LUISS

Department of Business and Management

Master in Global Management and Politics

Chair of Political Risk Analysis

"Managing strategic investment under security uncertainty: institutional and economic determinants of defense spending patterns"

Prof. Manfredi Valeriani
SUPERVISOR

Prof. Francesco Galietti
CO-SUPERVISOR

Melis Gedik - 783851
CANDIDATE

Academic Year 2025/2026

Index

Chapter 1: Literature review: strategic uncertainty, investment management and defense spending

1.1 Introduction: global order, power politics, and strategic uncertainty

The contemporary international system is characterized by an increasing degree of strategic uncertainty and by the gradual erosion of the structural assumptions that shaped the post–Cold War international order. In the decade following the Cold War, international politics was largely shaped by expectations of institutionalized cooperation, deepening economic interdependence, and the consolidation of a rules-based liberal order. More recently, however, these expectations have weakened as geopolitical competition has intensified and the global environment has become increasingly fragmented and contested (Ikenberry, 2018; Acharya, 2017).

A growing body of scholarship argues that the liberal international order has entered a phase of decline or transformation, marked by the resurgence of great power rivalry, the weakening of multilateral mechanisms, and a renewed emphasis on deterrence and balancing behavior (Waltz, 2000; Brooks & Wohlforth, 2016). In this context, international stability is no longer primarily ensured through shared norms and institutionalized commitments, but increasingly through the management of relative power and security competition.

From a realist perspective, this return to power politics is neither anomalous nor unexpected. Classical and structural realism assumes that in an anarchic system, states ultimately rely on material capabilities to ensure survival, independently of institutional arrangements or normative commitments (Waltz, 1979; Mearsheimer, 2001). However, the current phase of the international system differs from earlier periods in important ways. Rather than being structured around a clearly defined bipolar or stable multipolar equilibrium, the contemporary order is characterized by ambiguity concerning power distribution, alliance reliability, technological disruption, and the credibility of security guarantees.

This ambiguity generates a persistent condition of strategic uncertainty. Uncertainty is not limited to moments of open crisis but represents a structural feature of international politics (Jervis,1978; Fearon, 1995). States face enduring difficulties in assessing other actors' intentions, capabilities, and long-term trajectories. Moreover, technological innovation and emerging military domains further complicate the assessment of future threat environments (Horowitz, 2020).

Under such conditions, defense policy tends to regain a central role in national strategy. Governments are forced to signal resolve, reassure allies, deter adversaries, and prepare for against adverse scenarios. However, strategic uncertainty does not translate

mechanically into immediate increases in military expenditure. The literature on the demand for military spending shows that defense budgets are shaped by a combination of economic constraints, political institutions, regime characteristics, and fiscal capacity (Smith, 1980; Dunne & Perlo-Freeman, 2003; Rota, 2016). Institutional determinants, regime type, and political accountability further mediate how security pressures translate into budgetary outcomes (Albalate et al., 2012; Lopes da Silva, 2023; Töngür et al., 2015).

Importantly, most existing research focuses on the determinants of the level of military expenditure. While this literature provides robust insights into why states spend more or less on defense, it pays comparatively less attention to how states structure and manage defense investment over time. Yet in a context of persistent uncertainty, the strategic challenge is not only how much to spend, but how to organize expenditure trajectories in a way that ensures credibility, continuity, and strategic coherence.

This thesis builds on this gap. It conceptualizes defense investment not merely as a fiscal aggregate, but as a strategic trajectory embedded in institutional, political, and geopolitical constraints. Rather than focusing exclusively on short-term reactions to specific crises and geopolitical events, it examines how states manage the medium-term orientation and stability of defense investment under conditions of structural uncertainty. Importantly, the analysis does not assume that strategic uncertainty or threat exposure automatically produce structured or coherent investment patterns. Instead, it investigates whether and under which conditions external pressures translate into sustained and organized defense trajectories.

Throughout the thesis, the terms “military expenditure” and “defense spending” refer to aggregate outlays as measured by SIPRI (SIPRI, 2024), while “defense investment” denotes the medium-term orientation, persistence, and structural management of such expenditure. This distinction is central to the analytical framework developed in the following chapters, where the focus shifts from levels of spending to the coherence and volatility of defense investment trajectories.

1.2 The political economy of military spending: classical determinants

The determinants of military spending have long occupied a central position within the fields of defense economics and political economy. A large body of literature tried to explain why states allocate resources to defense in the ways they do, traditionally focusing on the interaction between security needs, economic capacity, and political incentives (Smith, 1995; Nikolaidou, 2008; Douch & Solomon, 2014). As the nature of international conflict changed, from a system dominated by interstate rivalry to one that also includes internal conflicts and transnational threats, the analysis of defense behavior has gradually developed into a more coherent and interdisciplinary field (McGuire, 2007).

Globalization has played a significant role in reshaping the security environment in which defense spending decisions are made. Greater economic interdependence, the spread of military technologies, and the expansion of actors involved in defense production have all contributed to a more complex and uncertain security environment. This has encouraged scholars to adopt integrated analytical frameworks that link economic, political, and strategic considerations when examining military spending patterns (McGuire, 2007).

Understanding the drivers of defense spending is not merely an academic exercise, but one of substantial practical relevance. Military expenditure plays a key role in post-conflict recovery, can impose severe constraints on public finances, particularly in developing and fragile states, and may contribute to self-reinforcing cycles of insecurity, weak economic growth, and renewed violence (Bel & Elias-Moreno, 2009; Albalate et al., 2012). In this sense, defense spending emerges not only from strategic calculation, but also from the economic and institutional environments in which policy decisions are made.

Within the academic debate, two main models have historically dominated the study of military expenditure. The first approach has been strongly influenced by the arms race tradition. Building on Richardson's original framework, this approach conceptualizes defense spending as a reactive process in which states adjust their military outlays in response to perceived changes in the behavior of others. Subsequent reassessments, however, have highlighted important limitations of these models, particularly their reliance on restrictive assumptions and their limited ability to capture the complexity of real world security interactions (McGinnis, 1991). Later work argues that states do not operate in simple one-to-one rivalries but are instead embedded in broader security webs, where multiple actors and interdependencies shape defense behavior in ways that traditional arms race models struggle to explain (Rosh, 1988).

From this perspective, defense spending responds to overlapping and multilayered sources of insecurity, including regional rivalries, internal conflict, shifting alliance structures, and the influence of external agents, rather than to simple one-to-one interactions between states (Rosh, 1988). This insight anticipates later research highlighting that uncertainty and complex regional environments shape not only the level of military expenditure, but also its stability and temporal evolution.

The second major approach moves beyond arms race dynamics by incorporating economic, political, and strategic determinants more broadly. This literature covers a wide range of empirical approaches, yet it largely converges on a common set of explanatory factors. In particular, existing studies consistently point to economic capacity, the security environment, regime characteristics, and alliance membership as

key determinants of military expenditure (Dunne & Perlo-Freeman, 2003; Yildirim & Sezgin, 2005).

Among these determinants, economic capacity consistently emerges as one of the strongest predictors of military spending. Early work demonstrates that national income and fiscal strength condition states' ability to sustain defense efforts over time (Hewitt, 1991), a finding reinforced by more recent meta-analytic evidence (Bachtiar et al., 2025). Economic constraints also shape how governments balance long-term military commitments against other budgetary priorities.

A second determinant concerns the external threat environment and strategic context. Empirical studies show that states tend to increase military spending when exposed to regional instability, arms build-ups, or rising interstate tensions (Dunne & Perlo-Freeman, 2003; Hou, 2018). These findings align with long-standing expectations in international relations theory that states behave as security-seeking actors, adjusting their defense posture in response to perceived uncertainty in their strategic environment (Waltz, 1979). While the relationship between external threat and military spending is well established, several contributions emphasize that threat exposure alone cannot account for cross-national variation in the temporal management of defense expenditure, particularly under conditions of uncertainty and ambiguous signaling (Jervis, 1978; Walt et al., 2003; Brooks, 2016).

A third body of work focuses on regime type and domestic political institutions. The literature has extensively debated whether democracies systematically spend less on defense than autocracies. While some studies identify lower defense burdens among democratic regimes, this relationship is shown to be conditional on ideological orientation, strategic context, and economic capacity (Fordham & Walker, 2005; Yildirim & Sezgin, 2005; Töngür et al., 2015). Recent contributions confirm that institutional characteristics matter, but emphasize that their effects are heterogeneous across regions and political contexts (Bachtiar et al., 2025).

Finally, alliances and cooperative security arrangements play a critical role in shaping national defense incentives. Alliances have been conceptualized as collective-action settings in which burden-sharing dynamics influence members' defense behavior (Sandler, 2001). Changes in alliance structures and shifts in the international balance of power alter these incentives over time, affecting both the level and pattern of military spending (Sandler, 2025). States that are part of cooperative security arrangements may face different strategic expectations and follow different defense spending paths than more isolated states (Fordham & Walker, 2005).

Taken together, the classical political economy literature identifies a robust set of persistent determinants of military expenditure, including economic capacity, perceived threat, regime type, and alliance structures. At the same time, much of this literature treats

defense spending as a static budgetary outcome, focusing mainly on expenditure levels or year-to-year changes. However, existing approaches are less equipped to explain how defense spending is managed over time, how consistently governments commit to investment trajectories, and how stable these patterns remain under prolonged conditions of strategic uncertainty.

As a result, existing approaches are well suited to explain why states spend more or less on defense at a given point in time, but are less informative with respect to how defense investments are planned, adjusted, and sustained across multiple years. This limitation becomes especially relevant in contemporary security environments marked by persistent strategic uncertainty and increasingly complex investment choices. In such settings, the stability and persistence of defense budgets, as well as the way they are managed over time, can matter as much as their absolute level.

Building on this observation, the thesis shifts attention away from static measures of spending and short-term fluctuations, and toward the longer-term trajectories of defense investment. This analysis therefore focuses not only on how much states spend on defense, but on how consistently and sustainably they commit resources over time, linking insights from security studies with political economy approaches to military expenditure.
While these approaches provide a robust explanation of why states allocate different levels of resources to defense, they offer more limited insight into how defense expenditure evolves over time, how investment decisions are sustained, and how governments manage defense budgets under prolonged conditions of uncertainty.

These limitations are particularly evident once attention shifts from static spending levels to the strategic environments in which defense decisions are made. Despite the richness of this literature, most contributions conceptualize defense spending as a contemporaneous budgetary outcome. The focus remains on explaining levels or short-term changes in military expenditure, while little attention is paid to how defense resources are allocated across budget components or managed over time.

1.3 Strategic uncertainty & geopolitics: risks and opportunities

Strategic uncertainty refers to the difficulty states face in forming reliable expectations about the intentions, capabilities, and future behavior of other actors. This condition has long been recognized as a core feature of international politics and a key constraint on defense decision-making (Herz, 1950; Waltz, 1979). In classical international relations theory, uncertainty is not understood as a temporary disruption, but as a structural property of the international system. In the absence of a central authority capable of enforcing commitments, states must make security choices under conditions of incomplete information and persistent mistrust, which shape both their strategic

calculations and their investment behavior (Herz, 1950; Waltz, 1979). The foundational insight of the security dilemma literature is that uncertainty transforms even defensive actions into potential sources of insecurity. Measures adopted by states to increase their own security, such as military modernization, force expansion, or technological innovation, may be interpreted by others as offensive preparations and escalating dynamics (Jervis, 1978). In this framework, insecurity is not necessarily the result of aggressive intent, but emerges from the interaction between rational actors operating under uncertainty. Defense investment thus becomes both a response to and a generator of strategic uncertainty.

Realist theories place particular emphasis on uncertainty regarding intentions rather than capabilities. While material capabilities can be observed with some degree of accuracy, intentions are inherently opaque and subject to rapid change (Waltz, 1979). Uncertainty about future intentions creates strong incentives for precautionary military behavior. Because states cannot assume that actors perceived as benign today will remain so over time, they tend to invest in military capabilities as a form of insurance and deterrence against adverse future scenarios. From this perspective, defense spending reflects not only responses to immediate threats, but also forward-looking strategies aimed at managing an uncertain strategic environment (Mearsheimer, 2001). Within this theoretical tradition, uncertainty is often implicitly equated with risk, and military investment is framed as a defensive response to heightened danger. However, more recent scholarship suggests that such an interpretation is incomplete. Strategic uncertainty does not merely increase the probability of adverse outcomes; it also expands the range of strategic possibilities available to states. In this sense, uncertainty creates both risks and opportunities, shaping defense behavior in ways that cannot be reduced to linear threat-response mechanisms (McGuire, 2007; Acharya, 2017).

Defense economics has increasingly incorporated these insights, recognizing that uncertainty conditions how states translate security concerns into spending decisions. Military expenditure responds more strongly to regional instability in environments characterized by volatility and unpredictability (Dunne and Perlo-Freeman, 2003). Additionally, in regions marked by shifting power balances and unresolved security disputes, defense spending exhibits stronger non-linear dynamics and greater responsiveness to changes in perceived risk (Hou, 2018). These findings suggest that uncertainty amplifies the effect of threats, particularly with respect to aggregate effort and short-term responsiveness. Whether it systematically reshapes longer-term investment structure, however, remains an open empirical question.

Much of the literature treats uncertainty not as an independent cause of military spending, but as a condition that shapes how security concerns translate into policy choices. When threats are relatively clear and stable, defense budgets tend to adjust in incremental and predictable ways. When threats are instead ambiguous or contested, uncertainty amplifies

their perceived urgency, encouraging more precautionary investment responses. In this sense, uncertainty does not replace threat as a driver of defense policy, but alters how threats are interpreted, prioritized, and incorporated into defense planning.

The current geopolitical environment has intensified these dynamics, transforming uncertainty from an episodic condition into a persistent structural feature. The gradual erosion of the post–Cold War security order, the weakening of arms-control regimes, and the return of large-scale interstate war in Europe following Russia's invasion of Ukraine have altered strategic expectations across regions. At the same time, growing tensions in the Middle East have contributed to a security environment in which escalation risks, alliance commitments, and long-term strategic alignments appear increasingly difficult to assess. Compared to the relative predictability that characterized much of the immediate post–Cold War period, contemporary international politics is marked by greater fragmentation, intensified great-power competition, and declining institutional constraints. In this setting, defense planning is shaped less by stable threat benchmarks and more by uncertainty surrounding escalation dynamics, alliance cohesion, and the durability of existing security arrangements (Brooks & Wohlforth, 2016; SIPRI, 2023; SIPRI, 2024).

Technological change further reinforces strategic uncertainty by shortening decision-making horizons and reducing transparency. Globalization and the diffusion of advanced military technologies, particularly dual-use technologies, cyber capabilities, and precision-guided systems, have blurred the boundaries between civilian and military domains (McGuire, 2007). These developments make threat assessment more difficult, and encourage states to invest in capabilities whose strategic relevance may only become clear over time. In this context, modernization cycles, driven by technological uncertainty, also weaken the usefulness of traditional indicators of the military balance, as governments increasingly prioritize long-term capability development that is not fully reflected in aggregate spending figures (Robertson, 2022).

Within this uncertain environment, alliances play a dual role. While collective defense arrangements are designed to mitigate insecurity by sharing resources and coordinating responses, they also introduce new layers of uncertainty related to burden-sharing, commitment credibility, and strategic coordination. Alliances can be seen as collective-action settings in which uncertainty about partners' behavior can generate both free-riding and precautionary over-investment (Sandler, 2001). Additionally, shifts in the international system, such as changes in U.S. strategic priorities, alliance enlargement, or evolving threat perceptions, reshape, rather than eliminate, these uncertainties (Sandler, 2025).

Strategic uncertainty also encourages states to avoid committing fully to a single strategic direction. Instead, governments often make investment choices that preserve flexibility

and limit exposure to adverse future developments. This may involve maintaining some excess capacity, spreading resources across different military capabilities, or combining alliance participation with efforts to retain room for independent action, especially when future alignments or technological trajectories remain uncertain (Acharya, 2018; McGuire, 2007)

Periods of higher uncertainty are therefore frequently associated with increased investment in military innovation, industrial capacity, and technological independence. Rather than simply reacting defensively, states may exploit uncertainty to reposition themselves strategically, accelerate modernization, or reshape their role within regional and global security architectures. Modernization efforts undertaken under uncertain conditions can redefine the effective military balance, even in the absence of immediate conflict (Robertson, 2022). In this sense, uncertainty functions not only as a constraint but also as a catalyst for long-term strategic transformation.

At the same time, uncertainty also makes defense planning more demanding. Governments are required to take long-term investment decisions without reliable forecasts, which increases the risk of misallocation, overinvestment, or sudden policy reversals. Managing defense investment under these conditions therefore depends not only on strategic considerations, but also on institutional capacity, fiscal discipline, and political coordination (Hou, 2018). Where these capacities are limited, uncertainty is more likely to result in reactive and volatile spending patterns rather than sustained investment trajectories (Bachtiar et al., 2025).

Taken together, the literature converges on a clear conclusion: strategic uncertainty is a persistent and defining feature of contemporary geopolitics, shaping defense behavior through multiple and interacting channels. It amplifies threat perception, conditions alliance dynamics, accelerates technological competition, and expands the strategic opportunity set available to states. Yet despite its centrality, much of the existing research continues to focus on how uncertainty affects the level of military spending, paying comparatively little attention to how it shapes the stability, composition, and temporal consistency of defense investment.

This limitation is central in an international environment where uncertainty is no longer episodic but structural. Under such conditions, the ability of states to plan and manage defense investment over time becomes a central strategic challenge. Understanding how political and economic management mediates the relationship between uncertainty and defense investment is essential for explaining contemporary patterns of military expenditure and provides a crucial point to the analysis developed in the following sections.

In line with this perspective, the thesis does not attempt to measure strategic uncertainty directly. Rather, uncertainty is treated as a structural background condition that shapes

how observable factors, such as threat exposure, institutional quality, and alliance membership, translate into different patterns of defense investment over time.

The security dilemma provides the theoretical mechanism through which uncertainty translates into reactive defense behavior. Importantly, while strategic uncertainty is widely acknowledged in the literature, it is rarely treated as an object of empirical estimation. Rather than being operationalized directly, uncertainty functions as a background condition shaping how observable factors translate into defense spending outcomes.

1.4 The security dilemma and reactive defense investment

At the theoretical core of the relationship between threat, uncertainty, and military spending lies the concept of the security dilemma, originally introduced by John H. Herz in the early post-war period and then refined within realist international relations theory. Herz first articulated the security dilemma in his critique of both political idealism and classical realism, arguing that insecurity and arms accumulation cannot be explained only by aggressive intentions or innate human drives. Instead, he located the roots of persistent conflict in the structural conditions of international anarchy, where states, acting defensively and rationally, may generate insecurity for others (Herz, 1950; Herz, 1951).

In Political Realism and Political Idealism, Herz rejects explanations that attribute war primarily to human aggressiveness or expansionist ambition. Looking at historical cases of arms accumulation, he shows that insecurity often arises even in the absence of revisionist intent, with states acting out of fear rather than ambition (Herz, 1951). Defensive measures, such as military modernization or precautionary armament, are inherently ambiguous: actions taken to increase security can be perceived by others as threatening. This ambiguity triggers reciprocal responses that can escalate insecurity even when no actor seeks confrontation.

The importance of Herz's contribution lies in shifting the focus away from psychological causes and toward the structural conditions of the international system. By highlighting uncertainty, misperception, and the absence of enforceable commitments, his research helps explain how defense policies emerge from systemic constraints rather than from individual preferences alone. In this view, insecurity and arms accumulation are not necessarily the result of aggressive intent, but can be produced endogenously by the system itself, even when states would otherwise prefer stability and restraint.

Herz later revisited the security dilemma to emphasize its continued relevance in changing geopolitical contexts. Writing in the early 2000s, he argued that security concerns had not diminished with the end of the Cold War; rather, they had intensified in new and less predictable forms (Herz, 2003). Contrary to expectations of a post-1989 "peace dividend," levels of military spending and arms transfers remained relatively high,

especially in regions marked by weak institutions and unresolved conflicts. Herz also observes that alliances such as NATO did not dissolve with the disappearance of their original adversary, but instead persisted and expanded geographically. From this perspective, enlargement contributed to renewed perceptions of insecurity, particularly on the Russian side, reinforcing rather than alleviating underlying strategic tensions (Herz, 2003). For defense investment, this implies that insecurity does not automatically decline as identifiable threats diminish. Instead, it is often reshaped by institutional change, strategic ambiguity, and shifts in power relations. In some contexts, the absence of a clearly defined adversary can even increase uncertainty, leading governments to favor more cautious and anticipatory investment choices. From this perspective, arms accumulation and reactive investment patterns are better understood as rational responses to an environment characterized by uncertain futures and weak mechanisms of credible commitment.

Jervis (1978) refines the logic of the security dilemma by focusing on two elements: the balance between offensive and defensive capabilities, and the degree of uncertainty surrounding intentions. When it is difficult to distinguish between offensive and defensive postures, or when offense is seen as having the upper hand, states tend to interpret one another's military moves in a cautious and often pessimistic way. In this setting, even limited changes in force posture or procurement can provoke reciprocal reactions, setting off arms racing and escalation dynamics. Where defensive capabilities are more clearly dominant and intentions can be credibly communicated, these dynamics are less pronounced and cooperation becomes easier to sustain (Jervis, 1978).

Crucially, Jervis emphasized that uncertainty, rather than hostility per se, drives these dynamics. Even status-quo oriented states may become trapped in cycles of reactive investment if they are unable to distinguish defensive preparations from offensive intentions. This insight reinforces Herz's original argument and highlights the centrality of perception, information asymmetries, and strategic ambiguity in shaping defense behavior over time.

Applied to military spending, the security dilemma provides a powerful framework for understanding reactive defense investment. Defense budgets do not simply respond to realized conflict or objective threat levels; they are shaped by anticipatory judgments about others' future behavior. States increase military expenditure not only when confronted with direct aggression, but when they perceive changes in the strategic environment that could alter the balance of power. Military spending thus becomes a form of insurance against adverse contingencies rather than a proportional response to current danger.

Empirical work in defense economics supports this interpretation. Military expenditure is shown to respond systematically to the spending patterns of neighboring states, in line

with reciprocal and reactive dynamics (Dunne & Perlo-Freeman, 2003). In regions marked by unresolved disputes and shifting power balances, defense budgets also appear particularly sensitive to changes in regional military postures (Hou, 2018). Taken together, these findings indicate that reactive investment behavior reflects a structural feature of defense planning under uncertainty, rather than a short-term response to isolated shocks.

Importantly, the security dilemma has implications not only for the level of military spending, but also for its temporal dynamics. Reactive investment behavior tends to introduce volatility, as governments adjust budgets in response to perceived changes in the strategic environment. Periods of increased uncertainty are often associated with faster procurement decisions, accelerated modernization efforts, and shifts in budgetary priorities. When perceived threats instead stabilize or recede, defense spending may contract, producing cycles of expansion and retrenchment rather than smooth adjustment paths (Dunne & Perlo-Freeman, 2003; Hou, 2018; Robertson, 2022). From this perspective, volatility in defense investment is not necessarily a symptom of poor governance or irrational policy. Rather, it reflects the strategic logic of interaction under uncertainty. The security dilemma explains why states may over-invest in military capabilities even in the absence of immediate conflict, and why arms accumulation persists despite defensive intentions on all sides.

In the current geopolitical context, these dynamics have become more pronounced. Renewed great-power competition, the weakening of arms-control arrangements, and the diffusion of advanced military technologies have made assessments of both capabilities and intentions less clear. As a result, governments face stronger incentives to prioritize precautionary and reactive forms of defense investment. In this setting, the security dilemma remains a useful reference point for interpreting contemporary patterns of military spending (Brooks & Wohlforth, 2016; SIPRI, 2023). At the same time, the security dilemma highlights a critical limitation of purely systemic explanations. While uncertainty and strategic interaction explain why reactive investment occurs, they do not explain why some states manage these dynamics more effectively than others. This suggests that domestic political and economic institutions mediate the translation of systemic pressures into concrete budgetary outcomes.

Taken together, the security dilemma provides a crucial bridge between classical international relations theory and contemporary empirical analyses of military expenditure. It links uncertainty to reactivity, explains persistent arms accumulation in the absence of aggressive intent, and offers a foundational framework for interpreting volatility in defense investment under conditions of strategic ambiguity. At the same time, it points toward the importance of domestic institutional capacity and economic management in shaping how states respond to systemic pressures, an issue addressed in the following section. From an investment perspective, the security dilemma is relevant

not because it predicts higher spending per se, but because it encourages reactive and episodic adjustments that may undermine long-term investment stability.

1.5 Volatility and stability of defense investment: procurement, R&D, and budget composition

A key insight in the study of military expenditure is that defense budgets should not be treated as single, undifferentiated aggregates. Instead, they are made up of distinct functional components, such as personnel, operations and maintenance, procurement, and research and development, that follow different political, institutional, and economic logics.

These components respond differently to strategic pressures and are characterized by different levels of flexibility under fiscal and political pressure. Treating military spending as a single aggregate can therefore obscure the mechanisms through which governments plan, prioritize, and manage defense resources over time (McGuire, 2007). This limitation has gained importance as contemporary security environments have grown more complex and uncertain. Defense investment decisions today are shaped not only by traditional interstate rivalry, but also by technological change, industrial globalization, and ambiguous threat signals. In this context, understanding the stability and volatility of defense spending requires moving beyond aggregate measures and examining how different budget components behave across time (Dunne & Perlo-Freeman, 2003a; Becker & Dunne, 2024).

However, cross-national data constraints often limit the availability of consistent and comparable information on detailed budget composition, particularly for long time horizons. As a result, much of the empirical literature continues to rely on aggregate spending indicators, even when the underlying theoretical mechanisms concern investment structure and adjustment dynamics. Building on this tension, this study does not directly observe procurement or R&D shares across countries, but instead approximates investment structure through dynamic indicators of medium-term orientation and volatility. Rather than focusing exclusively on budget composition in an accounting sense, the analysis captures whether defense spending follows sustained and coherent trajectories over time, or whether it is characterized by episodic and reactive adjustments.

In this way, the distinction between stability and volatility is operationalized not as a purely compositional feature of defense budgets, but as a temporal characteristic of how governments manage defense expenditure under conditions of strategic uncertainty.

1.5.1 Defense budget composition and adjustment patterns

A substantial body of recent research emphasizes the importance of defense budget composition for understanding spending patterns over time. Within defense budgets,

personnel expenditure is generally the least flexible component. Salaries, pensions, and established force structures are embedded in legal rules, administrative practices, and social expectations, which makes them difficult to adjust quickly. As a result, personnel spending tends to change only gradually and often remains stable even during periods of fiscal tightening or political transition (Becker & Dunne, 2024).

This rigidity reflects both administrative path dependence and the political costs associated with reducing military employment. Reducing personnel numbers often carries significant political costs, including electoral backlash, social resistance, and opposition from military and bureaucratic actors. For this reason, governments are generally reluctant to adjust personnel spending in the short term. As a result, personnel accounts tend to account for only a limited share of short-term variation in defense budgets, even when strategic priorities change or fiscal pressures increase (Becker & Dunne, 2024).

In contrast, procurement and R&D constitute the most flexible and strategically responsive segments of defense budgets. These investment-oriented categories are more sensitive to changes in the external security environment, macroeconomic conditions, and political priorities. Investment spending typically increases when governments perceive strategic opportunities or rising threats, and declines when fiscal constraints become more binding or political attention shifts to other priorities (Mintz & Huang, 1991; Becker & Dunne, 2024). This asymmetry explains why total military expenditure may appear relatively stable while underlying investment components exhibit pronounced volatility. While this study does not directly observe these components at the cross-national level, this distinction provides the conceptual foundation for interpreting volatility and medium-term orientation as proxies for investment dynamics.

1.5.2 Volatility as a structural feature of defense investment

Volatility in procurement and R&D should not be read simply as a sign of incoherent or short-term policymaking. Instead, it reflects a structural aspect of how governments manage defense investment under uncertainty. Investment spending serves as the main adjustment channel through which states respond to strategic shocks, economic downturns, or political shifts, while leaving politically sensitive personnel commitments largely unchanged (Mintz & Huang, 1991). From this perspective, volatility is endogenous to the political economy of defense budgets. Governments tend to concentrate adjustments in investment categories because these expenditures are not supported by strong domestic constituencies in the way personnel spending is. As a result, procurement and R&D are more exposed to short-term fluctuations, even when longer-term strategic priorities remain broadly unchanged (Mintz & Huang, 1991; Hou, 2018). Defense investment combines elements of both flexibility and rigidity. In the short run, procurement and R&D can be adjusted more easily than personnel spending. At the same time, these expenditures are tied to long-term contracts, technological dependencies, and

global production networks. Major weapons programs involve large sunk costs and complex industrial relationships, which commit governments to multi-year investment paths and make reversal costly and politically difficult (McGuire, 2007). These constraints shape distinctive investment cycles. Procurement spending often shows sharp changes when major programs begin or end, followed by extended periods in which contractual obligations limit adjustment. In this context, observed volatility may reflect the timing of strategic investment decisions rather than underlying instability in defense policy or governance (McGuire, 2007). In the empirical analysis developed in this thesis, volatility is not interpreted mechanically as dysfunction, but as a potential indicator of how governments adjust investment under uncertainty.

1.5.3 Measuring volatility across countries

Cross-national comparisons make the interpretation of defense spending volatility more complex. Differences in the relative prices of military goods across countries and over time mean that procurement-intensive budgets can appear volatile when measured in nominal or real expenditure terms. This is especially the case during modernization phases, when shifts from legacy systems to advanced platforms generate large swings in recorded spending even if the underlying investment strategy remains consistent (Robertson, 2022). More broadly, observed volatility reflects not only policy choices but also measurement conventions, exchange rate movements, and the timing of major procurement decisions. Aggregate spending indicators can therefore obscure the behavior of investment-oriented budget components, leading to potentially misleading conclusions about policy instability or strategic inconsistency (Robertson, 2022). These measurement challenges reinforce the need to complement volatility indicators with measures that capture the direction and persistence of investment over time.

1.5.4 Volatility as a governance problem

Beyond measurement concerns, volatility in defense investment also raises broader questions about political and economic governance. Sustaining coherent investment paths over time depends not only on available fiscal resources, but also on institutional capacity, policy coordination, and political commitment. Governments must allign long-term strategic objectives with short-term budget constraints, manage complex procurement processes, and sustain domestic support for defense priorities alongside competing demands (Besley & Persson, 2011; Bove & Nisticò, 2014).

In this context, high volatility in investment spending is often taken as an indicator of weak governance. Empirical work links high fluctuations in defense expenditure to fiscal stress, fragmented decision-making, and reactive policymaking, particularly in countries with limited institutional capacity (Bachtiar et al., 2025). Importantly, volatility should not be interpreted mechanically as evidence of poor governance or irrational policymaking. In certain contexts, fluctuations in defense investment may reflect

deliberate strategic adjustment rather than institutional weakness. At the same time, interpreting volatility only as a governance failure risks oversimplification. As discussed before, fluctuations in investment may also result from deliberate strategic adjustment in response to uncertainty. Periods of increased strategic ambiguity can lead governments to accelerate procurement in anticipation of adverse scenarios, followed by retrenchment once fiscal or political constraints become binding. In such cases, volatility reflects adaptation to changing conditions rather than policy mismanagement (Jervis, 1978; Hou, 2018).

1.5.5 The limits of volatility-based approaches

Volatility-based measures capture how much defense spending fluctuates, but say little about why these changes occur. Budget fluctuations can result from strategic decisions, structural constraints, or policy instability, and volatility alone does not allow these sources to be separated. It also fails to capture the direction of investment: a volatile budget may follow a declining path, while a stable budget may hide stagnation or underinvestment.

For this reason, volatility provides only a partial view of how defense investment is managed over time. Countries with similar levels of volatility may pursue very different investment paths, depending on whether adjustments take place around rising, falling, or flat spending trends (Bove & Nisticò, 2014; Rota, 2016). Likewise, low volatility can reflect either consistent long-term planning or an inability to adapt investment levels to changing conditions. These limits are especially relevant in security environments characterized by sustained uncertainty rather than short-term shocks. In such settings, the central issue is not simply whether spending fluctuates, but whether governments are able to maintain a coherent direction in defense investment over time (Acharya, 2018). This ambiguity suggests that volatility alone is not sufficient to assess the quality of defense investment decisions, pointing instead to the need to examine the institutional and economic conditions under which volatility emerges.

1.5.6 From volatility to the management of defense investment trajectories

The literature reviewed in this section suggests that, while volatility captures important aspects of instability, it should not be equated with the quality of defense investment management. Fluctuations in spending provide limited information about how governments plan, prioritize, and sustain defense investment under conditions of strategic uncertainty. A focus on volatility alone therefore overlooks key dimensions such as persistence, direction, and consistency in investment decisions over time (Bove & Nisticò, 2014; Rota, 2016; Robertson, 2022). This observation motivates a shift away from purely volatility-based measures toward indicators that better capture the longer-term orientation of defense investment. Examining whether states consistently expand, maintain, or reduce defense investment over multiple years offers a more direct way to

assess how political and economic management shapes defense policy outcomes, particularly in environments characterized by prolonged uncertainty rather than short-lived shocks (Acharya, 2018; Hou, 2018). This perspective provides the conceptual basis for the operationalization of the dependent variables and the empirical strategy developed in the following chapter. Whether volatility reflects strategic adaptation or institutional weakness ultimately depends on the domestic political and economic structures within which defense decisions are made. While existing studies recognize volatility as an important feature of military spending, they rarely integrate volatility into a broader framework of defense investment management. Volatility is typically treated as an outcome of shocks or political instability, rather than as an indicator of governments' capacity to manage long-term defense investment under uncertainty

1.6 The role of institutions, economic capacity and threat perceptions

While international threats and strategic uncertainty define the external environment within which defense decisions are made, a substantial and growing body of literature emphasizes that domestic institutions fundamentally condition how states translate these pressures into military spending behavior (Albalate et al., 2012; Bove & Nisticò, 2014; Besley & Persson, 2011). This perspective represents a decisive shift in the political economy of defense: rather than treating military expenditure as an automatic response to external danger, it conceptualizes defense spending as a politically mediated outcome shaped by institutional constraints, fiscal capacity, and domestic power structures (Nikolaidou, 2008; Dunne & Perlo-Freeman, 2003a).

One body of the literature emphasizes the role of accountability, transparency, and institutional constraints in shaping defense spending patterns. Empirical studies show that stronger institutions, such as effective legislature, transparent budgeting processes, and limits on executive discretion, are associated with lower defense burdens and more controlled spending paths (Bel & Elias-Moreno, 2009; Albalate et al., 2012). Where these mechanisms are weak or absent, military budgets are more exposed to rent-seeking behavior, inefficient procurement, and politically driven expansion, especially in contexts where security threats are ambiguous rather than immediate (Bel & Elias-Moreno, 2009). Taken together, this evidence suggests that institutional quality influences not only the level of military expenditure, but also the extent to which governments engage in excessive or reactive responses to perceived insecurity, contributing to greater spending stability over time (Albalate et al., 2012).

The interaction between regime type and institutional quality further complicates this relationship. While a large empirical literature finds that democracies, on average, use a smaller share of resources to defense than autocracies, this relationship is neither uniform nor unconditional (Yildirim & Sezgin, 2005; Töngür et al., 2015).

Democratic institutions constrain military spending only when accountability mechanisms are effectively enforced and political competition limits executive discretion (Fordham & Walker, 2005). Where democratic rules coexist with weak enforcement, strong military influence, or highly polarized politics, defense spending patterns can resemble those observed in more authoritarian contexts, especially under conditions of elevated threat or instability (Bove & Nisticò, 2014).

Economic capacity constitutes a second critical mediating factor. A consistent finding across political economy models is that fiscal capacity conditions both the feasibility and the form of defense responses to insecurity (Hewitt, 1991; Bachtiar et al., 2025). States with higher income levels, diversified tax bases, and access to credit markets are better positioned to absorb security shocks without resorting to abrupt or destabilizing budgetary adjustments (Besley & Persson, 2011). By contrast, fiscally constrained states often face trade-offs between security provision and economic stability, increasing the likelihood that defense spending becomes volatile or opportunistic (Collier & Hoeffler, 2007).

Institutional persistence further strengthens these patterns. Political and economic institutions tend to endure over time, continuing to shape policy choices even after underlying power relations change (Acemoglu & Robinson, 2006). In settings characterized by weak institutions and recurring political violence, fiscal fragility, insecurity, and reactive spending often reinforce one another, creating self-sustaining cycles (Besley & Persson, 2011). In such contexts, military expenditure serves both as a response to insecurity and as a tool for maintaining political authority, increasing sensitivity to perceived threats and contributing to greater spending volatility (Hou, 2018).

Measurement issues also matter for understanding institutional effects. Democracy and governance are multidimensional concepts encompassing participation, competition, accountability, and constraints on executive authority (Boese, 2019). Empirical studies relying on highly aggregated regime indicators risk obscuring the specific institutional channels through which political systems shape defense spending behavior. This limitation is particularly consequential for analyses of volatility, where differences in budgetary rules and procurement governance may matter more than regime labels alone (Boese, 2019).

Taken together, this literature converges on a central conclusion: domestic institutions act as conditioning mechanisms that shape how states translate threat and uncertainty into defense spending outcomes. Institutions influence not only how much states spend on defense, but how rapidly and how strongly they respond to changes in the strategic environment (Bove & Nisticò, 2014). Where institutional constraints are strong and fiscal capacity is robust, defense spending tends to be incremental and stable; where such

constraints are weak, military budgets are more likely to display reactive and volatile patterns in response to perceived insecurity (Hou, 2018).

This institutional perspective is therefore essential for explaining heterogeneity in defense spending behavior across states facing similar external conditions. It highlights why exposure to the same geopolitical shocks may generate sharply divergent budgetary trajectories, and why volatility in defense investment cannot be explained by threat alone. By treating institutions as a key link between uncertainty and defense spending, this literature helps explain why spending dynamics vary across countries and over time (Besley & Persson, 2011). Taken together, this literature suggests that institutions, economic capacity, and threat exposure shape defense spending outcomes through distinct but interacting mechanisms. However, while their effects on spending levels have been extensively examined, their role in shaping medium-term investment orientation and the persistence of defense trajectories remains comparatively underexplored. This gap becomes particularly relevant when distinguishing between the overall level of military expenditure and the way in which defense investment is structured and sustained over time, a distinction that motivates the empirical analysis developed in the following chapters.

1.7 Synthesis, research gap, and research question

The literature reviewed in this chapter offers a broad view of the main determinants of military spending, drawing on contributions from defense economics, political economy, and international relations. Across these approaches, a consistent set of factors emerges. Economic capacity, external threat, regime type, and alliance arrangements appear as central drivers of defense expenditure across countries and over time, from early arms race models to more recent political–economic analysis (Sandler & Hartley, 1995; Dunne & Perlo-Freeman, 2003a; Nikolaidou, 2008).

At the same time, the review reveals important limitations that motivate further inquiry. Much of the existing literature conceptualizes defense spending as a static budgetary outcome, focusing primarily on aggregate levels or annual changes. This approach obscures the fact that defense budgets are internally differentiated and temporally structured, composed of functionally distinct categories that respond differently to political, economic, and strategic pressures (Becker & Dunne, 2024). Personnel spending is largely rigid, while procurement and research and development represent the most flexible and volatile components of defense budgets, making them central to understanding contemporary defense dynamics (Mintz & Huang, 1991).

A second major theme concerns the role of strategic uncertainty. Rather than acting as an independent determinant, uncertainty operates as a powerful amplifier that conditions how states interpret threat and translate it into military investment (Hou, 2018). Under conditions of ambiguity regarding intentions, alliance reliability, and technological

trajectories, states are more likely to engage in precautionary and reactive behavior, increasing both the level and volatility of defense spending, particularly in capital-intensive investment categories (Robertson, 2022).

The security dilemma provides the unifying theoretical framework underpinning these dynamics. By highlighting how defensive actions can generate insecurity and reciprocal responses, it explains why military spending may escalate even in the absence of aggressive intent (Herz, 1950; Jervis, 1978). The dilemma clarifies the persistence of arms accumulation, the prevalence of reactive investment behavior, and the tendency for uncertainty to magnify perceived threats, offering a conceptual bridge between systemic anarchy and observed patterns of military expenditure (Waltz, 1979).

Crucially, the literature also demonstrates that domestic institutions and economic capacity mediate these processes. Institutions shape not only how much states spend on defense, but how they respond to threat and uncertainty over time. Accountability, transparency, fiscal capacity, and the political role of the military condition the translation of external pressures, producing heterogeneous spending trajectories across states facing similar security environments (Albalate et al., 2012; Bove & Nisticò, 2014; Besley & Persson, 2011). Where institutional constraints are strong, defense spending tends to be stable; where they are weak, spending is more volatile.

Despite the range of existing research, several gaps remain. First, strategic uncertainty, institutional quality, and defense spending volatility are often analyzed separately, with few studies examining their interaction within a single empirical framework (Bachtiar et al., 2025). Second, while the determinants of military spending levels are well documented, systematic panel analyses of spending volatility and budget composition, especially over long time horizons and across global samples, are still relatively scarce. Third, and more fundamentally, the literature largely assumes that higher threat and greater uncertainty translate into higher or more reactive spending, yet it pays comparatively little attention to whether states differ systematically in the management of defense investment over time, even when exposed to similar structural pressures.

Addressing these gaps requires an analytical approach that moves beyond static measures of military expenditure and explicitly models variation in volatility, composition, and institutional context. In this thesis, “defense investment” is used to denote the medium-term direction and persistence of expenditure, whereas “military spending” refers to annual outlays as recorded by SIPRI. Defense spending must be understood not only as a response to threat, but as a managed investment process evolving over time under conditions of strategic uncertainty and domestic constraint (McGuire, 2007). Strategic uncertainty is therefore treated in this thesis as a latent contextual condition shaping defense decision-making rather than as a directly observed variable. In the empirical analysis, uncertainty is captured indirectly through observable indicators of

threat exposure, conflict dynamics, and alliance structures, which condition governments' investment choices under uncertainty. Importantly, this thesis distinguishes between three analytically distinct outcomes: the level of military spending, the volatility of spending, and the medium-term orientation and consistency of defense investment. While the first two have received substantial attention in the literature, the third remains comparatively underexplored in cross-national panel analyses.

Guided by this objective, the central research question of this thesis is:

To what extent do strategic uncertainty, alliance structures, and domestic institutional capacity shape different dimensions of defense investment, including aggregate levels, medium-term orientation, and stability, across countries between 1990 and 2024?

The research question formulated above reflects this perspective by shifting attention from aggregate expenditure levels to the volatility and composition of defense investment. The contribution of this thesis therefore lies not in identifying new determinants of military spending levels, but in clarifying why some states display sustained and coherent investment trajectories while others exhibit episodic or reactive patterns, even under comparable structural pressures.
The following chapter builds on this approach by developing the theoretical framework and research design used to analyze defense investment dynamics across countries.

Chapter 2: Theoretical framework: defense investment under strategic uncertainty

This chapter develops the theoretical framework that guides the empirical analysis of defense spending patterns under conditions of strategic uncertainty. Building directly on the literature reviewed in the previous chapter, the aim is not to revisit existing debates, but to translate their key insights into a coherent analytical structure capable of explaining cross-national variation in defense investment management over time, rather than merely differences in aggregate expenditure levels.

The central premise of this thesis is that contemporary defense spending decisions are made in an international environment characterized by persistent strategic uncertainty rather than clearly identifiable and stable threats. As discussed in the previous chapter, uncertainty shapes the context in which governments operate, amplifying the relevance of precautionary behavior, reactive investment, and long-term planning challenges. However, uncertainty alone does not determine observable spending outcomes. States exposed to similar geopolitical conditions often display markedly different defense

spending paths, suggesting that domestic political and economic structures play a crucial mediating role in shaping the direction, persistence, and stability of defense investment trajectories.

To account for this variation, the framework developed in this chapter conceptualizes defense spending not as a static policy output, but as a managed investment process. Governments are assumed to face intertemporal trade-offs, institutional constraints, and strategic incentives that shape how defense resources are allocated, adjusted, and sustained over time. Rather than focusing exclusively on annual expenditure levels, the analysis emphasizes three analytically distinct dimensions of defense policy outcomes: overall spending levels, medium-term investment orientation, and spending volatility.

This approach allows for the integration of insights from defense economics, political economy, and international relations within a single analytical structure. Strategic uncertainty is treated as a structural condition that defines the external environment, while domestic institutions, economic capacity, threat exposure, alliance commitments, and defense-industrial structures determine how states respond to that environment. Crucially, the framework does not assume that systemic pressures translate mechanically into similar outcomes across countries. Instead, it models defense investment as the result of an interaction between external strategic conditions and domestic management capacity.
The chapter first clarifies the conceptualization of defense spending as an investment process, before introducing the main explanatory dimensions that will later be operationalized in the empirical analysis.

2.1 Defense spending as a managed investment process

A core limitation of much of the existing literature on military expenditure lies in its treatment of defense spending as a contemporaneous budgetary outcome. Traditional models, whether inspired by arms race dynamics or demand-side political economy approaches, typically explain variation in military expenditure by relating annual spending levels to contemporaneous measures of threat, income, regime type, or alliance membership (Dunne & Perlo-Freeman, 2003; Yildirim & Sezgin, 2005; Hou, 2018). While this approach has generated robust findings regarding the determinants of aggregate spending levels, it offers a limited understanding of how defense resources are planned, adjusted, and sustained over time.

Defense spending differs from many other categories of public expenditure in its intertemporal nature. Major defense capabilities are built over time and cannot be easily adjusted on a year-to-year basis. Procurement programs, research and development projects, and force modernization efforts typically evolve over long time horizons and involve substantial sunk costs, contractual commitments, and industrial dependencies

(McGuire, 2007). As a result, current spending decisions are closely linked to past investment choices and future strategic expectations. From this perspective, defense spending is better understood as a managed investment process rather than as a series of independent annual budgetary decisions. Governments do not simply decide how much to spend on defense in response to immediate security conditions; they decide how to allocate resources across different components of the defense budget, how rapidly to adjust investment levels, and how much volatility they are able to tolerate over time. These choices reflect not only strategic considerations, but also political constraints, fiscal capacity, and institutional arrangements.

The distinction between consumption-oriented and investment-oriented components of defense spending is central to this argument. Personnel expenditures and operations and maintenance costs tend to be relatively rigid, anchored in legal obligations, organizational structures, and domestic political commitments. By contrast, procurement and research and development represent the most flexible and strategically responsive components of defense budgets, and therefore constitute the primary channels through which governments adjust defense investment in response to changing conditions (Becker & Dunne, 2024).

This internal differentiation implies that stability at the aggregate level may hide substantial variation in underlying investment behavior. A country can maintain a stable defense burden while simultaneously engaging in volatile procurement cycles, accelerating modernization in some periods and postponing investment in others. A steady increase in aggregate spending can mask stagnation or underinvestment in critical capability areas. Focusing exclusively on expenditure levels therefore risks overlooking the strategic content of defense spending decisions (Rota, 2016; Robertson, 2022).

Treating defense spending as an investment process shows why stability over time matters. Advanced military capabilities require sustained and predictable funding, particularly in high-technology areas. Frequent changes in investment levels can reduce efficiency, increase costs, and undermine long-term planning. However, some flexibility is inevitable in uncertain and evolving security environments.

Volatility in defense investment should not be interpreted mechanically as evidence of irrationality or policy failure. As discussed in the previous chapter, fluctuations may reflect deliberate strategic adaptation to uncertainty, changes in alliance expectations, or shifts in technological priorities. However, excessive or poorly managed volatility can also signal institutional weakness, fiscal stress, or fragmented decision-making processes (Bove & Nisticò, 2014; Bachtiar et al., 2025).

The investment perspective adopted in this thesis aims to capture this dual nature of defense spending dynamics. By focusing on both investment orientation and spending volatility alongside traditional measures of expenditure levels, the analysis aims to assess

how governments manage defense resources over time rather than simply how much they spend. Importantly, these dimensions are treated as analytically distinct: spending levels capture scale, investment orientation captures medium-term direction, and volatility captures adjustment dynamics. This shift in focus is particularly relevant in contemporary security environments, where uncertainty is persistent and long-term capability development has become increasingly central to military effectiveness (Acharya, 2018).

Treating defense spending as a managed investment process connects external security pressures with domestic political and economic conditions. Strategic uncertainty affects all states, but domestic institutions, economic resources, and industrial structures determine how governments respond to it. As a result, uncertainty does not determine a specific investment pattern. While it increases strategic pressure, whether this translates into stable long-term planning or reactive adjustments depends primarily on alliance frameworks and domestic governance capacity.

The following sections build on this conceptualization by specifying the main channels through which uncertainty is processed domestically. Section 2.2 clarifies the role of strategic uncertainty as a structural context rather than a directly observable determinant. Following sections examine how institutional capacity, economic constraints, threat exposure, alliance commitments, and defense-industrial structures jointly shape defense investment outcomes under conditions of persistent uncertainty.

2.2 Strategic uncertainty as a structural context

A central methodological choice of this thesis concerns how strategic uncertainty is conceptualized within the analytical framework. Rather than treating uncertainty as an independent explanatory variable whose direct effect on military spending is to be estimated, this study conceptualizes strategic uncertainty as a structural condition that defines the environment in which defense investment decisions are made.

This choice follows directly from the literature reviewed in Chapter 1, which shows that uncertainty is a persistent and systemic feature of international politics rather than an episodic shock. As a result, uncertainty does not operate in the same way as observable variables such as income, conflict incidence, or alliance membership. Instead, it conditions how states interpret information, assess risks, and translate external signals into policy choices. Treating uncertainty as a directly observable determinant would risk mixing up contextual conditions with the mechanisms through which outcomes are produced.

From an analytical point of view, strategic uncertainty works as a background constraint that shapes the decision-making space available to policymakers. Governments do not observe uncertainty directly; rather, they deduce it from a combination of threat signals, alliance dynamics, institutional reliability, and technological change. Defense investment

decisions are thus made under conditions of incomplete information about future intentions, capabilities, and commitments, which limits the possibility of fully optimizing behavior and increases reliance on precautionary and adaptive strategies (McGuire, 2007).

This perspective implies that uncertainty is best understood as a latent condition that amplifies the relevance of other explanatory factors, rather than as a driver of spending outcomes. In environments characterized by relatively low uncertainty, changes in threat exposure or economic capacity may translate into gradual and predictable budgetary adjustments. By contrast, under high or persistent uncertainty, similar changes may produce more reactive, volatile, or precautionary investment responses. In this sense, uncertainty alters the mapping between inputs and outcomes, rather than acting as an input itself (Hou, 2018). This also implies that the absence of a direct statistical effect of threat variables does not necessarily indicate the irrelevance of insecurity, but may instead reflect the mediating role of domestic institutions and alliance structures.

Conceptualizing uncertainty in this way also helps address a common issue in the empirical literature. While many studies recognize the importance of uncertainty, they often approximate it using observable indicators such as conflict incidence, regional instability, or arms racing behavior. These measures capture specific expressions of insecurity, but they do not fully reflect the broader condition of strategic ambiguity emphasized in international relations theory (Jervis, 1978). Treating uncertainty as a structural context instead allows the analysis to rely on observable indicators of threat and alliance dynamics without assuming that these measures fully capture the uncertainty faced by decision-makers (McGuire, 2007; Hou, 2018).

In practical terms, this approach implies that variation in defense investment outcomes across countries facing similar external conditions should not be attributed only to differences in uncertainty itself, but to differences in domestic capacity to process uncertainty. Institutional quality, fiscal strength, and industrial structures determine whether uncertainty leads to sustained investment, cautious adjustment, or unstable spending behavior. This logic is consistent with political economy approaches emphasizing that external pressures are filtered through domestic constraints rather than translated mechanically into policy outputs (Bove & Nisticò, 2014; Besley & Persson, 2011).

Treating uncertainty as a contextual condition helps avoid identification problems. Since uncertainty is hard to measure, direct inclusion in econometric models often relies on proxies that overlap with threat or conflict variables, increasing multicollinearity and adding limited explanatory value. This is particularly relevant in panel settings, where threat indicators may capture episodic shocks while uncertainty operates as a persistent background condition. Incorporating uncertainty at the theoretical level preserves

conceptual clarity and model simplicity. This approach is consistent with recent work in defense economics and international political economy, which increasingly emphasizes the role of uncertainty in shaping strategic behavior while avoiding attempts to measure it directly. McGuire (2007) explicitly frames uncertainty as a defining feature of the global defense environment that conditions decision-making rather than determines outcomes mechanically. Similarly, Hou (2018) shows that instability and unpredictability amplify the responsiveness of military expenditure to other factors, particularly in regions characterized by shifting power balances.

A similar logic has been developed in the broader political economy literature on policy-making under uncertainty. While not focused specifically on defense, this work highlights that uncertainty affects how governments weigh future costs and benefits, increasing the value of flexibility and precaution in investment decisions. One influential contribution conceptualizes uncertainty as a condition that alters intertemporal policy trade-offs rather than as a variable with a direct marginal effect (Rodrik, 1991).

While Rodrik's analysis focuses on private investment, the underlying logic is directly applicable to defense spending, which also involves irreversible commitments, long planning horizons, and high sensitivity to expectations about the future. Under uncertainty, governments may favor strategies that preserve flexibility or protect against adverse scenarios, leading to distinct investment patterns even in the absence of immediate threats.

In this thesis, strategic uncertainty is treated as an implicit feature of the international environment that shapes how observable variables, such as threat exposure, alliance commitments, and economic capacity, affect defense investment outcomes. The empirical analysis does not attempt to estimate the effect of uncertainty itself, but rather examines how domestic institutions and economic constraints mediate investment behavior under conditions of persistent uncertainty. This distinction is crucial for interpreting the empirical results. If threat indicators do not systematically predict structured investment across the full sample, this does not contradict the theoretical relevance of insecurity; rather, it suggests that systemic pressures are processed through institutional and alliance-based mechanisms, producing heterogeneous investment trajectories across states.

This conceptual choice provides the foundation for the following sections. Having clarified the role of uncertainty as a structural context, the next section introduces the main strategic inputs shaping defense investment decisions: threat exposure, conflict dynamics, and alliance commitments. These factors define the external incentives that governments face under uncertainty, before turning to the domestic mechanisms that condition their response.

2.3 Threat exposure, conflict dynamics, and alliance commitments

While institutional and economic capacity determine how defense investment is governed and financed, threat exposure defines the strategic incentives that motivate defense spending decisions. This section develops the argument that threats, conflict dynamics, and alliance commitments shape defense investment not as isolated drivers of expenditure levels, but as interacting strategic inputs whose effects depend on domestic capacity and the broader context of strategic uncertainty.

A robust finding across defense economics and international relations is that exposure to external threats is positively associated with military spending (Dunne & Perlo-Freeman, 2003; Hou, 2018). States facing higher regional tensions, unresolved disputes, or neighboring military build-ups tend to allocate more resources to defense. However, as emphasized in the previous chapter, the relationship between threat and spending is not mechanical. Similar levels of objective threat often produce divergent spending outcomes across countries, suggesting that threat exposure alone is insufficient to explain variation in defense investment trajectories. In particular, while threat exposure is frequently associated with higher aggregate expenditure, its effect on the medium-term orientation and stability of defense investment remains theoretically and empirically ambiguous.

From an investment perspective, the relevant question is not whether threats exist, but how they are interpreted and translated into medium-term budgetary commitments. Threats vary in their temporal structure and clarity. Severe conflicts and immediate security crises can lead to sudden increases in defense spending, as governments react to urgent threats. By contrast, long-lasting but unclear security challenges tend to shape defense investment over longer time horizons, influencing planning rather than triggering immediate responses. In settings marked by persistent uncertainty, governments therefore face choices between sustained capability development, gradual adjustment, or short-term and reactive spending cycles (Dunne & Perlo-Freeman, 2003). Whether threat exposure translates into structured long-term investment or into episodic adjustments depends on political coordination, fiscal space, and especially on the presence of institutionalized alliance frameworks that provide planning and coordination mechanisms.

Conflict dynamics play a crucial role in shaping these decisions. Empirical studies show that ongoing interstate conflict and repeated militarized disputes increase defense spending, but their effects on investment stability are less straightforward (Dunne & Perlo-Freeman, 2003). Prolonged conflicts can encourage sustained investment in procurement and R&D, particularly when governments perceive that military capability gaps must be closed over time. At the same time, recurrent low-intensity conflicts may lead to reactive and volatile spending patterns, as governments adjust budgets episodically without committing to long-term modernization paths (Hou, 2018). This distinction is central to the analytical framework of this thesis: threat intensity does not automatically imply coherent investment orientation.

Internal conflict and domestic instability further complicate this picture. In countries affected by civil conflict or political violence, defense spending often serves multiple functions, including regime survival and internal control. In such contexts, investment decisions may prioritize immediate operational needs over long-term capability development, increasing volatility and undermining investment coherence (Besley & Persson, 2011). These dynamics highlight that not all threats generate the same investment incentives, and that the nature of conflict matters for how defense resources are allocated over time.

Alliance commitments introduce an additional layer of complexity. Alliances are commonly understood as mechanisms for collective security and burden-sharing, but they also reshape national incentives for defense investment. Membership in security alliances can reduce incentives for unilateral defense spending by providing external security guarantees, encouraging free-riding behavior among some members (Sandler, 2001). At the same time, alliance commitments may impose expectations regarding capability contributions, interoperability, and readiness that encourage sustained investment in specific areas of military capacity.

The effect of alliances on defense investment is therefore ambiguous and context-dependent. Empirical evidence suggests that alliance membership can be associated with both lower aggregate spending levels and higher investment in specialized capabilities, depending on alliance structure and strategic environment (Fordham & Walker, 2005). In alliances characterized by credible leadership and clear burden-sharing rules, members may coordinate investment and reduce redundant spending. Where alliance credibility is uncertain or contested, however, members may engage in precautionary investment to manage the risk of abandonment.

Alliance dynamics interact closely with strategic uncertainty. Uncertainty regarding the reliability of security guarantees, shifts in alliance priorities, or changes in leadership can alter national defense incentives even in the absence of changes in objective threat levels. Governments may respond to perceived weakening of alliance commitments by increasing domestic investment, particularly in autonomous capabilities, while maintaining formal alliance participation. Conversely, strong and credible alliances can allow governments to smooth investment over time and rely more heavily on collective defense arrangements (Sandler, 2025). In this sense, alliances may not simply substitute for national spending, but structure the temporal organization of defense investment.

Recent geopolitical developments have reinforced these dynamics. The erosion of arms-control regimes, shifts in great-power competition, and debates over alliance burden-sharing have increased uncertainty surrounding the durability of existing security arrangements, such as NATO. In this context, alliances no longer function only as substitutes for national defense investment, but also as sources of strategic ambiguity that

influence how governments plan and prioritize defense resources over time. At the same time, certain alliances may provide organizational frameworks that discipline and coordinate investment decisions, reducing the likelihood of purely reactive spending cycles.

Importantly, the impact of threat and alliance dynamics is mediated by institutional and economic capacity. States with strong institutions and fiscal resources are better able to translate threat perceptions into coherent investment strategies, aligning short-term responses with long-term objectives. Fiscally constrained or institutionally weak states, by contrast, are more likely to respond through episodic and reactive spending, particularly when alliance commitments are uncertain or contested (Bove & Nisticò, 2014).

Taken together, this analysis suggests that threats and alliances should not be seen as direct or uniform drivers of defense spending. Instead, they act as strategic inputs whose effects depend on domestic conditions and the wider context of strategic uncertainty. While threat exposure is often associated with higher military expenditure, its effect on the stability and orientation of defense investment is conditional rather than automatic**.** In situations of ongoing uncertainty, the key issue is not simply whether states face threats or are part of alliances, but whether they have the institutional and economic capacity to manage defense investment in a stable and coherent way.

The next section shifts the focus to institutional capacity and defense budget governance, examining how political accountability, administrative coordination, and fiscal discipline shape governments' ability to translate strategic pressures into stable and coherent defense investment trajectories.

2.4 Institutional capacity and defense budget governance

A central proposition of this thesis is that domestic institutional capacity fundamentally shapes how states manage defense investment under conditions of strategic uncertainty. While external pressures define the strategic environment in which governments operate, institutions determine how these pressures are translated into concrete budgetary outcomes. This section develops the argument that institutional arrangements influence not only the level of military spending, but more importantly the stability, persistence, and internal allocation of defense investment over time. Institutional capacity refers to the formal rules, organizational arrangements, and accountability mechanisms that shape how defense budgets are made. This includes civilian control over the military, legislative oversight, transparency in budgeting, and limits on executive discretion. Together, these factors affect governments' ability to plan, coordinate, and maintain defense investment under uncertainty.

A large body of political economy research shows that defense budgets are especially affected by institutional weaknesses. Unlike many other types of public spending, military expenditure is often less transparent, justified on national security grounds, and marked by strong information asymmetries between political decision-makers and military or bureaucratic actors (Bel & Elias-Moreno, 2009; Albalate et al., 2012). As a result, in countries with weak institutions, defense budgets are more exposed to inefficient allocation, rent-seeking, and short-term political interference.

Empirical studies consistently find that stronger institutions are associated with more restrained and predictable defense spending patterns. Countries with effective legislative oversight, transparent budgeting processes, and clear civilian control tend to exhibit lower defense burdens and smoother expenditure paths, even when exposed to comparable security threats (Albalate et al., 2012; Lopes da Silva, 2023). However, the strength and consistency of this relationship vary across empirical settings, and institutional quality does not uniformly prevent reactive or volatile adjustments under heightened strategic pressure. By contrast, weak institutional environments are more likely to produce reactive and volatile spending behavior, particularly under conditions of heightened uncertainty.

From an investment perspective, institutional capacity matters because it affects how consistent budget decisions are over time. Sustained investment in procurement and research and development requires governments to commit resources across several budget cycles, manage complex contracts, and align long-term strategic goals with annual budget limits. Where institutions are weak, these capabilities are undermined, making it more likely that investment plans are delayed, revised, or reversed in response to short-term political or economic pressures (Bove & Nisticò, 2014).

The link between regime type and institutional capacity adds further complexity to this discussion. A large body of research has examined whether democracies tend to spend less on defense than authoritarian regimes. However, more recent studies show that regime labels by themselves explain little about defense spending outcomes (Töngür et al., 2015). Instead, what matters is how well accountability mechanisms actually work in practice.

Democratic institutions limit defense spending only when legislative oversight is effective, budgetary processes are transparent, and political competition is strong enough to constrain executive discretion. When democratic procedures exist but enforcement is weak, or when the military retains significant influence over decision-making, defense spending patterns can resemble those observed in more authoritarian systems. This tendency is especially visible in contexts marked by high perceived insecurity, where executive authority tends to expand and institutional constraints are more easily bypassed (Bove & Nisticò, 2014).

Authoritarian regimes, by contrast, often display greater executive discretion in defense budgeting, which can produce divergent outcomes. In some cases, centralized authority allows for coherent long-term investment planning, particularly where the regime prioritizes military modernization as a core strategic objective. In other cases, the absence of accountability mechanisms increases the risk that defense spending becomes a tool for regime survival, or political signaling, leading to inefficient allocation and heightened volatility (Carter, 2024). These contrasting patterns highlight that institutional capacity, rather than regime type per se, is the key mediating factor.

Institutional persistence further reinforces these effects. Political and economic institutions tend to be durable, continuing to shape policy choices even as governments change or external conditions evolve (Acemoglu & Robinson, 2006). This persistence implies that defense investment trajectories are often path-dependent. Countries with historically strong institutions are better positioned to absorb strategic shocks without abandoning long-term investment plans, while countries with weak institutional foundations are more likely to respond to uncertainty through reactive budgetary adjustments (Besley & Persson, 2011).

Institutional capacity also conditions how governments manage trade-offs within the defense budget. As discussed in the previous chapter, personnel expenditures are typically rigid, while procurement and R&D constitute the main adjustment margins. In weak institutional settings, adjustment pressures are often concentrated on investment-oriented components, amplifying volatility and undermining long-term capability development. Stronger institutions, by contrast, facilitate more balanced adjustment strategies, allowing governments to smooth investment spending and align short-term responses with long-term strategic objectives (Becker & Dunne, 2024).

The importance of institutional capacity becomes particularly relevant under conditions of strategic uncertainty. When future threats, alliance commitments, and technological trajectories are unclear, governments must make decisions with incomplete information and limited ability to forecast outcomes. In such environments, institutionalized decision-making processes help reduce the risk of overreaction, improve coordination across agencies, and sustain investment commitments despite changing political circumstances. Where such processes are ineffective, uncertainty is more likely to translate into reactive and volatile defense spending behavior (Hou, 2018; Bachtiar et al., 2025).

Taken together, this literature supports the view that domestic institutional capacity conditions how strategic uncertainty influences defense investment outcomes. Institutions do not remove uncertainty, but they shape the extent to which governments are able to convert external pressure into stable and coherent investment trajectories. At the same time, institutional quality alone cannot fully account for cross-national variation in

defense investment patterns, suggesting that governance interacts with strategic and structural factors rather than operating in isolation.

This perspective implies that variation in defense investment patterns across countries facing similar strategic environments should not be attributed solely to differences in threat exposure, but also to differences in institutional capacity and policy coordination mechanisms. The empirical analysis developed in the following chapters builds on this insight by examining how measures of governance quality and political accountability are associated with spending levels, investment orientation, and volatility across countries and over time.

The next section turns to economic capacity and fiscal constraints, examining how resource availability and intertemporal budgetary trade-offs interact with institutional structures to shape defense investment behavior under uncertainty.

2.5 Economic capacity, fiscal constraints, and intertemporal trade-offs

While institutional capacity shapes how defense investment decisions are made, economic capacity determines the financial limits within which those decisions can be carried out. Even governments with strong institutions and clear strategic goals face fiscal constraints that affect how much they spend, when they invest, and how resources are allocated within defense budgets. This section argues that economic capacity matters not only because it allows higher levels of defense spending, but also because it affects governments' ability to maintain stable investment paths and manage uncertainty over time.

A long-standing finding in the political economy of military spending is that national income and fiscal resources constitute among the most robust predictors of defense expenditure (Hewitt, 1991; Dunne & Perlo-Freeman, 2003; Bachtiar et al., 2025). Higher income levels give governments more policy options, making it easier to finance defense without cutting other public spending. However, economic capacity matters for more than just overall spending levels. Strong fiscal positions also influence how governments handle the long-term trade-offs involved in defense investment.

Defense investment is inherently forward-looking. Procurement, research and development, and modernization programs require long-term financial commitments that usually extend across multiple budget cycles. Governments therefore have to balance current fiscal limits with expected future security needs. Countries with stronger economic capacity, such as higher income levels, broader tax bases, and better access to credit, are better able to spread defense investment over time and maintain continuity, even when they face temporary economic shocks or revenue changes. (Rota, 2016).

By contrast, states with limited fiscal capacity face more difficult trade-offs. When government revenues are low and borrowing options are restricted, defense spending becomes more costly, especially during periods of fiscal stress. In these situations, defense investment is more likely to follow the economic cycle: procurement and R&D spending tend to increase during periods of growth and to be cut sharply during downturns. This pattern leads to greater volatility in investment-oriented parts of defense budgets, even when overall strategic priorities do not change (Bachtiar et al., 2025).

Public debt constitutes an additional constraint shaping defense investment behavior. High debt levels limit fiscal flexibility and increase the political and economic costs of sustained military expenditure. Governments operating under significant debt burdens may be forced to postpone modernization programs, or rely more heavily on external security guarantees. Empirical work suggests that debt pressures are associated with lower defense spending growth and greater sensitivity of military budgets to short-term fiscal considerations (Rota, 2016).

Importantly, fiscal constraints do not affect all components of defense spending equally. As discussed in Chapter 1, personnel expenditures are typically rigid, while procurement and R&D function as the primary adjustment margins. Under economic pressure, governments tend to protect personnel commitments while cutting investment spending, increasing volatility and undermining long-term capability development (Becker & Dunne, 2024). This asymmetry reinforces the importance of distinguishing between spending levels and investment patterns when analyzing defense budgets.

Economic capacity also interacts with institutional structures in shaping defense investment outcomes. When institutions are strong, governments are better able to manage fiscal stress by coordinating adjustments and protecting key investment priorities. Weak institutions, by contrast, amplify the impact of economic constraints, increasing the likelihood that defense spending adjustments are driven by short-term fiscal pressures rather than long-term strategic considerations (Bove & Nisticò, 2014). In this sense, economic capacity and institutional quality are complementary rather than independent determinants of defense investment behavior.

From a longer-term perspective, economic capacity affects how governments weigh present costs against future benefits when deciding on defense investment. Countries with stable public finances and reliable access to future revenues are more willing to accept short-term costs in order to support long-term capability development. By contrast, governments facing fiscal fragility or political instability tend to prioritize short-term flexibility, often at the expense of sustained investment. This reasoning is consistent with broader political economy arguments showing that fiscal capacity shapes the time horizons of public investment decisions (Besley & Persson, 2011).

Recent research further suggests that economic shocks can have asymmetric effects on defense investment under conditions of uncertainty. In relatively stable economic environments, governments may respond to uncertainty by increasing precautionary investment. When fiscal conditions are tight, uncertainty can instead push governments toward retrenchment, resulting in sudden spending cuts and delays in modernization. These different responses help explain why countries facing similar geopolitical pressures can show very different investment outcomes, depending on their economic capacity (Gbadebo et al., 2025). Although this strand of research often focuses on aggregate spending effects rather than medium-term investment orientation, it reinforces the broader insight that fiscal conditions shape how defense budgets respond to shocks and uncertainty.

Finally, economic capacity affects the credibility of long-term defense commitments. Sustained investment trajectories require not only political will but also credible expectations that future resources will be available. Where fiscal capacity is weak or volatile, defense investment plans may lack credibility, increasing the risk of program cancellations and inefficiencies. These risks are particularly severe in capital-intensive procurement programs, where uncertainty about future funding can raise costs and reduce effectiveness (McGuire, 2007).

Taken together, this literature supports the argument that economic capacity conditions defense investment behavior through multiple channels. It affects the scale of feasible spending, the ability to smooth investment over time, the distribution of adjustment pressures across budget components, and the time horizons governing policy choices. Under conditions of strategic uncertainty, these effects become more pronounced, as governments must commit resources without reliable forecasts of future threats or fiscal conditions.

The implication for this thesis is that variation in defense investment patterns cannot be explained by strategic factors alone. Even when exposed to similar levels of threat and uncertainty, differences in economic capacity may shape how investment adjustments are distributed over time, particularly with respect to volatility. However, economic strength alone does not guarantee coherent investment orientation, suggesting that fiscal capacity operates in interaction with institutional and strategic factors rather than as a sufficient condition. The next section builds on this insight by examining how structural constraints related to the defense industrial base further condition national investment incentives and long-term capability development.

2.6 Defense industrial capacity and investment feasibility

Defense investment decisions are carried out through complex processes of production, procurement, and innovation that connect governments with both domestic and

international industrial actors. In this thesis, the defense industrial base is not conceptualized as a primary driver of spending levels or investment orientation. Rather, it is treated as a structural constraint that shapes the feasibility, timing, and implementation of investment decisions once political and strategic choices have been made. Ignoring this dimension would overlook important constraints on procurement and research and development, which are central to the investment-oriented outcomes examined in this study.

Defense industrial capacity refers to the presence and characteristics of domestic firms and production networks involved in the design, production, and maintenance of military equipment. This includes not only major defense contractors, but also specialized suppliers, technological capabilities, and organizational know-how embedded in national production systems. While these structures do not determine whether governments decide to invest in defense, they strongly affect how such investment can be carried out in practice, especially in capital-intensive and technologically complex areas (McGuire, 2007).

The relevance of industrial capacity is most evident for procurement and R&D spending. Major weapons programs require sustained interaction between governments and industrial actors, long-term contracting, and the coordination of technical and financial resources over multiple years. Countries with an established domestic defense industrial base are generally better positioned to initiate and sustain such programs, as they face lower coordination costs, reduced dependence on foreign suppliers, and greater control over production timelines. Conversely, states lacking domestic industrial capacity often rely on imports or licensed production, which can constrain flexibility and increase exposure to external shocks (Becker & Dunne, 2024).

From an investment perspective, industrial capacity primarily affects the implementation and persistence of procurement cycles rather than the initial political decision to allocate resources. Domestic production capabilities can support smoother investment trajectories by anchoring procurement programs in long-term industrial and organizational structures. Once major programs are underway, governments face significant political, economic, and contractual costs if they attempt abrupt reversals, increasing persistence in procurement and R&D spending even under conditions of fiscal or strategic uncertainty (Markowski et al., 2010).

At the same time, industrial capacity may also introduce rigidity. Long-term contracts, sunk costs, and employment considerations can limit governments' ability to adjust investment plans in response to changing strategic priorities. This can result in path dependence, where existing programs continue despite shifts in threat perception or alliance dynamics. Such rigidity should not be interpreted automatically as inefficiency; in some contexts, it reflects deliberate efforts to preserve technological autonomy and

strategic relevance within alliance structures. However, it underscores that industrial structures shape how defense investment evolves over time, independently of short-term strategic signals (Robertson, 2022).

Industrial capacity also interacts closely with institutional and economic factors discussed in previous sections. Strong institutions can mitigate the risks associated with close government–industry relationships by enhancing transparency, oversight, and competitive procurement practices. Where institutional constraints are weak, by contrast, defense industrial actors may exert disproportionate influence over investment decisions, increasing the risk of cost overruns, inefficient allocation, or politically motivated procurement. These risks are particularly pronounced in environments characterized by high uncertainty and limited accountability (Bel & Elias-Moreno, 2009).

Economic capacity further conditions the role of industrial structures. Sustaining a domestic defense industrial base requires stable demand and significant public investment, which may not be feasible for smaller or fiscally constrained states. In such contexts, governments may prioritize selective industrial capabilities or rely on international cooperation and joint procurement arrangements. These choices are often embedded within broader alliance frameworks and industrial integration mechanisms, particularly in NATO contexts. These choices affect the scale and composition of defense investment, as well as its exposure to volatility associated with external suppliers and exchange rate fluctuations (McGuire, 2007).

Importantly, this thesis does not assume that the presence of a domestic defense industry leads mechanically to higher military spending. Empirical evidence on this point is mixed, and spending levels remain primarily driven by strategic, institutional, and economic considerations. Instead, industrial capacity is treated as a conditioning factor that shapes the feasibility and form of investment choices once governments decide to allocate resources to defense. This distinction is crucial to avoid conflating political drivers of spending with structural constraints on implementation.

Recent work on the components of military expenditure reinforces this interpretation. Procurement and R&D respond differently to political and economic variables than personnel spending, reflecting their closer integration with industrial production cycles (Becker and Dunne, 2024). Cross-national differences in defense prices and production structures complicate direct comparisons of investment spending, further highlighting the need to account for industrial context when interpreting investment patterns (Robertson, 2022).

Methodologically, industrial capacity is incorporated in a limited and clearly delimited way. It functions as a contextual control and interpretative lens rather than as a core explanatory variable. The empirical strategy does not posit an independent causal effect of industrial capacity on investment orientation or volatility, but uses it to account for

structural heterogeneity across countries. This approach ensures consistency with the theoretical framework developed in previous sections, while preserving analytical clarity and parsimony.

Finally, industrial capacity plays an important interpretative role in the qualitative analysis developed later in the thesis. Differences in domestic production capabilities help explain why some countries emerge as outliers in terms of investment orientation or volatility, despite similar institutional or strategic conditions. In particular, countries with strong industrial bases and deep alliance integration may sustain coherent investment trajectories even when threat indicators or governance variables do not fully account for observed patterns. Treating industry as a structural context rather than a causal driver allows these cases to be analyzed without overstating the explanatory power of industrial interests.
The next section synthesizes the theoretical arguments developed in this chapter and formalizes the testable hypotheses guiding the empirical analysis.

2.7 Hypotheses development

This section formalizes the hypotheses guiding the empirical analysis by translating the theoretical arguments developed in this chapter into testable expectations. In line with the conceptual framework adopted in this thesis, defense spending is not treated as a single undifferentiated outcome, but as a multidimensional policy domain encompassing aggregate expenditure levels, medium-term investment orientation, and spending volatility. These dimensions, while related, are analytically distinct and are not expected to respond uniformly to the same explanatory factors. Strategic uncertainty remains a structural condition that defines the external environment in which defense decisions are taken. As argued in the previous sections, uncertainty is not modeled as an independent variable, but as a background context that shapes how observable inputs such as threat exposure, alliance commitments, and domestic governance structures translate into spending outcomes (McGuire, 2007; Hou, 2018). The hypotheses developed below reflect this distinction between structural context and observable mechanisms.

A first expectation concerns the relationship between threat exposure and aggregate military expenditure. A robust body of literature in defense economics and international relations demonstrates that higher levels of external threat, regional instability, or militarized disputes are associated with increased military spending (Dunne & Perlo-Freeman, 2003; Hou, 2018). Within realist theory, this relationship reflects the logic of self-help under anarchy, where states respond to perceived insecurity by strengthening material capabilities (Waltz, 1979). Under conditions of persistent strategic uncertainty, governments are expected to allocate greater resources to defense as a precautionary measure against adverse contingencies (Jervis, 1978). However, while threat exposure is expected to increase the level of military spending, it does not necessarily imply a more

coherent or stable investment trajectory. The hypothesis therefore distinguishes between spending magnitude and investment structure.

H1: *Higher threat exposure is associated with higher aggregate military spending levels.*

A second expectation concerns institutional capacity and the governance of defense budgets. The political economy literature consistently emphasizes that domestic institutions condition how governments process external pressures and translate them into policy outcomes (Albalate et al., 2012; Bove & Nisticò, 2014; Besley & Persson, 2011). Strong institutions, including effective legislative oversight, civilian control of the military, and transparent budgetary procedures, are associated with more predictable spending paths. In contrast, weak institutional environments are more prone to reactive adjustments, rent-seeking, and politically driven fluctuations. Nevertheless, recent empirical evidence suggests that institutional quality does not systematically generate coherent long-term investment orientation across countries. Instead, institutional capacity appears more relevant for moderating volatility than for determining the structural direction of investment itself.

H2: *Higher institutional capacity is expected to be associated primarily with lower spending volatility, while its effect on medium-term investment orientation is likely to be limited or conditional.*

A third expectation concerns economic capacity and fiscal feasibility. National income and fiscal resources are among the most consistent predictors of military expenditure across countries and time (Hewitt, 1991; Dunne & Perlo-Freeman, 2003; Bachtiar et al., 2025). However, economic capacity affects defense policy not only through the scale of feasible spending, but also through governments' ability to manage intertemporal trade-offs. Procurement and research and development programs require sustained financial commitments that extend across multiple budget cycles. States with stronger fiscal capacity and better access to credit markets are more able to smooth investment over time and absorb shocks without abrupt adjustment (Rota, 2016; Besley & Persson, 2011). At the same time, economic resources alone do not guarantee coherent investment orientation. Fiscal strength enables investment but does not determine whether governments adopt sustained capability development strategies.

H3: *Greater economic capacity is associated with higher overall military spending and reduced fiscal-driven volatility, but does not automatically produce coherent long-term investment orientation.*

A fourth expectation concerns alliance commitments. The economics of alliances literature shows that collective defense arrangements reshape national incentives by altering burden-sharing expectations and capability planning requirements (Sandler, 2001; Sandler, 2025). Alliances may reduce incentives for unilateral spending in some

contexts, but they may also encourage sustained investment in interoperable capabilities and modernization. Importantly, highly institutionalized alliances provide planning frameworks, standardization mechanisms, and coordination procedures that extend beyond annual budget cycles. In this sense, alliance membership can affect not only how much states spend, but how coherently they structure defense investment over time. Institutionalized security alliances, particularly highly structured arrangements such as NATO, are expected to provide coordination frameworks that may foster more coherent and sustained defense investment orientation over time.

H4: *Membership in highly institutionalized security alliances is associated with more coherent and sustained defense investment orientation, conditional on domestic governance and fiscal capacity.*

Finally, the empirical analysis also evaluates the role of broader systemic indicators such as aggregate militarization levels and arms trade integration. While militarization indices capture the intensity of military resources within societies, and arms trade flows reflect international integration in defense markets, the theoretical framework developed in this thesis suggests that these factors do not necessarily translate into structured national investment trajectories once alliance coordination and domestic capacity are taken into account. Aggregate militarization may reflect outcomes rather than drivers of investment management, and trade integration may shape procurement feasibility without determining investment coherence.

H5: *Aggregate militarization levels and arms trade integration do not independently predict defense investment orientation once alliance commitments and domestic capacity are accounted for.*

Taken together, these hypotheses reflect a central empirical and theoretical insight of this thesis: aggregate spending levels, investment orientation, and volatility represent distinct dimensions of defense policy that respond differently to strategic and domestic inputs. Threat exposure primarily affects spending magnitude. Institutional and economic capacity condition volatility and feasibility. Alliance commitments, particularly within highly institutionalized frameworks, are expected to shape the coherence and persistence of investment orientation. The empirical analysis that follows evaluates these expectations across a cross-national panel from 1990 to 2024. The key contribution of this framework lies in explicitly separating magnitude, direction, and temporal stability as analytically distinct dimensions of defense policy, thereby allowing for differential institutional and strategic effects.

2.8 Conceptual framework

The conceptual framework developed in this chapter integrates insights from defense economics, political economy, and international relations into a unified analytical structure. It tries to formalize how defense spending outcomes emerge from the interaction between strategic inputs and domestic mediating mechanisms under conditions of strategic uncertainty.

At the systemic level, strategic uncertainty constitutes the structural context of the framework. Rather than acting as a direct determinant of military spending, uncertainty conditions how governments interpret threats, assess alliance commitments, and evaluate long-term investment risks (McGuire, 2007; Hou, 2018). In this environment, defense decision-making is characterized by incomplete information and forward-looking behavior, increasing the importance of institutional and economic capacity as mechanisms that filter and structure responses to external pressures.

Within this context, threat exposure and alliance commitments act as primary strategic inputs. They shape governments' incentives to invest in military capabilities, but their effects are not mechanical. Identical strategic environments can produce divergent spending outcomes depending on how domestic structures process these inputs. This helps explain why aggregate spending levels, investment orientation, and volatility often diverge across countries facing similar external conditions (Bove & Nisticò, 2014). In particular, threat exposure is expected to affect primarily the scale of military effort, while alliance commitments may influence the organizational coherence and medium-term direction of defense investment.

In this framework, domestic institutions and economic capacity act as the main factors that shape defense investment outcomes. Institutions determine how defense budgets are prepared, approved, and carried out, influencing coordination, oversight, and the ability to sustain investment over time (Albalate et al., 2012). Economic capacity sets the fiscal limits within which these decisions are made, affecting how well governments can smooth spending and commit to long-term modernization (Besley & Persson, 2011; Rota, 2016). Together, institutional quality and fiscal capacity condition whether strategic pressures translate into incremental and stable adjustment or into reactive and volatile budgetary responses.

Defense industrial capacity enters the framework as a structural condition affecting the feasibility and persistence of investment choices. While not treated as an autonomous driver of spending, industrial structures influence procurement cycles, adjustment costs, and path dependence, particularly in capital-intensive and technologically complex programs (McGuire, 2007; Becker & Dunne, 2024; Robertson, 2022). Industrial capacity therefore shapes the implementation constraints of defense investment, reinforcing or limiting the effects of institutional and economic factors without independently determining aggregate spending levels.

This framework implies that defense spending outcomes must be analyzed along multiple dimensions. Aggregate spending levels capture the scale of defense effort. Investment orientation reflects the medium-term direction and persistence of resource commitment. Volatility captures the temporal stability of spending paths. These dimensions are conceptually distinct and are not expected to respond uniformly to the same explanatory variables. Threat exposure primarily affects magnitude. Institutional and economic capacity condition volatility and feasibility. Alliance commitments, particularly within highly institutionalized security frameworks such as NATO, are expected to provide coordination mechanisms, capability targets, and planning procedures that foster more coherent and sustained defense investment orientation over time.

The conceptual framework directly informs the empirical strategy developed in Chapter 3. The following chapter operationalizes these theoretical relationships through the construction of a global panel dataset covering the period 1990–2024 and the definition of three dependent variables: military spending level, investment orientation, and spending volatility. It further specifies the independent variables and controls used to capture institutional capacity, economic resources, strategic inputs, and structural conditions, and outlines the econometric methods employed to test the hypotheses formulated above. Chapter 3 translates this conceptual framework into an empirical research design by operationalizing these dimensions through a global panel dataset and multiple dependent variables.

Chapter 3: Research design and data

This chapter sets out the research design and data strategy used to analyze cross-national patterns of defense spending under conditions of strategic uncertainty. Building on the theoretical framework developed in Chapters 1 and 2, the empirical analysis is designed to distinguish between different dimensions of defense expenditure and to assess how they respond to strategic inputs and domestic capacity. The objective is not merely to test whether military spending reacts to conflict or alliance commitments per se, but to examine how aggregate spending levels, investment orientation, and volatility are differently shaped by threat exposure, alliance structures, institutional quality, and economic capacity.

A large literature in defense economics and political economy has established that military spending reflects a combination of strategic incentives, economic resources, and political institutions (Smith, 1989; Dunne & Perlo-Freeman, 2003; Bove & Nisticò, 2014). However, much of this work continues to rely on aggregate spending measures, which provide limited insight into how defense resources are structured and sustained over time. Recent contributions instead emphasize that volatility, budget composition,

and investment persistence are central to understanding the strategic quality of defense spending, particularly in environments characterized by sustained uncertainty (Hou, 2018; Becker & Dunne, 2024).

This thesis adopts that perspective and treats defense spending as a managed investment process rather than as a static budgetary outcome. Empirically, this requires moving beyond single-year expenditure levels and incorporating temporal indicators that capture medium-term investment orientation and spending volatility. The analysis therefore relies on a longitudinal research design that exploits both cross-national and within-country variation to identify systematic differences in spending magnitude, investment persistence, and adjustment dynamics.

The empirical analysis is based on an original large-N panel dataset covering the period 1990–2024. The dataset integrates information on military expenditure, institutional quality, economic capacity, alliance participation, and conflict exposure from established international sources. Data construction followed a structured and transparent integration process to ensure internal consistency and cross-national comparability over time and replicability of results.

Consistent with the conceptual framework developed in Chapter 2, strategic uncertainty is not operationalized as a directly observable explanatory variable. Instead, it is treated as a structural condition shaping the environment in which defense decisions are made. The empirical models therefore incorporate observable indicators of threat exposure and alliance commitments, and evaluate how these factors are associated with distinct dimensions of defense spending outcomes (Jervis, 1978; McGuire, 2007; Hou, 2018).

The chapter is structured as follows. Section 3.1 presents the research design and analytical strategy. Section 3.2 introduces the panel dataset and data sources. Sections 3.3 and 3.4 describe the dependent and independent variables, while Section 3.5 details the construction and operationalization of the main measures, clarifying how investment orientation and volatility are derived from annual expenditure data.

3.1 Research design and analytical strategy

The empirical analysis is built around a longitudinal panel design with annual observations for a large set of countries over the period 1990–2024. This design follows directly from the theoretical framework developed in the previous chapters, which conceptualizes defense spending as a managed investment process unfolding over time rather than as a sequence of independent annual budgetary choices.

Defense investment decisions are inherently intertemporal. Major procurement programs, research and development activities, and force modernization efforts extend across multiple budget cycles and embed governments in long-term financial and industrial commitments. These characteristics make short-term changes in military expenditure a poor proxy for strategic adjustment (McGuire, 2007). A panel framework is therefore necessary to capture persistence, delayed responses, and medium-term investment trajectories, and to distinguish structural change from short-run budgetary noise.

The panel structure allows the analysis to exploit two distinct sources of variation. Cross-national variation captures structural differences in institutional capacity, economic resources, alliance integration, and exposure to security threats. Within-country variation captures how changes in these conditions are associated with adjustments in defense investment outcomes over time. The empirical strategy identifies systematic associations rather than definitive causal effects, given the observational nature of the data (Bove & Nisticò, 2014).

The baseline specifications are estimated using fixed-effects models with country and year controls. Country fixed effects absorb time-invariant characteristics such as geography, long-standing security postures, and historically embedded military doctrines. Year fixed effects capture shocks common to all countries, including global economic cycles, shifts in the international security environment, and major geopolitical events. This approach is standard in comparative political economy and defense economics and is well suited to isolating medium-term adjustments in defense spending behavior (Cameron & Miller, 2015).

A defining feature of the research design is the explicit distinction between different dimensions of defense spending. Rather than treating military expenditure as a single aggregate outcome, the analysis distinguishes between aggregate spending levels, medium-term investment orientation, and spending volatility as analytically separate dependent variables. This distinction is central to the argument of the thesis. Countries with similar defense burdens may pursue fundamentally different investment strategies and display very different planning and governance outcomes, particularly under conditions of heightened strategic uncertainty (Hou, 2018; Becker & Dunne, 2024).

The selection of explanatory variables follows directly from the theoretical framework. Institutional capacity is captured through governance indicators reflecting the quality of policy implementation and the credibility of formal constraints, consistent with established empirical practice (Bove & Nisticò, 2014). Economic capacity is measured using indicators designed to proxy fiscal space and long-run resource availability rather than contemporaneous budgetary choices, thereby reducing concerns related to simultaneity and reverse causality. Strategic conditions are represented through observable indicators of conflict exposure and alliance participation. These variables are

interpreted as strategic inputs whose effects may differ across the three dependent dimensions, consistent with the treatment of strategic uncertainty as a structural context developed in Chapter 2 (Jervis, 1978; Sandler, 2001).

Methodologically, the baseline models are estimated using ordinary least squares with country and year fixed effects, and standard errors clustered at the country level. This approach addresses serial correlation and heteroskedasticity in macro-political panel data while preserving transparency in coefficient interpretation. Alternative specifications and robustness checks are introduced in later sections to assess the sensitivity of the results to different modeling choices and variable constructions.

Overall, the research design is built to align empirical identification as closely as possible with the theoretical claims of the thesis. By jointly treating aggregate spending levels, investment orientation, and volatility as distinct but related outcomes of interest, the analysis is able to examine not only whether countries devote more or fewer resources to defense, but how they structure, adjust, and sustain defense investment over time in uncertain security environments.

3.2 Panel dataset and data sources

The empirical analysis is based on an original cross-national panel dataset covering the period 1990–2024. The dataset is explicitly constructed to capture medium- to long-term patterns in defense spending and defense investment behavior, rather than short-term budgetary fluctuations. This temporal scope reflects the central premise of the thesis: defense spending is best understood as a dynamic investment process unfolding over time under conditions of persistent strategic uncertainty. The dataset adopts a country–year panel structure, which allows the analysis to combine cross-national differences in institutional capacity and economic resources with within-country variation in strategic and fiscal conditions. This structure is essential to the empirical strategy, as it enables the identification of systematic differences in defense investment trajectories over time rather than relying exclusively on cross-sectional comparisons (Wooldridge, 2010).

The period under analysis begins in the early post–Cold War era, a phase marked by structural changes in the international security environment. Since the early 1990s, states have operated under evolving threat perceptions, changing alliance configurations, and increasing ambiguity regarding the durability of security guarantees. Covering this period makes it possible to observe both phases of relative strategic stability and episodes of renewed geopolitical tension, and to assess how defense investment behavior evolves across distinct strategic contexts. The dataset integrates information from several internationally recognized sources commonly used in defense economics and political economy research. All variables are harmonized at the country–year level and merged

using standardized ISO3 country codes to ensure consistent alignment across sources and comparability over time.

Military expenditure data are taken from the Stockholm International Peace Research Institute (SIPRI), which provides the most comprehensive and widely used cross-national dataset on total military expenditure (SIPRI, 2024). The analysis relies on aggregate military expenditure (milexp) as the empirical basis for constructing the dependent variables. Rather than using disaggregated budget components, medium-term indicators of investment orientation (invest_orientation_5y) and spending volatility (invest_volatility) are derived from dynamic transformations of aggregate expenditure data. This approach aligns with the conceptual framework of the thesis, which emphasizes temporal investment trajectories over static budget composition.

Macroeconomic data are obtained from the World Bank's World Development Indicators. Economic capacity is captured through GDP per capita in logarithmic form (log_gdppc). This measure reflects long-run material capacity rather than short-term fiscal fluctuations and is commonly used as a proxy for governments' ability to sustain defense investment over time (Dunne & Perlo-Freeman, 2003). Log transformation improves cross-national comparability and reduces the influence of extreme values.

Institutional variables are taken from the Worldwide Governance Indicators (WGI). The analysis focuses on Government Effectiveness (gov_effect_wgi) and Rule of Law (rule_of_law_wgi), which capture the quality of public administration, the credibility of policy implementation, and the extent to which executive authority is constrained by formal rules (World Bank, 2024). These indicators operationalize the concept of institutional capacity developed in Chapter 2 and are used to assess whether governance quality is associated with differences in spending volatility and investment orientation.

Strategic conditions are measured using observable indicators of conflict exposure and alliance commitments. Exposure to insecurity is captured through a composite measure of internal and external conflict (threat_total), which aggregates information on civil conflict and interstate militarized disputes from established datasets (Sarkees & Wayman, 2010). This variable captures concrete manifestations of threat rather than attempting to quantify strategic uncertainty directly. Consistent with the theoretical framework, uncertainty is treated as a structural context shaping decision-making, while threat_total represents observable strategic signals.

Alliance commitments are measured using data from the Correlates of War Formal Alliances Dataset (Leeds et al., 2002). The baseline empirical analysis relies on a binary indicator of NATO membership (nato_member), which captures participation in a highly institutionalized collective defense arrangement. NATO membership plays a central role in the analysis, as it represents a structured multilateral coordination framework that may influence medium-term defense investment orientation and planning stability.

Additional alliance-related indicators are included in the dataset and are used selectively in robustness checks.

The dataset also includes supplementary structural variables, such as indicators of arms trade flows and broader militarization levels, which are used in extended specifications and robustness analyses. However, the baseline models focus on a theoretically grounded subset of explanatory variables.

Dataset construction followed a transparent and replicable workflow. All variables were collected from their original sources and converted into a standardized country–year format. Country identifiers were harmonized using ISO3 codes (country_iso3) prior to merging. Key explanatory variables are lagged where appropriate, and investment-related outcomes are constructed using rolling multi-year windows consistent with the medium-term investment logic developed in Chapters 1 and 2. This approach reduces simultaneity concerns and aligns empirical measurement with the intertemporal nature of defense investment. Missing observations are not mechanically interpolated, and the final dataset is unbalanced. This choice avoids introducing artificial smoothness that could distort medium-term investment patterns. As a result, sample size varies across model specifications depending on data availability.

Overall, the resulting dataset provides the empirical foundation for the analysis developed in Chapter 4. It is designed to capture how institutional capacity, economic resources, alliance commitments, and threat exposure are associated with three distinct dimensions of defense policy: aggregate military spending levels, medium-term investment orientation, and spending volatility. By distinguishing these dimensions, the empirical analysis is able to assess not only how much states spend on defense, but how they structure and manage defense investment over time under conditions of strategic uncertainty.

3.3 Dependent variables: multidimensional defense outcomes

This thesis departs from the conventional focus on aggregate military expenditure levels and instead centers on how defense resources are allocated and managed over time. Consistent with the theoretical framework developed in Chapters 1 and 2, defense spending is treated as a dynamic investment process shaped by strategic inputs, alliance commitments, institutional capacity, and intertemporal constraints, rather than as a sequence of isolated annual budgetary decisions (Dunne & Perlo-Freeman, 2003). On this basis, the empirical analysis relies on three dependent variables that capture distinct dimensions of defense spending behavior: aggregate spending levels, investment orientation, and spending volatility. Investment orientation captures the medium-term direction and persistence of defense expenditure, reflecting whether countries follow structured and coherent investment paths over time. Spending volatility captures the

degree of fluctuation in defense budgets across years, indicating the stability or instability of adjustment patterns. Aggregate spending levels, by contrast, reflect the overall scale of defense effort. These dimensions are treated as analytically distinct and are examined separately throughout the empirical analysis, allowing the empirical results to reveal whether strategic, institutional, and economic factors operate through different channels across level, orientation, and volatility. Together, they allow the study to move beyond headline spending figures and to assess not only how much countries spend on defense, but how they structure and sustain defense investment under conditions of strategic uncertainty.

3.3.1 Military spending levels

Aggregate military expenditure represents the conventional dependent variable in the defense economics literature. Most empirical studies examine why states spend more or less on defense in a given year, typically relating military expenditure to income, threat exposure, regime type, or alliance participation (Dunne & Perlo-Freeman, 2003; Nikolaidou, 2008; Bachtiar et al., 2025). In this tradition, military spending is treated as a contemporaneous response to observable strategic and economic conditions. In this thesis, aggregate military expenditure is retained as a dependent variable, but it serves a different analytical purpose. Rather than constituting the primary object of explanation, spending level functions as a benchmark outcome against which investment orientation and volatility can be compared. Including aggregate expenditure allows the empirical analysis to distinguish between determinants of defense effort magnitude and determinants of defense investment structure.

Military spending levels are measured using total military expenditure (milexp) from the Stockholm International Peace Research Institute (SIPRI, 2024), which provides the most widely used and internationally comparable dataset in defense economics research (Dunne & Perlo-Freeman, 2003; McGuire, 2007). To improve cross-national comparability and reduce skewness, expenditure is operationalized in logarithmic form. This transformation mitigates the influence of extreme values and facilitates interpretation in proportional terms.

The inclusion of military spending levels serves three specific analytical functions.

First, it allows the thesis to verify whether standard findings in the literature are replicated within the sample. A large body of research demonstrates that threat exposure and economic capacity are positively associated with aggregate military spending (Waltz, 1979; Dunne & Perlo-Freeman, 2003; Hou, 2018). Estimating models with spending levels as the dependent variable provides a benchmark against which deviations in investment orientation can be interpreted.

Second, using spending level as a benchmark helps clarify whether factors such as alliance membership or institutional capacity affect how much countries spend, or how they structure that spending over time. If a variable significantly predicts aggregate expenditure but not investment orientation, this suggests that it influences scale rather than strategic coherence. Conversely, if it affects orientation without affecting levels, this indicates a structural role in shaping medium-term trajectories.

Third, including aggregate spending helps avoid over-interpreting null findings in the orientation models. If threat exposure increases spending levels but does not produce coherent medium-term investment patterns, this suggests that threat operates primarily as a scale driver rather than as a structuring mechanism of defense investment. This distinction is central to the theoretical contribution of the thesis.

Importantly, military spending levels are not interpreted as a direct measure of strategic quality. High expenditure does not necessarily imply structured investment, nor does low expenditure imply underinvestment. Aggregate spending reflects the size of defense effort, but not its allocation priorities, persistence, or stability (Rota, 2016; Robertson, 2022). For this reason, it is treated as a baseline outcome rather than the core dependent variable.

By incorporating military expenditure as a benchmark, the analysis is able to extract three analytically distinct dimensions of defense policy: how much states spend, whether they pursue structured investment trajectories, and how stable those trajectories are over time. This multidimensional approach allows the thesis to move beyond traditional threat–response models and to evaluate whether domestic institutions, economic capacity, and alliance coordination shape not only the magnitude but also the organization of defense investment under conditions of strategic uncertainty.

3.3.2 Defense spending volatility

The second core dependent variable captures the stability of defense investment over time. Existing research shows that volatility in military spending can undermine long-term planning, disrupt procurement programs, and weaken the effectiveness of defense investment, even in countries with relatively high defense budgets (Smith, 1989; Dunne & Perlo-Freeman, 2003). However, in line with the conceptual framework developed in Chapter 2, volatility is not interpreted normatively as inherently inefficient or undesirable. Rather, it is treated as an empirical indicator of adjustment intensity in defense investment trajectories under conditions of strategic uncertainty.

Spending volatility is operationalized as the five-year rolling dispersion of defense spending outcomes, constructed using the same rolling window length adopted for investment orientation. This ensures conceptual and temporal consistency across the two dependent variables and allows volatility to capture medium-term instability rather than

isolated annual fluctuations driven by temporary shocks, political cycles, or accounting adjustments.

The resulting variable, invest_volatility, takes non-negative values, with higher values indicating greater instability in defense investment trajectories. Low volatility reflects relatively smooth investment paths, consistent with stronger planning capacity and more effective institutional constraints on abrupt budgetary change. High volatility, by contrast, reflects more frequent or sharper medium-term adjustments in spending trajectories. These adjustments may arise fiscal constraints, reactive responses to threat exposure, shifts in alliance expectations, or structural realignments in defense policy (Dunne & Perlo-Freeman, 2003). Importantly, volatility does not capture the direction of change (increase or decrease), but only the dispersion of spending outcomes over the rolling window. A country may show high volatility during rapid modernization phases as well as during periods of retrenchment.

By focusing on volatility rather than spending levels, this measure captures a dimension of defense policy that is often overlooked in conventional analyses. As emphasized in the literature, unstable investment patterns may be as damaging to long-term military capability as persistently low levels of spending, even when aggregate expenditure appears adequate (Hou, 2018). At the same time, the framework adopted in this thesis allows for the possibility that moderate volatility reflects adaptive adjustment rather than institutional weakness. The empirical analysis therefore evaluates volatility as an outcome to be explained, rather than assuming it represents policy failure. Analyzing volatility separately from aggregate spending levels makes it possible to assess whether strategic inputs primarily affect the magnitude of defense effort or instead shape the stability of investment trajectories. This distinction is central to the multidimensional approach of the thesis, which treats level, orientation, and volatility as analytically distinct dimensions of defense policy management.

3.3.3 Defense investment orientation

Defense investment orientation captures the medium-term directional pattern of military expenditure rather than its annual composition. Unlike traditional measures that focus on the internal distribution of defense budgets, such as the share allocated to procurement or research and development, this thesis conceptualizes investment orientation as a temporal property of defense spending trajectories. It reflects whether countries display sustained expansion, contraction, or persistence in military expenditure over multi-year periods, consistent with structured capability development rather than episodic adjustment.

This distinction is central to the theoretical framework developed in the previous chapters. Defense investment is inherently intertemporal: major capability development programs, force modernization efforts, and strategic repositioning unfold across multiple budget cycles and require consistent financial commitment over time (McGuire, 2007). A single-

year increase in military spending does not necessarily indicate structured investment, just as a temporary reduction does not automatically imply retrenchment. What matters is whether governments follow coherent trajectories that reflect sustained planning rather than reactive or fragmented responses to short-term pressures.

Empirically, investment orientation is operationalized using a five-year rolling measure of directional persistence in military expenditure. Rather than capturing a compositional share, the variable identifies the extent to which defense spending follows a consistent upward or downward trajectory within a medium-term window. The use of a rolling multi-year structure aligns measurement with the planning horizons emphasized in the defense economics literature and reduces sensitivity to temporary fluctuations driven by one-off procurement decisions, fiscal cycles, or accounting adjustments (Dunne & Perlo-Freeman, 2003; Bove & Nisticò, 2014).

The resulting variable, does not measure the absolute scale of defense effort. Instead, it captures the structural coherence of spending trajectories over time. High values indicate sustained directional commitment, whether expansionary or consolidating, while low values reflect fragmented, oscillating, or stop-and-go investment patterns. In this sense, orientation is analytically distinct from both spending level and volatility. A country may exhibit high military expenditure without coherent orientation, or display structured orientation even at moderate spending levels.

Conceptualizing investment orientation as a temporal property rather than a compositional share reflects the broader contribution of this thesis. Existing research often equates defense investment with procurement or R&D shares (Dunne, Smith, & Willenbockel, 2005). While such measures capture important aspects of modernization, they do not fully reflect whether governments sustain coherent investment trajectories over time. By focusing on medium-term directional persistence, the present measure aligns more closely with the argument that defense spending should be understood as a managed investment process unfolding under conditions of strategic uncertainty.

This operationalization therefore allows the empirical analysis to distinguish between governments that merely adjust spending episodically and those that follow structured and sustained investment paths. In doing so, it provides a more direct test of how institutional capacity, economic constraints, and alliance commitments shape the management of defense investment over time.

3.4 Core independent variables

The empirical analysis examines how domestic capacity and strategic conditions jointly shape multidimensional defense outcomes, including aggregate spending levels, investment orientation, and spending stability. Consistent with the theoretical framework developed in Chapter 2, the independent variables are organized into four main blocks:

the strategic environment, institutional capacity, economic capacity, and structural or systemic controls. This organization reflects the central argument of the thesis: defense investment outcomes emerge from the interaction between external security incentives and domestic governance and fiscal constraints operating under conditions of strategic uncertainty. All independent variables are measured at the country–year level and enter the empirical specifications with a temporal lag. This choice reflects the intertemporal nature of defense investment decisions, which respond to changes in strategic exposure, institutional quality, and economic capacity with delay rather than instantaneously. Lagging the explanatory variables also helps mitigate concerns related to simultaneity and reverse causality, particularly for institutional and economic indicators that may themselves evolve in response to longer-term defense policy choices (Wooldridge, 2010).

3.4.1 Strategic environment

Defense investment decisions are shaped not only by domestic institutional and economic capacity, but also by the strategic environment in which states operate. External threats, internal conflict, and alliance commitments influence both the perceived need for military capabilities and the structure of defense planning. Consistent with the conceptual framework developed in Chapter 2, strategic uncertainty is not treated as a directly observable explanatory variable. Instead, it constitutes the structural context within which observable strategic inputs, such as conflict exposure and formal security commitments, shape defense investment outcomes.

The empirical analysis captures the conflict dimension of the strategic environment through a composite indicator of threat exposure (threat_total), which aggregates information on internal armed conflict and external militarized disputes. This variable reflects observable manifestations of insecurity that may affect defense planning, resource allocation, and perceptions of risk. The use of conflict-based proxies for threat exposure is well established in the literature on military spending and arms race dynamics (Dunne & Perlo-Freeman, 2003; Hou, 2018; Gleditsch et al., 2002). Higher levels of threat exposure are generally associated with greater defense effort, particularly in terms of aggregate spending. However, their implications for medium-term investment orientation and spending stability are theoretically less determinate. Sustained and predictable security pressures may encourage structured capability development, while episodic or volatile conflict environments may induce reactive and short-term adjustments.

Alliance commitments represent a second dimension of the strategic environment. Alliances reshape national defense incentives by altering threat perceptions, redistributing security burdens, and embedding member states within coordinated planning frameworks (Sandler, 2001; Leeds et al., 2002). Rather than treating alliances as purely substitutive or complementary to national defense effort, this thesis conceptualizes them as

institutionalized security environments that may influence not only spending levels but also the structure and persistence of investment decisions over time. The baseline analysis therefore includes a binary indicator of NATO membership (nato_member), capturing participation in a highly institutionalized collective defense arrangement characterized by formalized planning processes, interoperability requirements, and shared capability targets. This variable reflects a qualitatively distinct form of alliance embeddedness compared to looser or less institutionalized security ties. A broader measure of formal alliance participation is available in the dataset and employed in robustness checks, allowing the analysis to distinguish between deeply institutionalized commitments and more diffuse alliance networks.

By jointly incorporating conflict exposure and alliance commitments within the strategic environment block, the empirical framework captures the observable strategic inputs through which governments respond to insecurity, while preserving the theoretical distinction between measurable threat signals and the broader condition of strategic uncertainty that shapes defense decision-making.

3.4.2 Institutional capacity

Institutions play a critical role in shaping how governments manage defense spending over time. While strategic inputs define the incentives to allocate resources to defense, institutional capacity conditions the process through which these resources are planned, approved, and implemented. In line with the theoretical framework developed in the previous chapter, institutions are not assumed to mechanically determine higher or lower defense spending levels. Rather, they are expected to influence the stability, coordination, and predictability of defense investment decisions.

A large literature in political economy emphasizes that stronger institutions reduce policy volatility, improve budgetary discipline, and enhance governments' ability to sustain medium-term investment commitments by constraining opportunistic and short-term political behavior (Acemoglu & Robinson, 2006; Besley & Persson, 2011). In the context of defense policy, these mechanisms are particularly relevant given the opacity of military budgeting, the complexity of procurement processes, and the long time horizons associated with capability development.

Institutional capacity is captured using two indicators from the World Bank's Worldwide Governance Indicators: Government Effectiveness and Rule of Law. Government Effectiveness (gov_effect) measures the quality of public services, the competence and autonomy of the civil service, and the credibility of policy implementation. Rule of Law (rule_of_law) captures the extent to which agents have confidence in and abide by formal rules, including contract enforcement and constraints on executive discretion (World Bank, 2024).

These indicators correspond closely to the concept of institutional capacity developed in Chapter 2, where institutions are understood as mechanisms that structure decision-making and limit discretionary adjustments under conditions of strategic uncertainty. In empirical terms, stronger institutional capacity is expected to be associated primarily with more stable defense spending trajectories and more disciplined adjustment patterns, rather than automatically with higher levels of investment orientation. This distinction reflects the broader argument of the thesis that aggregate spending levels, structural orientation, and volatility represent analytically distinct outcomes.

Both indicators enter the baseline models separately in order to assess whether different institutional dimensions operate through partially distinct channels. Government effectiveness may be more closely linked to administrative coordination and procurement management, while rule of law may operate through credibility, contract enforcement, and constraints on abrupt executive-driven budget changes. Other governance measures available in the dataset, such as Political Stability, are not included in the baseline specifications. These indicators are more directly related to short-term shocks and conflict dynamics and may overlap conceptually with the threat exposure variables included in the strategic environment block. They are therefore reserved for robustness checks, ensuring that the core institutional measures capture structural governance capacity rather than transient instability.

3.4.3 Economic capacity

Economic capacity captures the material resources available to governments to sustain defense investment over time. While institutional quality affects how resources are managed, economic capacity constrains the feasible scale and continuity of long-term military investment. The distinction between institutional and economic capacity is central to the analytical framework of the thesis and mirrors standard approaches in the defense economics literature (Dunne & Perlo-Freeman, 2003).

Economic capacity is proxied using GDP per capita from the World Bank's World Development Indicators. To improve comparability and reduce skewness, GDP per capita is expressed in logarithmic form. The resulting variable (log_gdppc) captures differences in income levels and productive capacity across countries and over time.

GDP per capita is widely used as a proxy for fiscal and economic capacity in studies of defense spending and public investment, as it reflects both long-run resource availability and broader development constraints (Rota, 2016). In this thesis, log_gdppc is interpreted primarily as an indicator of the structural fiscal space within which defense decisions are made, rather than as a direct determinant of investment orientation**.** Higher values of log_gdppc are expected to be associated with greater feasibility of sustained defense effort and a reduced likelihood that short-term fiscal shocks translate into abrupt spending adjustments, particularly in investment-oriented components.

Importantly, economic capacity is not assumed to automatically generate coherent long-term investment trajectories. While higher income levels expand governments' room for operations, the direction and structure of defense investment remain conditional on strategic inputs and institutional capacity. Economic resources therefore operate as enabling constraints rather than as sufficient drivers of structured investment behavior.

Alternative indicators of fiscal governance and macroeconomic management are available in the dataset but are not used as core measures of economic capacity, as they conceptually overlap with institutional variables. These indicators are instead used for robustness analyses.

3.4.4 Structural and systemic controls

In addition to the core explanatory variables, the empirical analysis includes a set of structural and systemic controls designed to account for broader contextual factors that may influence defense spending outcomes without constituting primary theoretical drivers of investment management.

First, aggregate militarization levels are included as a contextual control Militarization is measured using the Global Militarization Index (GMI) published by the Bonn International Centre for Conflict Studies (BICC), which combines indicators of military expenditure, military personnel, and heavy weapons relative to population and economic size. The GMI provides a standardized cross-national measure of the relative weight of military resources within society and is widely used in comparative security analysis. While higher militarization may reflect sustained defense effort, existing research suggests that such indicators often capture outcomes rather than causal determinants of spending behavior (Dunne & Perlo-Freeman, 2003; Becker & Dunne, 2024). Including militarization as a control therefore helps distinguish structural military intensity from the institutional and strategic mechanisms emphasized in this thesis.

Second, arms trade integration is accounted for through indicators of military imports and exports. Arms trade variables are constructed using SIPRI Trend Indicator Values (TIV), which measure the volume of international transfers of major conventional weapons rather than their financial cost. Using TIV allows for consistent cross-national comparison of arms flows over time and avoids distortions associated with price variation and exchange rate movements (SIPRI, 2024). In the baseline specifications, arms imports and exports are operationalized as the ratio of total arms transfers (imports plus exports) to overall merchandise trade, rather than as a share of GDP. This choice reflects the intention to capture the degree of integration into international defense markets relative to external trade exposure, rather than overall economic size. Countries highly dependent on imported military equipment may face different adjustment constraints compared to states with stronger domestic production capabilities (McGuire, 2007; Robertson, 2022).

All arms trade variables are expressed in logarithmic form after adding a small constant where necessary to address zero flows, reducing skewness and limiting the influence of extreme values. However, arms trade exposure does not in itself determine whether governments pursue coherent long-term investment trajectories. It instead conditions the feasibility and flexibility of procurement decisions.

Third, broader systemic characteristics such as country size and demographic scale are included to control for structural differences in defense needs. Total population (in logarithmic form) is included as a proxy for demographic scale and baseline force requirements. Larger states may require higher baseline defense expenditures due to geographic exposure, territorial scope, or force requirements, independently of institutional or alliance dynamics (Hewitt, 1991; Dunne & Perlo-Freeman, 2003). Controlling for these factors reduces the risk that estimated relationships simply reflect size-related structural differences.

Importantly, these structural and systemic controls are not expected to independently predict coherent investment orientation once alliance commitments and domestic capacity are accounted for. Their inclusion serves primarily to isolate the mechanisms central to the theoretical framework, namely, how strategic environment, institutional capacity, and economic feasibility jointly shape defense investment management under conditions of strategic uncertainty.

3.5 Variable construction and operationalization

This section details how the main theoretical concepts developed in previous chapters are translated into empirical measures. The objective is not to restate the conceptual framework, but to clarify the precise construction of the dependent and independent variables used in the econometric analysis, ensuring consistency between theory, measurement, and estimation strategy.

A central methodological principle guiding the operationalization strategy is temporal alignment. Defense investment decisions unfold over time and are shaped by institutional and strategic conditions that operate with delay. For this reason, all time-varying explanatory variables enter the baseline specifications with a one-year lag. Lagging reduces simultaneity concerns and better reflects the fact that institutional quality, economic capacity, alliance status, and threat exposure influence defense planning with delay rather than instantaneously (Wooldridge, 2010).

The benchmark dependent variable, military spending level, is measured using total military expenditure from SIPRI. In the baseline specifications, military spending is expressed as a share of GDP in order to capture defense effort relative to economic size and to ensure comparability across countries and over time (Dunne & Perlo-Freeman, 2003). In alternative specifications, expenditure is expressed in logarithmic form to test

robustness to scale effects. This benchmark outcome serves primarily to verify whether traditional threat–response relationships hold in the sample and to distinguish spending magnitude from investment structure.

Defense spending volatility is constructed as the five-year rolling standard deviation of annual military expenditure (as a share of GDP). The use of a rolling window reflects the medium-term planning horizon emphasized throughout the thesis and avoids interpreting short-lived annual fluctuations as structural instability. A five-year window is consistent with common defense planning cycles and has been used in the literature to smooth temporary shocks while retaining meaningful variation in spending dynamics (Bove & Nisticò, 2014; Hou, 2018). Higher values of the resulting variable, invest_volatility, indicate greater instability in defense spending trajectories.

Defense investment orientation is operationalized differently from earlier compositional approaches. Rather than relying exclusively on disaggregated procurement shares, the measure captures the medium-term direction and persistence of defense expenditure. Specifically, investment orientation is constructed as a five-year rolling growth-based indicator that reflects whether defense spending follows a sustained expansionary, contractionary, or stable trajectory. This approach aligns the empirical measure with the theoretical emphasis on investment management over time and avoids mechanical reliance on disaggregated budget categories, which are not consistently available across all countries (McGuire, 2007; Becker & Dunne, 2024). The resulting variable, invest_orientation_5y, captures coherence and persistence in defense effort rather than absolute budget composition.

Institutional capacity is measured using indicators from the Worldwide Governance Indicators (WGI), specifically Government Effectiveness and Rule of Law. Government Effectiveness captures the quality of public administration, bureaucratic competence, and policy implementation capacity. Rule of Law measures the credibility of formal rules, contract enforcement, and constraints on executive discretion (World Bank, 2024). Both indicators are standardized and entered separately in the baseline models in order to avoid imposing a priori assumptions about their equivalence. Their inclusion reflects established findings linking institutional quality to fiscal discipline and investment continuity (Albalate et al., 2012; Bove & Nisticò, 2014; Besley & Persson, 2011).

Economic capacity is proxied by GDP per capita from the World Bank's World Development Indicators. The variable is expressed in logarithmic form (log_gdppc) to reduce skewness and capture diminishing marginal effects of income on defense effort. GDP per capita is widely used as a proxy for long-run fiscal capacity and resource availability in studies of military expenditure (Dunne & Perlo-Freeman, 2003; Rota, 2016). Because defense investment depends on expected future fiscal space rather than

contemporaneous revenue alone, the lagged specification aligns measurement with theoretical expectations.

The strategic environment is operationalized through two observable dimensions: threat exposure and alliance commitments. Threat exposure (threat_total) is constructed as a composite indicator combining internal armed conflict (UCDP) and external militarized disputes (Correlates of War), following established practice in defense economics (Dunne & Perlo-Freeman, 2003; Hou, 2018; Gleditsch et al., 2002). This variable captures concrete manifestations of insecurity rather than attempting to measure strategic uncertainty directly, which remains a structural background condition in the theoretical framework (Jervis, 1978).

Alliance commitments are measured primarily through a binary indicator of NATO membership (nato_member), derived from the Correlates of War Formal Alliances Dataset (Leeds et al., 2002). NATO membership captures participation in a highly institutionalized collective defense arrangement characterized by coordinated planning, interoperability standards, and burden-sharing expectations (Sandler, 2001; Sandler, 2025). Additional alliance-count variables are available in the dataset and used in robustness checks to distinguish highly institutionalized alliances from broader security ties.

Structural and systemic controls include the Global Militarization Index (GMI) published by the Bonn International Centre for Conflict Studies (BICC), which measures the relative weight of military resources within society. The GMI captures militarization intensity but is treated as a contextual control rather than a primary explanatory factor (Becker & Dunne, 2024). Arms trade integration is measured using SIPRI Trend Indicator Values (TIV) for imports and exports of major conventional weapons (SIPRI, 2024). Arms flows are expressed as a ratio to total merchandise trade and transformed logarithmically to reduce skewness. This specification captures exposure to international defense markets while avoiding distortions associated with price variation or exchange rate movements (Robertson, 2022). Population size (log form) is included to control for structural differences in force requirements.

All variables are harmonized at the country–year level using standardized ISO3 country codes. Missing observations are not mechanically interpolated in order to preserve genuine medium-term dynamics in volatility and orientation measures. The final dataset is unbalanced, reflecting differences in data availability across countries and years.

Taken together, this operationalization strategy ensures that empirical measurement closely follows the theoretical claims of the thesis. By combining lagged explanatory variables, rolling multi-year dependent variables, and well-established international data sources, the analysis is designed to capture how defense spending is structured and managed over time under conditions of persistent strategic uncertainty.

Table 3.1 in the Appendix summarizes the construction, data sources, and operational definitions of all variables used in the empirical analysis.

Chapter 4: Empirical Analysis

This chapter presents the empirical results of the thesis. Building on the theoretical framework and on the research, design outlined in the previous chapters, the analysis evaluates how strategic environment, institutional capacity, and economic feasibility are associated with different dimensions of defense spending outcomes. Consistent with the multidimensional approach adopted in this thesis, military expenditure levels, medium-term investment orientation, and spending volatility are analyzed separately. This structure reflects the core argument of the thesis: defense spending should be understood as a managed investment process rather than as a single aggregate outcome (Dunne & Perlo-Freeman, 2003; McGuire, 2007; Hou, 2018). This perspective is particularly relevant in the context of the post-2014 and post-2022 rearmament phase, where increases in defence budgets have been accompanied by renewed emphasis on capability development and investment benchmarks. By distinguishing between level, orientation, and volatility, the chapter moves beyond single-indicator approaches and aligns the empirical analysis with recent work on the composition of defense budgets (Becker & Dunne, 2024).

The chapter proceeds as follows. Section 4.1 presents descriptive statistics and summarizes the main characteristics of the sample. Sections 4.2, 4.3, 4.4 and 4.5 report baseline regression results. Section 4.6 examines robustness tests and alternative specifications, including income splits and alliance variants. Section 4.7 concludes by synthesizing the empirical findings in light of the hypotheses developed in the theoretical framework.

4.1 Descriptive statistics

A detailed overview of summary statistics for all variables used in the analysis is provided in Appendix (Table 4.1). The table provides an overview of the distribution of defense spending outcomes, institutional capacity, economic resources, and strategic exposure across the sample. Differences in the number of observations across variables primarily reflect variation in data availability across sources such as SIPRI, the World Bank, and the Worldwide Governance Indicators (Kaufmann et al., 2011).

Military expenditure (milexp), measured in constant USD, shows substantial dispersion. While the mean value exceeds 10,000 million USD, the standard deviation is considerably larger, and the maximum exceeds one trillion USD. This confirms the highly skewed

global distribution of military expenditure, where a small number of major powers account for a disproportionate share of total defense spending. Such asymmetry is widely documented in the defense economics literature and reflects structural inequalities in military capability and economic size (Dunne & Perlo-Freeman, 2003; Hewitt, 1991; SIPRI, 2023, 2024).

Turning to the core dependent variables, investment orientation (invest_orientation_5y) has a mean of approximately 0.60 and ranges between 0 and 1. On average, countries allocate a substantial share of military resources to procurement and research and development over five-year windows. However, the standard deviation of 0.28 indicates marked heterogeneity across states. Some countries systematically devote a large share of their defense budgets to long-term capability development, while others prioritize personnel or operational expenditure. This variation supports the conceptual distinction developed in Chapter 2 between aggregate spending levels and internal allocation structure (Becker & Dunne, 2024; Dunne, Smith, & Willenbockel, 2005).

Spending volatility (invest_volatility) presents a different pattern. The mean value is relatively low (0.12), but the maximum reaches 0.88, indicating that certain countries experience high instability in defense investment trajectories. Even where average volatility appears limited, the upper tail of the distribution suggests that medium-term instability can be substantial in specific cases. As emphasized in previous research, unstable spending patterns may undermine procurement continuity and long-term modernization efforts, independently of spending magnitude (Bove & Nisticò, 2014; Hou, 2018).

Threat exposure (threat_total) has a mean close to 0.90. This reflects the coding of the composite indicator capturing internal and external conflict exposure. Given its binary structure, the variable exhibits limited dispersion around a high mean, indicating that most country-years in the sample register at least some form of armed conflict or instability according to UCDP and Correlates of War–based measures (Sarkees & Wayman, 2010). The binary nature of the variable implies limited dispersion, but its inclusion captures observable manifestations of insecurity rather than attempting to measure strategic uncertainty directly. Consistent with the framework adopted in this thesis, uncertainty operates as a structural background condition, while threat_total captures concrete strategic signals (Jervis, 1978; Hou, 2018).

NATO membership is obviously observed in approximately 14 percent of the sample. This confirms that highly institutionalized collective defense commitments are limited to a subset of countries. The relatively small share of NATO observations provides empirical evidence for assessing whether structured alliance commitments are associated with differences in defense investment behavior, as suggested in the alliance literature (Sandler, 2001; Leeds et al., 2002). In particular, it allows the analysis to compare

members and non-members while holding constant broader trends in the international system.

Institutional capacity, proxied by Government Effectiveness and Rule of Law from the Worldwide Governance Indicators, exhibits wide variation. Both indicators are centered around zero and span from strongly negative to strongly positive values. This distribution reflects substantial cross-national differences in bureaucratic quality, policy implementation capacity, and legal constraints on executive authority. Such variation is consistent with comparative political economy research and provides the basis for testing whether stronger institutional environments are associated with more stable investment trajectories (Besley & Persson, 2011; Albalate et al., 2012).

Economic capacity, measured as log GDP per capita, also shows significant dispersion, covering both low-income and highly developed economies. This confirms the presence of meaningful cross-country variation in material resources available to sustain defense commitments. As widely documented, economic development remains one of the most robust correlates of military expenditure in cross-national studies (Dunne & Perlo-Freeman, 2003; Rota, 2016).

The Global Militarization Index (BICC) further highlights differences in the structural weight of military resources within national societies (BICC Website, 2023). Although militarization captures broader military intensity, it does not necessarily imply coherent long-term investment orientation, as recent research on expenditure composition suggests (Becker & Dunne, 2024). Finally, log arms imports (TIV) show considerable variation, reflecting heterogeneous levels of integration in international defense markets. Dependence on imported equipment may shape procurement feasibility, but it does not automatically translate into structured investment management (Robertson, 2022).

Overall, the descriptive statistics confirm substantial cross-national variation across all relevant dimensions of defense spending and domestic capacity. Importantly, aggregate expenditure, investment orientation, and volatility display distinct distributions, reinforcing the multidimensional conceptualization of defense policy developed in the previous chapters. These patterns justify analyzing the three outcomes separately in the regression analysis and support the expectation that their determinants only partially overlap. The next section turns to the baseline regression analysis.

4.2 Baseline models across defense dimensions

This section presents the baseline regression results across the three dimensions of defense spending analyzed in this thesis: aggregate expenditure levels, medium-term investment orientation, and spending volatility. Each outcome is examined separately using a common empirical framework, which allows a systematic comparison of how strategic, institutional, and economic variables operate across different aspects of defense

investment behavior. By applying the same core specification to conceptually distinct outcomes, the analysis directly assesses whether the correlates of defense spending scale, composition, and stability overlap or diverge.

All models are estimated using a two-way fixed effects specification with country and year fixed effects. This approach controls for time-invariant country characteristics, such as geography, long-standing military doctrines, or traditional institutional structures, as well as for common global shocks affecting all countries in a given year, including systemic geopolitical shifts and global economic crises (Becker & Dunne, 2024; Wooldridge, 2010).
Standard errors are clustered at the country level to account for serial correlation and heteroskedasticity within countries over time (Cameron & Miller, 2015).

The baseline empirical specification can be expressed as:

$$Y_{\{it\}} = \beta_1 Threat_{\{i,t-1\}} + \beta_2 NATO_{\{i,t-1\}} + \beta_3 GovEff_{\{i,t-1\}} + \beta_4 RuleLaw_{\{i,t-1\}} + \beta_5 \log GDPpc_{\{i,t-1\}} + \alpha_i + \gamma_t + \varepsilon_{\{it\}}$$

where $Y_{\{it\}}$ represents the dependent variable for country *i* in year *t*, corresponding to military expenditure levels (benchmark outcome), five-year investment orientation, or five-year spending volatility.

$Threat_{\{i,t-1\}}$ captures lagged exposure to internal and external conflict. $NATO_{\{i,t-1\}}$ is a binary indicator of alliance membership. $GovEff_{\{i,t-1\}}$ and $RuleLaw_{\{i,t-1\}}$ measure institutional capacity using the Worldwide Governance Indicators. $\log GDPpc_{\{i,t-1\}}$ proxies economic capacity. The terms α_i and γ_t denote country and year fixed effects, respectively, while $\varepsilon_{\{it\}}$ represents the idiosyncratic error term. All variables are expressed in annual frequency, and the panel remains unbalanced due to differences in data availability across sources, as discussed in the previous chapter**.**

All explanatory variables enter the model with a one-year lag. This reflects the intertemporal nature of defense planning: procurement cycles, budget formulation, and capability development programs respond to institutional and strategic conditions with delay rather than immediately (Dunne & Perlo-Freeman, 2003; Hou, 2018). Lagging also mitigates simultaneity concerns and reduces the risk of reverse causality, particularly for governance indicators that can partially change or evolve in response to defense policy choices (Wooldridge, 2010). The lag structure is therefore both substantively motivated and econometrically conservative.

For the investment orientation models, additional structural controls are included: the Global Militarization Index and logged arms imports expressed in SIPRI Trend Indicator Values, in order to account for broader militarization intensity and integration into international defense markets (McGuire, 2007; Robertson, 2022; SIPRI, 2024). These variables are included as conditioning factors that may shape procurement feasibility and structural military intensity, but they are not treated as primary theoretical drivers. They capture the extent to which countries operate within highly militarized domestic environments and rely on external suppliers for key capabilities, without predetermining how defense budgets are internally allocated. Using the same empirical specification across all three dependent variables allows for a clean comparison of how strategic pressures, institutional capacity, and economic constraints operate across different dimensions of defense spending. It helps us understand if these factors affect military spending in the same way across scale, composition, and stability, or if their impact changes depending on what aspect of defense investment we are looking at. The next subsections first examine the benchmark models for aggregate military expenditure and then contrast these results with those for investment orientation and spending volatility, highlighting where classical predictors of defense spending stop to be informative once the focus shifts from "how much" to "how" and "how stably" states invest.

4.2.1 Military spending levels

Table 4.2 Baseline fixed effects models across defense dimensions

Variable	**Military Expenditure**	**Investment Orientation**	**Spending Volatility**
Threat (t-1)	798.2* (381.9)	0.0456 (0.0924)	-0.0140 (0.0118)
NATO member (t-1)	-561.2 (707.2)	0.3010* (0.1436)	0.0535 (0.1186)
Government effectiveness (t-1)	-197.5 (783.1)	-0.0964 (0.1000)	-0.0035 (0.0229)
Rule of law (t-1)	-2,466.3 (1,621.5)	0.0546 (0.1249)	0.0233 (0.0392)
Log GDP per capita (t-1)	1,352.1 (1,104.3)	0.0182 (0.1590)	-0.0104 (0.0342)
Global Militarization Index (t-1)	-	0.0018* (0.0008)	-
Log arms imports (TIV) (t-1)	-	-0.0059 (0.0069)	-
Country FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	730	651	698

R^2	0.9505	0.5154	0.6612
Within R^2	0.0200	0.0414	0.0063

Notes: OLS estimates with country and year fixed effects. Standard errors clustered at the country level. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 4.2 presents the baseline regression results for the three defense outcomes analyzed in this thesis. This subsection focuses on aggregate military expenditure as a benchmark outcome before turning, in the next sections, to investment structure and spending stability**.** Treating expenditure levels as a reference point is consistent with the traditional defense economics literature, which models military spending primarily as a function of threat exposure, economic capacity, and alliance commitments (Dunne & Perlo-Freeman, 2003; Smith, 2009; Becker & Dunne, 2024).

The dependent variable in this specification is total military expenditure (SIPRI). The model includes lagged threat exposure, NATO membership, institutional capacity (Government Effectiveness and Rule of Law), and log GDP per capita, alongside country and year fixed effects. As discussed in the theoretical framework, the two-way fixed effects framework identifies effects from within-country variation over time, controlling for time-invariant structural characteristics and common global shocks (Wooldridge, 2010; Cameron & Miller, 2015). The coefficients therefore capture short-run adjustments in spending around long-run country-specific trajectories documented in comparative studies of military expenditure (Smith, 2009; SIPRI, 2024).

The results indicate that lagged threat exposure is positively and statistically significant. A one-unit increase in the conflict exposure indicator, corresponding to the presence of internal or external conflict, is associated with an increase of approximately 798 units in military expenditure, conditional on country and year fixed effects. This finding is consistent with standard threat–response models and with the broader security dilemma logic in international relations theory (Sandler & Hartley, 1995; Dunne & Perlo-Freeman, 2003). It confirms that, at the level of aggregate expenditure, defense budgets remain reactive to observable security pressures, in line with recent evidence on the post–Cold War and post-2014 upturn in global military spending (Tian et al., 2023).

In contrast, NATO membership does not show a statistically significant association with aggregate spending levels in the baseline specification. Once structural heterogeneity across countries is absorbed by fixed effects, alliance participation does not systematically increase total military expenditure. This result aligns with the long-standing debate on alliance burden-sharing, where formal commitments do not necessarily translate into uniformly higher aggregate spending across members (Sandler, 2001). Institutionalized cooperation may influence planning and coordination, but it does not automatically alter the overall scale of expenditure.

Similarly, the institutional capacity indicators, Government Effectiveness and Rule of Law, do not have statistically significant effects on military expenditure levels. While stronger institutions are generally associated with fiscal discipline and more predictable public investment (Besley & Persson, 2011), their influence does not appear to operate primarily through the magnitude of defense outlays. This pattern is consistent with recent work suggesting that governance quality may shape allocation efficiency and spending stability more than aggregate levels (Becker & Dunne, 2024).

Economic capacity, proxied by log GDP per capita, is positive but statistically insignificant in the fixed-effects specification. In a two-way fixed effects framework, much of the cross-national variation in income levels is absorbed by country fixed effects. Identification therefore relies on within-country changes over time, which may be limited relative to long-standing structural income differences (Smith, 2009). As a result, short-run fluctuations in GDP per capita do not appear to drive substantial adjustments in aggregate military expenditure once persistent country characteristics are controlled for.

Importantly, the within R^2 of the model is modest. This indicates that, although threat exposure explains part of the short-run variation in military expenditure, a large share of expenditure dynamics remains driven by persistent country-specific factors captured by the fixed effects. These unobserved components include long-standing strategic orientations, entrenched civil–military relations, and historically embedded budgetary commitments that evolve only gradually over time (Becker & Dunne, 2024). The relatively modest within R^2 values are consistent with the well-documented persistence and path-dependence of defence budgeting processes. Aggregate defense spending thus appears to reflect long-standing strategic positioning and historical commitments as much as immediate security shocks (Becker & Dunne, 2024).

Overall, the benchmark results confirm that traditional threat–response mechanisms remain relevant for explaining short-run adjustments in aggregate military expenditure. However, alliance membership and institutional capacity do not systematically alter the overall scale of spending once structural heterogeneity is accounted for. This benchmark pattern provides a crucial point of comparison for the subsequent analysis: the next subsections examine whether the same covariates behave differently when the outcome shifts from the scale of defense effort to its composition and stability, thereby testing whether "how much" states spend is governed by different logics than "how" and "how stably" they invest.

4.2.2 Investment orientation

Table 4.3 Baseline model investment orientation

Variable	**Investment Orientation**

Threat (t-1)	0.0456 (0.0924)
NATO member (t-1)	0.3010* (0.1436)
Government effectiveness (t-1)	-0.0964 (0.1000)
Rule of law (t-1)	0.0546 (0.1249)
Log GDP per capita (t-1)	0.0182 (0.1590)
Global Militarization Index (t-1)	0.0018* (0.0008)
Log arms imports (TIV) (t-1)	-0.0059 (0.0069)
Country FE	Yes
Year FE	Yes
Observations	651
R^2	0.5154
Within R^2	0.0414

Notes: OLS estimates with country and year fixed effects. Standard errors clustered at the country level. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 4.3 reports the baseline fixed-effects estimates for five-year investment orientation. In contrast to aggregate military expenditure, this specification captures the medium-term allocation of resources toward capital-intensive and modernization-oriented components of defense spending. As discussed in the theoretical framework, investment orientation reflects not simply how much a country spends, but how it structures its defense budget over time, whether resources are directed toward long-term capability development rather than short-term operational expenditures (McGuire, 2007; Hou, 2018; Becker & Dunne, 2024).

The dependent variable measures the share of spending devoted to medium-term investment components over a rolling five-year window. The model includes the same core explanatory variables as the benchmark expenditure regression, lagged threat exposure, NATO membership, institutional capacity, and economic capacity, alongside two additional structural controls: the Global Militarization Index and logged arms imports. These controls account for broader militarization intensity and participation in international defense procurement markets (Robertson, 2022; SIPRI, 2024).They capture whether a country maintains a generally militarized posture and relies on external suppliers for key capabilities, without assuming ex ante how its budget is internally allocated.

The results reveal a markedly different pattern compared to the expenditure-level model.

First, lagged threat exposure does not have a statistically significant association with investment orientation. While threats increase aggregate spending, they do not appear to

systematically shift the composition of spending toward medium-term investment. This suggests that conflict exposure may trigger short-run budget expansions without necessarily altering strategic allocation patterns. Such a distinction is consistent with arguments emphasizing that modernization and procurement cycles are less reactive and more path-dependent than aggregate budget adjustments (Dunne & Perlo-Freeman, 2003; Hou, 2018). In other words, even when security shocks lead governments to spend more, the share of resources devoted to investment often reflects longer-term planning horizons rather than immediate crisis responses.

Second, NATO membership displays a positive and statistically significant coefficient. Controlling for country and year fixed effects, alliance membership is associated with a higher medium-term investment orientation. Substantively, this indicates that alliance integration can influence the structure of defense spending even when it does not raise total expenditure levels. This finding aligns with the literature on alliance coordination and standardization, which suggests that institutionalized defense cooperation can shape procurement strategies, interoperability requirements, and capability planning (Leeds et al., 2002; Sandler, 2001; Becker & Dunne, 2024). It also recalls to NATO's "2/20" defence investment pledge: allies are expected not only to move towards spending 2 per cent of GDP on defence, but also to allocate at least 20 per cent of their defence budgets to major equipment and related R&D, a target that most members have recently met or exceeded (North Atlantic Treaty Organization, 2014; Alozious, 2022; Atlantic Council, 2023). The positive association between NATO membership and investment orientation is consistent with the idea that such institutional commitments foster more investment-heavy budget structures, even in the absence of uniform increases in overall spending.

Third, institutional capacity indicators, Government Effectiveness and Rule of Law, are not statistically significant in this baseline specification. While stronger governance is theoretically associated with improved fiscal planning and credible long-term commitments (Besley & Persson, 2011), the evidence here suggests that institutional quality alone does not automatically translate into higher investment orientation once structural heterogeneity is controlled for. This is consistent with the broader argument in the theoretical framework that institutions may shape how states manage defence resources, but their effect on budget composition is likely to be indirect or conditional, rather than a simple, linear driver, a possibility examined further in the robustness section.

Economic capacity, proxied by log GDP per capita, is positive but statistically insignificant. As in the expenditure model, much of the cross-country income variation is absorbed by fixed effects. Within-country income fluctuations may not be sufficiently large in the short run to alter medium-term procurement strategies (Smith, 2009). Given the multi-year nature of procurement programmes and capability planning, changes in income are more likely to affect the overall budget available for defense than the share of the defence budget devoted to investment in the short run.

Importantly, the Global Militarization Index enters positively and significantly. Countries with higher overall militarization intensity tend to show a greater orientation toward investment components. This supports the interpretation that structurally militarized states are more likely to maintain sustained modernization efforts rather than purely operational spending profiles (McGuire, 2007; Robertson, 2022).
This pattern is in line with recent policy debates that link long-term defence readiness to a stronger industrial and technological base. Both the European Defence Industrial Strategy and the proposed European Defence Industry Programme stress the need for multi-year investment and coordinated procurement to sustain credible military capabilities (Clapp, 2024; Ostanina & Tardy, 2024). By contrast, logged arms imports are not statistically significant in the baseline model, suggesting that import intensity alone does not translate into higher investment shares once broader structural militarization is controlled for.

The within R^2 of the model remains modest, indicating that short-term within-country variation in investment orientation is limited. This reinforces a key argument of the thesis: the structure of defence investment changes more slowly than total spending and depends mainly on long-term commitments and structural factors, rather than on short-term threat shocks.
In empirical terms, most of the variation in investment orientation is cross-sectional and slow-moving, consistent with the idea of defence spending as a managed investment process embedded in long-term planning cycles rather than an annually adjustable budget line (McGuire, 2007; Hou, 2018; Becker & Dunne, 2024).

Overall, the baseline results for investment orientation reveal that alliance membership and structural militarization, rather than direct threat exposure, are associated with medium-term allocation patterns. This stands in clear contrast to the expenditure-level findings and supports the thesis' core claim that defense spending should be understood as a managed investment process with distinct determinants across dimensions. This supports the view of defence spending as an intertemporal investment governance process rather than as a purely reactive budget line. Allocation patterns appear embedded in medium-term planning frameworks that extend beyond immediate security shocks.

4.2.3 Spending volatility

The third baseline specification examines spending volatility, measured as medium-term fluctuations in defense investment. While aggregate expenditure captures scale and investment orientation captures composition, volatility reflects the stability and predictability of defense planning over time. This dimension is particularly relevant for understanding whether defense policy is reactive and erratic or structured and strategically managed (Hou, 2018; Becker & Dunne, 2024; Bove & Nisticò, 2014). It also matters for the defence industrial base, as irregular investment can undermine production planning, learning effects, and the viability of key suppliers (Markowski et al. 2010).

The baseline fixed-effects results for the volatility model are reported in the Appendix (Table 4.4). In contrast to the expenditure-level and investment-orientation specifications, none of the core explanatory variables show statistically significant effects on spending volatility in the baseline model.

Lagged threat exposure does not significantly increase volatility. This suggests that while conflict exposure triggers higher aggregate expenditure, it does not systematically lead to greater instability in medium-term investment patterns. In other words, states tend to change how much they spend when threats increase, but this does not automatically make their investment paths more unstable. This finding is consistent with the idea that defense institutions often rely on multi-year budgeting frameworks that smooth short-term shocks (Dunne & Perlo-Freeman, 2003).

Similarly, NATO membership does not significantly affect volatility. This indicates that alliances do not automatically generate either stabilizing or destabilizing effects on spending patterns once structural heterogeneity is controlled for. The absence of a significant effect suggests that alliance coordination may influence investment orientation, but not the temporal stability of expenditures. In practice, NATO's focus on capability targets and investment benchmarks appears more closely related to what states buy than to how they spend over time (North Atlantic Treaty Organization, 2014; NATO, 2025).

The institutional capacity indicators, Government Effectiveness and Rule of Law, are also not statistically significant. While strong institutions are often associated with fiscal discipline and policy consistency (Besley & Persson, 2011), their effect does not seem to show up as lower short- to medium-term volatility in defence spending. This may reflect the highly path-dependent nature of defense budgets, which are shaped by procurement cycles and long-term contractual commitments rather than annual governance fluctuations (Hou, 2018).

Finally, economic capacity does not significantly influence volatility within countries over time. As in the expenditure model, much of the cross-national variation in income levels is absorbed by country fixed effects, leaving limited within-country variation to explain changes in spending stability (Wooldridge, 2010).

Importantly, the within R^2 of the volatility model is very low. This suggests that short-term changes in defence spending are driven mostly by factors that the current set of strategic and institutional variables does not capture. These factors are likely to include idiosyncratic procurement decisions, one-off acquisition programmes, domestic fiscal shocks, or shifts in political coalitions, which are hard to summarise with standard macro-political indicators (Bove & Nisticò, 2014; Markowski et al., 2010).

Volatility therefore appears to reflect structural inertia, procurement timing and country-specific political cycles rather than systematic responses to observable macro-political drivers. This suggests that temporal stability in defence investment is governed more by institutional and contractual rigidities than by short-term shifts in threat or alliance status. Overall, the baseline evidence suggests that volatility is comparatively less responsive to observable strategic and institutional drivers than expenditure levels or investment orientation. This suggests that temporal stability in defence investment is governed more by institutional and contractual rigidities than by short-term shifts in threat or alliance status. (Clapp, 2024).

4.3 Alliance commitments and structured investment

The baseline results showed that alliance membership does not significantly increase aggregate military expenditure, but it is positively associated with medium-term investment orientation. This section investigates this finding more systematically. The objective is to assess whether NATO membership is robustly associated with structured defense investment once alternative specifications and sample restrictions are considered.

The literature on alliances has traditionally focused on burden-sharing and free-riding (Sandler, 2001; Leeds et al., 2002). However, more recent work suggests that alliances may also shape procurement strategies, interoperability standards, and long-term capability planning (Becker & Dunne, 2024; Robertson, 2022). If alliance commitments operate through coordination and institutionalized planning rather than simple spending pressure, their effect should emerge more clearly on investment orientation than on expenditure levels.

The rest of this section asks whether NATO membership still predicts higher medium-term investment orientation when the empirical set-up changes. Section 4.3.1 presents descriptive evidence comparing NATO and non-NATO members. Sections 4.3.2 to 4.3.4 look at alternative NATO measures, the exclusion of major spenders, and differences between high- and low-income states, while Section 4.3.5 adds an interaction between NATO membership and income.

Before turning to the regression-based evidence, descriptive trends comparing the average investment orientation of NATO and non-NATO countries are presented in the Appendix (Figure 4.1). NATO members display systematically higher investment shares, which motivates a more systematic examination of the alliance–investment link in the following sections.

4.3.1 NATO and investment orientation

The baseline results reported in Section 4.2.2 suggest that NATO membership is positively associated with medium-term defense investment orientation. This subsection

examines this relationship more closely and situates it within the broader theoretical framework developed in Chapter 2.

Within this framework, alliances are not expected to affect defense policy only through burden-sharing incentives or collective security guarantees. Highly institutionalized alliances may also shape the internal composition of military budgets by promoting coordination, interoperability standards, joint planning procedures, and capability targets that extend beyond short-term threat responses (Sandler, 2001; Leeds et al., 2002). Recent contributions in defense economics similarly emphasize that alliance integration can influence modernization patterns and procurement strategies even when aggregate spending levels remain unchanged (Becker & Dunne, 2024). NATO's "2/20" guideline, to move towards spending 2 per cent of GDP on defence and to devote at least 20 per cent of defence expenditure to major equipment and related R&D, reflects this focus on the structure, and not only the size, of defence budgets (North Atlantic Treaty Organization, 2014; NATO, 2025; Alozious, 2022; Atlantic Council, 2023).

Table 4.3 showed that NATO membership is positively and statistically significant in the baseline investment orientation model. Controlling for lagged threat exposure, institutional capacity, and economic capacity, NATO members spend a larger share of their defense budgets to medium-term investment components. Importantly, this effect emerges in a two-way fixed effects specification, meaning that it is identified from within-country variation over time rather than from simple cross-sectional differences between NATO and non-NATO states (Wooldridge, 2010). Country fixed effects absorb persistent structural characteristics, while year fixed effects control for common global shocks, ensuring that the estimated coefficient reflects temporal changes associated with alliance participation.

Figure 4.2 Coefficient plot for investment orientation models

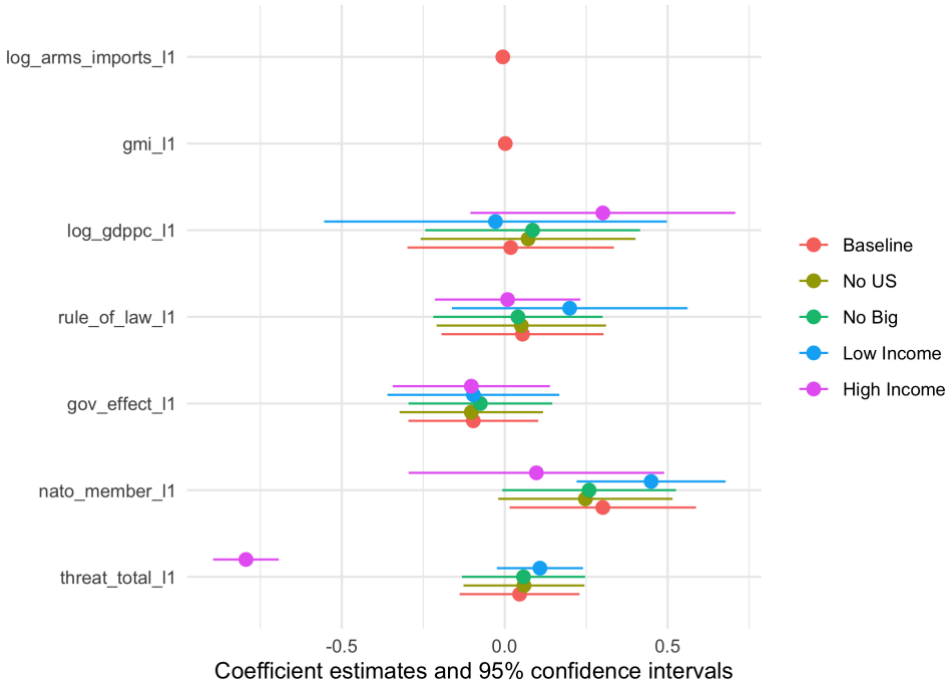


Figure 4.2 provides a visual representation of this relationship. The figure plots the estimated coefficients and 95 per cent confidence intervals for the main explanatory variables, including NATO membership, across five specifications of the investment orientation model: the baseline, a model excluding the United States, a model excluding other major spenders, and separate models for low- and high-income countries. The coefficients and clustered confidence intervals are taken directly from the fixed-effects models estimated in R, using country-level clustered standard errors consistent with the baseline specification (Cameron & Miller, 2015). Each dot represents the point estimate for a given variable–specification combination, while the horizontal lines represent the corresponding 95 per cent confidence intervals.

For the purposes of this subsection, the key row is *nato_member_l1*. Across all specifications, the coefficient on NATO membership remains positive. Its magnitude changes when major spenders are removed or when the sample is split by income, but the sign and overall size of the effect are stable. The figure shows that the positive association between NATO membership and investment orientation remains stable as additional controls are introduced. This pattern strengthens the interpretation that alliance membership is associated with structured investment behavior rather than simply capturing correlated factors such as economic development or exposure to conflict.

At the same time, the effect is not overwhelmingly large and does not explain the majority of within-country variation. This suggests that alliance commitments operate as one important component within a broader investment governance framework, rather than as a deterministic driver. Defense investment orientation remains shaped by long-term structural characteristics and path-dependent procurement cycles (Dunne & Perlo-

Freeman, 2003; Hou, 2018), but alliance integration appears to push allocation patterns toward capital-intensive components.

These findings provide the foundation for the subsequent analyses. The next section examines alternative specifications of NATO membership, including pre-Ukraine and adjusted alliance indicators, in order to verify that the baseline effect is not driven by specific time periods or coding choices. The analysis then tests whether the results are sensitive to the exclusion of the United States and other major spenders, and whether the effect varies across income groups. Finally, the interaction between NATO membership and economic capacity is tested to assess whether alliance commitments operate differently across levels of development.

4.3.2 Alternative NATO specifications

While the baseline specification indicates a positive association between NATO membership and medium-term investment orientation, it is necessary to verify that this relationship is not driven by specific coding choices or by particular historical periods. Alliance variables are often sensitive to how membership is defined and to major geopolitical events that alter the strategic environment. For this reason, this section examines alternative operationalizations of NATO membership.

The first alternative specification distinguishes NATO membership prior to the 2022 invasion of Ukraine. In this case, the NATO dummy is set to missing for the years affected by the war, so that the coefficient is identified only from the pre-2022 period. This adjustment isolates the effect of alliance participation in a relatively stable strategic period and excludes the immediate shock of large-scale interstate war in Europe. The logic behind this test is simple: if the baseline effect were mainly driven by post-2022 dynamics or emergency rearmament, the coefficient should become weaker once the most recent years are removed. If, instead, NATO membership is linked to higher investment orientation in a more structural way, the effect should still be visible even without the war period.

Results from alternative NATO codings confirm that the positive association between alliance membership and investment orientation persists (see Table 4.5 in the Appendix). This suggests that the baseline effect is not only a product of the most recent geopolitical shock, but reflects longer-term alliance dynamics. This finding is consistent with the view that NATO operates through institutionalized planning frameworks and capability targets that shape procurement decisions over time rather than through ad hoc reactions to single crises (Sandler, 2001; Leeds et al., 2002; Becker & Dunne, 2024; Tian et al. 2023).
This robustness check further reduces the risk that short-term emergency reallocations drive the result. The NATO coefficient remains positive and of a similar size, which suggests that the link between alliance membership and investment-oriented spending is not just a wartime artefact.

Taken together, these alternative specifications suggest that the positive association between NATO membership and medium-term investment orientation is not an artifact of a single historical moment or of a particular coding decision. Instead, it appears consistent with a broader institutional logic: highly structured alliances may influence how defense budgets are composed, even if they do not uniformly raise total expenditure levels (Dunne & Perlo-Freeman, 2003; Becker & Dunne, 2024).

Importantly, these results remain consistent with the broader argument developed in the theoretical framework. Strategic environment variables, such as conflict exposure, are more directly associated with changes in aggregate spending levels, while alliance commitments appear more closely linked to the structural organization of investment

The next subsection tests whether the NATO effect is mainly driven by the big spenders like United States or by a small group of major military spenders. If the result depended only on a few large countries, it would be hard to generalise. Checking this possibility is therefore an important step in validating the findings.

4.3.3 Excluding the United States as major NATO spender

A potential concern in cross-national analyses of defense spending is that results may be disproportionately influenced by a small number of structurally dominant military powers. The United States, in particular, accounts for a substantial share of global military expenditure and plays a central role within NATO's institutional structure (SIPRI, 2024; Becker & Dunne, 2024). Similarly, a small group of high-spending countries may drive aggregate patterns simply due to scale effects rather than systematic institutional mechanisms.

To ensure that the positive association between NATO membership and investment orientation does not merely reflect the weight of the United States, this section re-estimates the baseline investment orientation model under an additional sample restriction. The United States is excluded from the estimation. The specification, controls and estimation strategy are the same as in the baseline model. Detailed results are reported in Appendix (Table 4.6).

When the United States is excluded from the sample, the coefficient on lagged NATO membership remains positive and of similar magnitude compared to the baseline model. Although statistical significance is slightly lower, the size of the coefficient remains stable. This indicates that the baseline NATO effect is not driven exclusively by the structural weight of the United States. In other words, the association between alliance membership and medium-term investment orientation persists even when the dominant NATO member is removed from the estimation. In other words, the link between alliance membership and medium-term investment orientation survives even when the dominant

NATO member is removed from the sample. This suggests that the NATO effect captures a broader pattern among member states, rather than a single-country outlier.

This result aligns with theoretical expectations developed in the theoretical framework. Alliance membership may shape procurement behavior through institutionalized planning frameworks, interoperability requirements, and shared capability targets (Sandler, 2001; Leeds et al., 2002). These mechanisms are likely to matter more for states whose defence planning is closely tied to alliance processes and common capability packages. In that context, they may exert stronger coordinating effects on smaller member states, whose defense planning is more closely embedded within alliance structures and whose procurement decisions are more directly influenced by collective standards.

In contrast, larger military powers may have more autonomy in how they structure their defence budgets, which can weaken the observable impact of formal alliance membership on investment composition. This fits with burden-sharing and alliance politics research, which highlights asymmetries between large and small members in terms of influence and room for manoeuvre (Sandler, 2001; Becker & Dunne, 2024).

Importantly, the stability of the NATO coefficient after excluding the United States reinforces the core empirical claim of the thesis. The positive association between NATO membership and medium-term investment orientation reflects a broader structural relationship between alliance embeddedness and the composition of defense spending.

At the same time, the within R^2 of this restricted model remains modest, consistent with previous sections. This confirms that changes in investment orientation occur gradually and are influenced by structural positioning rather than short-term fluctuations. The exclusion of the United States therefore supports the interpretation of NATO membership as one factor associated with more investment-oriented allocation patterns, rather than as a simple proxy for global military dominance (North Atlantic Treaty Organization, 2014).

The next subsection asks whether this relationship varies systematically between higher- and lower-income countries, exploring potential heterogeneity in how alliance membership interacts with economic capacity.

4.3.4 Income heterogeneity (high vs low income)

The previous sections suggest that alliance membership is associated with higher investment orientation. However, the ability to translate alliance commitments into structured investment may depend on economic capacity. Defense modernization requires fiscal space, technological capacity, and long-term procurement feasibility. These factors are unequally distributed across countries and are closely linked to income levels (Hou, 2018). Within NATO, this is visible in the contrast between wealthier Western members and newer, often lower-income allies. (Tianet al. 2023).

To examine whether the effect of NATO membership differs across levels of economic development, the sample is split into two groups based on the median of log GDP per capita. The detailed split-sample estimates are reported in the Appendix (Table 4.7).

The results reveal a clear heterogeneity.
For low-income countries, NATO membership is positively and strongly associated with investment orientation. The coefficient is large and statistically significant (0.4493***), suggesting that alliance membership is linked to a substantial increase in medium-term investment allocation. Among relatively poorer states, those that are NATO members devote a much larger share of their defence budgets to investment components than non-members at similar income levels. In these cases, being part of NATO can help governments stick to modernization plans that they might otherwise struggle to finance. This interpretation is consistent with theories of institutional anchoring and capability convergence within alliances (Sandler, 2001; Leeds et al., 2002; Becker & Dunne, 2024). It also fits recent evidence that several lower- and middle-income allies have sharply increased equipment spending and moved closer to NATO's 20 per cent investment benchmark since 2014 (Tian et al., 2023).

By contrast, for high-income countries, the coefficient on NATO membership is small and statistically insignificant (0.0971). This suggests that among economically advanced states, alliance membership does not alter investment orientation. One plausible explanation is that high-income countries already have structured procurement systems and established modernization cycles independent of alliance pressure (Hou, 2018). In these cases, alliance participation may reinforce existing trajectories rather than fundamentally reshape them. Richer NATO members would invest heavily in equipment even without additional pressure from alliance commitments.

An additional important result concerns threat exposure. Among high-income countries, threat exposure is negative and highly significant (−0.7942***). This suggests that conflict exposure may temporarily reduce medium-term investment orientation in richer states. This mechanism is in line with recent cases in which high-income allies have redirected resources toward short-term deployments and support to ongoing operations, while delaying or stretching some equipment programmes (Tian et al., 2023).

In contrast, threat exposure is not statistically significant for low-income countries. This again highlights that investment orientation is not mechanically driven by security shocks, but is conditioned by structural capacity and fiscal feasibility. For poorer states, the scope for reallocating budgets in response to crises is more limited, and the main difference remains between those embedded in NATO planning frameworks and those outside.

The split-sample results suggest that institutional effects alone do not dominate investment orientation once country fixed effects are included. Instead, the interaction

between alliance commitments and economic capacity appears more important: NATO seems to matter especially where resources are scarce and modernization would otherwise be harder to sustain.

The within R^2 is higher in the high-income subsample (0.0866) compared to the low-income subsample (0.0416), indicating that within-country variation in investment orientation is more structured among wealthier states. Nevertheless, much of the variation remains driven by persistent country-specific characteristics captured by fixed effects.

These findings reinforce the core argument developed in the theoretical framework: defense spending is best understood as a managed investment process rather than a purely reactive budgetary response. In low-income countries, NATO membership appears to serve as a structural driver of modernization-oriented allocation. In high-income countries, by contrast, investment orientation is less dependent on alliance status and in pre-existing institutional and fiscal structures. This heterogeneity motivates the next subsection, which moves from split-sample analysis to a formal interaction model testing whether the effect of NATO membership varies systematically with income levels.

4.3.5 Interaction: NATO × income

While the split-sample analysis shows that the NATO–investment relationship differs by income, it does so by dividing countries into only two groups. This creates an arbitrary threshold and does not use all the information in the continuous income variable. To deal with this and to test the heterogeneity mechanism more directly, this section estimates an interaction model between NATO membership and income, a standard way of capturing conditional effects in panel data (Wooldridge, 2010).

The empirical specification extends the baseline investment orientation model by including an interaction term between lagged NATO membership and lagged log GDP per capita:

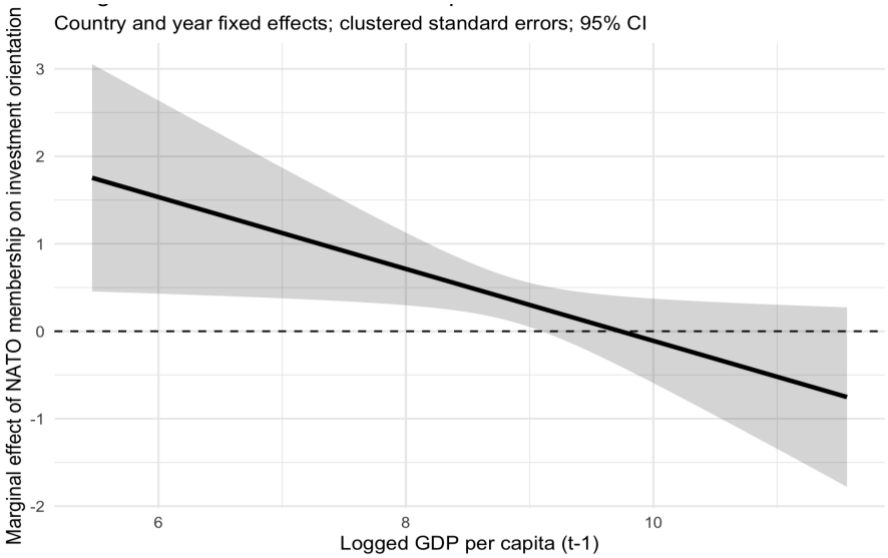
$$InvestOrientation_{\{it\}} = \beta_1 NATO_{\{i,t-1\}} + \beta_2 \log GDPpc_{\{i,t-1\}} + \beta_3 \left(NATO_{\{i,t-1\}} \times log\ GDPpc_{\{i,t-1\}}\right) + Controls + \alpha_i + \gamma_t + \varepsilon_{\{it\}}$$

where the control variables and fixed effects follow the structure defined in Section 4.2. The interaction term allows the marginal effect of NATO membership on investment orientation to vary continuously across income levels.

The results indicate that the interaction coefficient is negative and statistically significant. This implies that the positive association between NATO membership and investment orientation declines as income increases. NATO membership has its strongest effect on

investment in relatively poorer countries, and this effect gradually weakens as economic development rises.

Figure 4.3 NATO × income interaction marginal effect



To illustrate this pattern, Figure 4.3 plots the marginal effect of NATO membership on investment orientation across the observed range of log GDP per capita. The figure is constructed using the estimated coefficients and cluster-robust variance–covariance matrix from the fixed-effects interaction model. For each value of income within the sample range, the marginal effect is calculated as:

$$\frac{\partial InvestOrientation}{\partial NATO} = \beta_{\{NATO\}} + \beta_{\{Interaction\}} \cdot log\ GDPpc$$

Confidence intervals are calculated using the delta method and reflect clustering at the country level.

The figure confirms the regression results. At lower income levels, NATO membership is associated with a substantively large and statistically significant increase in medium-term investment orientation. As income rises, the estimated effect decreases and eventually becomes statistically indistinguishable from zero.

This finding is highly consistent with the framework developed in the theoretical framework. Lower-income countries face tighter fiscal constraints, more limited domestic defense-industrial capacity, and greater uncertainty in long-term procurement planning. In such contexts, alliance membership can serve as an external structuring device that promotes modernization, interoperability standards, and coordinated capability

development (Sandler, 2001; Leeds et al., 2002; Becker & Dunne, 2024). NATO's defence planning instruments and capability targets, such as the NATO Defence Planning Process and the 20 per cent guideline on equipment spending, provide exactly this kind of framework for allies with more constrained resources (Alozious, 2022).

By contrast, in higher-income countries, with stronger domestic fiscal capacity and more developed defense-industrial bases, modernization and procurement cycles may already be institutionalized and embedded within national planning frameworks. As a result, NATO membership does not generate an additional structural shift in investment orientation once income and fixed effects are controlled for. In these cases, alliance commitments mainly reinforce patterns that are already in place rather than changing the overall structure of the budget.

Taken together, the results of this section show that alliance commitments are not mainly about making countries spend more on defence overall, but about how they organise that spending inside the budget. Across the baseline model, alternative NATO codings, restricted samples, income splits and the interaction specification, the evidence points in the same direction: NATO membership is linked to a higher share of medium-term investment, especially in countries with more limited resources (Ostanina, 2024). This supports the idea that defence spending is best seen as a managed investment process, shaped by institutional integration and economic constraints, rather than by simple burden-sharing rules.

Having shown that alliance commitments are linked to more structured investment behaviour, the next section turns to the second core factor: threat exposure. If alliances mainly work through coordination and long-term planning, threats are expected to matter in a different way, by pushing governments to change how much they spend rather than how they structure their budgets. Section 4.4 therefore asks whether conflict exposure leads to more reactive spending dynamics across the three defence dimensions.

4.4 Threat exposure and reactive spending

This section looks at the second core factor in the framework: threat exposure. Unlike alliance commitments, which work mainly through coordination and planning, conflict and insecurity are expected to push governments to adjust defence budgets more directly (Sandler & Hartley, 1995; Smith, 2009). Recent increases in military spending after the 2014 Crimea crisis and the 2022 invasion of Ukraine show how sharp security shocks can trigger budget hikes, especially in Europe and NATO countries (Tian et al.2023).

Here, the analysis focuses on how lagged threat exposure relates to three outcomes: aggregate military expenditure, medium-term investment orientation, and spending

volatility. The goal is to see whether threat mainly affects how much states spend, or whether it also changes how they structure and stabilise their defence budgets.

4.4.1 Threat and aggregate spending

The first test concerns aggregate military expenditure. As shown in Table 4.2, lagged threat exposure is positive and statistically significant in the military expenditure model. In years following internal or external conflict, countries tend to spend more on defence. This is exactly what standard threat–response approaches would expect: higher perceived risk leads to higher budgets (Sandler & Hartley, 1995; Smith, 2009; Dunne & Perlo-Freeman, 2003). Recent increases in spending after the 2014 Crimea crisis and the 2022 full-scale invasion of Ukraine show the same pattern at the descriptive level, especially among European and NATO states (Tian et al., 2023).

Because the model includes country fixed effects, the coefficient is identified from changes within countries over time, not from simple differences between peaceful and conflict-prone states. The result shows that when a given country moves from no conflict-to-conflict exposure, its military spending rises relative to its own historical baseline (Wooldridge, 2010). Year fixed effects absorb common global shocks and clustering standard errors by country deals with serial correlation in defence budgets (Cameron & Miller, 2015).

Compared with the alliance results in Section 4.3, this points to a clear division of labour between explanatory factors. NATO membership was mainly associated with how resources are allocated inside the budget, whereas threat exposure operates directly on how much is spent in total (Becker & Dunne, 2024). Defence budgets therefore combine a reactive component, adjustments to security shocks, with a more institutionalised component linked to alliances and planning rules.

At the same time, the within R^2 of the expenditure model remains modest. Threat exposure explains part of the short-run variation, but a large share of spending dynamics is still driven by persistent country characteristics captured by the fixed effects, such as economic size, long-standing strategic posture or defence-industrial capacity (Rota, 2016).

Overall, the results confirm that the security environment remains a central driver of aggregate defence effort. The next subsection examines whether conflict exposure also affects medium-term investment orientation, or whether its impact is largely confined to the overall level of spending.

4.4.2 Threat and investment orientation

While aggregate military expenditure reacts positively to conflict exposure, this section analyzes if exposure to internal or external conflict shift the composition of spending toward medium-term investment, or if it primarily generates short-run expansions in total expenditure.

Table 4.3 reports that lagged threat exposure is not statistically significant in the investment orientation specification. Once country and year fixed effects are included, the estimated coefficient remains small and imprecisely estimated. This stands in contrast to the clear positive effect found for aggregate spending.

Fundamentally, this suggests that while conflict exposure leads governments to increase total military spending, it does not systematically induce a reallocation toward medium-term investment components. In the theoretical framework, this distinction is central. Aggregate spending captures the scale of defense effort, which may respond quickly to observable security shocks. Investment orientation, by contrast, reflects medium-term procurement decisions and modernization strategies that are embedded in longer planning cycles (Dunne & Perlo-Freeman, 2003; Hou, 2018).

In most countries, defence procurement and capability development are planned through multi-year budgets and long-term contracts (Markowski et al., 2010). When the security situation deteriorates, governments usually add resources to day-to-day operations or personnel costs, rather than reopening and redesigning existing equipment programmes. This interpretation is consistent with arguments in defense economics emphasizing the path-dependent nature of procurement cycles and the inertia of capital allocation decisions (McGuire, 2007; Becker & Dunne, 2024; Hartley, 2024).

The absence of a significant threat effect on investment orientation also aligns with the empirical results from the previous sections. Whereas NATO membership was positively associated with medium-term investment structure, threat exposure does not appear to reshape allocation patterns once institutional and economic controls are included. This reinforces the argument that reactive security pressures and institutionalized alliance commitments affect different aspects of defense policy.

It is important to emphasize that this null result does not imply that threats are irrelevant for defense policy. Rather, it suggests that their influence is concentrated on the expansion of total budgets rather than on the composition of spending. In short, when threats increase, countries spend more on defence, but this does not necessarily change how that money is divided inside the budget.

This distinction is theoretically meaningful. Traditional threat–response models largely focus on expenditure levels (Sandler & Hartley, 1995; Smith, 2009), but this results

indicate that once disaggregated defense spending into different dimensions, the effect of threat becomes more selective. Aggregate spending reacts; investment structure remains comparatively insulated.

The next section completes this analysis by examining if threat exposure affects the temporal stability of defense spending. If investment orientation remains stable under threat conditions, volatility can represent an alternative channel through which reactive behavior manifests.

4.4.3 Threat and volatility

The final dimension considered in this section is spending volatility. While aggregate expenditure captures the scale of defence effort and investment orientation its internal composition, volatility reflects how stable defence planning is over time. This matters for the main argument of the thesis: if defence spending is planned as a medium-term investment, threats would be expected to change how much countries spend, not to create large year-to-year fluctuations in their defence budgets.

The baseline results indicate that lagged threat exposure has no statistically significant effect on spending volatility. In years following internal or external conflict, military budgets tend to be higher, but not systematically more unstable. This is consistent with classic security-dilemma accounts, which stress that states respond to threats by building up capabilities (Herz, 1950; Jervis, 1978), but do not necessarily imply chaotic budgeting.

From a rationalist and political-economy perspective, this is not surprising. Defence procurement involves multi-year contracts, industrial coordination and bureaucratic procedures that naturally smooth short-term shocks (Markowski et al.,2010). Empirical work on military expenditure dynamics similarly finds that adjustment processes are gradual and display a high degree of persistence (Bachtiar et al., 2025). Taken together, the evidence on levels, investment orientation and volatility clarifies the differentiated role of threat exposure. Conflict increases aggregate military expenditure but does not systematically reshape the internal structure or temporal stability of defence investment. In contrast to alliance commitments, threat exposure works predominantly through the scale of defence effort.

4.4.4 Disaggregating threat: external vs internal conflict

While the baseline specification relied on a composite measure of threat exposure, it's worth to examinate whether different types of conflict exert heterogeneous effects across defense dimensions. To address this concern, the threat variable was disaggregated into external conflict and internal conflict, both lagged by one year and estimated within the

same two-way fixed effects framework. The detailed estimates for the disaggregated threat specification are reported in the Appendix (Table 4.8).

This refinement allows a more precise test of whether defense spending responds differently to interstate versus domestic security pressures. External conflict is typically associated with interstate rivalry, deterrence dynamics, and territorial security concerns (Waltz, 1979; Jervis, 1978), whereas internal conflict reflects domestic instability, insurgency, or civil violence, which may generate different budgetary priorities and institutional responses (Collier & Hoeffler, 2004). Recent debates on Russia's full-scale invasion of Ukraine, on the one hand, and on civil wars and state fragility, on the other, show that interstate and internal threats are often treated in separate policy discussions (Tian et al., 2023).

The results show a different pattern than the baseline composite threat specification.

First, external conflict is positively associated with aggregate military expenditure, consistent with classical threat–response models (Sandler & Hartley, 1995; Smith, 2009). The coefficient is no longer statistically significant once the threat variable is split, but its size and sign are close to the baseline estimate. This suggests that the composite threat effect on spending levels is mainly driven by interstate conflict rather than by internal instability.

Second, external conflict is negatively and statistically significant in the investment orientation model. Exposure to interstate conflict reduces the medium-term investment share of defense spending**.** In practice, when states face external conflict, total defence budgets tend to rise, but a smaller share is devoted to capital-intensive modernisation. This indicates that while governments increase total budgets under external threat, they simultaneously shift allocation away from capital-intensive modernization components.

This finding is theoretically meaningful. In most countries, defence procurement and capability development are organised through multi-year budgets and long-term contracts (Markowski et al., 2010; Hou, 2018). Under high perception of external threat, governments may prioritize immediate operational readiness, personnel expansion, or maintenance expenditures rather than long-term capital investment (Dunne & Perlo-Freeman, 2003). The negative coefficient therefore suggests short-term operational reallocation rather than structural modernization acceleration.

By contrast, internal conflict does not show a statistically significant association with either expenditure levels or investment orientation. This implies that domestic instability does not systematically reshape defense budget structure once country fixed effects are accounted for. Internal security challenges can be managed through other instruments, including policing or paramilitary structures, rather than through reallocation of formal defense investment components (Collier & Hoeffler, 2004).

Third, neither external nor internal conflict significantly affects spending volatility. This reinforces the conclusion that threat exposure influences scale rather than temporal stability. Defence budgets react to external pressures mainly through higher levels and modest compositional shifts, but medium-term planning cycles remain relatively stable. This is consistent with dynamic adjustment models of military expenditure, which emphasize persistence and institutional inertia (Töngür et al., 2015; Hartley, 2024).

Taken together, these disaggregated results strengthen the multidimensional argument of the thesis. When threat is treated as a single composite indicator, its main effect appears on aggregate expenditure. Once external and internal components are separated, a clearer picture emerges: external conflict increases total spending, reduces the investment share, and leaves volatility broadly unchanged, while internal conflict has no systematic effect.

In short, external threats increase the overall level of defence spending and, in the short run, tend to pull resources away from investment, but they do not unsettle planning. This goes in the opposite direction of alliances, where NATO membership is linked to a higher investment share rather than to higher total spending. Alliances mainly affect how defence budgets are structured, while threats mainly affect how big they are.

4.5 Institutions and economic capacity

While the previous sections examined the role of alliance commitments and threat exposure, this section turns to the third pillar of the theoretical framework: domestic institutions and economic capacity. If alliances shape investment structure and threats affect aggregate scale, institutional quality and economic feasibility may condition how defense resources are planned, allocated, and sustained over time.

The literature on political economy emphasizes that public investment outcomes depend not only on external pressures but also on state capacity and fiscal governance (Besley & Persson, 2011; North et al., 2009). In the defense sector, credible long-term planning requires bureaucratic competence, budgetary discipline, and institutional predictability (Markowski et al., 2010). Similarly, economic capacity determines the fiscal space available for sustaining capital-intensive modernization programs (Hou, 2018).

This section asks whether governance quality and economic development systematically influence the three defense dimensions analyzed, and whether their effects differ from those associated with alliances and threat exposure.

4.5.1 Governance indicators

The baseline models included two institutional capacity measures drawn from the Worldwide Governance Indicators: Government Effectiveness and Rule of Law. The first

captures the quality of public administration and service delivery; the second captures the predictability and enforcement of legal rules (World Bank, 2024).

Stronger governance should facilitate structured and stable defense investment. Long-term procurement programs require administrative competence, contractual enforcement, and intertemporal budget credibility (Besley & Persson, 2011). From this perspective, higher institutional quality could be expected to correlate positively with investment orientation and negatively with volatility.

The empirical results, however, suggest a more limited picture. Across the baseline specifications (Table 4.2 and Table 4.3), neither Government Effectiveness nor Rule of Law is statistically significant for aggregate military expenditure, investment orientation or volatility once country and year fixed effects are included. Within countries over time, changes in these indicators are not systematically translated into changes in defence outcomes.

This does not mean that institutions are irrelevant. Rather, it reflects how the fixed-effects strategy identifies the coefficients. Country fixed effects absorb persistent cross-national differences in governance quality. The remaining within-country variation in WGI scores is small and evolves slowly, making it difficult to detect clear short-run effects in panel regressions (North et al., 2009; Besley & Persson, 2011).

These findingss are consistent with recent defense economics research emphasizing that institutional quality shapes long-term development trajectories rather than short-term budget reallocations (Becker & Dunne, 2024). In the context of this thesis, governance appears to act as a background structural condition more than as a direct short-run driver of defense spending outcomes. Overall, compared with alliances and threats, domestic institutions seem to matter more in the long run than in the short run, so their influence is harder to pick up in these panel regressions.

4.5.2 Economic capacity

Economic capacity represents the second structural dimension considered in this section. In the theoretical framework, fiscal feasibility is a necessary condition for sustained defense investment. Alliances may help with coordination and threats may trigger reactive increases in spending, but long-term modernisation and stable procurement still depend on having enough economic resources (McGuire, 2007).

In the empirical analysis, log GDP per capita is used as a proxy for economic development and fiscal capacity. In much of the defence economics literature, richer countries are expected to spend more on defence because they have larger tax bases and more fiscal room (Hartley, 2024). Once country fixed effects are introduced, however, the logic

changes. The models in this thesis use within-country variation over time, not simple comparisons between rich and poor countries.

The baseline results show that log GDP per capita does not have a statistically significant effect on aggregate military expenditure once fixed effects are included. The coefficient is positive but imprecise. This suggests that short-run changes in income inside a country do not translate into proportional changes in defence budgets. Military spending is known to adjust slowly, with a high degree of inertia and persistence (Töngür et al., 2015).

A similar picture emerges for investment orientation. In the baseline model, log GDP per capita does not significantly predict the share of medium-term investment. Higher income, by itself, does not automatically generate a larger share of modernisation-oriented spending within countries over time. For volatility, income is again statistically insignificant. Short-run economic fluctuations do not systematically destabilise defence spending patterns.

The role of economic capacity becomes clearer when heterogeneity is modelled explicitly. Section 4.3.4 showed that the effect of NATO membership differs between lower- and higher-income allies: in lower-income countries, NATO membership is strongly associated with higher investment orientation, whereas in richer countries the effect is weaker. The interaction model in Section 4.3.5 confirmed that the marginal effect of NATO declines as income rises. Economic capacity, in other words, conditions how alliance commitments translate into investment behaviour rather than acting as a simple linear driver of spending.

This pattern is consistent with political-economy arguments that emphasise fiscal constraints (Besley & Persson, 2011; North et al., 2009). Lower-income states face more budget limits and greater uncertainty over future revenues, which makes it harder to commit to long-term equipment programmes. In these cases, alliance frameworks can provide an external anchor for modernisation. On the other hand, higher-income countries have more domestic capacity and can sustain structured investment even without strong external pressure (McGuire, 2007).

Taken together, the evidence suggests that economic capacity does not directly drive short-run changes in the level**,** composition**,** or stability of defence spending once fixed effects are accounted for.

Instead, it works as a conditioning factor that shapes the environment in which alliances and security threats operate.

4.5.3 Why institutional effects remain limited

The results in Sections 4.2 and 4.5 show that Government Effectiveness and Rule of Law do not have clear, statistically significant effects on the level, structure or volatility of defence spending once country and year fixed effects are included. This is not obvious, given how often recent debates on rearmament stress the role of good governance and efficient use of growing defence budgets (Tian et al., 2023; Becker & Dunne, 2024).

A first reason is methodological. Governance indicators, such as the Worldwide Governance Indicators, move slowly and capture broad, long-run features of state capacity. In a two-way fixed-effects model, most cross-country differences are absorbed by country dummies, so the coefficients rely on relatively small changes within each country over time (North et al., 2009). With such limited movement, it is hard to identify strong short-term effects on defence outcomes.

Second, institutional capacity is likely to affect defence spending indirectly**.** Work on fiscal and administrative quality shows that better governance improves policy implementation, transparency and bureaucratic efficiency (Rota, 2016). These issues are central to current discussions on improving the value of defence spending in Europe after 2022, but they mainly concern how well resources are used rather than how large the budget is (Hartley, 2024). In addition, defence budgets are often prepared inside specialised organisations, which can operate quite differently from the rest of the public administration (Markowsky et al., 2010).

Third, defence programmes are strongly path-dependent. Long-term contracts, ties with domestic industry and alliance commitments limit how quickly governments can modify existing plans (Bove & Nisticò, 2014). Changes in governance quality therefore do not automatically appear as immediate shifts in spending levels, composition or volatility.

Finally, institutional quality may work mainly as a conditioning environment. It can shape how effectively states use their economic capacity or how they implement alliance commitments, rather than determining spending patterns on its own (Becker & Dunne, 2024). This view is consistent with recent NATO and EU debates, which link stronger governance to more credible and coordinated capability development, not simply to higher budgets (Ostanina, 2024).

Overall, the evidence suggests that institutions matter more for the long-run feasibility and efficiency of defence planning than for the short-term movements captured by these panel models. The next section therefore turns to additional structural controls and robustness checks, focusing on militarisation intensity and arms-market integration.

4.6 Structural controls and robustness

The previous sections showed a clear pattern: NATO membership is associated with higher medium-term investment orientation, while threat exposure mainly affects aggregate military expenditure. Before moving on with the analysis, it is important to check whether these results survive a set of additional controls and robustness tests. The section addresses three related issues. It examines if the NATO coefficients might simply be capturing overall militarisation, if they could instead reflect participation in the international arms trade rather than alliance mechanisms, and if the main results change once sample composition and model specifications are varied. These issues are central in the recent debate on global rearmament after Russia's full-scale invasion of Ukraine, where both the level and the quality of defence effort are under scrutiny (Bachtiar et al., 2025). The following sections address these concerns, starting from structural controls for militarisation intensity and arms-trade integration, and then moving to defence-industrial structure, governance robustness and GDP per capita as an alternative outcome.

4.6.1 Militarisation intensity and arms-trade integration

A first concern is that the positive association between NATO membership and investment orientation might simply reflect how militarised a country already is. States with more intensive defence sectors could both be more likely to join formal alliances and to allocate a larger share of their budget to equipment and other capital-intensive items (Rota, 2016).

To address this, the baseline investment-orientation model includes the Global Militarisation Index (GMI) as a structural control. The GMI captures the broader weight of the military sector by combining information on military expenditure, personnel and major weapons systems relative to population and GDP (Bonn International Centre for Conflict Studies, 2023).

The results show that higher values of the GMI are positively associated with investment orientation. More militarised states tend to maintain more capital-intensive force structures and more regular modernisation cycles, in line with structural accounts of defence organisation (Albalate, Bel, & Elias-Moreno, 2012). However, the inclusion of the GMI does not remove the NATO effect. The coefficient on NATO membership remains positive and statistically significant, and its size changes only marginally. This suggests that alliance membership is not just a proxy for general militarisation intensity.

A second concern is that higher investment orientation may simply track international arms-trade integration. Countries that import large volumes of equipment will naturally show higher spendings, which could push up the investment-orientation measure. To control for this, the model adds logged arms imports (SIPRI Trend Indicator Values) as an additional structural variable (SIPRI, 2023).

Once fixed effects and other controls are included, arms imports do not have a statistically significant effect on investment orientation. Participation in the global arms market, by itself, does not systematically increase the medium-term investment share. More importantly, the NATO coefficient remains strong and positive when arms imports are added. The alliance effect therefore cannot be reduced to a simple correlation with procurement volumes.

Taken together, these structural controls confirm that militarisation intensity is related to investment orientation, but it does not explain away the NATO effect. Arms-trade integration does not drive the results either. The link between NATO membership and higher investment orientation seems to reflect alliance planning and common capability goals, for example the NATO Defence Planning Process, rather than just the size or equipment level of national armed forces (NATO, 2023a).

4.6.2 Defense industrial structure: producers vs buyers

One possible alternative explanation for the NATO–investment result concerns the defense-industrial structure of member states. Countries with established arms production capabilities might display higher investment shares because they produce and export weapons, not because of alliance membership itself (Markowski et al., 2010). In that case, the positive NATO coefficient in would mainly reflect the concentration of advanced producers inside the alliance.

To probe this mechanism, two additional specifications are estimated. First, a producer dummy is introduced, coded as 1 when a country records positive net arms exports and 0 otherwise. Second, a continuous measure of defense-industrial capacity is included using lagged logged arms exports (SIPRI TIV). In both cases, interaction terms between NATO membership and industrial capacity are added to test whether the alliance effect is conditional on being a producer. The detailed estimates are reported in the Appendix (Table 4.9).

The estimates show that producer status on its own is not statistically significant once country and year fixed effects are included. Logged arms exports also do not show a clear, independent association with investment orientation. Most importantly, the interaction terms between NATO membership and producer status or exports are not statistically significant either. Taken together, these results indicate that the positive association between NATO membership and medium-term investment orientation cannot be reduced to domestic arms production capacity. In other words, the NATO effect is not just a proxy for being an arms-exporting country.

This is consistent with the interpretation developed in the analysis that alliance integration seems to work mainly through planning and capability frameworks, such as common targets, NATO defence planning processes and standardisation, rather than through

industrial scale alone (NATO, 2023a). Industrial capacity may help countries implement modernization programmes, but it does not fully explain the patterns observed for lower-income NATO members, where alliance commitments are more clearly linked to investment-oriented spending. Since producer status does not explain the results, the NATO × income effect seems to reflect a specific role of NATO itself, not just threats or domestic defence-industrial capacity.

4.6.3 Governance robustness

A further robustness check concerns how institutional capacity is measured. Up to this point, the analysis relied mainly on Government Effectiveness and Rule of Law from the Worldwide Governance Indicators (WGI). These are standard proxies in political economy, but they capture only some aspects of governance quality (Kaufmann et al., 2010). It is therefore useful to see whether the results change when other institutional dimensions are introduced.

To do so, the investment-orientation model is re-estimated including two additional WGI indicators: Political Stability and Absence of Violence and Control of Corruption. Political stability captures the risk of government destabilisation and politically motivated violence, while control of corruption reflects constraints on rent-seeking and misuse of public resources (World Bank, 2024), both of which are central in debates on the efficient use of higher defence budgets after 2022 (Tian et al., 2023). The detailed estimates are reported in the Appendix (Table 4.10).

Across both specifications, the NATO coefficient remains positive, large and highly significant. Its magnitude is even stronger than in the baseline model, confirming that the association between alliance membership and higher investment orientation is not sensitive to how governance is measured. By contrast, the additional governance indicators are not statistically significant. Both variables do not shows a clear effect on medium-term investment shares once country and year fixed effects are included. This reflects the limited direct effects previously found for Government Effectiveness and Rule of Law: within countries over time, small movements in these governance scores do not translate into systematic changes in the share of the defence budget devoted to investment (North et al., 2009).

The implication is that changing the governance indicators does not alter the core results: the structuring effect of NATO membership on investment orientation is robust, while institutional variables have a weak short-run impact. Institutions still matter as part of the broader background of state capacity and fiscal governance (Besley & Persson, 2011), but in this empirical design they act more as slow-moving constraints than as immediate drivers of reallocation.

4.6.4 GDP per capita as alternative outcome

As a final robustness check, this section tests whether the core variables of the thesis capture defence-specific dynamics or mainly reflect broader patterns of economic development. The baseline model is therefore estimated using log GDP per capita as the dependent variable, and then using GDP per capita growth (Δ log GDP per capita) as an alternative outcome. The detailed estimates are reported in the Appendix (Table 4.11).

If NATO membership, threat or militarisation mainly act as proxies for development, their effects should become more visible once GDP, rather than defence outcomes, is used as the dependent variable.

In the level specification, NATO membership and Government Effectiveness are positive and statistically significant. This is not surprising, considering that most long-standing NATO members are high-income democracies, and better governance is strongly associated with higher income in the long run (Acemoglu & Robinson, 2012). Threat exposure is not significant, while The Global Militarization Index is positive and significant, which reflects the fact that many highly militarised states are also relatively rich, especially in Europe and North America (SIPRI, 2024).

The results change when the dependent variable is GDP per capita growth. In the growth specification, none of the core security variables like threat, NATO membership, militarisation, arms imports, is statistically significant. Governance indicators also lose significance. The within R^2 is very low, indicating that year-to-year changes in income are largely unrelated to the political and defence variables used in the main models (Dunne & Perlo-Freeman, 2003).

This brings to two main conclusions. First, the positive link between threat exposure and military spending in seen in the previous sections does not just mirror faster economic growth. Threat raises defence budgets, but it is not associated with systematic changes in GDP growth over the same horizon. This is in line with studies that find weak or ambiguous macroeconomic effects of military spending (Smith, 2009; Dunne & Tian, 2013).

Second, although NATO membership is correlated with higher income levels in the cross-section, it does not predict income growth once country fixed effects are included. This supports the identification strategy of the thesis: the NATO effect on investment orientation is unlikely to be a simple artefact of rich countries spending differently. It points instead to allocation patterns linked to alliance integration and capability planning (Becker & Dunne, 2024).

Overall, the GDP-outcome exercise reinforces the main interpretation. The factors that drive defence investment in this chapter do not just mirror standard development patterns. They work through defence-specific channels, alliances, threat, institutions and economic

capacity, in line with the theoretical framework of the thesis.

4.7 Summary of findings

This chapter set out to test whether threat exposure, alliance commitments, institutional quality and economic capacity affect defence spending in the same way across different dimensions. The results show clearly that they do not. Once defence expenditure is disaggregated into level, investment orientation and volatility, the explanatory mechanisms diverge. The evidence confirms that rearmament is not a single fiscal phenomenon. Defence effort in the 2020s unfolds across multiple dimensions: how much states spend, how they allocate that spending, and how stable those allocations remain over time.

However, the same does not hold for investment orientation. Threat exposure does not significantly increase the medium-term share of capital and R&D expenditure. When threat is disaggregated, external conflict is even associated with a lower investment share. In periods of heightened pressure, governments increase total spending but prioritise short-term operational needs over long-term modernization. This pattern is consistent with the idea that procurement cycles are path-dependent and embedded in multi-year planning frameworks (McGuire, 2007). The distinction is central: security shocks affect how much states spend, but not necessarily how they structure spending.

The second major result concerns alliance commitments. NATO membership does not systematically increase aggregate military expenditure once country fixed effects are included. This finding resonates with the long-standing burden-sharing debate, where formal commitments do not automatically translate into higher total spending (Sandler, 2001). At the same time, NATO membership is positively and robustly associated with higher medium-term investment orientation. This effect survives alternative codings, the exclusion of the United States as major spender, controls for militarisation intensity, arms imports, defence-industrial structure, and alternative governance indicators. Alliance commitments therefore shape the internal structure of defence budgets more than their aggregate size.

This interpretation is in line with recent work highlighting the role of institutionalised planning and capability coordination inside alliances (Becker & Dunne, 2024). It also reflects the policy context of NATO's post-2014 and 2022 emphasis on equipment spending and modernization targets. Alliance commitments appear to operate through coordination mechanisms and long-term capability planning rather than through simple pressure to spend more.

The interaction analysis further refines this result. The positive effect of NATO membership on investment orientation is strongest among lower-income countries and falls as income increases. For wealthier states, structured procurement systems can

already be embedded domestically (Hou, 2018), reducing the marginal impact of alliance membership. For lower-income states, alliance integration seems to function as a stronger external driver of modernization. This conditional effect highlights the importance of economic capacity as a background constraint rather than a direct short-run driver.

Institutional indicators, including Government Effectiveness and Rule of Law, do not show strong direct effects in the fixed-effects specifications. This does not imply that governance is irrelevant. Institutional capacity shapes long-term fiscal credibility and state effectiveness (Besley and Persson, 2011). However, within-country annual changes in governance indicators are limited, and defence procurement is highly path-dependent. Defence investment is embedded in structural and institutional arrangements that evolve slowly (Becker and Dunne, 2024). The panel design therefore captures short-run variation more effectively than deep institutional change. Institutions appear to function as conditioning environments rather than direct short-term drivers of defence reallocation.
Spending volatility is the least systematically explained dimension. Neither threat exposure nor NATO membership consistently predicts changes in volatility. This suggests that instability in defence investment is driven more by country-specific procurement timing, political turnover, or national shocks than by observable macro-political variables. Volatility reflects structural inertia and procurement timing more than systematic responses to alliance or threat shocks (Dunne & Perlo-Freeman, 2003).

Taken together, the findings confirm the central argument of this thesis. Defence spending is multidimensional. The determinants of aggregate expenditure differ from those of investment structure. Threat affects scale. Alliance commitments affect composition. Institutions and economic capacity condition these relationships rather than directly driving short-run changes. Volatility reflects deeper structural dynamics that are only partially captured by standard macro indicators.

By separating level, orientation and stability, the analysis moves beyond single-indicator approaches and shows that defence spending should be understood as a managed investment process rather than as a homogeneous fiscal aggregate. This empirical distinction provides the foundation for the broader theoretical implications discussed in the next chapter.

Chapter 5: Conclusions

This final chapter brings together the empirical and theoretical frameworks developed in the previous sections. The analysis has shown that defence spending cannot be treated as a single outcome. Scale, structure, and stability respond differently to strategic pressures and institutional contexts. The purpose of this chapter is not to restate the statistical results, but to interpret their broader meaning. It situates the findings within the research question, revisits the hypotheses, and reflects on their implications for alliance theory, contemporary defence debates, and future research. The central argument remains clear: understanding defence policy requires moving beyond aggregate expenditure and examining how budgets are internally organized over time.

5.1 Main findings

This thesis set out to examine whether strategic environment, institutional capacity, and economic feasibility shape defence spending in a uniform way across different dimensions of military expenditure. The empirical results indicate that they do not. Instead, their effects vary depending on whether the outcome captures aggregate levels, medium-term investment orientation, or spending volatility.

First, the analysis provides clear support for Hypothesis 1. Higher threat exposure is associated with higher aggregate military spending. This finding is consistent with the established literature on the demand for military expenditure, which shows that governments respond to observable insecurity by expanding defence budgets (Dunne & Perlo-Freeman, 2003; Hou, 2018). The relationship remains robust across specifications and confirms that threat primarily operates on the scale of defence effort. However, this effect does not extend systematically to the composition of spending. Increased insecurity raises how much states spend, but it does not automatically generate more investment-oriented allocation patterns. In other words, threat generates expansion, but it does not by itself generate modernization.

Second, the evidence strongly supports Hypothesis 4. NATO membership is consistently associated with higher medium-term investment orientation. This effect remains stable under alternative codings, including specifications that exclude the post-2022 war period and models that remove the United States or other large spenders from the sample. The association is therefore not driven by a single geopolitical shock or by scale dominance. It reflects a broader structural pattern.

This finding suggests that alliance integration influences the internal organization of defence budgets. Institutionalized alliances do not just affect burden-sharing at the aggregate level. They shape planning frameworks, capability targets, and procurement

priorities (Becker & Dunne, 2024). In the NATO context, the post-2014 Wales Summit commitments and the emphasis on investment benchmarks provide an institutional mechanism linking alliance participation to modernization incentives (NATO, 2014; Alozious, 2022). The empirical results are consistent with this interpretation. Alliance embeddedness appears to stabilize medium-term allocation patterns even when it does not uniformly raise total expenditure. Alliance participation therefore operates less as a simple fiscal contribution mechanism and more as a governance framework structuring long-term investment behaviour.

Third, Hypotheses 2 and 3 receive more limited support. Institutional quality and economic capacity show weaker and less systematic effects on investment orientation once fixed effects are included. Governance indicators do not emerge as strong predictors of structured allocation across countries over time. This does not imply that institutions are irrelevant. Rather, it suggests that institutional differences are relatively stable and largely absorbed by country fixed effects. Institutional capacity can matter more for long-term structural characteristics than for year-to-year variation.

Economic capacity remains important for the feasibility of defence effort. Higher income levels are associated with greater ability to sustain defence spending. However, economic strength does not automatically translate into modernization-oriented allocation patterns. Wealth enables defence effort, but it does not determine its internal direction. This supports the argument developed in the theoretical framework that fiscal capacity conditions defence policy without fully shaping its structural orientation. Fiscal feasibility is therefore a necessary condition for defence effort, but not a sufficient condition for structured capability development.

Finally, spending volatility proves more difficult to explain. The explanatory power of macro-political variables remains modest. While some evidence points to a moderating role for institutional capacity, volatility appears only partially captured by standard governance and threat indicators (Bove & Nisticò, 2014). This indicates that instability in defence investment is shaped by deeper national characteristics, procurement cycles, and structural adjustment dynamics that are not fully observable in annual cross-national data.

This suggests that defence policy cannot be understood as a purely reactive annual budgeting process. It is embedded in multi-year procurement commitments, contractual rigidities, and path-dependent investment trajectories.

Taken together, the results demonstrate that defence spending must be analyzed as a multidimensional phenomenon. Threat explains scale. Alliance integration helps explain structure. Volatility remains less systematically determined by the standard variables of the political economy of defence. These findings imply that treating defence expenditure as a single fiscal aggregate obscures the fact that distinct mechanisms operate across

scale, structure, and stability. This differentiation confirms the theoretical framework developed in Chapter 2 and supports the central argument of the thesis: magnitude, composition, and temporal stability represent distinct dimensions of defence policy, and they respond to different combinations of strategic and domestic factors. Defence policy should therefore be conceptualized not as a scalar fiscal output mechanically responding to geopolitical shocks, but as an intertemporal investment process governed by institutional coordination and economic constraints.

5.2 Rethinking defense spending: from scale to structure

The period covered by this analysis, 1990–2024, spans the most profound transformation of the international security order since 1945. It begins with the collapse of the bipolar system (Waltz, 1979) and the temporary consolidation of a liberal international order (Ikenberry, 2018). It ends in a geopolitical environment defined by renewed great-power rivalry, systemic competition, and high-intensity interstate war in Europe. Defence spending patterns during this period cannot be interpreted outside this structural shift.

The early 1990s marked a sharp contraction in military expenditure across advanced democracies. With the dissolution of the Soviet Union, perceived systemic threat declined. SIPRI data show a sustained global reduction in military spending throughout the decade (SIPRI, 2023; SIPRI, 2024). This period was widely described as the "peace dividend." Defence budgets were reduced, force structures were reduced and procurement programs were postponed. The security dilemma identified by Herz (1950, 2003) and Jervis (1978) appeared temporarily muted in Europe.

Yet the underlying alliance architecture remained intact. NATO expanded eastward, institutional commitments persisted and the bipolar threat structure disappeared, but collective defence arrangements survived.

The post-9/11 period altered the trajectory. Military expenditure increased significantly, particularly in the United States, as operations in Afghanistan and Iraq expanded (SIPRI, 2023). However, much of this growth reflected operational demands rather than structural modernization. Spending supported deployments, logistics, and personnel costs. It did not necessarily translate into sustained increases in investment-oriented allocation. The literature on defence demand has long emphasized that threat shocks increase aggregate expenditure (Smith, 1980; Dunne & Perlo-Freeman, 2003; Hou, 2018). The 2000s confirm this logic: scale responded but structure did not automatically adjust.

A deeper structural transformation began after 2014. Russia's annexation of Crimea challenged the assumption of a stable European security order (Brooks & Wohlforth, 2016). NATO's Wales Summit Declaration established a renewed political commitment to meet the 2 percent guideline and to move towards a 20 percent equipment share within ten years (NATO, 2014). This shift was important not only because it emphasized

aggregate effort, but because it explicitly targeted spending composition. Burden sharing was reframed as both quantitative and qualitative (Alozious, 2022).

The full-scale invasion of Ukraine in 2022 marked another inflection point. Global military expenditure reached record levels in 2023 and 2024, with Europe registering its largest annual increase in decades (SIPRI, 2024; Tian et al., 2023). Germany announced a €100 billion special defence fund (German Federal Government, 2022). Poland expanded large-scale procurement and Nordic and Eastern-flank states accelerated modernization programs (SIPRI, 2024). This renewed instability was not confined to Europe. The escalation of violence between Israel and Hamas in October 2023, and the subsequent regional spillovers involving Lebanon and Iran security dynamics, further intensified global threat perceptions. Military operations in Gaza and heightened tensions across the Middle East contributed to sustained defence mobilization and reinforced the perception of a deteriorating international security environment (SIPRI, 2024; Westerman, 2024). Taken together, these developments signal a structural transition toward a more conflict-prone and multipolar security landscape The security dilemma re-emerged in its classical form (Jervis, 1978). At the same time, strategic competition between the United States and China was formally institutionalized in defence planning documents (U.S. Department of Defense, 2022). The international system moved decisively away from the post–Cold War unipolar moment toward a more competitive and fragmented order.

In this new environment, defence debates increasingly extend beyond expenditure levels. They include industrial capacity, supply-chain resilience, and long-term modernization planning. The European Defence Industrial Strategy emphasizes coordinated procurement and reduced fragmentation (Clapp, 2024; Ostanina & Tardy, 2024). Military expenditure is no longer treated only as a fiscal aggregate. It is embedded within broader strategic and industrial ecosystems.

This historical trajectory frames the core contribution of the thesis.

Traditional models of military expenditure treat defence spending as a scalar outcome. The literature on demand for military spending (Smith, 1980; Dunne & Perlo-Freeman, 2003; Hou, 2018) explains variation primarily through threat exposure, regime type, economic capacity, and alliance commitments.

These models capture important determinants of aggregate expenditure. They remain empirically valid. The results of this thesis confirm that threat exposure is positively associated with total military spending. Hypothesis 1 is in fact supported. However, the empirical analysis demonstrates that this scalar perspective is incomplete. Defence spending is not a single dimension. It includes magnitude, composition, and temporal stability. Political economy models that focus exclusively on expenditure levels therefore capture only one layer of defence governance.

The results show that medium-term investment orientation is more closely associated with alliance integration than with threat exposure alone. This finding connects directly to the economics of alliances literature (Sandler, 2001; Sandler, 2025). Alliances influence not only burden sharing but also capability coordination. NATO's planning frameworks, collective targets, and interoperability standards shape procurement behavior over time. The "2/20" benchmark institutionalizes modernization incentives (NATO, 2014; Alozious, 2022). The empirical evidence suggests that alliance embeddedness is associated with more structured allocation patterns even when aggregate spending levels are controlled for.

This distinction becomes especially relevant in the post-2022 environment. Many states have increased defence budgets in response to renewed insecurity. Yet not all increases have translated into sustained modernization. Some expansions have prioritized personnel and short-term readiness. Others have been channeled into equipment and long-term capability development. Aggregate spending alone does not reveal these differences. In this context, measuring defence commitment only through headline budget increases can be misleading. Higher spending does not automatically translate into structural modernization.

The volatility dimension further reinforces the multidimensional perspective. Spending instability is only partially explained by macro-political variables. Institutional capacity and governance show limited systematic effects once fixed effects are included. This aligns with work highlighting the role of political dynamics and civil-military relations in shaping budgetary allocation (Bove & Nisticò, 2014). Volatility appears driven by country-specific institutional trajectories and procurement cycles rather than immediate threat shocks.

Taken together, the period 1990–2024 demonstrates that defence spending evolves along layered dimensions, strategic shocks alter scale, alliance structures influence allocation, domestic institutions condition stability and all these dimensions interact but remain analytically distinct.

Rethinking defence spending therefore requires moving beyond aggregate burden-sharing ratios. The central question is not only how much states spend, but how they allocate resources over time and within institutional frameworks.

In a geopolitical environment characterized by renewed rivalry and insecurity and industrial competition, this distinction is fundamental. Modernization capacity, interoperability, and long-term capability development depend on structural allocation patterns rather than short-term fiscal expansion alone. The empirical findings of this thesis support this reconceptualization. Defence policy must be understood as multidimensional: scale matters but structure matters differently. It should not be conceptualized as a scalar fiscal output mechanically responding to geopolitical shocks,

but as an intertemporal investment process governed by institutional coordination, procurement planning, and industrial capacity. Stability reflects deeper institutional characteristics and treating military expenditure as a single scalar variable obscures these distinctions. The post–Cold War trajectory makes this clear.

5.3 Implications for alliance theory and burden sharing

The empirical results of this thesis speak directly to alliance theory and to the long-standing debate on burden sharing within collective defence organizations. Classical alliance theory has traditionally conceptualized security as a public good (Sandler, 2001; Sandler, 2025).

In this framework, alliances mitigate external threats by pooling resources, but they also generate incentives for free-riding (Sandler, 2001). Smaller members may underinvest, relying on the capabilities of larger allies. The core empirical question has therefore focused on aggregate expenditure levels. Defence spending as a share of GDP has become the dominant metric of contribution. This logic has shaped both academic models and policy debates. Within NATO, the 2 percent of GDP guideline reflects precisely this approach. Contribution is treated as an input variable. States are evaluated according to fiscal effort relative to economic capacity. Under this view, alliance cohesion depends on whether members meet a quantitative threshold.

However, the empirical evidence presented in this thesis suggests that this scalar perspective is incomplete. NATO membership does not consistently increase aggregate military expenditure once threat exposure and economic capacity are controlled for. The effect of alliance membership on total spending is not systematic. Instead, the most robust association concerns medium-term investment orientation. Alliance embeddedness appears to influence how defence resources are allocated, rather than simply how much is spent. In other words, alliance participation does not automatically expand budgets. It structures them. This distinction challenges the traditional free-riding narrative. If alliance effects operate primarily through structural allocation patterns, then burden sharing cannot be assessed just through GDP ratios. A state may meet the 2 percent benchmark while allocating limited resources to modernization. Another may remain below the threshold but devote a high share of expenditure to equipment and capability development. Input measures alone obscure these differences. Headline ratios therefore capture effort, but not necessarily capability.

The shift from inputs to outputs has increasingly entered the burden-sharing debate. Scholars have argued that aggregate ratios fail to capture qualitative dimensions of contribution (Alozious, 2022). NATO's post-2014 evolution reflects this. The Wales Summit Declaration did not only reaffirm the 2 percent guideline. It also established the objective of allocating at least 20 percent of defence spending to major equipment within

a decade (NATO, 2014). Burden sharing was reframed as both quantitative and qualitative.

The findings of this thesis support this qualitative turn. NATO membership is associated with higher investment orientation over time. This association persists under alternative specifications and exclusion tests. It remains visible when the post-2022 war period is removed. It also survives the exclusion of the United States and other major spenders. This suggests that alliance integration operates through institutionalized planning frameworks rather than through short-term reactive spending. Alliance commitments appear to shape medium-term investment behaviour more consistently than short-term spendings.

The economics of alliances literature has recognized that institutions can mitigate collective action problems (Sandler, 2025). However, most empirical studies continue to treat aggregate expenditure as the main dependent variable. The present results indicate that alliance effects may be more visible in the internal structure of defence budgets. Alliances shape procurement expectations, standardize capability packages and influence modernization timelines. These mechanisms affect allocation choices across multi-year planning cycles.

This structural perspective becomes even more relevant in the contemporary geopolitical environment. Since 2014, NATO has faced renewed territorial aggression in Europe. Since 2022, high-intensity interstate war has returned to Europe. Global military expenditure reached record levels in 2023 and 2024 (SIPRI, 2024). Yet the increase in aggregate spending has not translated uniformly into modernization. Some states have prioritized personnel expansion and operational readiness. Others have focused on equipment acquisition and long-term capability development. The divergence confirms that scale and structure are analytically distinct. The current rearmament cycle therefore reinforces, rather than contradicts, the multidimensional argument developed in this thesis.

Recent political developments further complicate the burden-sharing debate. Uncertainty regarding the future of U.S. commitment to European security has intensified discussions about European responsibility. Alliance conditionality became explicit in political discourse. More recently, concerns about the durability of transatlantic commitments have re-emerged (Marrone, 2025). Analyses of NATO under potential renewed U.S. retrenchment emphasize that European allies must strengthen both spending levels and structural capability development to ensure credibility (Kremidas-Courtney, 2026).

This context reinforces the relevance of the present findings. If U.S. security guarantees become more conditional or politically contested, alliance sustainability depends less on headline spending ratios and more on credible modernization capacity. Structural allocation patterns, capability outputs and industrial resilience matter (Marrone, 2025).

The European debate on defence industrial strategy and strategic autonomy reflects this shift (Clapp, 2024; Ostanina & Tardy, 2024). Defence spending is increasingly embedded within broader questions of supply-chain resilience, coordinated procurement, and long-term industrial capacity.

Alliance theory must therefore adapt to this evolving reality. In an environment characterized by systemic competition and renewed great-power rivalry (U.S. Department of Defense, 2022), alliances do not function only as burden-sharing mechanisms. They operate as coordination platforms, aligning planning processes, establishing standards for interoperability and generating expectations about modernization trajectories. The empirical evidence suggests that these structural mechanisms are visible in investment orientation. NATO membership appears associated with more investment-oriented allocation patterns, even when aggregate spending levels remain controlled for. This does not eliminate cross-national variation. Domestic politics, fiscal constraints, and industrial capacity continue to shape outcomes. But it indicates that alliance embeddedness influences how states organize their defence budgets.

The exclusion tests further strengthen this interpretation. When the United States, considered the major NATO spender, is removed, the positive association between NATO membership and investment orientation persists. This aligns with asymmetry arguments in alliance theory. Larger powers retain greater strategic autonomy. Smaller members are more deeply embedded within collective planning frameworks and may therefore internalize alliance benchmarks more directly (Sandler, 2001).

These findings have theoretical implications. First, models of alliance contribution should incorporate multidimensional dependent variables. Aggregate spending captures only one dimension of contribution. Composition and temporal stability provide additional insight into how alliances shape behaviour. Second, the burden-sharing debate should move beyond fiscal ratios. Structural indicators such as equipment shares, modernization investment, and procurement coordination may offer a more accurate measure of alliance commitment. Alliance contribution is therefore not only a matter of magnitude, but of structure and time horizon.

In the current geopolitical climate, this distinction is not academic but also strategic. Debates about European defence responsibility, U.S. retrenchment, and alliance credibility increasingly revolve around capability outputs rather than fiscal inputs. The question is no longer only how much allies spend. It is whether they can sustain credible modernization and interoperability over time.

Overall, the findings of this thesis suggest that alliance theory must be recalibrated. Alliances influence scale under certain conditions, particularly when threat exposure is high. However, their more consistent and durable effect appears in shaping allocation

structure. Defence contribution is therefore not only a matter of magnitude. It is a matter of organization, coordination, and long-term capability development.

5.4 Limits of the design

No empirical design fully captures the complexity of defence policymaking. Cross-national panel analysis identifies structural regularities. It necessarily abstracts from detailed political processes. The design adopted in this thesis follows the dominant quantitative tradition in the economics of defence (Smith, 1980; Dunne & Perlo-Freeman, 2003; Hou, 2018). It prioritizes comparability across countries and consistency over time. This choice allows general patterns to emerge but it also imposes limits.

A first limitation concerns measurement. Military expenditure data, even when harmonized by SIPRI, remain aggregate indicators (SIPRI, 2024). They do not fully capture qualitative differences in procurement, readiness, or technological modernisation. The investment orientation variable relies on equipment shares over a multi-year window. This follows established practice in burden-sharing research (Alozious, 2022). However, equipment expenditure is an imperfect proxy for modernization quality. Capital investment may include upgrades of older systems or acquisition of advanced capabilities. The dataset does not distinguish between these categories.

The volatility measure faces similar constraints. Defence budgeting is often characterized by multi-year procurement cycles and lumpy capital expenditures (Bove & Nisticò, 2014). Annual fluctuations can reflect contractual timing rather than political instability. The statistical variance of expenditure over time captures instability in allocation. It cannot isolate underlying causes. This limitation is inherent in annual panel data.

A second limitation relates to institutional variables. Governance indicators such as rule of law and government effectiveness are widely used in cross-national research (World Bank, 2024). However, they change slowly over time. When country fixed effects are included, most cross-sectional variation is absorbed (Wooldridge, 2010). As a result, estimated coefficients reflect only within-country variation. This reduces statistical leverage. The limited effects observed for governance variables are therefore consistent with methodological expectations rather than necessarily with substantive irrelevance.

The same constraint applies to alliance membership. NATO membership is a relatively stable institutional characteristic. Fixed-effects estimation relies on temporal change. For long-standing members, alliance status is constant across most of the sample. This restricts within-country variation and limits identification. However, robustness checks across alternative codings mitigate concerns that results are driven by short-term geopolitical shocks (Becker & Dunne, 2024).

Endogeneity presents a further challenge. Defence spending, alliance participation, and threat exposure are jointly determined (Sandler, 2001). States facing higher threat may seek alliances, alliance membership may alter threat perceptions, military expenditure may provoke external reactions. The models use lagged independent variables to reduce simultaneity bias, following standard practice in defence economics (Hou, 2018). However, lagging does not eliminate reciprocal causality. The analysis identifies consistent associations, it does not establish strict causal sequencing.

Omitted variable bias is also possible. Defence allocation decisions are shaped by domestic political dynamics, civil-military relations, and bureaucratic capacity (Bove & Nisticò, 2014). Industrial base structure and existing force structure influence modernization trajectories. While country fixed effects absorb time-invariant national characteristics, time-varying domestic factors remain only partially captured. The design emphasizes structural determinants, it does not incorporate detailed political economy mechanisms.

The operationalization of threat can represent another limitation. The threat index aggregates internal and external conflict indicators. This follows the literature linking military expenditure to observable insecurity (Dunne & Perlo-Freeman, 2003). However, objective conflict indicators may diverge from perceived threat. Strategic culture and elite interpretation shape responses to similar external signals (Jervis, 1978). The design captures exposure but it cannot capture perception.

Economic feasibility is approximated through GDP per capita. This reflects structural fiscal capacity. It does not capture debt constraints, political preferences, or distributive trade-offs. Fiscal capacity conditions possibility but does not determine allocation choice (Hou, 2018). The distinction between feasibility and preference remains analytically important.

Data comparability across countries also requires caution. Military accounting practices differ. And the inclusion of pensions, paramilitary forces, or off-budget expenditures varies. Although SIPRI harmonizes reporting (SIPRI, 2024), measurement error cannot be excluded. Such error may attenuate coefficients and reduce precision.

Finally, the quantitative design limits direct observation of institutional mechanisms. The interpretation that alliance embeddedness shapes allocation structure through planning frameworks and capability targets is consistent with alliance theory (Sandler, 2001) and with recent NATO policy evolution (NATO, 2014). However, the dataset does not directly observe internal planning negotiations or procurement decision-making. Complementary qualitative research would strengthen causal inference.

Recognizing these limitations clarifies the scope of the findings. The results identify structural associations between threat and scale, and between alliance membership and allocation structure, but they do not fully capture the determinants of defence policy.

5.4.1 External validity

External validity raises additional considerations. The empirical analysis focuses primarily on NATO membership as the central institutional variable. NATO is the most institutionalized contemporary collective defence organization. It features integrated planning processes, interoperability standards, and capability benchmarks (NATO, 2014). The structural association between alliance membership and investment orientation may therefore reflect the depth of NATO's institutional architecture.

Other alliance systems may not exhibit similar structural effects. Alliances differ in legal obligations, enforcement mechanisms, and operational integration (Leeds et al., 2002). Less institutionalized arrangements can show weaker influence on allocation patterns. Extending the analysis to other alliance frameworks would test whether the structural mechanism generalizes beyond NATO.

Temporal context also matters. The period 1990–2024 covers distinct systemic phases: post-Cold War contraction, post-9/11 expansion, post-2014 deterrence adjustment, and post-2022 high-intensity interstate war. Structural alliance effects can vary across systemic conditions. Under low-threat environments, modernization incentives may weaken, on the other hand, under sustained insecurity, institutional coordination may intensify (Sandler, 2025). Geographic heterogeneity further complicates generalization. European NATO members face direct exposure to Russian military pressure, alliance embeddedness may interact with geographic proximity. Future research could test interaction effects between alliance membership and regional threat exposure.

Industrial context also affects external applicability. Contemporary defence policy increasingly integrates procurement coordination and industrial resilience (Clapp, 2024). The structural allocation patterns identified here may depend on industrial capacity and supply-chain integration. States lacking domestic defence industries can respond differently to alliance benchmarks.

Despite these limits, the distinction between scale and structure is not confined to the NATO case. Defence budgets everywhere involve trade-offs. Governments must decide how much to allocate to personnel, operations, and equipment. When threat levels rise, total spending usually increases. This pattern is well established in the literature (Dunne & Perlo-Freeman, 2003). What differs across contexts is how those additional resources are distributed. For this reason, external validity should not be assessed only in terms of coefficients. The exact size of the NATO effect may depend on institutional setting, geography, and strategic environment. But the underlying mechanism is broader. Alliance

integration can influence how defence budgets are organized, even when it does not systematically determine how large they are. That distinction between scale and structure travels beyond the specific sample examined here. It offers a conceptual lens that can be applied to other alliance systems and security environments.

5.5 Broader policy implications

The empirical findings of this thesis suggest that current policy debates on defence cannot be reduced to spending ratios alone. The evidence shows that threat exposure primarily affects the scale of defence budgets, while alliance membership is more closely associated with the structure of allocation. This confirms that defence policy does not operate along a single dimension. Scale and structure respond to different mechanisms and must be evaluated separately. This distinction matters in the present geopolitical environment. Since 2022, governments across Europe have increased defence budgets at an unprecedented rate. Global military expenditure reached record levels in 2023 and continued to grow in 2024 (SIPRI, 2024). Several European states met or exceeded the 2 percent benchmark for the first time in decades (NATO,2024). Yet aggregate increases do not automatically imply modernization, interoperability, or long-term capability development. Higher budgets signal political commitment. They do not automatically generate structural capability transformation.

This becomes particularly relevant in the context of NATO's evolving burden-sharing debate. The Wales Summit Declaration linked the 2 percent guideline to a qualitative commitment to allocate at least 20 percent of expenditure to major equipment within a decade (NATO, 2014). More recently, alliance discussions have increasingly emphasized output-oriented contributions, readiness targets, and capability packages rather than input ratios alone (Alozious, 2022). The empirical results of this thesis support this shift. If alliance membership is systematically associated with higher medium-term investment orientation, then the relevant policy question is not only how much is spent, but how resources are distributed within defence budgets. Meeting a fiscal threshold without restructuring allocation can satisfy political commitments without strengthening capabilities. Alliance frameworks therefore matter less as fiscal scorecards and more as governance mechanisms shaping investment behaviour.

This issue has gained further relevance as debates on European strategic responsibility intensify. During the Trump administration, questions about the sustainability of American security guarantees re-emerged (Kremidas-Courtney, 2026). European governments have responded by announcing significant spending increases. Germany established a €100 billion special defence fund in 2022 (German Federal Government, 2022). Poland accelerated procurement of advanced systems and expanded force modernization (SIPRI, 2024). Nordic and Eastern-flank states significantly increased equipment investment. However, the findings presented here imply that the sustainability

of these efforts depends less on headline budget figures and more on whether spending is structurally based on multi-year modernization planning. Alliance coordination can shape these trajectories, but it does not automatically guarantee convergence.

Industrial capacity further complicates this picture. The war in Ukraine exposed structural weaknesses in European defence production, including ammunition shortages and fragmented procurement markets (Ostanina & Tardy, 2024). The European Defence Industrial Strategy and related initiatives emphasize coordinated purchasing, supply-chain resilience, and scaling production capacity (Clapp, 2024). Defence expenditure is increasingly embedded within industrial policy and strategic autonomy debates (Ostanina & Tardy, 2024). This aligns with the structural dimension identified in this thesis. Investment orientation is not merely an accounting category. It reflects procurement cycles, technological upgrading, and industrial coordination. States that increase personnel spending without strengthening capital investment may raise aggregate budgets without improving long-term capability. Rearmament without structural industrial integration risks reproducing fragmentation rather than strengthening collective capacity.

The renewed centrality of great-power competition reinforces this conclusion. The 2022 U.S. National Defense Strategy formally prioritizes strategic competition with China (U.S. Department of Defense, 2022). Russia's full-scale invasion of Ukraine has reintroduced high-intensity interstate war into Europe (SIPRI, 2024). Simultaneously, conflict escalation in the Middle East has contributed to sustained global insecurity and regional destabilization (SIPRI, 2024). In such an environment, rapid fiscal expansion may be politically feasible. Yet structural modernization requires institutional continuity, procurement discipline, and industrial absorption capacity. The empirical results suggest that alliances can support this structural coordination, threat shocks alone do not. Threat generates urgency. It does not automatically generate coherent modernization. At the same time, fiscal sustainability remains a binding constraint. European governments face rising debt levels, inflationary pressures, and competing social expenditures. Defence budgets are politically salient but remain subject to domestic trade-offs (European Commission, 2024). The volatility findings in this thesis indicate that spending instability is not fully explained by macro-political variables. Budgetary cycles, coalition politics, and legacy procurement commitments shape trajectories over time (Bove & Nisticò, 2014). Defence investment is therefore an intertemporal commitment. It cannot be governed effectively through reactive annual adjustments alone. This implies that modernization strategies must be embedded within stable fiscal frameworks rather than short-term reactive expansions, otherwise, investment surges risk being followed by retrenchment.

Taken together, the policy implications are clear but cannot be reduced to a single dimension. Aggregate spending targets remain relevant. Threat environments still influence how much states allocate to defence. However, the composition and stability of

spending are equally decisive for long-term capability development. Alliance structures appear to influence allocation patterns in ways that extend beyond simple burden-sharing ratios. Industrial coordination, procurement planning, and modernization incentives operate at the structural level.

In a security environment characterized by systemic rivalry, supply-chain fragmentation, and renewed interstate war, defence policy must therefore be evaluated multidimensionally. Fiscal expansion alone does not guarantee modernization. Alliance commitments alone do not eliminate domestic constraints. Defence should not be treated as a simple fiscal output reacting mechanically to geopolitical shocks. It is a governed investment process unfolding over time. The distinction between scale, structure, and stability offers a more precise analytical lens for contemporary defence debates. This framework does not prescribe specific policy choices, it clarifies the dimensions along which those choices operate.

5.6 Future research

The findings of this thesis open several avenues for future research. The multidimensional framework developed here shows that defence spending cannot be reduced to a single scalar indicator. However, the available cross-national data constrain how precisely mechanisms can be identified. Future research can improve both empirical depth and theoretical clarity.

A first direction concerns institutional mechanisms. This thesis finds limited within-country effects for governance indicators once fixed effects are included. Yet institutional capacity has been shown to shape fiscal extraction, budget allocation, and state capacity over the long run (Acemoglu & Robinson, 2006). Institutional structures have been shown to influence cross-national patterns of military expenditure (Albalate et al., 2012; Bel & Elias-Moreno, 2009).

The absence of strong short-term effects in the present models can reflect slow-moving institutional persistence rather than irrelevance. Future work could combine panel data with historical institutional indicators to capture deeper structural mechanisms that are absorbed by country fixed effects in annual models.

Second, regime dynamics deserve more specific analysis. A large literature links regime type and political accountability to defence allocation (Fordham & Walker, 2005; Yildirim & Sezgin, 2005; Töngür, Hsu, & Elveren, 2015; Lopes da Silva, 2023). Some studies show that democracies allocate military resources differently from autocracies. Others emphasize the role of political leaders and elite incentives (Conrad et al., 2013). The present thesis controls for institutional quality but does not explicitly model leadership turnover, ideological orientation, or electoral cycles. Recent work shows that

political ideology shapes military spending choices in EU and NATO countries (Olejnik, 2025). Incorporating leader-level or executive-level variables could clarify whether alliance embeddedness interacts with domestic political competition in shaping modernization decisions.

Third, the fiscal dimension can be integrated more directly. Military spending is embedded in broader public finance constraints. Fiscal capacity influences defence effort and interacts with democratic institutions (Rota, 2016). The link between military expenditure and public debt has been highlighted in the literature (Dunne et al., 2004). The present analysis includes GDP per capita but does not explicitly model fiscal space or debt burdens. Given rising public debt levels and tightening fiscal conditions in advanced economies (European Commission, 2024), future research should examine how debt-to-GDP ratios, tax capacity, and deficit rules condition modernization trajectories. This would link the scale–structure distinction to macro-fiscal sustainability.

Fourth, technological transformation deserves greater attention in future research. Military modernization today is not only about equipment shares. It involves emerging technologies, digital capabilities, and innovation ecosystems. Emerging military technologies alter strategic competition and capability hierarchies (Horowitz, 2020) and determinants vary across components of military spending (Becker and Dunne, 2024). A more detailed differentiation between traditional procurement and high-technology investment would clarify whether alliance coordination affects advanced capability development differently from conventional force modernization.

Fifth, cross-regional comparison would strengthen external validity. Much of the literature on military expenditure has focused on developing countries (Walt & Perlo-Freeman, 2003) or specific regions such as Asia (Hou, 2018). The present analysis centers heavily on NATO states. Future work could test whether the scale–structure distinction holds in Asia-Pacific alliances, Middle Eastern security environments, or hybrid regimes. The armed conflict datasets developed by Gleditsch et al. (2002) and Sarkees and Wayman (2010) provide opportunities to extend threat-based models to alternative regions.

Sixth, the volatility dimension requires more targeted modelling. Volatility may reflect procurement cycles, leadership change, civil–military relations, or strategic uncertainty. Policy uncertainty has been shown to affect investment behaviour in broader economic contexts (Rodrik, 1991). Similar mechanisms may operate in defence budgeting. Military involvement in politics has been found to influence budget allocations (Bove & Nisticò, 2014). Future research could operationalize political instability, coalition fragmentation, or executive turnover as predictors of defence spending instability.

Another important avenue concerns how different institutional frameworks shape defence allocation within advanced democracies. The empirical results of this thesis identify a

structural association between alliance embeddedness and investment orientation in the global sample. Yet alliances are not homogeneous institutional environments. NATO operates through formalized defence planning procedures, capability targets, and structured burden-sharing benchmarks (Alozious, 2022). Its coordination mechanisms are explicitly military and operational.

As a first exploratory step, the baseline investment-orientation model was re-estimated on an EU-only sample (see Table 5.1 and Figure 5.1 in the Appendix). In this subsample, several variables lose independent variation once fixed effects are included. NATO membership cannot be separately identified, largely because most EU countries in the observed period are also NATO members. Threat exposure is similarly absorbed by country and year effects. Some structural indicators remain correlated with allocation patterns, but the smaller sample and limited variation require caution. This exercise is not meant to establish a new result, but serves to illustrate how institutional context affects what can be identified empirically. The comparison suggests that the association observed in the global model may be linked to specific features of NATO's institutional configuration rather than to regional integration more broadly. Whether this reflects hierarchical planning mechanisms, coordination intensity, or other structural features remains an open question. A more systematic comparative design would be needed to assess this more precisely.

The European Union represents a different governance model. Its defence role has expanded through industrial policy instruments, regulatory coordination, and joint procurement initiatives (Clapp, 2024). Yet it lacks a centralized operational command structure and formal capability enforcement mechanisms comparable to NATO. Coordination is more decentralized and authority is more diffuse.

Future research should therefore move beyond binary alliance membership and differentiate between types of institutional coordination. A comparative design distinguishing hierarchical military alliances like NATO from regulatory integration frameworks could clarify whether modernization incentives depend on formal capability benchmarks, power asymmetries, or normative coordination processes. Modelling interaction effects between alliance type and institutional depth would allow a more precise identification of structural mechanisms.

Such an approach would deepen the scale–structure framework developed in this thesis. It would test whether the disciplining effect identified for NATO is a property of alliance embeddedness per se or a function of institutional architecture.

This thesis set out to move beyond the traditional question of how much states spend on defence. The evidence presented across the chapters shows that this question is incomplete. Military expenditure is not a single outcome, but a multidimensional governance process shaped by distinct logics. Threat exposure increases aggregate

spending, confirming classical security-dilemma dynamics (Herz, 1950; Jervis, 1978). Alliance membership, by contrast, is associated not with higher budgets, but with a more investment-oriented internal structure, especially among lower-income members, consistent with institutional coordination theories (Sandler, 2001; Becker & Dunne, 2024). Institutional quality and economic capacity operate more as conditioning environments than as direct short-term drivers, reinforcing the view that defence budgeting is deeply path-dependent and embedded in long-term procurement cycles (McGuire, 2007; Hou, 2018).

The broader implication is clear. Rearmament is not only a quantitative phenomenon. It is an organizational and intertemporal choice. States react to insecurity by expanding expenditure, but they structure investment through institutional commitments and fiscal feasibility. The distinction matters. A reactive spending increase does not necessarily produce sustained modernization, and alliance integration does not automatically generate higher aggregate effort. Defence policy therefore reflects the interaction between external pressure and internal governance capacity, not a simple mechanical response to conflict.

In a security environment increasingly defined by geopolitical fragmentation, strategic uncertainty and renewed great-power rivalry, understanding this differentiation is essential. If policymakers focus exclusively on headline spending targets, they risk overlooking the structural dimension that ultimately determines capability development and long-term readiness. The findings of this thesis suggest that the future of defence policy will depend less on temporary expenditure spikes and more on the institutional frameworks that stabilize investment decisions over time. In that sense, defence spending is not merely a reaction to threat. It is a test of state capacity, alliance integration and strategic planning under uncertainty.

Appendix

Table 3.1 summarizes the operationalization of the key dependent and independent variables

Variable category	Concept	Variable name	Operationalization	Source	Temporal treatment
Dependent variable	Military spending level (benchmark)	milexp_gdp	Military expenditure as share of GDP	SIPRI / World Bank (WDI)	Annual
Dependent variable	Defense investment orientation	invest_orientation_5y	Five-year rolling measure of directional persistence in military expenditure growth (captures sustained upward or downward trajectories rather than compositional shares)	SIPRI (constructed)	5-year rolling window
Dependent variable	Defense spending volatility	invest_volatility	Five-year rolling standard deviation of military expenditure growth rates	SIPRI (constructed)	5-year rolling window
Institutional capacity	Government effectiveness	gov_effect	Index of public service quality, bureaucratic competence, and credibility of policy implementation	Worldwide Governance Indicators (World Bank)	Lagged (t-1)
Institutional capacity	Rule of law	rule_of_law	Index of contract enforcement,	Worldwide Governan	Lagged (t-1)

			legal credibility, and constraints on executive power	ce Indicators (World Bank)	
Economic capacity	Income level	log_gdppc	Log of GDP per capita (constant USD)	World Bank (WDI)	Lagged (t-1)
Strategic environment	Threat exposure	threat_total	Composite indicator of internal armed conflict and external militarized disputes	UCDP / Correlates of War	Lagged (t-1)
Strategic environment	Alliance commitment	nato_member	Binary indicator of NATO membership (1 = member)	Correlates of War Alliances Dataset	Lagged (t-1)
Structural control	Aggregate militarization	militarization_index	Global Militarization Index (GMI)	Bonn International Centre for Conflict Studies (BICC)	Lagged (t-1)
Structural control	Arms trade integration	arms_trade_ratio	Military imports + exports (TIV) as share of total merchandise trade	SIPRI Arms Transfers Database	Lagged (t-1)
Structural control	Country size	log_population	Log of total population	World Bank (WDI)	Lagged (t-1)
Controls	Time-invariant heterogeneity	Country FE	Country fixed effects	—	—
Controls	Common shocks	Year FE	Year fixed effects	—	—

Table 4.1 Descriptive statistics

Variable	N	Mean	SD	Min	Max
Military expenditure (USD)	5909	10,838.353	63,298.931	0.000	1,031,257.143
Investment orientation (5y)	5322	0.595	0.276	0.000	1.000
Spending volatility (5y)	5210	0.123	0.109	0.000	0.882
Threat exposure	2611	0.905	0.293	0.000	1.000
NATO membership	3514	0.141	0.348	0.000	1.000
Government effectiveness (WGI)	5694	-0.105	1.012	-2.440	2.470
Rule of law (WGI)	5800	-0.119	1.022	-2.591	2.125
Log GDP per capita	7939	8.461	1.470	5.116	12.418
Global Militarization Index	5777	130.657	66.175	0.000	500.000
Log arms imports (TIV)	8540	1.778	2.338	0.000	8.570

Table 4.4 Baseline fixed effects model: spending volatility

Variable	Spending Volatility
Threat (t−1)	−0.0140 (0.0118)
NATO member (t−1)	0.0535 (0.1186)
Government effectiveness (t−1)	−0.0035 (0.0229)
Rule of law (t−1)	0.0233 (0.0392)
Log GDP per capita (t−1)	−0.0104 (0.0342)
Country FE	Yes
Year FE	Yes
Observations	698
R^2	0.6612
Within R^2	0.0063

Notes: OLS estimates with country and year fixed effects. Standard errors clustered at the country level. * p < 0.05; ** p < 0.01; *** p < 0.001.

Figure 4.1 Investment orientation in NATO and non-NATO countries, 1990–2024

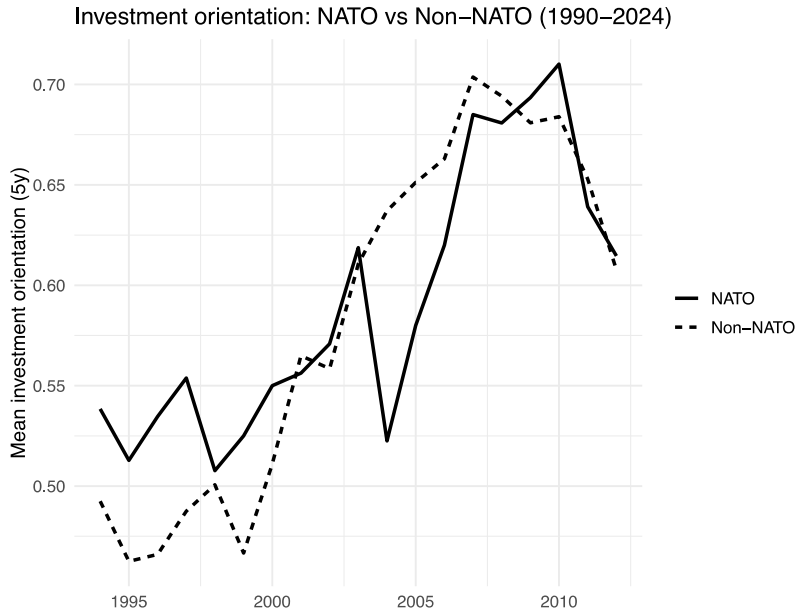


Table 4.5 Alternative NATO specifications (Investment orientation)

Variable	Baseline	NATO Pre-2022	Pre-2022 Sample
Threat (t-1)	0.0456 (0.0924)	0.0419 (0.0950)	0.0438 (0.0972)
NATO member (t-1)	0.3010* (0.1436)	0.2785* (0.1504)	0.2661* (0.1528)
Government effectiveness (t-1)	-0.0964 (0.1000)	-0.0921 (0.1048)	-0.0884 (0.1071)
Rule of law (t-1)	0.0546 (0.1249)	0.0493 (0.1302)	0.0517 (0.1339)
Log GDP per capita (t-1)	0.0182 (0.1590)	0.0205 (0.1624)	0.0179 (0.1651)
Global Militarization Index (t-1)	0.0018* (0.0008)	0.0017* (0.0008)	0.0016* (0.0008)
Log arms imports (t-1)	-0.0059 (0.0069)	-0.0056 (0.0071)	-0.0053 (0.0073)
Observations	651	620	598
Within R^2	0.0414	0.0398	0.0387

Notes: OLS estimates with country and year fixed effects. Standard errors clustered at the country level. * p < 0.05; ** p < 0.01; *** p < 0.001.

Table 4.6 Robustness: excluding the United States

Variable	Baseline	Excluding US
Threat (t-1)	0.0456 (0.0924)	0.0591 (0.0931)
NATO member (t-1)	0.3010* (0.1436)	0.2475. (0.1342)
Government effectiveness (t-1)	-0.0964 (0.1000)	-0.1026 (0.1105)
Rule of law (t-1)	0.0546 (0.1249)	0.0509 (0.1305)
Log GDP per capita (t-1)	0.0182 (0.1590)	0.0717 (0.1654)
Country FE	Yes	Yes
Year FE	Yes	Yes
Observations	651	637
R^2	0.5154	0.5129
Within R^2	0.0414	0.0202

Notes: OLS estimates with country and year fixed effects. Standard errors clustered at the country level. * p < 0.05; ** p < 0.01; *** p < 0.001.

Table 4.7 Investment orientation by income group

Variable	Low Income	High Income
Threat (t-1)	0.1081 (0.0655)	-0.7942*** (0.0498)
NATO member (t-1)	0.4493*** (0.1132)	0.0971 (0.1939)
Government effectiveness (t-1)	-0.0961 (0.1306)	-0.1026 (0.1193)
Rule of law (t-1)	0.1994 (0.1791)	0.0088 (0.1103)
Log GDP per capita (t-1)	-0.0284 (0.2604)	0.3011 (0.2009)
Country FE	Yes	Yes
Year FE	Yes	Yes
Observations	322	324
R^2	0.4720	0.6435
Within R^2	0.0416	0.0866

Notes: OLS estimates with country and year fixed effects. Standard errors clustered at the country level. * p < 0.05; ** p < 0.01; *** p < 0.001.

Table 4.8 Disaggregated threat effects

Variable	Military Expenditure	Investment Orientation	Spending Volatility
External conflict (t-1)	303.9 (196.1)	−0.0949* (0.0459)	0.0107 (0.0108)
Internal conflict (t-1)	−212.2 (453.5)	0.0670 (0.0632)	−0.0100 (0.0164)
Country FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	562	491	534

Notes: OLS estimates with country and year fixed effects. Standard errors clustered at the country level. * p < 0.05; ** p < 0.01; *** p < 0.001.

Table 4.9 NATO, Investment orientation and defense industrial structure

Variable	Baseline	Producer Dummy Model	Exports Interaction Model
NATO member (t-1)	0.3010* (0.1436)	— (collinear)	— (collinear)
Producer dummy (t-1)		-0.0193 (0.0315)	
Log arms exports (t-1)			0.0026 (0.0029)
NATO × Producer		0.1319 (0.0851)	
NATO × Exports			0.0583 (0.0391)
External conflict (t-1)		-0.0947* (0.0461)	-0.0944* (0.0459)
Internal conflict (t-1)		0.0669 (0.0633)	0.0666 (0.0628)
Government effectiveness (t-1)		-0.0396 (0.1090)	-0.0415 (0.1091)
Rule of law (t-1)		0.0640 (0.1522)	0.0673 (0.1535)
Log GDP per capita (t-1)		0.0028 (0.1975)	-0.0043 (0.1961)
Country FE / Year FE	Yes / Yes	Yes / Yes	Yes / Yes

Notes: OLS estimates with country and year fixed effects. Standard errors clustered at the country level. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 4.10 Governance robustness with alternative institutional indicators

Variable	Political Stability Model	Control of Corruption Model
Threat (t-1)	-0.0036 (0.1157)	-0.0098 (0.1134)
NATO member (t-1)	0.4283*** (0.0586)	0.4481*** (0.0742)
Government effectiveness (t-1)	-0.1160 (0.1329)	-0.0639 (0.1228)
Rule of law (t-1)	0.0890 (0.1421)	—
Political stability (t-1)	0.0522 (0.0523)	—
Control of corruption (t-1)	—	0.0353 (0.1230)
Log GDP per capita (t-1)	-0.0826 (0.1853)	-0.0472 (0.2063)
Global Militarization Index (t-1)	0.0024* (0.0011)	0.0026* (0.0011)
Log arms imports (t-1)	-0.0102 (0.0069)	-0.0101 (0.0073)

Observations: 433 (both models)
Country FE: Yes
Year FE: Yes
Adj. R^2: 0.5488 (Political Stability); 0.5417 (Control of Corruption)
Within R^2: 0.0785 (Political Stability); 0.0614 (Control of Corruption)
Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Across both specifications, the NATO coefficient

Table 4.11 GDP per capita as alternative outcome

Variable	Log GDP per capita (Level)	Δ Log GDP per capita (Growth)
Threat (t-1)	-0.0178 (0.0427)	0.0346 (0.0248)
NATO member (t-1)	0.1615* (0.0666)	-0.0084 (0.0236)
Government effectiveness (t-1)	0.1842** (0.0593)	0.0138 (0.0127)
Rule of law (t-1)	0.0992 (0.0768)	0.0033 (0.0149)
Global Militarization Index (t-1)	0.0020* (0.0008)	-0.00009 (0.0001)
Log arms imports (TIV) (t-1)	0.0067 (0.0051)	-0.0010 (0.0016)
Country FE	Yes	Yes
Year FE	Yes	Yes
Observations	766	766
R^2	0.99336	0.31099
Within R^2	0.19092	0.01621

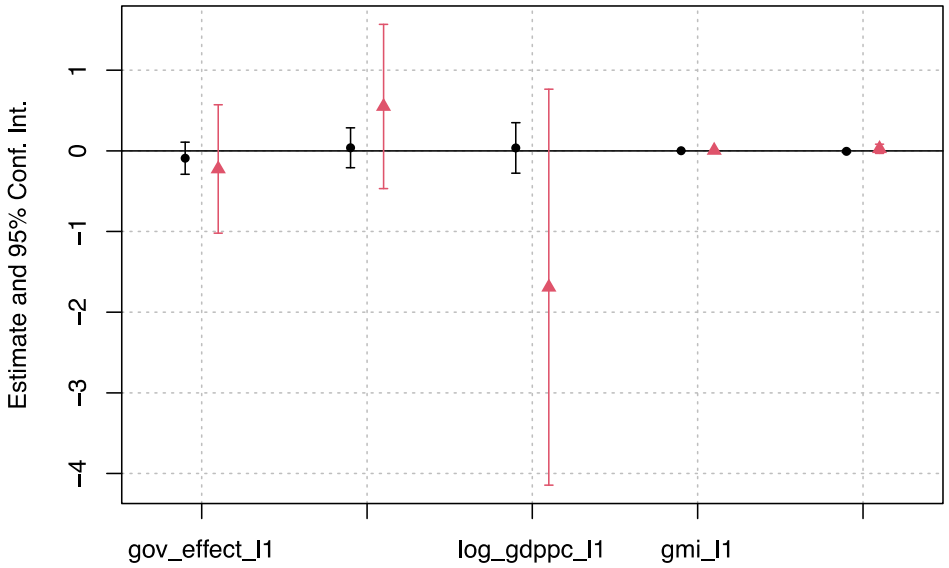
Notes: OLS estimates with country and year fixed effects. Standard errors clustered at the country level. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.All models include country and year

Table 5.1 Investment orientation model: global vs EU-only sample

Variable	Global Sample	EU-only Sample
Threat (t-1)	0.0464 (0.0933)	
NATO member (t-1)	0.2964* (0.1324)	
Gov effectiveness (t-1)	-0.0914 (0.0998)	-0.2254 (0.3684)
Rule of law (t-1)	0.0376 (0.1239)	0.5500 (0.4711)
Log GDPpc (t-1)	0.0354 (0.1569)	-1.690 (1.136)
GMI (t-1)	0.0016. (0.0008)	0.0044** (0.0013)
Log arms imports (t-1)	-0.0057 (0.0067)	0.0255 (0.0260)

Fixed Effects: Country and Year
Standard errors clustered at the country level.
Observations: Global = 665; EU-only = 60
R^2: Global = 0.508; EU-only = 0.585
Within R^2: Global = 0.037; EU-only = 0.199
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Figure 5.1 Comparison of investment orientation determinants: global vs EU-only



Bibliography

- Acemoglu, D., & Robinson, J. A. (2006). De facto political power and institutional persistence. *American Economic Review, 96*(2), pp. 325–330. https://economics.mit.edu/sites/default/files/publications/de%20facto%20political%20power%20and%20institutional%20persist.pdf

- Acharya, A. (2017). After Liberal Hegemony: The Advent of a Multiplex World Order. *Ethics & International Affairs*, *31*(3), pp. 271–285. https://www.cambridge.org/core/journals/ethics-and-international-affairs/article/after-liberal-hegemony-the-advent-of-a-multiplex-world-order/DBD581C139022B1745154175D2BEC639

- Albalate, D., Bel, G., & Elias, F. (2012). *Institutional determinants of military spending*. (2), pp. 279–290. https://doi.org/10.1016/j.jce.2011.12.006

- Alozious, J. (2022). *NATO's Two Percent Guideline: A Demand for Military Burden Sharing or a Demand for Military Outputs?* Defence and Peace Economics, 33(8), pp. 993–1012. https://ideas.repec.org/a/taf/defpea/v33y2022i4p475-488.html

- Atlantic Council. (2023). *The pathway to NATO's "2/20" goal is through real growth of defense spending.* New Atlanticist Blog. https://www.atlanticcouncil.org/blogs/new-atlanticist/live-expertise-and-behind-the-scenes-insight-as-nato-leaders-gather-at-the-washington-summit/

- Bachtiar, M., Ahmad, I., Sahabuddin, Z. A., & Trismadi, T. (2025). *A comprehensive meta-analysis of determinants influencing military expenditure: New methodological insights and implications for defence budget allocation*. Statistica Politica, 16(1), pp 87–103. https://doi.org/10.1515/spp-2024-0024

- Becker, J., & Dunne, J. P. (2024, September 22). *Determinants of components of military spending*. SSRN. https://doi.org/10.2139/ssrn.4964245

- Becker, J., & Dunne, J. P. (2024). *Determinants of components of military spending*. Manuscript. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4964245

- Bel, G., & Elias-Moreno, F. (2009). *Institutional determinants of military spending* (Working Paper No. 2009/22). Research Institute of Applied Economics

(IREA), University of Barcelona. https://www.ub.edu/irea/working_papers/2009/200922.pdf

- Besley, T., & Persson, T. (2011). The logic of political violence. *The Quarterly Journal of Economics, 126*(3), pp. 1411–1445. https://doi.org/10.1093/qje/qjr025

- Boese, V. A. (2019). How (not) to measure democracy. *International Area Studies Review, 22*(2), pp. 95–127. https://doi.org/10.1177/2233865918815571

- Bollen, K. A. (1980). Issues in the comparative measurement of political democracy. *American Sociological Review, 45*(3), pp. 370–390. https://doi.org/10.2307/2095172

- Bonn International Centre for Conflict Studies (BICC). (2023). *Global Militarisation Index 2023.* Bonn International Centre for Conflict Studies. https://gmi.bicc.de/

- Bove, V., & Nisticò, R. (2014). *Military in politics and budgetary allocations*. Journal of Comparative Economics, 42(4), pp. 1065–1078. https://doi.org/10.1016/j.jce.2014.02.002

- Brooks, S. G., & Wohlforth, W. C. (2016). *The rise and fall of the great powers in the twenty-first century. International Security, 40*(3), pp. 7–53. https://doi.org/10.1162/ISEC_a_00225

- Cameron, A. C., & Miller, D. L. (2015). *A practitioner's guide to cluster-robust inference. Journal of Human Resources, 50*(2), pp. 317–372. https://doi.org/10.3368/jhr.50.2.317

- Carter, J. (2024). Political leaders and military spending. *Conflict Management and Peace Science, 41*(2), pp. 132–154. https://doi.org/10.1177/07388942231199164

- Clapp, S. (2024). *European defence industrial strategy.* European Parliamentary Research Service Briefing, PE 762.402. https://www.europarl.europa.eu/RegData/etudes/BRIE/2024/762402/EPRS_BRI(2024)762402_EN.pdf

- Conrad, J., Kim, H.-C., & Souva, M. (2013). Narrow interests and military resource allocation in autocratic regimes. *Journal of Peace Research, 50*(6), pp.

737–750. https://doi.org/10.1177/0022343313498885

- Dunne, J. P., & Perlo-Freeman, S. (2003). The demand for military spending in developing countries: A dynamic panel analysis. *Defence and Peace Economics, 14*(6), pp. 461–474. https://doi.org/10.1080/1024269032000085224

- Dunne, John & Perlo-Freeman, Sam & Soydan, Aylin. (2004). *Military expenditure and debt in South America.* Defence and Peace Economics. 15. pp. 173-187. https://www.researchgate.net/publication/227352469_Military_expenditure_and_debt_in_South_America

- Ecer, S., & Veasey, N. J. (2015). *The Shifting Determinants of Defense Spending Preferences Between 1980 and 2008.* Defence and Peace Economics, 26(1), pp. 75–88. https://doi.org/10.1080/10242694.2013.848578

- Elbadawi, I. A., & Keefer, P. (2014). *Democracy, democratic consolidation and military spending* (Working Paper No. 848). Economic Research Forum. https://erf.org.eg/app/uploads/2015/12/848.pdf

- European Commission. (2024). *European Economic Forecast – Autumn 2024.* European Commission, Directorate-General for Economic and Financial Affairs. https://economy-finance.ec.europa.eu/economic-forecast-and-surveys/economic-forecasts/autumn-2024-economic-forecast_en

- Fearon, J. D. (1995). Rationalist explanations for war. International Organization, 49(3), pp. 379–414. https://www.cambridge.org/core/journals/international-organization/article/abs/rationalist-explanations-for-war/E3B716A4034C11ECF8CE8732BC2F80DD

- Fordham, B. O., & Walker, T. C. (2005). *Kantian liberalism, regime type, and military resource allocation: Do democracies spend less?* International Studies Quarterly, 49(1), pp. 141–157. https://doi.org/10.1111/j.0020-8833.2005.00337.x

- Gbadebo, A. D., Bekun, F. V., Akande, J. O., & Adekunle, A. O. (2025). Defence spending and real growth in an asymmetric environment: Accessing evidence from a developing economy. *International Journal of Finance & Economics, 30*(2), pp. 1372–1389. https://doi.org/10.1002/ijfe.2966

- Gbadebo, A. D., Bekun, F. V., Akande, J. O., & Adekunle, A. O. (2025). *Defence spending and real growth in an asymmetric environment: Accessing evidence*

from a developing economy. International Journal of Finance & Economics, 30(2), pp. 1372–1389. https://doi.org/10.1002/ijfe.2966

- German Federal Government (2022) Federal Government of Germany. (2022). *100 billion euro special fund for the Bundeswehr*. https://www.bmvg.de/en/news/over-eur-100-billion-for-the-bundeswehr-and-for-our-security-5362626

- Gleditsch, N. P., Wallensteen, P., Eriksson, M., Sollenberg, M., & Strand, H. (2002). *Armed conflict 1946–2001: A new dataset. Journal of Peace Research, 39*(5), pp. 615–637. https://doi.org/10.1177/0022343302039005007

- Herz, J. H. (1950). Idealist internationalism and the security dilemma. *World Politics, 2*(2), pp. 157–180. https://doi.org/10.2307/2009187

- Herz, J. H. (1951). *Political realism and political idealism: A study in theories and realities*. University of Chicago Press.

- Herz, J. H. (2003). The security dilemma in international relations: Background and present problems. *International Relations, 17*(4), pp. 411–416. https://doi.org/10.1177/00471178030174005

- Herz, J. H. (2003). The security dilemma in international relations: Background and present problems. *International Relations, 17*(4), pp. 411–416. https://journals.sagepub.com/doi/abs/10.1177/0047117803174001

- Hewitt, D. P. (1991). *What determines military expenditures? Empirical evidence on the economic and political factors that influence national military spending*. Finance & Development, 28(4), pp. 22–25. https://www.elibrary.imf.org/view/journals/022/0028/004/article-A008-en.xml

- Hou, D. (2018). *The determinants of military expenditure in Asia and Oceania, 1992–2016: A dynamic panel analysis*. Peace Economics, Peace Science and Public Policy, 24(4), pp. 1–20. https://doi.org/10.1515/peps-2018-0004

- Ikenberry, G. J. (2018). *The end of liberal international order? International Affairs, 94*(1), pp. 7–23. https://doi.org/10.1093/ia/iix241

- J. Paul Dunne & Ron Smith & Dirk Willenbockel, 2005. *"Models Of Military Expenditure And Growth: A Critical Review,"* Defence and Peace Economics, Taylor & Francis Journals, vol. 16(6), pp. 449-461. https://doi.org/10.1080/10242690500167791

- Jervis, R. (1976). *Perception and Misperception in International Politics: New Edition* (REV-Revised). Princeton University Press. https://doi.org/10.2307/j.ctvc77bx3

- Jervis, R. (1978). Cooperation under the security dilemma. *World Politics, 30*(2), pp. 167–214. https://doi.org/10.2307/2009958

- Kalaitzidakis, P., & Tzouvelekas, V. (2011). Military spending and the growth-maximizing allocation of public capital: A cross-country empirical analysis. *Economic Inquiry, 49*(4), pp. 1029–1041. https://doi.org/10.1111/j.1465-7295.2009.00242.x

- Kaufmann, D., Kraay, A., & Mastruzzi, M. (2011). *The worldwide governance indicators: Methodology and analytical issues. Hague Journal on the Rule of Law, 3*(2), pp. 220–246. https://doi.org/10.1017/S1876404511200046

- Kremidas-Courtney, C. (2026). *America's new Defence Strategy and Europe's moment of truth.* European Policy Centre. https://www.epc.eu/publication/americas-new-defence-strategy-and-europes-moment-of-truth/

- Leeds, B. A., Ritter, J. M., Mitchell, S. M., & Long, A. G. (2002). *Alliance treaty obligations and provisions, 1815–1944. International Interactions, 28*(3), pp. 237–260. https://doi.org/10.1080/03050620213653

- Lopes da Silva, D. (2023). *Political accountability and military spending*. Defence and Peace Economics, 34(5), pp. 563–580. https://doi.org/10.1080/10242694.2022.2129128

- Lopes da Silva, D. (2023). *Political accountability and military spending. Defence and Peace Economics, 34*(5), pp. 563–580. https://doi.org/10.1080/10242694.2022.2129128

- Markowski, S., Hall, P., & Wylie, R. (2010). *Defence procurement and industry policy: A small country perspective*. Routledge.

https://www.routledge.com/Defence-Procurement-and-Industry-Policy/Markowski-Hall-Wylie/p/book/9780415482134

- Marrone, A. (2025). *NATO and European Defence during the Trump Administration: A Stocktaking*. Istituto Affari Internazionali (IAI). http://www.jstor.org/stable/resrep71019

- McGinnis, M. D. (1991). *Richardson, Rationality, and Restrictive Models of Arms Races.* Journal of Conflict Resolution, 35(3), pp. 443 473. https://doi.org/10.1177/0022002791035003003

- McGuire, M. C. (2007). Economics of defense in a globalized world. In T. Sandler & K. Hartley (Eds.), *Handbook of Defense Economics* (Vol. 2, pp. 623–646). Elsevier. https://doi.org/10.1016/S1574-0013(06)02021-7

- Mearsheimer, J. J. (2001). *The tragedy of great power politics*. W. W. Norton & Company. https://bxscience.edu/ourpages/auto/2015/12/17/46553148/Mearsheimer%20-%20Tragedy%20of%20Great%20Power%20Politics.pdf

- Michael C. Horowitz. 2020. *Do Emerging Military Technologies Matter for International Politics?. Annual Review Political Science.* 23: pp. 385 400. https://doi.org/10.1146/annurev-polisci-050718-032725

- Mintz, A., & Huang, C. (1991). *Guns versus butter: The indirect link*. American Journal of Political Science, 35(3), pp. 738–757. https://doi.org/10.2307/2111564

- NATO (North Atlantic Treaty Organization). (2014). *Wales Summit Declaration.* North Atlantic Treaty Organization https://www.nato.int/en/about-us/official-texts-and-resources/official-texts/2014/09/05/wales-summit-declaration

- NATO. (2025). *Funding NATO.* NATO official website https://www.nato.int/en/what-we-do/introduction-to-nato/funding-nato

- Nikolaidou, E. (2008). *The demand for military expenditure: evidence from the eu15 (1961–2005).* Defence and Peace Economics, 19(4), pp. 273–292. https://doi.org/10.1080/10242690802166533

- Olejnik, Ł. W. (2025). *How political ideology shapes military spending? Political determinants of military expenditures in EU and NATO member countries*. Armed

Forces & Society, 51(1), pp. 1–29. https://doi.org/10.1177/0095327X251315429

- Ostanina, S., & Tardy, T. (2024). *Turbo-charging the EU's defence – industry and security implications of the European Defence Industrial Strategy.* Jacques Delors Institute Policy Paper. https://institutdelors.eu/content/uploads/2025/04/20240417_EDIS_Paper_Ostanina_Tardy.pdf

- Robertson, P. E. (2022). *The real military balance: International comparisons of defense spending*. Review of Income and Wealth, 68(3), pp. 797–823. https://doi.org/10.1111/roiw.12536

- Robertson, P. E. (2022). *The real military balance: International comparisons of defense spending. Review of Income and Wealth, 68*(3), pp. 797–823. https://doi.org/10.1111/roiw.12536

- Rodrik, D. (1991). *Policy uncertainty and private investment in developing countries*. Journal of Development Economics, 36(2), pp. 229–242. https://doi.org/10.1016/0304-3878(91)90034-S

- Rodrik, D. (1991*). Policy uncertainty and private investment in developing countries. Journal of Development Economics, 36*(2), pp. 229–242. https://doi.org/10.1016/0304-3878(91)90034-S

- Rosh, R. M. (1988). Third World Militarization: Security Webs and the States They Ensnare. *The Journal of Conflict Resolution*, *32*(4), pp. 671–698. http://www.jstor.org/stable/174027

- Rota, M. (2016). *Military spending, fiscal capacity and the democracy puzzle*. Explorations in Economic History, 60, pp. 41–51. https://doi.org/10.1016/j.eeh.2015.11.002

- Sandler, T. (2001). The economics of alliances: Lessons for collective action. *Journal of Economic Literature, 39*(3), pp. 869–896. https://doi.org/10.1257/jel.39.3.869

- Sandler, T. (2025). Economic theory of alliances sixty years later. *Defense and Peace Economics, 36*(1), pp. 1–27. https://doi.org/10.1080/10242694.2024.2345678

- Sarkees, M. R., & Wayman, F. W. (2010). *Resort to war: 1816–2007*. CQ Press. https://correlatesofwar.org

- SIPRI (2024). *Trends in World Military Expenditure 2023.* https://www.sipri.org/publications/2024/sipri-fact-sheets/trends-world-military-expenditure-2023
- Smith, R. P. (1980). The demand for military expenditure. *The Economic Journal, 90*(360), 811–820. https://doi.org/10.2307/2231744

- Stockholm International Peace Research Institute (SIPRI). (2023). *SIPRI Yearbook 2023: Armaments, disarmament and international security*. Oxford University Press. https://www.sipri.org/yearbook/2023

- Stockholm International Peace Research Institute (SIPRI). (2024). *Military expenditure database*. https://www.sipri.org/databases/milex

- Tian, N., Lopes da Silva, D., Scarazzato, L., & Liang, X. (2023). *Trends in World Military Expenditure, 2022*. Stockholm International Peace Research Institute (SIPRI) Fact Sheet, April 2023. https://www.sipri.org/sites/default/files/2024-04/2404_fs_milex_2023.pdf

- Töngür, Ü., Hsu, S., & Elveren, A. Y. (2015). *Military expenditures and political regimes: Evidence from global data, 1963–2000*. Economic Modelling, 44, pp. 68–79. https://doi.org/10.1016/j.econmod.2014.10.004

- U.S. Department of Defense (2022). *2022 National Defense Strategy of the United States of America.* https://media.defense.gov/2022/Oct/27/2003103845/-1/-1/1/2022-NATIONAL-DEFENSE-STRATEGY-NPR-MDR.PDF

- Walt, P., & Perlo-Freeman, S. (2003). The demand for military spending in developing countries. *International Review of Applied Economics, 17*(1), pp. 23–48. https://doi.org/10.1080/0269217022000059313

- Waltz, K. N. (1979). *Theory of international politics*. McGraw-Hill. https://www.academia.edu/28686609/_WALTZ_KENNETH_Theory_of_International_Politics

- Waltz, K. N. (2000). *Structural realism after the Cold War. International Security, 25*(1), 5–41. https://doi.org/10.1162/016228800560372

- Westerman, I. (2024). *Israel's Civil-Military Relations and Security Sector Reform: Lessons for Conflict-Affected Societies* (1st ed.). Routledge. https://doi.org/10.4324/9781003452126

- Westerman, I. (2024). *Israel's Civil-Military Relations and Security Sector Reform: Lessons for Conflict-Affected Societies*. Routledge. https://doi.org/10.4324/9781003452126

- Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data* (2nd ed.). Cambridge, MA: MIT Press. https://mitpress.mit.edu/9780262232586/econometric-analysis-of-cross-section-and-panel-data/

- World Bank. (2024). *World development indicators*. https://databank.worldbank.org/source/world-development-indicators

- World Bank. (2024). *Worldwide Governance Indicators*. https://info.worldbank.org/governance/wgi/

- Yildirim, J., & Sezgin, S. (2005). *Democracy and military expenditure: A cross-country evidence*. Transition Studies Review, 12(1), pp. 93–100. https://doi.org/10.1007/s11300-005-0037-0