Issue Brief
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Bang for the Buck? Reassessing NATO's 5 Percent Benchmark Through Comparative Defense Accounting

Pierre Erik Gunnarsson

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The renewed emphasis on defense spending following Russia's full-scale invasion of Ukraine has reshaped transatlantic security debates. At the Hague Summit of June 2025, NATO allies committed to invest 5 percent of gross domestic product (GDP) annually by 2035, with at least 3.5 percent allocated for core defense requirements and up to 1.5 percent for defense- and security-related spending. The benchmark is simultaneously a political objective and a proxy for allied commitment. Yet comparing defense expenditure across countries is methodologically demanding because national accounting systems differ in their treatment of defense-related expenditure. This issue brief argues that headline expenditure figures are an incomplete measure of national defense effort. Drawing on official data, it examines how institutional differences shape international comparison. It focuses particularly on defense research and development, where the United States sustains an innovation ecosystem characterized by high technological ambition, tolerance of program failure, and correspondingly higher costs. The Zumwalt-class destroyer program illustrates both the opportunities and pitfalls of this approach. The issue brief demonstrates that meaningful comparison requires attention to the broader public-finance context. It concludes that assessments of allied burden sharing should distinguish between headline defense expenditure, defense-related public expenditure, and the military capability generated per unit of spending—referred to here as "bang for the buck."

Introduction

Defense expenditure has long served as an indicator of political commitment within NATO. Since the Wales Summit September 2014, allies agreed to move towards spending at least 2 percent of GDP on defense and at least 20 percent of defense expenditure on major equipment including associated research and development,[1] member states have increasingly been judged by quantitative spending targets rather than by qualitative measures of military capability. Following Russia's full-scale invasion of Ukraine in February 2022,

the political debate shifted towards a substantially more ambitious benchmark, formalized at The Hague in June 2025.[2]

The Hague commitment is not a single figure but a two-tier construction. Allies agreed to allocate at least 3.5 percent of GDP to core defense requirements and to meeting NATO Capability Targets, assessed against NATO's agreed definition of defense expenditure, and up to 1.5 percent of GDP to protecting critical infrastructure, defending networks, ensuring civil preparedness and resilience, unleashing innovation, and strengthening the defense industrial base.[3] Allies submit annual plans showing a credible, incremental path; the trajectory and balance of spending will be reviewed in 2029, and the target date is 2035.[4] Critically for the argument developed here, the second tier has no agreed accounting definition, which means that the headline 5 percent figure aggregates one measured quantity with one unmeasured one.[5]

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Although attractive because of its simplicity, percentage-of-GDP comparison obscures substantial differences in national accounting systems and in the allocation of defense-related costs across ministries and public budgets. Two countries reporting identical defense expenditure as a share of GDP may devote markedly different total public resources to maintaining military capability and may convert those resources into military output at markedly different rates.

The United States presents a particularly complex case. While the Department of Defense constitutes the core of American military spending, significant defense-related expenditure is financed through the Department of Veterans Affairs, the Department of Energy's National Nuclear Security Administration (NNSA), the Department of Homeland Security, the intelligence agencies, and Treasury-funded military retirement obligations. Some of these fall outside NATO's reporting framework; others are partially included under specific accounting rules. The U.S. federal budget itself distinguishes budget function 050 (national defense), which comprises subfunction 051 (Department of Defense), subfunction 053 (atomic energy defense activities) and subfunction 054 (other defense-related activities)—a structure that already demonstrates that "defense spending" is not a single administrative object.[6]

European countries face a different institutional landscape: Universal healthcare systems, national pension schemes, and varying arrangements for military retirement means that expenditure associated with armed forces personnel is often financed outside defense ministries. Defense budgets may therefore understate the broader public cost of sustaining military establishments—

although, as section 5 shows, NATO's reporting rules correct for part of this, and the asymmetry is smaller than it is often assumed to be.

The objective of this issue brief is not to question NATO's accounting methodology, but to identify how differences in public-sector organization affect the interpretation of defense spending: specifically, to what extent differences in public-sector accounting, military personnel systems, veterans' benefits, healthcare financing, defense R&D, foreign assistance, and the organization of the state affect the comparability of NATO defense expenditure and burden-sharing metrics.

The analysis asks three research questions:

1. To what extent do institutional accounting differences affect comparisons between NATO defense expenditure?
2. How do differences in defense research and development influence military capability relative to expenditure?
3. What alternative indicators better capture the effectiveness, the "bang for the buck," of defense spending?

The issue brief adopts a comparative public-finance perspective, integrating insights from defense economics, public administration, and security studies. It is a conceptual and documentary study: it triangulates published official accounting data rather than generating new estimates, and its claims about capability output are therefore illustrative rather than measured.

Theoretical Framework

Inputs, Outputs and Outcomes

Military expenditure is commonly measured as annual government spending devoted to defense activities. Defense effort, however, extends beyond budget appropriations and expenditure. High expenditure does not necessarily produce proportionally greater military capability and economic analysis can distinguish between:

- financial inputs (appropriations, obligations, outlays)
- military capability outputs (deployable units, platforms, stocks, readiness)
- strategic outcomes (deterrence, war-fighting effectiveness, alliance contribution)

The concept of "bang for the buck" adopted here refers to the efficiency with which financial inputs are converted into usable military capability. It is an input-output ratio, not an outcome measure, and it should not be conflated with strategic success.

Alliance theory has long examined how collective defense creates incentives for unequal burden sharing in NATO and the UN. Larger members often provide disproportionate funding, while smaller allies can partially free-ride on shared security commitments. NATO's GDP-based spending targets attempt to reduce free-riding by making national contributions measurable and publicly comparable.

Burden Sharing in Alliances

Alliance theory has long examined how collective defense creates incentives for unequal burden sharing in NATO and the UN.[7] Larger members often provide disproportionate funding, while

smaller allies can partially free-ride on shared security commitments. NATO's GDP-based spending targets attempt to reduce free-riding by making national contributions measurable and publicly comparable.

Koivula[8] observes a focus on input-centered discussions on GDP share regarding burden sharing, while Zyla[9] concludes that GDP shares alone cannot account for what allies achieve. Reviewing the silence on efficiency, he argues that examining input and output variables is insufficient to judge the balance of contributions to NATO operations. Spending should thus be supplemented by measures of outcomes and long-term impacts. Burden sharing should therefore incorporate capability-based and qualitative indicators alongside financial ones.

A Center for Strategic and International Studies (CSIS) study[10] seeks to expand the concept of burden sharing into one of "responsibility sharing" by also capturing features such as dependency on Russian gas and the allocation of assistance to Ukraine, looking at whole-of-government contributions rather than relying solely on the two-percent metric. The indicators presented in Table 1 serve as an example of alternative metrics.

Defense Accounting

Defense accounting is fundamentally an exercise in defining which public expenditures contribute directly to military capability. Under NATO's agreed definition, reportable defense expenditure comprises payments made by a national government to meet the needs of its armed forces, those of allies, or those of the Alliance. It covers armed forces and reserve personnel, civilian personnel of defense ministries, operations and maintenance, procurement of military equipment, military infrastructure, and research and development devoted to major equipment. Importantly, personnel expenditure under the NATO definition includes pensions paid to retirees, irrespective of the ministry through which they are disbursed.[11]

Expenditure that primarily serves civilian purposes is normally excluded, even where it indirect-

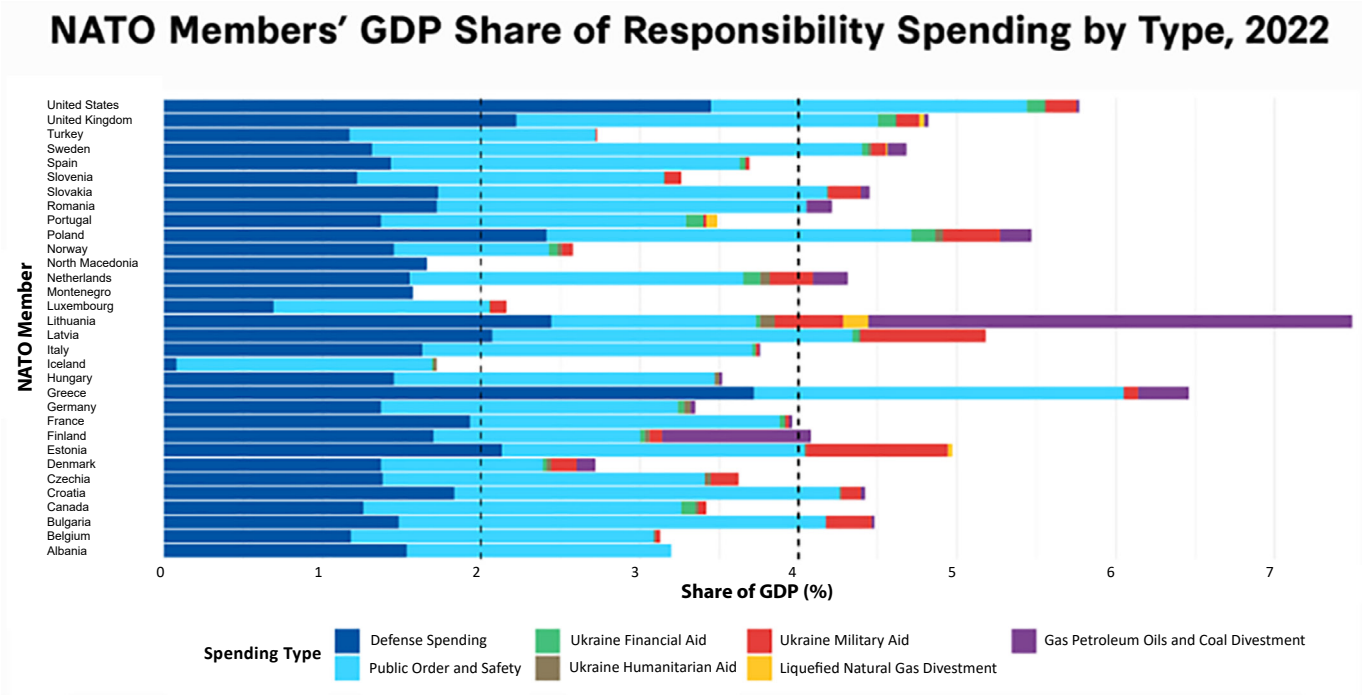

Table 1: An alternative metric to GDP spending alone, proposed by CSIS.[68]

ly benefits national security. NATO itself notes that its figures may diverge considerably from those quoted by national authorities or given in national budgets, precisely because national and NATO definitions differ.[12] The magnitude of that divergence is clearly observable: comparing NATO-reported defense expenditure with Eurostat's, the largest gap was observed in Poland, which reported 3.3 percent of GDP under the NATO definition against 2.1 percent in 2023.[13] Thus, two internationally standardized statistical systems applied to the same country in the same year can differ by more than a percentage point of GDP.

Moreover, Alozious[14] observes that spending targets risk encouraging some allies to resort to "creative forms" of accounting in a bid to achieve and maintain spending objectives, even at the much lower two-percent guideline, citing as an example the United Kingdom, which in 2015 changed the method used to calculate military expenditure reported to NATO by adding expenses that previously were not counted as military.

> ***Military capability depends not only on expenditure but also on how resources are transformed into deployable forces. The same spending share may produce very different military outputs because of differences in demographic structure, salary levels, procurement efficiency, research and industrial policy, technological ambition, and operational readiness.***

Expenditure that indirectly supports defense—universal healthcare, veterans' disability compensation, civilian pension systems, etc.,—may fall outside defense budgets while nevertheless representing real fiscal costs generated by military institutions.

A third category concerns the placement of expeditionary and constabulary activity. Overseas military deployments may be financed from the defense budget, from the foreign ministry's budget, or partly from both, and the choice is administrative rather than substantive. Finland illustrates the split model precisely: the upkeep costs of Finnish crisis-management contingents, including pay during operations, are budgeted under the Ministry for Foreign Affairs (moment 24.10.20), while equipment and administrative costs of military crisis management and observer activity are budgeted under the Ministry of Defence (moment 27.30.20).[15] Sweden, by contrast, finances its international military contributions within the defense expenditure area while maintaining a separate development-cooperation budgetary frame.

Innovation Economics in Defense

The economics of defense innovation differs fundamentally from that of civilian technological development. Military R&D typically involves highly uncertain technological outcomes, long development timelines, small production volumes, limited commercial markets, and requirements for technological superiority rather than cost-optimal sufficiency.

The United States has deliberately accepted higher levels of technological risk than most European countries. The Defense Advanced Research Projects Agency (DARPA) is the institutional expression of that choice: it maintains a flat organization, tenure-limited program managers with unusual autonomy, and an explicit tolerance of

failure where the payoff from success is large enough.[16] European defense industries have, by contrast, more often favored evolutionary procurement with lower technological risk and greater emphasis on multinational collaboration. That approach can reduce development costs and schedule variance, but it can also slow innovation and introduce coordination costs.[17]

The resulting divergence has direct implications for interpreting expenditure. Countries investing heavily in frontier research will appear less efficient over any short measurement window, even where successful innovations generate large long-term strategic advantages; countries buying mature systems will appear efficient even where they are consuming, rather than generating, the technological base. Any efficiency metric applied to a single year therefore has a systematic bias, and its direction depends on the innovation model of the country being measured.

NATO's Defense Expenditure Benchmark: What Does the Five Percent Measure?

From the Two Percent Guideline to the Five Percent Commitment

Since the 2014 Wales Summit, NATO's defense spending benchmark has functioned primarily as a political indicator of burden sharing rather than as a direct measure of military effectiveness. The original guideline—at least 2 percent of GDP on defense, and at least 20 percent of defense expenditure on major equipment and associated R&D—was intended to reverse decades of declining European military investment following the Cold War.[18] The 2 percent commitment itself built on an earlier guideline agreed upon by NATO defense ministers in 2006.[19]

Russia's full-scale invasion of Ukraine altered the debate fundamentally. Allied defense expenditure

> ***Military retirement systems illustrate institutional diversity further. In the United States, retirement obligations are financed through a dedicated trust fund supported by Treasury payments and Department of Defense accrual contributions. Several European countries instead finance military pensions wholly or partly through national pension systems.***

rose sharply: on NATO's own figures, all allies with armed forces were estimated to meet or exceed the 2 percent guideline in 2025, compared with three allies in 2014.[20] At the June 2025 Hague Summit, allies committed to a benchmark of 5 percent of GDP by 2035, split into at least 3.5 percent for core defense and up to 1.5 percent for defense- and security-related expenditure.[21]

The 1.5 percent tier is the analytically novel element and the least specified. It covers critical infrastructure protection, network defense, civil preparedness and resilience, innovation, and the defense industrial base—categories that overlap with transport, energy, telecommunications, interior, and industrial policy, and that no existing statistical framework isolates. Until a common accounting definition exists, cross-national comparison of the 5 percent figure will be a comparison of one measured quantity plus one nationally defined one.[22] For research purposes, the 3.5 percent tier is therefore the tractable object, and this issue brief treats the 5

percent headline as a political aggregate rather than an accounting quantity.

GDP-based targets possess further methodological limitations independent of definitional questions. Gross domestic product measures economic output, not military requirements. Countries with similar GDP may face dramatically different threat exposure, personnel costs, procurement systems, and industrial structures. A ratio whose denominator moves with the business cycle also produces perverse arithmetic: a recession raises the measured ratio without adding a single deployable unit.

NATO's Definition of Defense Expenditure

NATO has developed a common accounting framework to improve comparability. Reportable expenditure generally includes armed forces personnel; reserve forces; civilian personnel employed by defense ministries; operations and maintenance; procurement of military equipment; military infrastructure; research and development devoted to major equipment; and pensions paid to military retirees. Data are collected from each ally's ministry of defense and combined with macroeconomic series from the European Commission's Directorate-General for Economic and Financial Affairs (DG ECFIN), the International Monetary Fund (IMF) and the Organisation for Economic Co-operation and Development (OECD).[23]

> ***One of the least understood dimensions of international defense spending comparison concerns research and development. Although NATO includes R&D devoted to major equipment within its definition of defense expenditure, countries differ markedly in how research is organized, financed, and linked to procurement.***

Expenditure primarily serving civilian purposes is normally excluded, even where it indirectly benefits national security. This harmonized methodology improves international comparison substantially relative to raw national budgets. Nevertheless, NATO itself acknowledges that institutional arrangements differ substantially among member states and that its published figures may diverge considerably from nationally published numbers. The framework harmonizes reporting; it does not harmonize the underlying institutions.

Capability Versus Expenditure

Military capability depends not only on expenditure but also on how resources are transformed into deployable forces. The same spending share may produce very different military outputs because of differences in demographic structure, salary levels, procurement efficiency, research and industrial policy, technological ambition, and operational readiness.

Defense economists and analysts have argued that burden sharing should incorporate more readiness indicators, deployable formations, ammunition stocks, logistics capacity, international assistance (e.g., foreign aid), and industrial resilience rather than relying exclusively on financial measures.[24] NATO's own machinery already reflects this: the NATO Defence Planning Process assigns country-specific Capability Targets, and the Hague commitment explicitly ties the 3.5 percent tier to meeting them.[25] The output-based measure thus exists inside the Alliance; it is sim-

ply not the one used in public debate, because Capability Target fulfillment is classified.

The United States Defense Budget Beyond the Department of Defense

The Department of Defense Budget

Public debate frequently equates American defense spending with the annual Department of Defense appropriation. The order of magnitude is large, but the boundaries are specific. For fiscal year 2026, the Department requested USD 848.3 billion in discretionary funding plus USD 113.3 billion in mandatory funding drawn from the 2025 reconciliation act, for a total request of USD 961.6 billion.[26] Enacted FY2026 appropriations for the Department's discretionary activities came to USD 839.2 billion.[27] Of the FY2026 discretionary request, USD 295.3 billion was for procurement and research, development, test and evaluation (RDT&E) combined.[28]

The wider aggregate is larger again: approximately USD 1.0 trillion was requested for discretionary activities within national defense budget function 050 for FY2026, of which USD 882.6 billion fell within the scope of the National Defense Authorization Act.[29] The gap between the Department of Defense appropriation and budget function 050 is the first and simplest illustration of this issue brief's argument: even within a single national accounting system, "defense spending" has at least three defensible values.

Veterans Affairs

The Department of Veterans Affairs administers disability compensation, veterans' healthcare, education benefits, pensions, rehabilitation programs, and long-term care. Unlike most European countries, veterans' healthcare in the United States is delivered through a separate federal department rather than through a universal healthcare system.

> ***"The consequence for burden-sharing measurement is that reporting identical NATO-defined R&D expenditure may capture very different shares of the total technological effort within a country's industrial base, depending on whether that base is organized as a state-owned enterprise, a privately held contractor, or a listed company with partial state ownership.***

The fiscal magnitude is substantial and growing. The FY2026 request for the Department totaled USD 434.81 billion, comprising USD 300.42 billion in mandatory and USD 134.39 billion in discretionary appropriations, against a FY2025 request of USD 369.3 billion.[30] The Congressional Budget Office notes that the Department's budget has more than quadrupled in real terms since 1999, driven by an ageing veteran population, expanded healthcare eligibility, long-term treatment of post-9/11 veterans, and the eligibility expansion enacted under the PACT Act.[31]

The comparative significance becomes clearer when compensation is aggregated across departments. CBO calculates total military compensation in the FY2026 budget request at USD 718 billion, of which USD 277 billion is attributable to the Department of Defense and USD 441 billion to the Department of Veterans Affairs.[32] On this measure, the majority of the fiscal cost of American military personnel is not carried by the defense budget at all. From a public-finance

perspective, these are costs generated by military service; from a NATO reporting perspective, only a portion is reportable defense expenditure.

Nuclear Weapons

The United States maintains an institutional arrangement in which nuclear warheads are developed, produced, and maintained by the National Nuclear Security Administration, a semi-autonomous agency within the Department of Energy. The arrangement descends from the wartime Manhattan Project and the subsequent decision, embodied in the Atomic Energy Act of 1946, to place fissile-material and warhead work under civilian rather than military control.[33] In federal budget terms, these activities appear under subfunction 053, atomic energy defense activities, rather than subfunction 051.[34] Although nuclear deterrence is among the most important American military capabilities, a significant portion of the associated expenditure therefore sits outside the Department of Defense.

> ***The institutional organization of states influences defense expenditure in ways that are invisible in international statistics. The U.S. maintains separate institutions for veterans' healthcare, military retirement funding, nuclear weapons, and national intelligence; many European countries finance such functionally similar services through broader public institutions.***

European nuclear powers use different models. France finances its deterrent principally through the Ministry of the Armed Forces, and the *Cour des Comptes* has published assessments of its cost within that framework.[35] The United Kingdom combines Ministry of Defence funding with expenditure associated with the Atomic Weapons Establishment, which since 2021 has operated at an arm's length though wholly owned by the Ministry of Defence.[36] The three arrangements are functionally comparable and administratively incommensurable, and only one of them places the cost squarely inside the defense budget line.

Intelligence

American intelligence activity is financed through two programs: the National Intelligence Program (NIP), overseen by the Director of National Intelligence, and the Military Intelligence Program (MIP), overseen by the Secretary of Defense. Only top-line figures are disclosed. For FY2025, Congress appropriated USD 73.3 billion to the NIP[37] and USD 27.8 billion to the MIP,[38] for a combined USD 101.1 billion. For FY2026, the two programs were requested at USD 81.9 billion and USD 33.6 billion, respectively.[39]

Part of this expenditure sits within the Department of Defense and part outside it, including resources managed by the Central Intelligence Agency and other members of the intelligence community. European countries likewise finance intelligence through varying combinations of defense ministries, interior ministries, and independent agencies, and most publish no comparable top-line figure at all. Intelligence expenditure is therefore only partially and inconsistently reflected in headline defense budgets across the Alliance—an asymmetry that runs in the opposite direction to the healthcare asymmetry discussed later, and is worth noting because the two are seldom presented together.

Military Retirement

Military retirement systems illustrate institutional diversity further. In the United States, retirement obligations are financed through a dedicated trust fund supported by Treasury payments and Department of Defense accrual contributions. Several European countries instead finance military pensions wholly or partly through national pension systems. NATO's reporting methodology addresses this directly by counting pensions paid to military retirees as personnel expenditure irrespective of the disbursing ministry,[40] which removes a large part of the potential distortion. What the methodology cannot remove is the difference in accrual treatment: a system that recognizes pension liabilities as they accrue and one that recognizes them as they are paid will report different annual figures for identical underlying obligations.

Why Comparing European Defense Budgets Is Difficult

One of the central challenges in burden-sharing analysis concerns identifying the true public cost of maintaining military personnel. In most European countries, healthcare is provided through universal national systems available to the whole population, and active-duty military personnel receive care within institutions that also serve civilians. Significant personnel-related expenditure may therefore not appear explicitly within defense ministry appropriations, even though maintaining military personnel generates demand for those services.

This observation should not be read as implying that European countries systematically under-report defense expenditure. Three qualifications are necessary. First, the effect is bounded: the marginal healthcare cost of a comparatively young and medically screened active-duty cohort is small relative to total national health spending. Second,

> ***"Although NATO harmonizes reporting, complete comparability remains unattainable. Military pensions, veterans' benefits, healthcare, intelligence, nuclear-weapons establishments, peacekeeping, Ukraine assistance, and coast guard functions are financed and measured differently across allies, and the divergence between NATO and EU figures for the same country and year can exceed one percentage point of GDP.***

NATO's definition already captures the largest single item that might otherwise escape—military pensions—regardless of the financing ministry. Third, the asymmetry runs in both directions, since intelligence and, in the United States, veterans' provision are institutionally separated in ways that also remove expenditure from the reported defense line. The accurate statement is that European and American systems distribute public costs differently, not that one conceals more than the other.

The categorization of defense activity is further shaped by the organization of the state. Overseas deployments may sit under the defense budget, the foreign ministry budget, or both, as the Finnish split between moments 24.10.20 and 27.30.20 demonstrates.[41] By contrast, Sweden funded its military contingent in Afghanistan within the defense budget.[42] Whereas peace and security

related activities have increasingly become official development assistance (ODA)-eligible under OECD Development Assistance Committee rules,[43] only narrowly defined components may be reported as aid, which still means that divergent national practices can occur.

Reorganization of the state can also civilianize activity that elsewhere are considered military. Coast guard functions provide an example. The Swedish case is instructive because the coast guard operated as a militarily organized branch of the Customs Service, under the Ministry of Finance, during parts of the nineteenth century, and became an independent civil agency under the Ministry of Defence in 1988.[44] It sits today within the defense policy area but is a civil authority whose expenditure is not reportable as NATO defense expenditure, whereas comparable functions in several allied states are performed by naval or gendarmerie forces whose costs are reportable. In the UK, however, the coast guard is a civilian-run authority under the Ministry of Transport.[45]

The variable here is not which ministry holds the agency but whether the function is performed by armed forces within the meaning of the NATO definition.

Defense Research and Development: Divergent Innovation Models

Research and Development as a Strategic Investment

One of the least understood dimensions of international defense spending comparison concerns research and development. Although NATO includes R&D devoted to major equipment within its definition of defense expenditure, countries differ markedly in how research is organized, financed, and linked to procurement.

The United States has historically pursued technological leadership through high-risk innovation, repeatedly investing in technologies whose operational value was uncertain at the time of development, including the goal of creating disruptive or revolutionary technologies.[46] This has produced both notable successes and costly failures. European countries have generally favored evolutionary development, encouraged by budget constraints, smaller domestic markets, and multinational procurement. That approach often reduces development costs but may also limit disruptive innovation. Comparisons based solely on annual expenditure therefore overlook a fundamental difference in what the expenditure is intended to achieve.

The Scale Difference

The magnitude of the divergence between Europe and the USA in RTD is measurable. In FY2025, the United States enacted USD 143.7 billion for RDT&E through regular appropriations, and the Department of Defense accounted for 50 percent of all federally funded R&D in FY2024.[47] The FY2026 request placed RDT&E at USD 179.1 billion, including reconciliation funding.[48] By comparison, defense R&D expenditure across the 27 EU member states reached EUR 13 billion in 2024, a 20 percent increase from 2023, of which research and technology narrowly defined accounted for EUR 5 billion; EDA foresaw EUR 17 billion for 2025.[49]

The ratio is roughly an order of magnitude rather than exact, but at any rate considerably wider than the corresponding ratio for total defense expenditure. This is the single most consequential asymmetry for "bang for the buck": European and American defense budgets are not merely different in size; they are differently composed, with the American budget carrying a far larger share of the Alliance's technological development value.

The American Defense Innovation System

The U.S. defense innovation ecosystem is decentralized through several specialized organizations, among them:

- Defense Advanced Research Projects Agency (DARPA)
- Office of Naval Research (ONR)
- Air Force Research Laboratory (AFRL)
- Army Futures Command
- Defense Innovation Unit (DIU)
- Strategic Capabilities Office (SCO)

DARPA is widely known to make pivotal investments in breakthrough technologies for national security rather than in incremental improvements. DARPA-funded research contributed to the development of stealth technology, precision-guided munitions, autonomous systems, artificial intelligence, and advanced semiconductor technologies.[50] A defining institutional feature of the agency is that it accepts that many projects will not succeed, provided the payoff from those that do is large enough, and that success is assessed by the strategic impact of the few rather than by the proportion of programs completed.[51] Azoulay et al.[52] attribute this tolerance specifically to the level of the empowered program director, and note that despite the model's prominence, rigorous empirical evaluation of its success rate remains elusive, partly due to the difficulties of evaluating breakthrough technologies and their long-term consequences, as the discourse tend to focus on the strength of its most-cited outputs rather than on its measured distribution of outcomes.

This philosophy of U.S. defense innovation differs fundamentally from that of conventional European procurement, where cost overruns and technical failures are treated as indicators of poor program management. The two logics are not reconcilable within a single performance metric, which is one reason why aggregate efficiency comparisons between the two systems tend to reproduce the assumptions of whichever logic the analyst began with.

Defense R&D in Europe

European defense research is considerably more fragmented than that of the U.S. Funding is distributed across national defense ministries, national research agencies, the European Defence Agency, the European Defence Fund, and multinational industrial partnerships. Most European governments hold research budgets that are small in absolute terms, and joint procurement decisions require consensus among several governments. Multinational decision-making reduces duplication but can slow technological development.

The collaborative dimension remains the structural weak point. EDA data show that collaborative research and technology spending has repeatedly fallen far short of the collective 20 percent benchmark, and that recent growth in European defense expenditure has been driven overwhelmingly by national, largely off-the-shelf equipment procurement—equipment procurement rose 39 percent in 2024 to EUR 88 billion, against EUR 13 billion for all defense R&D.[53] The composition of the European increase therefore reinforces rather than corrects the asymmetry described earlier.

European defense acquisition[54] accordingly tends to emphasize incremental capability improvement, export potential, interoperability, cost control, and industrial cooperation, yielding greater financial predictability and fewer revolutionary programs, with significant path dependencies in the acquisition process.

Procurement Incentives

Institutional incentives differ substantially. In the United States, a successful research program may

lead to production runs of hundreds or thousands of systems, so that development cost is amortized over a large base and innovation is commercially rational for the supplier. In Europe, production runs are often much smaller, often dozens rather than hundreds of platforms. Small volumes raise unit costs, reducing the opportunity to recover research investment. European governments therefore frequently seek multinational programs such as Eurofighter Typhoon, A400M, the FREMM frigate family, and the Boxer armored vehicle. Multinational collaboration spreads development costs but introduces political complexity that can delay programs and raise management costs.[55] The trade-off is between two distinct sources of cost escalation—technological risk in the American model, and coordination cost in the European one—and neither is eliminated by the choice of model.

The Public-Private Boundary in R&D Accounting

A further source of incomparability, distinct from the national/collaborative and evolutionary/high-risk distinctions discussed above, concerns who legally owns and finances the research effort itself. NATO's definition restricts reportable expenditure to payments made by a national government and captures the military-relevant share of mixed civilian-military activities—a category that explicitly includes R&D—only where that share can be specifically identified or estimated.[56] Where the entity performing the research is not itself part of the state, that identification becomes considerably harder, and NATO's guidance provides no operational method for making it.

The United States illustrates the problem in its most developed form. Under the Federal Acquisition Regulation, defense contractors may conduct Independent Research and Development (IR&D) at their own discretion, initially funded from company resources, and later recover part of that cost as an allowable indirect charge on government contracts. The Department of Defense reimburses contractors on this basis by roughly USD 4–5 billion annually, yet a 2020 review by the U.S. Government Accountability Office found that the Department does not systematically track how contractor-initiated IR&D projects relate to its own science-and-technology or RDT&E portfolio.[57] The expenditure therefore has a genuinely ambiguous status: the initiating outlay is private corporate investment and falls outside the NATO definition on its face, while the recovered share is folded, without being separately identified, into contract payments that are themselves reportable.

Comparable ambiguity affects European allies, though through a different mechanism. Company-level data drawn from the Stockholm International Peace Research Institute (SIPRI) Arms Industry Database indicate that, at several of the largest UK defense suppliers, more than half of total R&D expenditure in 2022 was funded by customers—principally the Ministry of Defence or allied governments—rather than internally.[58] The split between customer-funded and self-funded R&D therefore varies systematically by firm, and ownership structure is one of the variables driving that variation: publicly listed contractors report R&D that is only partly visible to national accounts, while research performed inside a state-owned prime—such as Poland's PGZ (Polska Grupa Zbrojeniowa) group—is, by construction, already government expenditure and therefore fully captured.

The broader defense-economics literature confirms that this is not a peripheral accounting quirk. Moretti, Steinwender & Van Reenen[59] show that publicly funded defense R&D substantially "crowds in" additional privately financed R&D investment, implying that government R&D figures alone understate the total innovation effort that public spending indirectly finances, and that the size of this gap depends on each

country's public–private R&D mix. Hartley & Belin,[60] reviewing the structure and conduct of national defense industries across NATO and allied states, similarly treat the balance between privately and state-funded R&D as a defining structural variable rather than a constant, one that differs by country according to the ownership model of the dominant supplier.

The consequence for burden-sharing measurement is that reporting identical NATO-defined R&D expenditure may capture very different shares of the total technological effort within a country's industrial base, depending on whether that base is organized as a state-owned enterprise, a privately held contractor, or a listed company with partial state ownership.

Case Study: The Zumwalt-Class Destroyer

Origins of the Program

The DDG-1000 Zumwalt-class destroyer is among the most ambitious naval procurement programs undertaken by the U.S. Navy since the Cold War. Conceived during the 1990s under the DD-21 designation as a transformational surface combatant, it sought to integrate numerous advanced technologies simultaneously: a wave-piercing tumblehome hull for reduced detectability, a partly composite superstructure, integrated electric propulsion, a total-ship computing environment, automation enabling a substantially reduced crew, a new vertical launch system, and two 155 mm Advanced Gun Systems.[61]

Rather than improving an existing design, the program attempted to revolutionize multiple technological domains at once. In the terms of Section 6, it applied a DARPA-style risk posture to a serial production program—a combination the American system tolerates in research but has considerable difficulty accommodating in acquisition.

Cost Growth and Quantity Reduction

The program encountered substantial technical and financial difficulty. Planned procurement fell from an initial 32 ships to 24, then to seven, and finally to three, with the Department of Defense announcing termination at three vessels in 2009 after cost breaches.[62] The reduction in volume consequently raised average procurement cost sharply, because development expenditure was distributed across far fewer platforms. The Government Accountability Office (GAO) reported program unit cost in excess of USD 10.6 billion per ship, inclusive of research and development, against roughly USD 2.5 billion for an Arleigh Burke destroyer.[63]

The Advanced Gun System illustrates the compounding mechanism with unusual clarity. The gun was engineered around a rocket-assisted guided projectile whose unit cost, once the class was reduced from 32 hulls to three, approached that of a more capable cruise missile. The munition was canceled, leaving the ships carrying guns for which no economically viable ammunition existed; the turrets were subsequently removed and replaced with launch tubes for Conventional Prompt Strike hypersonic missiles.[64] Quantity reduction did not merely raise unit cost; it invalidated the design of a primary weapon system.

Lessons from the Program

Four lessons follow for defense economics:

First, technological ambition increases outcome uncertainty, and concurrent ambition across several domains multiplies rather than adds to it.

Second, declining production quantities raise unit costs and may, as with the Advanced Gun System, destroy the economic rationale for subsystems designed around the original quantity.

Third, the strategic value of research cannot be

assessed solely by the success of the originating platform: technologies developed for the Zumwalt, including integrated electric propulsion and the associated power-management architecture, have informed later naval development, and the surviving hulls now host a hypersonic strike capability that did not exist when the program was conceived.

Fourth, and most relevant to burden-sharing measurement, the program would score catastrophically on any efficiency metric applied within its procurement window and considerably better on one applied across two decades.

Comparison with European Approaches

European naval programs have also experienced serious cost growth and schedule slippage, but the dominant causes have more often been political and industrial than technological: workshare allocation across participating states, divergent national requirements, and production rates set by budgetary rather than engineering considerations.[65] European procurement has generally emphasized incremental development of existing classes, collaborative industrial production, and lower technological risk, producing lower development costs and more predictable schedules at the price of fewer opportunities for breakthrough innovation.

The comparison accordingly demonstrates that defense research expenditure and defense procurement expenditure purchase qualitatively different things. Expenditure directed at future technological superiority and expenditure directed at acquiring mature capability may appear identical in a national account yet produce entirely different results, and do so on entirely different time horizons.

Measuring "Bang for the Buck": Beyond GDP Percentages

Limitations of GDP-Based Comparison

Defense expenditure as a share of GDP measures financial commitment relative to economic size. It does not account for the efficiency with which resources are converted into military capability. Several factors influence that conversion:

- national wage levels
- personnel structures and conscription arrangements
- procurement strategies and production volumes
- industrial capacity and security of supply
- technological ambition and research intensity
- maintenance and sustainment costs
- operational readiness and force availability

Two countries allocating identical shares of GDP may therefore generate significantly different levels of deployable capability. The analytical question is not how much governments spend but what the expenditure produces.

Defense Capability as an Output

An alternative framework distinguishes financial inputs from military outputs. Candidate output indicators could include:

- deployable combat brigades and their readiness states
- operational fighter squadrons and sortie generation rates or flight hours
- available naval task groups and days at sea
- strategic lift and air-to-air refueling capacity
- ammunition stockpiles measured in days of high-intensity combat
- mobilization capability and trained reserve depth
- logistics sustainability and medical throughput
- industrial production capacity and surge lead times

These indicators would capture military effectiveness more directly than budgetary inputs. They also present three methodological difficulties. Readiness data are generally classified; capability definitions differ across armed forces; and, most fundamentally, no output indicator is meaningful without a threat-referenced denominator, since a brigade is adequate or inadequate only relative to a specified task. NATO resolves this internally through the Defence Planning Process and its Capability Targets,[66] which are threat-referenced by construction but not publishable. Public burden-sharing debate is therefore conducted with the measurable proxy rather than the meaningful measure.

The Role of Public Institutions

The institutional organization of states influences defense expenditure in ways that are invisible in international statistics. The U.S. maintains separate institutions for veterans' healthcare, military retirement funding, nuclear weapons, and national intelligence; many European countries finance such functionally similar services through broader public institutions, while separating other functions that the United States integrates. Within the EU, countries may consider peacekeeping or border patrols non-military expenditure, and the framing of key infrastructure and logistics may or may not be classified as military.

These distinctions do not establish that one country spends more or less on defense than another. They establish that identical military functions appear in different sections of national budgets, and that the direction of the resulting bias is country-specific rather than systematic across the Atlantic.

Comparisons based exclusively on ministry-level appropriations therefore risk overlooking broader public expenditure associated with maintaining military capability.

Defense Research as a Long-Term Investment

The largest single difference between the United States and Europe concerns the strategic role of defense research. American planning has historically accepted high technological uncertainty; large frontier investments have produced revolutionary innovations and also expensive programs that failed to meet their original expectations. European governments have generally preferred lower technological risk through multinational cooperation and incremental development.

From a purely accounting perspective, the European model may appear more cost-efficient. From a strategic perspective, breakthrough innovation may justify substantial upfront cost even where individual programs fail. Evaluating defense expenditure therefore requires distinguishing between operational expenditure, capital investment, and technological investment, since these generate different forms of capability over different time horizons and are not substitutable at the margin.

Towards a Composite Indicator

The foregoing suggests that a usable measure of allied effort would need at least four components, reported alongside rather than aggregated into one another:

- **Tier 1 Headline defense expenditure** under the NATO definition, retained for continuity and political comparability.

- **Tier 2 Defense-related public expenditure**, including veterans' provision, defense-attributable pension liabilities, nuclear-weapons establishments outside defense ministries, and intelligence, reported on a common functional basis.

- **Tier 3 Technological investment**, separating R&D and research and technology from

equipment procurement, since the two purchase capability on different horizons.

- **Tier 4 Output and readiness indicators,** reported in aggregated or banded form where classification prevents disclosure of detail.

Such a structure would not resolve the incommensurability documented in this issue brief, , no accounting framework can, since the underlying institutions genuinely differ—but it would make the incommensurability visible rather than hidden inside a single ratio. The 1.5 percent tier of the Hague commitment is, in effect, an unstructured first attempt at Tier 2, and its definitional development is where the measurement question will next be decided in practice.

Discussion

This issue brief has examined whether headline defense expenditure accurately reflects national defense effort. Five conclusions follow.

- Although NATO harmonizes reporting, complete comparability remains unattainable. Military pensions, veterans' benefits, healthcare arrangements, intelligence organization, nuclear-weapons establishments, peacekeeping, Ukraine assistance, and coast guard functions are financed and measured differently across allies, and the divergence between NATO and EU figures for the same country and year can exceed one percentage point of GDP.

- The asymmetry is not unidirectional. European systems locate some personnel-related costs outside defense budgets; the American system locates veterans' provision, warhead work, and much of national intelligence outside the Department of Defense. Claims that either side systematically understates its effort do not survive examination of both sets of institutions together.

- Defense research should not be interpreted solely as annual expenditure. The American innovation model has generated transformative technologies and highly visible program failures; European approaches provide greater budgetary predictability and stronger cost control but demonstrate path dependency with generally slower technological change. The measured gap is roughly an order of magnitude in R&D, considerably wider than the gap in total expenditure, and recent European growth has widened rather than narrowed it because it has been concentrated in equipment procurement.

- Programs such as the Zumwalt-class destroyer illustrate the cost of technological ambition and also the difficulty of evaluating it: the same program scores very differently depending on the length of the measurement window and on whether spillover to later systems is counted.

- A country that efficiently converts financial resources into deployable forces contributes differently to collective security than one whose expenditure generates limited operational capability. Political debate around NATO spending targets should recognize that defense economics extends beyond ministry budgets, and that the operative question is whether allied investment collectively generates the capabilities required for deterrence—a question to which the Alliance already has a better answer, in the form of Capability Target fulfillment, than the one it publishes.

Conclusion

The Hague commitment illustrates both the strengths and the limitations of expenditure-based burden-sharing metrics. Headline defense budgets provide an accessible and politically useful measure of commitment, yet they do not capture the complexity of modern defense economics.

The 5 percent figure compounds the difficulty by aggregating a defined accounting quantity with an undefined one, so that its comparability across allies will depend entirely on definitional work that has not yet been completed.[67]

The accounting variations can prompt creative accounting in some cases, where governments may be tempted to inflate figures, while in other cases accounting choices may understate expenditure, for instance, Sweden historically excluded coast guard functions and the financing of certain foreign operations from its defense budget. The funding of military RTD remains elusive for the reasons set out here, but also because the defense industry in some countries is state-controlled and in other cases is privately owned, while the borders between civilian and military RTD are becoming increasingly obscured.

Headline defense budgets should be interpreted as approximations rather than as perfectly comparable measures of total defense effort. The United States and its European allies organize defense-related public expenditure through different institutional arrangements. Veterans' benefits, healthcare, pensions, nuclear deterrence, intelligence, research programs, and international assistance are financed differently across governments, and comparisons based solely on ministry-level appropriations or headline GDP percentages risk oversimplifying the real distribution of defense-related public expenditure.

High-risk innovation programs may appear inefficient in the short term while generating substantial long-term advantage; efficient procurement systems may maximize current capability while investing less in future technological superiority. Neither profile is visible in a single ratio and research spending alone tells little about the final outcome of the money spent.

Future research would benefit from two developments in particular. The first is a composite indicator combining defense expenditure, defense-related public expenditure on a common functional basis, research intensity, industrial resilience, and force availability, along the lines sketched in Section 8.5.

The second is a longitudinal and more in-depth study of how states finance international security relative to national security, which would allow the Finnish, Swedish, and American cases discussed here to be treated as instances of a general pattern rather than as national idiosyncrasies. Both would give policymakers a more comprehensive assessment of allied burden sharing than GDP percentages alone.

Author –

Dr. Pierre Erik Gunnarsson *is a Senior Research Associate with a long career within EU institutions and Swedish national administration. The researcher also holds a research position at the Swedish Defence University (Försvarshögskolan), Department of War Studies and has amongst others worked as a Performance Audit Director at the Swedish National Audit office and within the European Institutions as a Defence Policy Officer and in many capacities worked with results monitoring and program evaluation. His research focus is on geoeconomics, governance of international assistance, defense and security operations, in particular logistics, acquisition and related accountability.*

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