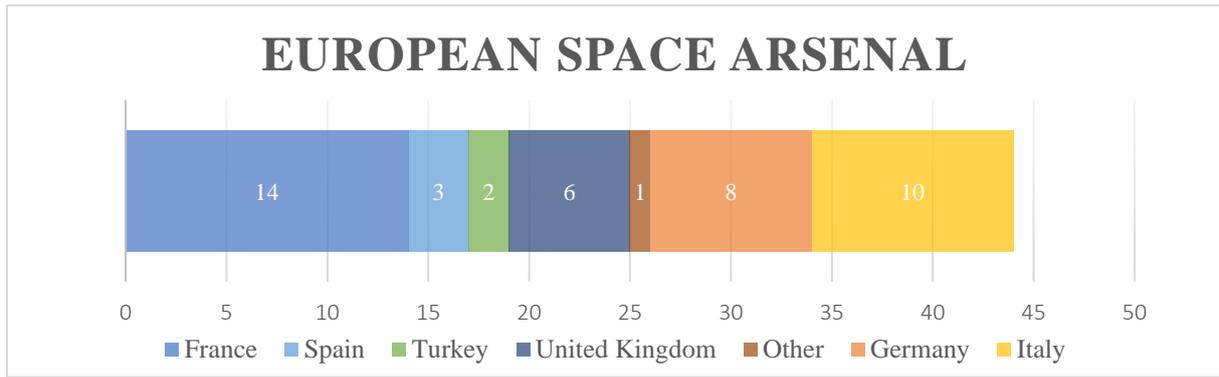


Figure 7: European Space Arsenal 2024

Source: International Institute for Strategic Studies. (2024). *The military balance* (Vol. 124, Issue 1). Routledge.

The aggregated European Navy, excluding coastal combat ships and other logistic and support boats are displayed in Figure 8. The aggregated navy of Europe is superior in quantity, with about double the submarines and four times more main battle ships, including Frigates and Destroyers.

Regarding the Russian threat the navy might seem less important than land and air, as only the relatively small Black and Baltic seas are potential battlefields. Nevertheless directly there is need for maritime capabilities due to the cable infrastructure on the ground in the Baltic sea and trade uses of the Black sea. Moreover Russia exports oil through the port of Sint-Petersburg (Dalay & Sabanadze, 2024; Messmer, 2024)

Indirectly having such naval capabilities is crucial for maintaining safe trade routes elsewhere, which Europe is especially dependent on. Furthermore in the South Chinese sea, NATO ally, the US wants to maintain a strong military position against China with regards to Taiwan. Having these naval capacities to support the US helps maintaining them as a partner when it comes to European needs.

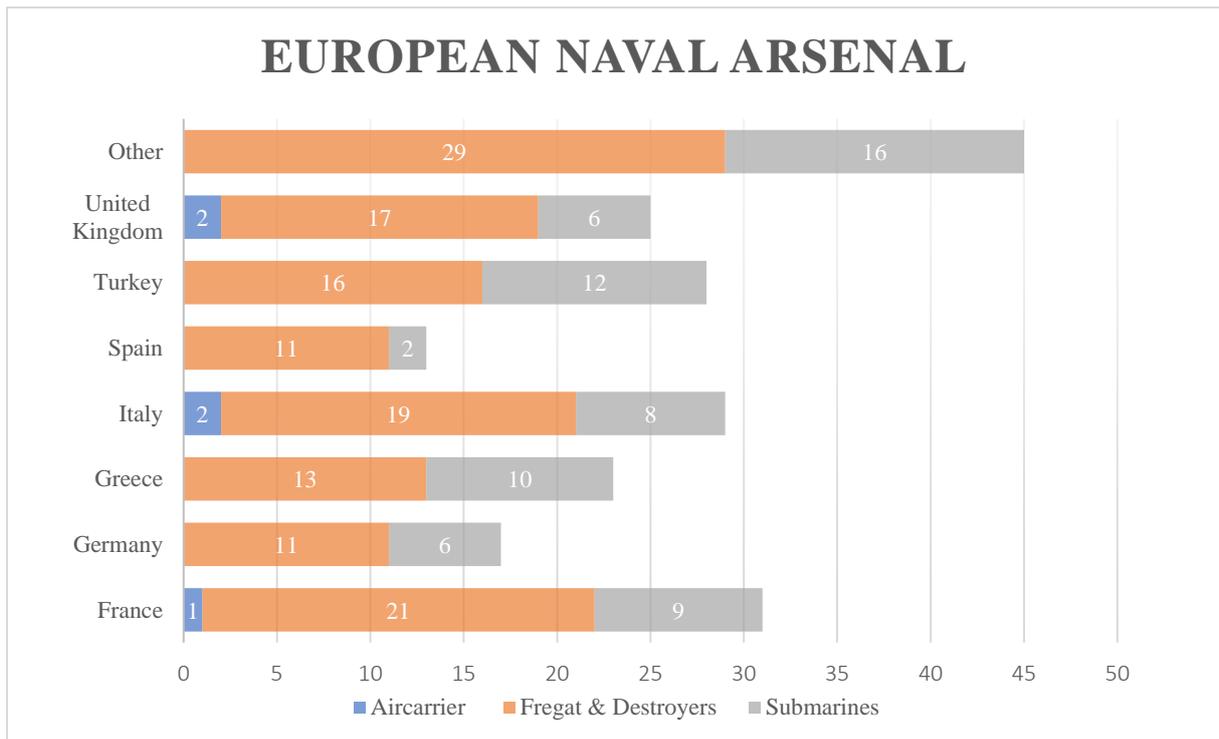


Figure 8: European Naval Arsenal 2024

Source: International Institute for Strategic Studies. (2024). *The military balance* (Vol. 124, Issue 1). Routledge.

Concluding the aggregated arsenal of European militaries is comparable to Russia, discounting the vast amount of differences in systems and thus also the lack of interoperability between these systems, from a technical as well as human operational point of view. To illustrate; the US army has 30 weapon systems while the EU-27 militaries have 180 (Herr & Speer, 2022; McCarthy, 2018). The main gaps with regards to European military capabilities seems to be the located in the domain of air defence and space, where Europe lacks compared to Russia. Interestingly these might be very costly to obtain. Take for instance the cost the European flagship tank model; the Leopard 2 (German). Germany recently purchased 18 of the the newest model Leopard 2A8 tanks for 525,6 million (EDA, 2023). The same amount of money would buy one Patriot or SAMP/T system with a few missiles. Tanks, hold the line on the battlefield. They benefit from air defence, but the air defence system itself also needs protection since it is so costly. Defending all assets against Russian projectiles which it produces and buys from Iran, will require more air defence.

A complete air defence system like the Sky Shield plans initiated by Germany would have to consist of several types with various ranges. In such a system, protection against the heaviest and furthest reaching (ballistic) missiles of Russia is also needed and those anti-missiles become ever more expensive. 62 million euros for one Arrow 3 missile – capable of intercepting in space – excluding the battery to fire it (MDAA, 2024). It was first used, by Israel, to defend against the Iranian strike on April 13, 2024. The US possesses even more expensive interceptor rockets, for nuclear ICBM's. A list of the cost of several different interceptor missiles can be found in appendix B.

### *European Defence Industrial Base*

- To what extent is the European defence industry suited to cost efficiently supply (*bottom right arrow*) the demanded military goods to European governments in case of demand shocks to military capabilities?

The right side of Figure 2 represents the market for military goods with the defence industry as actor. The industry consists of private and public firms as sellers and governments as buyers. These sellers must operate in a market structure with few buyers, although many private firms operate in other markets too, thereby what constitutes as a defence company is not always straightforward. Some firms are partly or wholly state owned, thus there is no fair competition among European sellers of military goods. As a result of this ‘monopsony’ like structure Dunne (2015) notes several characteristics; cost is less important than performance of technology, governments borne risks of R&D investments, close relationships between the players and prevalence of monopolies at the national level. Some other characteristics causing barriers to entry are high fixed costs and often companies need highly skilled labour.

### *Size and Type*

With regards to size, the European Defence Technological and Industrial Base (EDTIB) estimated the EU defence industry, including small and medium enterprises, had a revenue of 70 billion euros in 2021. In Figure 9 the arms revenue of the biggest European defence companies is depicted per country. The companies are present in top 100 worldwide by arms revenue, obtained from the Sipri Arms Industry Database (2023). About a third of the list is European, including Turkish firms, with BAE Systems (UK) the only ranked inside the top 10, having a three year average arms related turnover of about 25 billion euros (2022 prices). For comparison the US arms producers in the top 10 as of 2022 had an arms turnover of about 180 billion. Chinese firms in the top 100 had a combined 98 billion turnover. If taking Russian defence military expenditure of 6 percent of GDP, they spend 360 billion on defence including personnel and all other costs included in the SIPRI database (Sipri, 2024). Placing Russian figures in context; as of 2023 Finland spend 50 percent of their budget on large military equipment, so did Poland. The US spends about 30 percent (NATO, 2023). Note that Finland and Poland are buying relatively many military goods to other costs, like personnel. Russia likely spends much on military goods as well. The US and Russia have about equal size in personnel. Hence, Russia likely spends somewhere between 30 and 50 percent on military goods, which is between 108 and 180 billion. Some of that spending goes to imports and thus to non-Russian companies. The Russian companies in the top 100 as of 2022 have an arms revenue of only about 18 billion. It thus remains difficult to determine the Russian production capacity precisely, but Europe’s 70 billion in revenue with potential to expand and buy from the US, provides balancing options.

The more detailed list of European firms categorized by type of production can be found in the appendix A. With regards to all types of military goods present in the arsenals of European militaries

there is production capacity present within European defence industry, which is more technologically advanced than Russian defence industry is (Dunne, 2015; Watling & Reynolds, 2024). However aerospace is rather in Russian favour as Europe struggles to develop their own space industry (Nicoli et al., 2023).

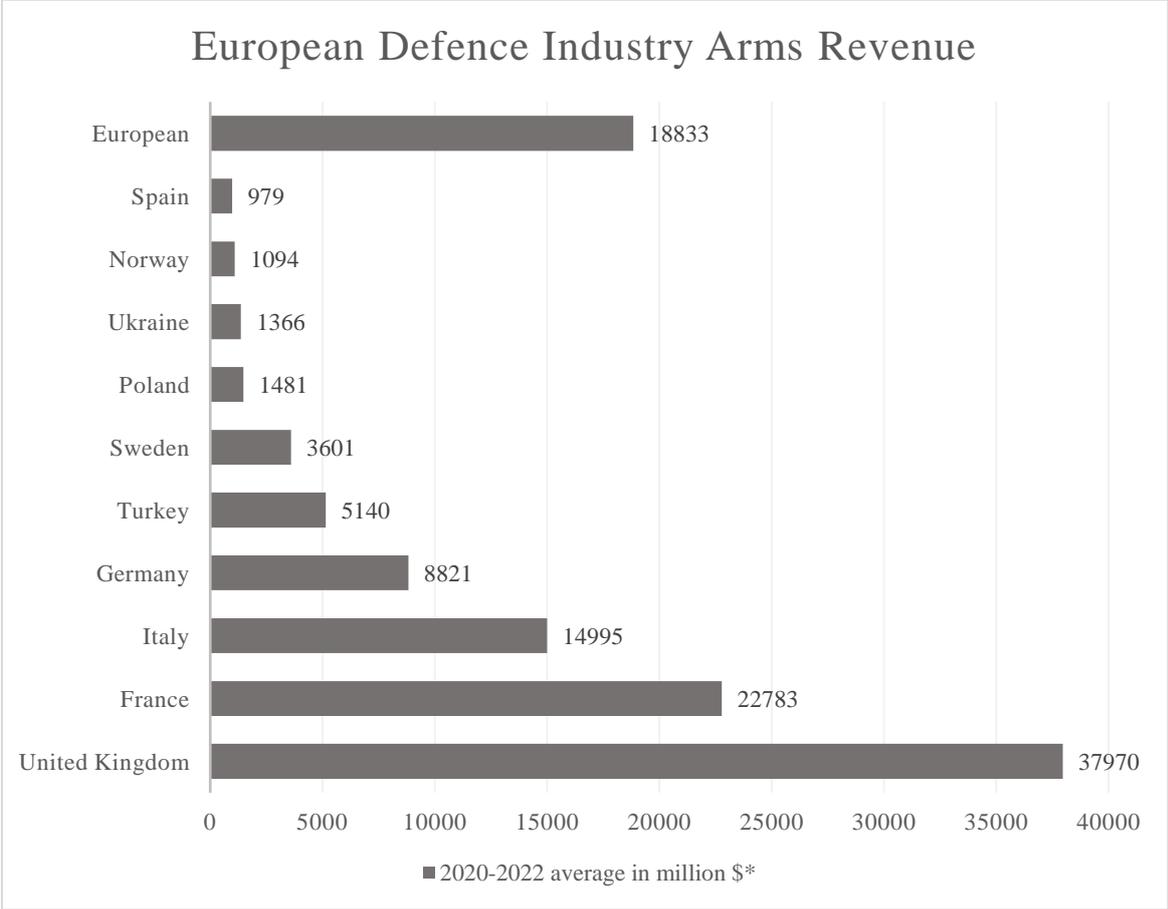


Figure 9: European Defence Industry Arms Revenue  
 \*Excluding nuclear and military services firms  
 Source: Stockholm International Peace Research Institute (2023). Sipri Arms Industry Database. Retrieved June 18, 2024, from <https://www.sipri.org/databases/armsindustry>

Supply Elasticity

The supply of European defence industry is dependent upon demand by governments. Though, US companies are favoured for some weapons by many European governments. For example the Netherlands tends to buy American, exemplified by their F-35, MQ9-Reaper and Patriot systems. In light of the F-35 which was competition for the European Eurofighter Typhoon project an exemplification of European disunity can be found. The Eurofighter project was initiated by Germany, France, Italy, Spain and the UK and European firm Airbus ended up producing it. A dispute over the production distribution led France to leave and produce the Rafale with French firm Dassault Aviation. The Netherlands was offered junior partnership in the European project but chose in the end to invest in the US Joint Strike Fighter program, out of which came the F-35 (Hartley et al., 2004). The given reasons; cost (NCA, n.d.). Much critique regarding the inefficiency of development the

Eurofighter led to a bad reputation. A UK study estimated it at about twice the cost of a national development project (Hartley, 2004; NAO, 2001). Interestingly Hartley (2008) ought the argument to be less applicable since R&D costs, making up a quarter of the Typhoon's cost, was split between four nations and thereby not quadrupled. As usually happens in the European market for military goods. Furthermore output increases with collaborative projects, decreasing the unit cost. Moreover Hartley (2008, p. 313) emphasizes the gains from employment in Europe, export benefits, technology transfer and learning. With regards to elasticity, supply of military goods (*bottom right arrow*) would be much more responsive to demand by governments if the demanded quantity is higher. Currently it is known that industry was wary of increasing production knowing the years of austerity facing the market and order from separate national governments are intuitively less favourable to the industry than larger common orders.

The cost inefficiencies of the supply in military goods in Europe come from the demand side. With some exemptions the defence industry in Europe is very nationally oriented. France is major shareholder in Safran and Naval Group, Italy in Leonardo and Fincantieri, Norway in Kongsberg-Gruppen. Turkey, Poland and Ukraine own about their whole defence industry. On the contrary, Germany and the UK have privatised their defence industry almost completely. Despite most companies a few have transnational structures, these are Airbus, MBDA and recently a merger between Nexter and Kraus Maffei added KNDS to that list. Airbus is mainly an aviation company producing aircraft and UAV's with advanced technology as the focus. They have co-produced the Eurofighter Typhoon. Furthermore they provide production capacity in the space domain. MBDA develops air defence and offensive missiles and systems. KNDS is more focused in the land domain, with armoured vehicles, advanced electronics and military equipment for those systems. The French designed Leclerc tank is part of their product portfolio. The company also produces a wide variety of (artillery) munitions and mortars with high precision.

The main cost efficiency gains can thus be made by collaborating in more transnational projects or even to go as far as creating a common defence market. Hartley (2006, p. 474-479) suggests building comparative advantages between countries in Europe which specialise in a military domain. This can be seen as an ideal type, as it necessitates a far reaching political unity and a single free market. When moving closer to such an ideal type several gains can be formulated in line with the gains from the Eurofighter Typhoon project. Broadly speaking these are gains from scale and learning. Moving to a single market for defence furthermore increases competition which should theoretically lead to lower prices and more innovation, when demand is present. Cost savings could amount to 10-20 percent according to Hartley (2008, p. 307). A major risk of creating competition is that companies will compete over the scarce resources that are necessary in the defence industry. As provided by the literature; raw materials, most notably aluminium and natural graphite; fossil energy and semiconductors all of which Europe does not have in abundance. The prices of these could be driven

up by a competitive defence market model. Furthermore skilled labour, especially technicians might be difficult to find.

Concluding, the size of European defence industry is comparable to Russian defence industry, however this is uncertain. The variety of type of military production Europe is about equal across domains and mostly in naval production, ammunitions and missiles. With a technological advantage relative to Russia. The elasticity of defence industrial supply depends in the demand by governments, which must recognize their influence as buyer to insure smooth supply. This includes common procurement, benefitting the unit cost. Of course per type of weapon the time of supply differs, but is assumed Europe and Russia do this about similar under pressure. Although again European governments have to recognize their role as demander, since the production of simple artillery shells provided hardship in Europe, due to lack of trust in longer term contracts from the industry (Tidey, 2024). Moreover the relations with the US defence industry needs to be reevaluated, as the US firms are much larger, exploiting economies of scale. European wide or transatlantic mergers are perhaps necessary to compete, while maintaining good relations and an industrial base (Guay & Callum, 2002). Without such a European base all money would flow out of Europe.

Hartley suggest two policy options, a centralized European procurement agency, buying for European armed forces and a twin-track model whereby the larger firms collaborate among nations and the smaller defence equipment market is being liberalized (Hartley, 2006, p. 481). This way the demand for these scarce resources could be managed. Reverting back to Figure 2, there seems to be a potential role for the EU with respect to these policies, considering its connection to governments with the largest defence industries. The current Defence Industrial Strategy lacks money to ensure smooth supply. Only 500 million euros is devoted to the strategy (European Commission, 2024).

## European Demand for Defence

- Which internal economic and political factors, affecting European governments, significantly increased demand shocks to military capabilities? And;
- Based on past geopolitical competition which external threats to European governments significantly increased the magnitude of demand shocks to military capabilities?

## Model

To estimate the demand shocks to defence expenditure a panel regression model (1961-2022) of European nations is estimated with internal economic and political predictors derived from the literature. Firstly an autoregressive component is added as it is very likely that defence spending follows a trend. Military capabilities cannot be increased with one year of spending unless it is an unrealistic amount. Furthermore time dummies representing period of geopolitical competition are added. The following specifications of the model is the result and will be explained below;

### *%ΔDefence Expenditure*

$$\begin{aligned} &= \beta_0 + \beta_1 \% \Delta \text{Defence Expenditure}_{t-1} + \beta_1 \text{GDP growth}_{t-1} \\ &+ \beta_3 \ln \text{Other Expenditure} + \beta_4 \text{Public Debt} + \beta_5 \text{Clientalism} + \beta_6 \text{Coldwar} \\ &+ \beta_7 \text{Crimea} + \beta_8 \text{Middle East} + \epsilon_{it} \end{aligned}$$

### *Internal*

Considering the provision of a public good, such as health and education, a positive relationship is consistently found in the literature. With regards to defence expenditure the literature has shown this result to be much less robust. Nevertheless an increase in GDP allows for defence expenditures without hard political choices. To control for annual changes in national income, the GDP growth rate is added to the model with one lag, assuming that changes in the previous period might affect budgetary considerations in the next.

When a European government needs to spend on defence, in response to a demand shock, they can cut other spending, increase taxes or acquire debt (Carter et al., 2021). The potential trade-off between defence expenditure and other government expenditure, also known as the guns versus butter debate. Can be addressed by incorporating the remaining government expenditure to the model. To address the debate properly, the remaining government expenditure is added as logarithm. Hereby it is tested whether a larger government budget over time has implications for shocks to defence expenditure on an annual basis. Considering the literature, an expanded government in terms of non-defence spending likely spends less on defence (Huber et al., 1993), Therefore, a negative relationship is expected with shocks to demand. Spending increases could however also be financed through acquiring public debt, whereby the trade-off will not be visible in through other expenditure as predictor. A high debt to GDP ratio might hinder this from happening, leading a government find other ways of financing such as decrease other expenditure. Therefore the public debt to GDP ratio is added to the model with an expected negative effect on the demand shocks to defence expenditure.

Lastly to control for the different dynamics between political arenas of different European states an indexation of clientelism from the V-Dem database is incorporated in the model. The more clientelistic a country the more it likely uses military expenditure for the purpose of private goods. Furthermore the more clientelistic the less democratic and thus again more likely that a European government has the defensive dynamic in its political arena that has been conceptualized. A positive relation is expected. The higher the index the more likely that higher shocks to demand for defence can be registered. However, these demand shocks can than not really be characterized as shocks to the provision of the public good.

### *External*

Waltz (1979, p.120-128), theorizes that balance of power realism in structural perspective is managing one's own survival as opposed to aggressing. In this line of thought Markowitz and Fariss formulated a

function that prescribes the movement of defence expenditure in relation to geopolitical competition. The degree to which such environment leads to increased defence expenditure, or defence expenditure increases, depends on the relative economic size and geographical proximity of threats with incompatible interests (Markowitz & Fariss, 2018).

During the Cold War the Soviet-Union threatened Europe on those accounts, being a large economy and much closer than Russian borders are currently. Moreover the diverging political interests of communism led European democracies to hold defence spending at higher levels. By adding a Cold War dummy, this study aims to test what that external threat did with regards to demand shocks in Europe.

After the Cold War, terrorist attacks have been widely perceived as the next serious threat to the Western democratic world, exemplified by the 9/11 attacks on the world trade centre in New York. Similarly, Europe has gone through some horrific terrorist attacks like the Madrid train bombings in 2004. Partly as results of the terrorist attacks on 9/11 the US, jointly with the UK initiated the war in Iraq in 2003. Several other European NATO members were by then already involved in the war in Afghanistan against the Taliban and al-Qaeda. All of which were a direct response to 9/11 but resulted in numerous terrorist attacks till the dawn of today. The war in Iraq officially ended in 2011 when the US troops retreated and the combat operations in Afghanistan endured till 2015. Only in 2021 did all Western troops leave the country when the Taliban had overtook most of the country. A Middle-East war dummy, starts in 2001 and ends in 2015 when the combat operations in Afghanistan officially ended. Though, in Iraq they had ended in 2011, the wars are so intertwined with the same goal of anti-terrorism and within the same region they are put together in the dummy since distinguishing the effects would be impossible.

At last, the invasion of Crimea marks a beginning for the current war in Ukraine started by Russia. Thus a dummy from the year of the invasion (2014) till the end of the sample is introduced. These three dummies are expected to have positive signs and are to be interpreted against the norm period which is the time that the specific external threat was not present, regardless of another external threat being present.

## Data

Defence expenditure as a percentage ratio of GDP can be obtained from the Sipri-Milex dataset for various countries (Sipri, 2024). A subset sample of European countries is extracted from the Sipri-Milex database containing datapoints for 15 European countries from 1960-2022. To obtain percentage changes, needed to test demand shocks, the level value for defence expenditure must first be computed by multiplying the ratio of defence expenditure to GDP. Adding local currency GDP (2022 prices) data from the World Bank (2024), results in an unbalanced panel with gaps. Denmark (1960-1965), Germany (1960-1989) and Switzerland (1970-1979) miss values for GDP. The level

value for defence expenditure is transformed into annual percentage changes of defence expenditure. In Table 1 the variance of the dependent variable within the sample is displayed. Portugal witnessed the lowest and a very high shock to demand in respectively 1975 and 1961. During these times it scored the highest on the clientelism index and was considered an autocracy. Greece can be considered second with a large positive shock (36 percent) due to the Cyprus conflict in 1974 and 2 large negative shocks (24 and 20 percent) in response to the sovereign debt crisis (2010 and 2011). Finland had a large positive shock to defence expenditure in response to Ukraine of 30 percent. Furthermore it had a 20 percent increase in 1962 responding to tensions with the Soviet-Union, when US-Soviet relations were also very heated. The next year a 20 decrease followed. Switzerland's interpolation was unreliable and was excluded, hence, no description of the 46 percent increase.

**Table 1**

*Dependent variable Defence Expenditure (%Δ)*

	Min	Median	Mean	Max
Austria	-14.89	3.55	4.40	23.56
Belgium	-18.90	2.79	3.90	18.59
Denmark	-8.17	4.17	4.78	21.06
Finland	-20.08	4.78	6.52	31.77
France	-3.39	3.89	4.63	14.31
Germany	-20.08	2.47	2.51	20.50
Greece	-24.27	9.43	8.61	36.53
Italy	-8.15	6.67	6.75	23.06
Netherlands	-6.57	2.99	4.48	21.03
Norway	-10.34	6.87	6.60	20.34
Portugal	-26.19	8.53	8.07	38.57
Spain	-13.03	6.19	7.79	28.61
Sweden	-9.243	5.72	4.94	16.33
Switzerland	-18.62	1.87	2.45	46.60
United Kingdom	-3.84	4.44	5.18	23.38

*Note: \* $p < 0.05$  \*\* $p < 0.01$  \*\*\* $p < 0.001$*

Government expenditure data is obtained as percentage of GDP from the IMF database (IMF, 2024). The level value of non-defence government spending is obtained by again computing with constant local currency GDP data from the World Bank and subtracting defence expenditure from it. This value for other expenditure is transformed in to a logarithmic value. Furthermore the IMF database provides the public debt to GDP ratio and GDP growth rates for all countries in the sample.

The V-Dem index for clientelism is obtained from the V-Dem database (Coppedge et al., 2024). The index is made up of four surveyed questions regarding public goods, regularly scheduled elections, vote buying and linkages of parties to constituents. In Figure 10 the distribution of the index is depicted, showing higher value for Portugal, Greece and Spain up until around 1980. As well as moderately higher values for Italy and France in the beginning of the sample. For detailed information about the composition of the index, see appendix (D).

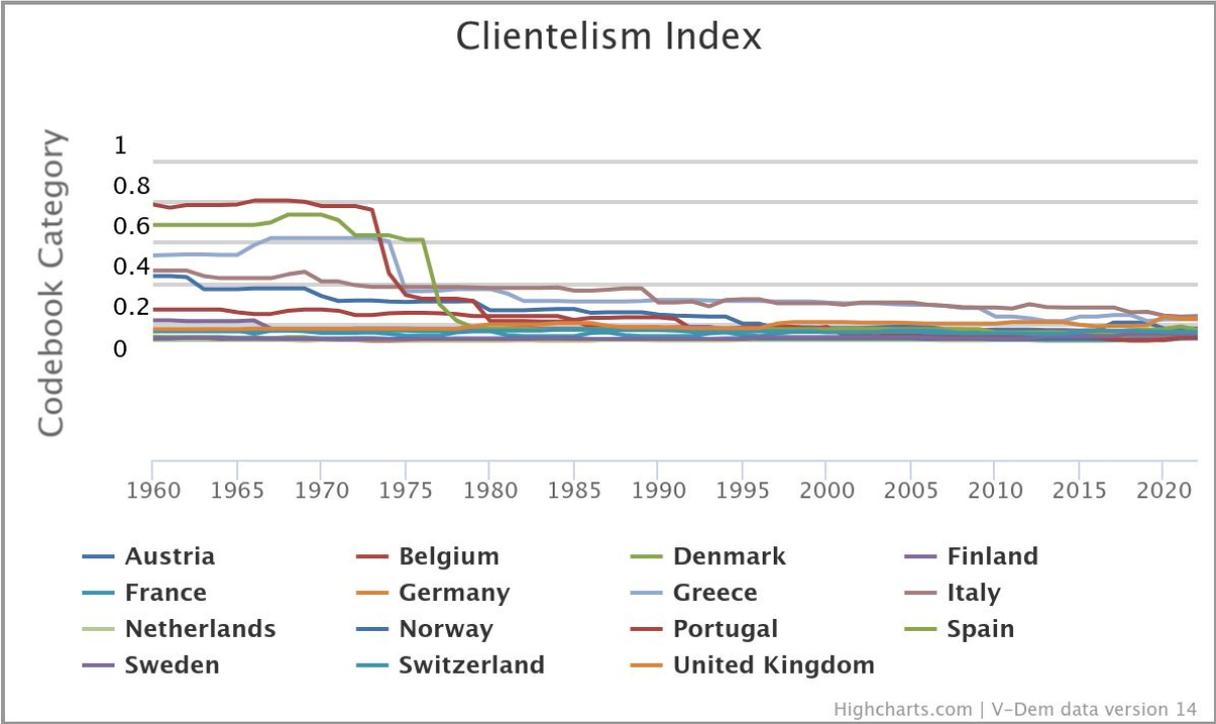


Figure 10: Clientelism Index  
 Source: V-Dem [Netherlands 2024/Netherlands 6-25-2024] Dataset v14” Varieties of Democracy (V-Dem) Project.

As stated, with respect to GDP levels (World Bank) the data is unbalanced with gaps. Interpolating the GDP levels with IMF GDP growth rates provides reliable results for Denmark (1960-1965) and Germany (1960-1989). Not for Switzerland (1970-1979), in 1970 government expenditure as a percentage of GDP more than doubles, while IMF and OECD GDP growth rates differ substantially. Interpolating with either of the two leads the difference between GDP in 1979 and 1980 to be likely overestimated. As it reaches far beyond a 100 percent increase. Due to the necessity to have reliable level GDP values to compute defence expenditure changes and other government expenditure Switzerland must be excluded from the panel, ending up with a panel of 14 countries (1961-2022).

**Empirical Estimation**

The data has two statistical flaws, heteroskedasticity and autocorrelation, that urge the use of robust standard errors. Furthermore to address the self-predictive nature of changes in military expenditure over time one lag of the dependent variable is added. The autoregressive (AR) component controls partly for the autocorrelation of order 1. Firstly a Pooled model with 868 observations was tested

explaining about 25 percent of the variance (Table 2). The average effect of GDP growth and other expenditure does not explain any differences across the sample with regards to the magnitude of demand shocks. The logarithm value of GDP has also been tested to assess whether economic size matters, but yielded no significant p-value. Moreover since GDP growth indicates no significant relationship to demand shocks, perhaps GDP decline leads the government to cut defence spending. However when a dummy for years of GDP decline was tested, similarly no significant result was found. Public debt however has a small significant negative effect on the magnitude of demand shocks across the sample. The time dummies suggest show that demand shocks to defence expenditure with respect to the reference period come mostly from external threat, especially more proximate threat such as that of the Soviet-Union and Russia. Opposed to the wars in the Middle East which have not yielded significant results, perhaps the financial crisis and following Austerity contributed to the insignificant result

**Table 2**

*Dependent variable Defence Expenditure (%Δ)*

Effect	Estimate	Robust SE	95% CI		p
			LL	UL	
Pooled					
Intercept	9.593	6.413	-2.977	22.163	0.135
AR(1)	0.114	0.074	-0.0311	0.259	0.124
GDP Growth	0.019	0.104	-0.186	0.224	0.856
Other Expenditure	-0.230	0.235	-0.691	0.230	0.327
Public Debt	-0.033***	0.009	-0.050	-0.016	<.001
Clientelism	6.899	3.607	-0.170	13.969	0.056
Cold War	3.956***	0.899	2.191	5.718	<.001
Crimea	4.119***	0.714	2.719	5.518	<.001
Middle-East	-0.520	0.912	-2.307	1.266	0.568

Note: \*p<0.01 \*\*p<0.001 \*\*\*p<0.000

However, testing the Pooled model for country specific variation (Chow Test) suggests that there are significant differences across European countries in the sample. To account for these differences the model is tested in a fixed effects regression. Hereby all-time invariant characteristics specific to the countries are captured by the fixed effect. The fixed effects results are accounted for unobserved heterogeneity between the countries. The focus of the results is on within country variation over time, rather than across country variation in the pooled model. The fixed effects model explains a slightly higher percentage of the variance at 26.6%. In Table 3 the coefficients of the model are provided. Similarly GDP in logarithms was tested for the effect of GDP levels, but yielded insignificant results.

The country specific intercepts can be found in the appendix (C). Similarly the fixed effects model tested the logarithms for GDP and the decline of GDP, but again no significant result was found with respect to demand shocks. The sample's timeframe might cause this insignificant result in Europe. Considering the times of peace, only moderate threat perceptions since the end of World War II. Along with continued long term GDP growth.

The results of the pooled and fixed effects model are about similar, although the average effects of external threat (Cold War and Crimea) within countries over time seem to be slightly larger. Furthermore, in the fixed effects model, other expenditure switched signs with an almost significant p-value and public debt had a slightly more negative effect. Perhaps this suggests that within countries defence expenditure shocks are accommodated with other expenditures while persistence of public debt as potential result dampens the magnitude of shocks. Though the results are too precarious to say this with much confidence.

**Table 3**

*Dependent variable Defence Expenditure (%Δ)*

Effect	Estimate	Robust SE	95% CI		p
			LL	UL	
Fixed Effects					
AR(1)	0.050	0.070	-0.088	0.187	0.481
GDP Growth	0.054	0.094	-0.131	0.239	0.570
Other Expenditure	0.567	0.302	-0.025	1.159	0.061
Public Debt	-0.075***	0.010	-0.095	-0.054	<.001
Clientelism	1.880	2.797	-3.608	7.368	0.501
Cold War	5.406***	0.870	3.705	7.115	<.001
Crimea	4.500***	0.586	3.351	5.650	<.001
Middle East	-0.800	1.010	-2.780	1.180	0.428

Note: \* $p < 0.05$  \*\* $p < 0.01$  \*\*\* $p < 0.001$

Another potentially interesting difference between the pooled and the fixed effects model is the difference of the effect from clientelism. Without being significant, the pooled model shows a higher coefficient estimate for clientelism with an almost significant result while the fixed effects model is totally insignificant with a much lower coefficient. The within country effect of might thus be much less of a predictor for demand shocks. While across countries, a higher clientelism score tends to mean that such country has much higher variance in annual defence expenditure changes. To test this a bit more thorough the countries with the highest clientelism scores in the sample; Portugal, Greece and Spain are each excluded separately, in pairs and all three together for both the pooled and fixed effects

model. Indeed the fixed effects model excluding these countries yields no significant result, except when only Spain is excluded a significant p-value (0.044) was estimated with a coefficient of 4.964. Thus Portugal and Greece seem to have other factors explaining the variance of their defence expenditure shocks over time. The pooled model without all three countries results in an estimated coefficient of 13.02 with a highly significant p-value ( $<0.001$ ). When merely Portugal is excluded from the pooled model the estimated coefficient is 10.75 with again a highly significant p-value ( $<0.001$ ). The exclusion of Greece and Spain however do nothing to the significance of the results, indicating that the effect of clientelism when measuring across country variation of clientelism on defence expenditure shocks is more applicable to these countries. In Portugal the shocks to demand for defence expenditure are likely better explained by other political factors.

At last, dividing the sample in pre- and post-Cold War time periods did increase the significance of most variables noting the time dummies were not added. This is likely due to smaller sample size since the coefficient estimates are similarly low.

Because differences between countries in the sample were present (Chow Test), all countries have been tested by a separate linear regression. This provides the effects for all variables per country in Table 4. The most interesting results regard the other expenditure variable for which Belgium and Finland show very positive effects on defence expenditure shocks. Furthermore the external threat dummies provide some significant differences among countries. Greece, the Netherlands, Norway, Spain and the UK show the highest positive significant effects to defence expenditure shocks in response to the Crimea invasion. The results of the Crimea dummy is to be interpreted as within country variation relative to all years before 2014.

**Table 4***Dependent variable Defence Expenditure (%Δ)*

	I	AR(1)	GDP	O E	P D	CL	C W	CR	M E
AUS	-37.374	-.134	-.799	2.748	<b>-.419*</b>	-11.115	-2.423	5.338	1.290
BEL	-78.547	.093	.226	<b>3.442*</b>	<b>-.157**</b>	101.67	-.665	3.938	.053
DEN	-20.325	-.201	.142	1.583	<b>-.146*</b>	-444.48	<b>6.497*</b>	5.194	-5.732
FIN	-16.918	<b>-.312*</b>	.321	<b>1.286*</b>	-.248	-34.283	5.737	7.055	3.071
FRA	-3.602	<b>.526***</b>	.127	.251	-.050	-14.602	2.578	4.229	1.997
GER	-54.730	-.041	.443	2.114	-.071	-88.968	6.041	9.602	4.029
GR	-34.094	.163	<b>-.816*</b>	2.611	<b>-.270**</b>	28.696	-5.973	<b>21.853*</b>	-3.161
IT	12.642	.019	-.149	1.217	-.174	-105.65	<b>11.122*</b>	.444	<b>-6.041*</b>
NL	<b>59.281**</b>	<b>-.482***</b>	.186	<b>-1.639*</b>	<b>-.340***</b>	294.300	.762	<b>6.162**</b>	-2.363
NOR	-14.966	-.246	.391	.392	-.100	301.539	<b>9.538***</b>	<b>9.454**</b>	4.103
POR	-50.612	-.147	.723	2.375	-.046	0.602	<b>14.0166*</b>	-.069	-3.489
SPA	67.037	<b>.339*</b>	-.286	-1.823	<b>-.232**</b>	-8.569	1.114	<b>13.918**</b>	-2.253
SWE	-43.928	.075	-.122	1.676	-.138	222.964	<b>7.156**</b>	-2.635	-4.349
UK	52.236	<b>.487***</b>	-.085	-2.059	<b>-.097*</b>	74.042	2.504	<b>8.218*</b>	2.980

Note: \*p<0.05 \*\*p<0.01 \*\*\*p<0.001

## Discussion of Supply and Demand

Combining the empirical analysis on the supply and demand of the public good security, this discussion will bring the main findings in relation to the cost minimizing perspective of the European Governments. Figure 2 must be taken into consideration.

- The security supply function of the government to the public ( $S_g$ ) depends on the *military capabilities* of that European government and the supply of military goods from the defence industry ( $S_i$ ).

*Military capabilities* which depend on the labour and capital inputs. The empirical analysis shows that these military capabilities are about balanced to the threat of Putin's Russia. The aggregated European military capabilities are almost equal to those of Russia. However, some serious imbalances can be witnessed among European countries. Especially the larger countries; France, Germany, Italy and the UK have significant military capabilities. Next comes Turkey and the Eastern European countries, among which Ukraine. Two major shortfalls can be addressed; Air defence capabilities are present but likely do not provide enough air defence when another front will be opened in the East. This conclusion is drawn from the fact that Ukraine struggles, with the second biggest air defence arsenal depicted in Figure 6. Furthermore the space domain needs to be addressed by European governments to balance against Russia, which has double the amount of satellites. While European countries, barely have a rocket to launch their satellites. The US provides this capacity as of now, but from a European perspective this capability needs improving.

- Supply of military goods by the European defence industry ( $S_i$ ) on its part depends on *cost of inputs* and importantly the demand of European governments ( $D_g$ ). Together making up the market sphere

Regarding the *cost of inputs*; critical raw material, semiconductors and skilled labour are likely to have the biggest influence. Moreover especially the first two are highly susceptible to trade risk, noting that China is not much of a European ally. More likely is it a better ally of the Russian Federation, although this not written in stone. To prevent such risks from materializing – increasing the cost of military goods – the European governments have a role to make inputs available to the defence industry. Furthermore the governments have a role to ensure demand for military goods ( $D_g$ ) is steady in the medium to long run. This is to ensure smooth supply of military goods and prevent production problems directly. A lack of capital resupply for  $S_g$  would namely lead to tough choices on the battlefield when actually defending. Likely losing more costly manpower and morale. Overall the supply of military goods in the European defence market is likely balanced in size and likely overbalanced in quality, however demand proves a significant burden to the cost efficiency. However if governments apply a cost efficient strategy, common procurement and competitive policies for the industry could increase the quantity of  $S_i$  and reduce the unit cost.

- The demand for security from the public ( $D_p$ ) has been estimated with defence expenditure from the government. As described defence expenditure can reasonably be used as a proxy for this demand. Because the government and military translate this demand into  $S_g$  and  $D_g$ .  $D_p$  shocks depend mostly on proximate external threats, as  $S_g$  balances against this threat there is one internal economic moderating factor.

This study has estimated that public debt has a slightly negative effect on defence expenditure shocks, in other words demand shocks. In case of such shock from external threat requires  $S_g$  to increase, a higher public debt decreases the adjustment capacity of  $S_g$  to the new military break even balance, possibly through lower  $D_g$  or recruitment. Another interesting result is the insignificance of both GDP, in growth and logarithms, suggesting that no business cycle effect is present and no effect between economic size and shocks to defence expenditure. When faced with significant threat, a larger economy intuitively still can increase its defence spending more, simply because it can acquire more debt and tax more.

## Conclusion

*What will be the economic costs for European governments when they will increasingly provide their own public good of security, in response to threat?*

To answer to main question of this study and come to a final conclusion on the cost of providing the public good security in Europe in response to threat of Putin's Russia, two scenarios can be distinguished with different economic cost magnitudes. Relating to defence and deterrence.

### Scenario 1: Balancing against Russia

In this first scenario European governments balance out the aforementioned shortcomings in their capacity to supply defence in response to demand shocks caused by Putin's aggression. This implies increasing air defence capabilities, continuing to develop space capabilities and ensuring smooth supply of the defence industry. Perhaps for some countries, creating awareness of Putin's threat and ensuring strong morale to defend when necessary is needed. The costs of this scenario are moderate. Some resources must be devoted from civil industry to defence industries, while more people from the public might need to work for the military and the government defence budget will stay higher to buy military goods and pay for a larger and operational military. Perhaps the largest costs in this scenario are opportunity cost of forgone possibility to invest in the European economy of the future. Since public debt presses the capacity for other spending. As mentioned several cost efficiency gains are possible within this scenario with respect to cooperation among European governments. Note the assumption that governments in Europe do see the need to balance against Russia with the conceptual idea that it is merely providing the public good of defence and not deterrence, which in this scenario still comes from NATO and nuclear capabilities from the UK and France.

### Scenario 2: Overbalancing to Deter Russia

In this scenario the building of deterrence capabilities becomes important. Either because of the need to replace the lost deterrence from the NATO alliance, partly or wholly. Or because the European governments develop their own political will, perhaps via the EU. Or because the threat of Putin's Russia keeps increasing triggering ever more demand shocks. Ensuring deterrence capabilities, by overbalancing against Russia, building more than equal military capabilities, could become a viable strategy for European governments in this scenario. It is no surprise the cost of this will be dramatically higher than scenario 1. The additional cost to scenario 1 will be; A European air defence dome, capable of defending most cities and infrastructure within reach of Russia, like Sky Shield initiative. Furthermore with the addition of much extra space capabilities for the European militaries, that is deploying at least some extra satellites and building steady capacity to launch them in to orbit. Such programmes would cost the European governments probably tens of billions. The European defence industry will need to grow, to meet at least similar size as the US and China which is a doubling. That industry would thus take labour and capital from the civilian sector and thus likely

hinder long term growth. Moreover the opportunity cost of forgone investment in the European economy of tomorrow will be even higher.

In conclusion, when looking at Figure 2 and taking stock of the supply and demand dynamics in the provisioning of the public good security – existing of deterrence and defence – European governments are faced with an external threat causing demand shocks that must be met with immediate supply of defence. European governments have such military capabilities, but nowhere near enough to provide realistic deterrence. They can provide defence, but not without economic costs of balancing against Russia as mentioned in the discussion and conclusion. These results provide a starting point for the more precise calculation of the economic costs for European governments that accompany providing security in a multilevel framework as described in Figure 2

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# Appendix

## A

**Table 1**

*European Defence Industrial Base by Country and Production Type*

<i>European Nations</i>	France	United Kingdom	Italy	Germany	Turkey	Other European
<b><i>European firms in top 100 by SIPRI**</i></b>	1.Dassault Aviation 2. Thales 3. Safran* 4. Naval Group*	1.BAE-systems 2. Rolls Royce 3. Babcock Internatinoal Group 4. QinetiQ 5. Melrose Industries	1. Leonardo* 2. Fincantieri*	1. Rheinmetall 2. ThyssenKrupp 3. Hensoldt 4. Diehl	1. ASELSAN* 2. Baykar*** 3. Turkish Aerospace Industries* 4. Roketsan*	1. EADS (EUR) 2. MBDA (EUR) 3. Saab (SWE) 4. KNDS(EUR) 5. PGZ* (POL) 6. UkrOboronProm* (UKR) 7. Kongsberg-Gruppen* (NOR) 8. Navantia* (SPA)
<b><i>Ammunition &amp; missiles</i></b>			Leonardo*	Rheinmetall Diehl	Roketsan*(TUR)	MBDA (EUR) KNDS (EUR) EADS (EUR) Saab (SWE) PGZ* (POL) Ukroboronprom* (UKR) Kongsberg-Gruppen*(NOR) KNDS (EUR) PGZ* (POL)
<b><i>Advanced electronics (inc. simulation training)</i></b>	Thales Safran*	QinetiQ	Leonardo*	Hensoldt	ASELSAN* (TUR) Baykar*** (TUR)	KNDS (EUR) PGZ* (POL)
<b><i>Air defence (portable and non-portable)</i></b>				Rheinmetall Diehl	ASELSAN (TUR) Roketsan*(TUR)	MBDA (EUR) Saab (SWE) Ukroboronprom* (UKR)
<b><i>Marine vessels</i></b>	Naval Group*	BAE-Systems Rolls Royce Babcock Internatinoal Group	Fincantieri*	ThyssenKrupp	ASELSAN* (TUR)	Saab (SWE) PGZ* (POL) Ukroboronprom* (UKR) Kongsberg-Gruppen (NOR)* Navantia (SPA)*
<b><i>Aviation systems</i></b>	Dassault-Aviation Safran*	BAE-Systems Rolls Royce QinetiQ			ASELSAN* (TUR) Baykar***(TUR)	EADS (EUR) Saab (SWE) PGZ* (POL) Ukroboronprom* (UKR)
<b><i>Armoured land vehicles</i></b>		BAE-Systems Babcock Internatinoal Group		Rheinmetall	ASELSAN* (TUR)	KNDS (EUR) PGZ* (POL) Ukroboronprom* (UKR)
<b><i>Aerospace</i></b>	Safran*	BAE-Systems Cobham Rolls Royce Melrose Industries Meggit			ASELSAN* (TUR)	EADS (EUR)

Note: \*Government as major shareholder \*\*Nuclear and services companies are left out. \*\*\*owned by the son-in-law of Erdogan

## B

**Table 2**

Type of Interceptor Missile	Price
<a href="#">Next Generation Interceptor (NGI)</a>	\$111,000,000
<a href="#">Ground Based Interceptor (GBI)</a>	\$70,000,000
<a href="#">Standard Missile 3 (SM-3) Block IIA</a>	\$27,915,625
<a href="#">Standard Missile 3 (SM-3) Block IB</a>	\$9,698,617
<a href="#">Standard Missile 6 (SM-6)</a>	\$3,901,818
<a href="#">Patriot PAC-3</a>	\$3,729,769
<a href="#">Arrow 3</a>	\$62,000,000
<a href="#">Standard Missile 2 (SM-2) Block IV</a>	\$2,100,000
<a href="#">Aster 30 (SAMP-T)</a>	\$2,000,000
<a href="#">Meteor BVRAAM</a>	\$2,398,000
<a href="#">Evolved Sea Sparrow Missile (ESSM)</a>	\$2,031,875
<a href="#">NASAM AMRAAM 120</a>	\$996,736
<a href="#">Rolling Airframe Missile (RAM)</a>	\$921,310
<a href="#">48N6 (S-300)</a>	\$1,000,000
<a href="#">BARAK-8</a>	\$553,435
<a href="#">IRIS-T</a>	\$450,000
<a href="#">NASAM AIM-9X</a>	\$1,181,018
<a href="#">Mistral M3</a>	\$545,600
<a href="#">Aspide Mk1/Mk2</a>	\$100,000
<a href="#">Stinger Missile/MANPADS</a>	\$480,000
<a href="#">VAMPIRE Missile/MANPADS</a>	\$1,400,000
<a href="#">Tamir (Iron Dome)</a>	\$20,000-100,000
*C-RAM	\$8,100
<a href="#">Directed Energy (Iron Beam)</a>	\$3.50

\*Based on an avg. 300 rounds per interception at \$27 a round

Source: Missile Defense Advocacy Alliance. (2024, February). *Missile Interceptors by Cost*. Retrieved from <https://missiledefenseadvocacy.org/missile-defense-systems-2/missile-defense-systems/missile-interceptors-by-cost/>

C

**Table 1**

*Dependent variable Defence Expenditure (%Δ)*

	Estimate	SE	p
Intercepts Fixed Effects			
Austria	-7.871	7.436	0.290
Belgium	-5.071	7.342	0.490
Denmark	-9.104	7.685	0.237
Finland	-6.797	7.079	0.337
France	-8.600	7.702	0.265
Germany	-11.149	7.851	0.156
Greece	-0.741	7.076	0.917
Italy	-3.663	7.840	0.641
Netherlands	-7.578	7.377	0.305
Norway	-7.721	7.691	0.316
Portugal	-2.907	6.993	0.678
Spain	-5.181	7.511	0.491
Sweden	-9.243	7.827	0.238
United Kingdom	-6.952	7.618	0.362

Note: \* $p < 0.05$  \*\* $p < 0.01$  \*\*\* $p < 0.001$

## D

### 5.4.2 Clientelism Index (D) (v2xnp\_client)

*Project Manager(s)*: Rachel Sigman, Staffan Lindberg

*Additional versions*: \*\_codelow, \*\_codehigh, \*\_sd

*Question*: To what extent are politics based on clientelistic relationships?

*Clarification*: Clientelistic relationships include the targeted, contingent distribution of resources (goods, services, jobs, money, etc) in exchange for political support. The point estimates for this index have been reversed such that the directionality is opposite to the input variables. That is, lower scores indicate a normatively better situation (e.g. more democratic) and higher scores a normatively worse situation (e.g. less democratic). Note that this directionality is opposite of that of other V-Dem indices, which generally run from normatively worse to better.

*Scale*: Interval, from low to high (0-1).

*Source(s)*: v2elvotbuy v2dlencmps v2psprlnks v2x\_elecreg

*Data release*: 9-14.

*Aggregation*: The index is formed by taking the reversed point estimates (so that higher scores = more clientelism) from a Bayesian factor analysis model of the indicators for vote-buying (v2elvotbuy), particularistic vs. public goods (v2dlencmps) and whether party linkages are programmatic or clientelistic (v2psprlnks).

*Citation*: Sigman and Lindberg (2017, *V-Dem Working Paper Series* 2017:56); Sigman and Lindberg (2018); Pemstein *et al.* (2024, *V-Dem Working Paper Series* 2024:21); *V-Dem Codebook* (see suggested citation at the top of this document).

*Years*: 1789-2023

### 3.1.2.7 Election vote buying (C) (v2elvotbuy)

*Project Manager(s)*: Staffan I. Lindberg

*Additional versions*: \*\_osp, \*\_ord, \*\_codelow, \*\_codehigh, \*\_sd, \*\_mean, \*\_nr

*Question*: In this national election, was there evidence of vote and/or turnout buying?

*Clarification*: Vote and turnout buying refers to the distribution of money or gifts to individuals, families, or small groups in order to influence their decision to vote/not vote or whom to vote for. It does not include legislation targeted at specific constituencies, i.e. "porkbarrel" legislation.

*Responses*:

0: Yes. There was systematic, widespread, and almost nationwide vote/turnout buying by almost all parties and candidates.

1: Yes, some. There were non-systematic but rather common vote-buying efforts, even if only in some parts of the country or by one or a few parties.

2: Restricted. Money and/or personal gifts were distributed by parties or candidates but these offerings were more about meeting an 'entry-ticket' expectation and less about actual vote choice or turnout, even if a smaller number of individuals may also be persuaded.

3: Almost none. There was limited use of money and personal gifts, or these attempts were limited to a few small areas of the country. In all, they probably affected less than a few percent of voters.

4: None. There was no evidence of vote/turnout buying.

*Scale*: Ordinal, converted to interval by the measurement model.

*Data release*: 1-14.

*Cross-coder aggregation*: Bayesian item response theory measurement model (see *V-Dem Methodology*).

*Date specific*: Election-specific dates (v2eltype).

*Citation*: Pemstein *et al.* (2024, *V-Dem Working Paper Series* 2024:21); *V-Dem Codebook* (see suggested citation at the top of this document).

*Years*: 1789-2023

### 3.6.0.6 Particularistic or public goods (C) (v2dlencmps)

*Project Manager(s):* Michael Coppedge, John Gerring, Staffan Lindberg

*Additional versions:* \*\_osp, \*\_ord, \*\_codelow, \*\_codehigh, \*\_sd, \*\_mean, \*\_nr

*Question:* Considering the profile of social and infrastructural spending in the national budget, how "particularistic" or "public goods" are most expenditures?

*Clarification:* Particularistic spending is narrowly targeted on a specific corporation, sector, social group, region, party, or set of constituents. Such spending may be referred to as "pork", "clientelistic", or "private goods."

Public-goods spending is intended to benefit all communities within a society, though it may be means-tested so as to target poor, needy, or otherwise underprivileged constituents. The key point is that all who satisfy the means-test are allowed to receive the benefit.

### 3.2.0.7 Party linkages (C) (v2psprlnks)

*Project Manager(s):* Allen Hicken

*Additional versions:* \*\_osp, \*\_ord, \*\_codelow, \*\_codehigh, \*\_sd, \*\_mean, \*\_nr

*Question:* Among the major parties, what is the main or most common form of linkage to their constituents?

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*Clarification:* A party-constituent linkage refers to the sort of "good" that the party offers in exchange for political support and participation in party activities.

*Responses:*

- 0: Clientelistic. Constituents are rewarded with goods, cash, and/or jobs.
- 1: Mixed clientelistic and local collective.
- 2: Local collective. Constituents are rewarded with local collective goods, *e.g.*, wells, toilets, markets, roads, bridges, and local development.
- 3: Mixed local collective and policy/programmatic.
- 4: Policy/programmatic. Constituents respond to a party's positions on national policies, general party programs, and visions for society.

*Scale:* Ordinal, converted to interval by the measurement model.

*Data release:* 1-14.

*Cross-coder aggregation:* Bayesian item response theory measurement model (see *V-Dem Methodology*).

*Citation:* Pemstein *et al.* (2024, *V-Dem Working Paper Series* 2024:21); *V-Dem Codebook* (see suggested citation at the top of this document).

*Years:* 1789-2023

*Convergence:* Model parameters with convergence issues: universal thresholds.

## 5.12 Elections

### 5.12.1 Electoral regime index (A) ( $v2x\_elecrag$ )

*Project Manager(s):* Staffan I. Lindberg, Jan Teorell

*Question:* At this time, are regularly scheduled national elections on course, as stipulated by election law or well-established precedent?

*Clarification:* Coded 0 until an executive or legislative election is held, defined by  $v2xel\_elecrag$  and  $v2xel\_elecparl$ , then set to 1 until any of the following two events occur (if they occur): (a) that the election was 'aborted', meaning that those elected did not resume power, as defined by  $v2x\_hosabort$  and  $v2x\_legabort$ ; or (b) an 'electoral interruption', meaning that either the legislature was shut down, as defined by  $v2xlg\_leginter$ , or there was an executive coup, as defined by  $v2x\_hosinter$ ; in the case of (a) or (b),  $v2x\_elecrag$  is set to 0 until there is another election. The operational indicator of an "aborted" executive election ( $v2x\_hosabort$ ) is that  $v2xpathhs$  did not turn 7 within 12 months after the election, for a legislative election ( $v2x\_legabort$ ) that  $v2lgbicam$  did not turn positive within 12 months after the election. An interruption of the electoral regime occurring through the HOS, *e.g.* a coup d'état, is indicated by  $v2x\_hosinter$  as a change in  $v2xel\_elecrag$ , meaning  $v2xpathhs$  turned from 7 to something else, with the exception of 6, approval by the legislature (in case the legislature remained in place). An interruption of the electoral regime occurring through the legislature is defined by  $v2xlg\_leginter$  based on  $v2lgbicam$  turning 0. We note that the

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OTHER INDICES CREATED USING V-DEM DATA  
5.12 ELECTIONS



coding of  $v2x\_elecrag$  does not merely follow mechanically from the scores on these other variables, as the coding of  $v2x\_elecrag$  has also been cross-checked and validated by research assistants. An executive and a legislative electoral regime cannot be separated since they form an integral part, where an aborted legislature is interpreted as a signal that also the executive is not standing for election any longer, and vice versa.

*Responses:*

0: No.

1: Yes.

*Scale:* Dichotomous.

*Source(s):*  $v2xel\_elecparl$   $v2xlg\_leginter$   $v2xel\_elecrag$   $v2x\_hosinter$   $v2x\_hosabort$   $v2x\_legabort$   $v2ex\_elechos$   $v2ex\_elechog$

*Data release:* 1-14.

*Country-Year Aggregation:* Maximum

*Citation:* *V-Dem Codebook* (see suggested citation at the top of this document).

*Years:* 1789-2023