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SUSTAINABLE DEFENCE ECONOMICS: EVALUATING THE IMPACT OF PUBLIC SECTOR FINANCING MODELS ON NATIONAL SECURITY OUTCOMES

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Abstract: *This paper explores the intersection of public finance and defence strategy through the lens of sustainability, focusing on how various public sector financing models influence national defence performance and resilience. Drawing from theoretical frameworks in institutional and defence economics, this study assesses how funding architectures – ranging from to tax-based to debt-financed models-shape the strategic and operational effectiveness of national defence systems. A comprehensive literature review reveals a growing but fragmented body of research on fiscal sustainability in defence, underscoring the need for a more integrated analysis. Methodological approach combines qualitative institutional analysis with quantitative assessments of defence outcomes, using comparative case studies to illustrate variation in performance across different financing regimes. Key findings suggest that the alignment between fiscal strategy and defence planning is critical for long-term sustainability, particularly in the face of evolving security threats and economic volatility.*

Keywords: defence economics, public sector financing, fiscal sustainability, national security policy, institutional performance

1. Introduction

Sustainability of national defence systems is increasingly shaped by the architecture of public sector financing. As global security threats evolve and fiscal pressures intensify, governments face dual challenge of maintaining military readiness while ensuring economic discipline. In this context, emerging field of sustainable defence economics calls for a deeper understanding of how financing models: tax-based, debt-financed or hybrid-affects performance, efficiency and resilience of defence institutions.

While defence spending has been analysed in strategic or operational terms, there is a growing need to assess the underlying financial frameworks that sustain such systems. Fragmented and opaque funding mechanisms often lead to inefficiencies, constrained planning capacities and misaligned priorities. Existing research tends to overlook the institutional and economic linkages between public finance and defence outcomes. Study addresses this gap by investing how different public sector financing models influence the effectiveness and long-term sustainability of national defence.

Central objective is to evaluate the economic and institutional conditions that enable or hinder sustainable defence financing. Key questions include:

- How do financing models impact defence system performance?
- What policy tools can support fiscal

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responsibility without compromising strategic objectives?
Structured over four chapters, this paper contributes to both economic policy and security studies by offering actionable insights into optimizing public finance structures for strategic defence needs. It concludes with policy recommendations aimed at enhancing fiscal discipline without compromising operational readiness.

2. Literature Review and Methodological Framework

2.1. Theoretical Foundations and Review of Empirical Literature

Study of defence financing sits at the intersection of institutional economics, public finance and strategic policy analysis. Institutional economics provides a framework for understanding how the formal rules, governance structures and decision-making processes within public institutions shape economic performance, including the efficiency and accountability of defence spending [1]. Public choice theory further complements this by highlighting how political and bureaucratic incentives can lead to suboptimal resource allocation, often prioritizing short-term goals over long-term sustainability [2]. Fiscal federalism offers another layer of analysis, particularly relevant in multi-level governance systems, by exploring the distribution of financial authority and responsibilities across national and supranational entities such as NATO [3].
Sustainable defence economics draws upon these traditions but introduces an explicit concern for long-term fiscal balance, resilience and institutional adaptability. This perspective argues that financing must be designed not only for operational effectiveness but also for macroeconomic stability and intergenerational equity. As such, financing models – whether tax-based, debt-financed or hybrid – must be assessed based on their capacity to support continuous strategic readiness without exacerbating fiscal vulnerabilities.

Empirical research has traditionally focused on the relationship between military spending and economic growth. For instance Dunne conducted a causal analysis in South Africa, demonstrating how military expenditure can both stimulate and suppress economic performance depending on institutional context [4]. Similarly, Koloas analysed EU countries using panel data, finding heterogeneous impacts shaped by national economic structures and defence spending outcomes are context-dependent and influenced by how funds are managed.
Recent literature has shifted focus from the scale of defence budgets to the structural and institutional features of financing mechanisms. Heo and Eger explored the U.S. “Security-prosperity” dilemma, emphasizing that high defence outlays often compere with social investment and broader fiscal stability [5]. The role of transparency and fiscal rules, shows that rigid or opaque financing systems compromise the flexibility and responsiveness of defence institutions in times of crisis.
Comparative analyses also point to best practices in defence financing. Hartley, for example, found that countries employing hybrid financing strategies – blending tax revenues with capital investment frameworks – tend to perform better in procurement cycles, innovation adoption and readiness indicators. These findings reinforce the argument that the structure of public financing, rather than just the volume of expenditure, significantly shapes national defence outcomes.
Despite growing interest in this area, literature remains fragmented. Few studies explicitly evaluate sustainability of defence financing models in terms of long-term institutional performance and national security outcomes. This study addresses that gap by systematically analysing how financing architecture influences defence system sustainability and proposing a more integrated framework for evaluating fiscal – military effectiveness.

2.2. Bibliometric Analysis

To further understand the scope and progression of research in defence economics and sustainable public financing, this study conducted a bibliometric analysis utilizing Scopus and Web of Science databases.

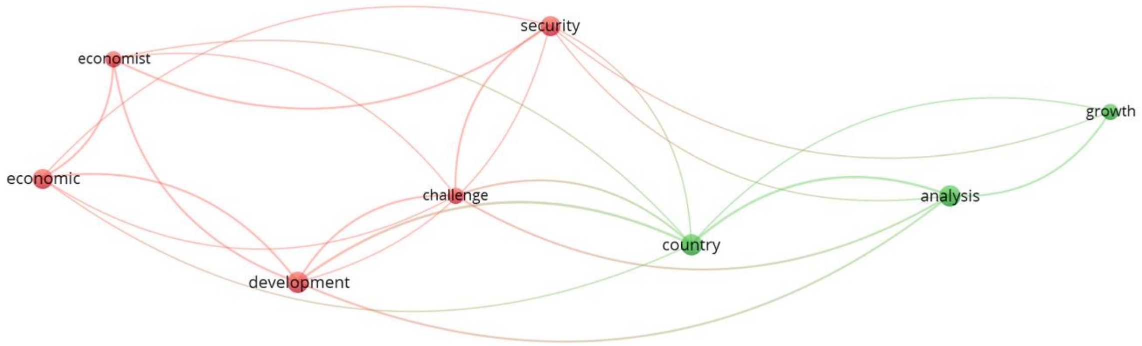

Figure 1: Mapping the Conceptual Landscape of Sustainable Defence Economics

VOSviewer map visualizes keyword co-occurrence within literature related to sustainable defence economics, public finance and national security. The network is composed of clusters of terms that frequently appear together in academic publications, indicating thematic groupings in the field.

Cluster Observations:

- Red Cluster, represents: Core of Economic and Security Nexus
- Green Cluster, represents: Outcomes and Sustainability

This map supports the notion that field of sustainable defence economics is evolving into a more integrated discipline, where economic development, security policy and fiscal strategy are analysed as interconnected phenomena. This justifies methodological approach and comparative case study framework, as literature increasingly values both theoretical richness and data – driven insights.

2.3. Methodological Approach

This study adopts a mixed-methods research design, combining qualitative institutional analysis with quantitative evaluation of defence system performance to investigate the relationship between public sector, financing models and national defence sustainability. Central objective is to assess how the structure and implementation of defence financing strategies affect institutional performance, fiscal resilience and long-term strategic readiness.

To facilitate this analysis, two European Union and NATO member states, France and Italy, are selected as comparative case studies. These countries represent contrasting financing models and institutional configurations. France features a centralized, tax-based system with high levels of state coordination and strategic planning, rooted in a long-standing tradition of state-led defence policy [6]. Italy, in contrast, employs a hybrid model involving both general taxation and significant public debt financing, often characterized by fiscal volatility and fragmented governance [7]. The divergence between these models provides an empirical basis for examining how different fiscal architectures influence defence policy outcomes and sustainability.

This research utilizes data from both primary and secondary sources, including national budget acts, defence white papers, financial reports published by relevant ministries and national audit offices. In addition, quantitative data is drawn from international sources such as OECD, NATO defence expenditure statistics and Eurostat databases. This multidimensional dataset enables an in-depth exploration of fiscal flows, procurement efficiency, readiness indices and modernization expenditures across both cases. Analytically, study applies:

- Qualitative content analysis to assess institutional documents and strategic defence reviews, focusing on how defence financing priorities align with national security objectives and fiscal rules.
- Quantitative time-series analysis of indicators such as defence expenditure as a percentage of GDP, public debt ratios, procurement cycle timelines and capability development metrics.

This mixed-method approach allows for triangulation of findings across different types of data and analytical perspectives, thereby increasing the reliability and validity of conclusions. This methodological design is particularly suited to exploring both fiscal mechanics and institutional consequences of defence financing strategies. It enables the identification of not only whether a given financing model is effective, but also how it achieves, or fails to achieve, sustainable defence outcomes under varied political and economic conditions.

3. Analysis of Public Sector Financing Models and Defence Outcomes

This chapter provides a comparative analysis of how different public sector financing models affect the performance and sustainability of national defence systems. Building on theoretical and methodological foundations outlined earlier, this chapter focuses on two EU and NATO member states, France and Italy, as illustrative case studies. France represents a centralized, tax-based model with long-term strategic planning, while Italy offers a contrasting hybrid model marked by fiscal fragmentation and reliance on public debt. Through a structured examination of budget allocations, institutional mechanisms and performance indicators, this chapter evaluates the strengths and limitations of each approach. Visual tools such as tables and charts are used to support analysis, highlighting tangible impacts of financing architecture on defence outcomes.

3.1. Typology of Public Financing Models

Defence financing models in advanced economies typically fall into three categories: tax-based, debt-financed and hybrid systems. Tax-based models emphasize fiscal discipline and state centrality in resource allocation, often embedded in long-term strategic planning. Debt-financed systems, by contrast, rely on borrowing to meet defence needs, enabling flexibility but raising concerns over long-term sustainability. Hybrid models incorporate elements of both, allowing governments to balance immediate defence demands with fiscal prudence.

The effectiveness of any model depends not only on how resources are mobilized, but also on institutional capacities to manage them.

Brauer and Dunne argue that financing structures influence defence outcomes by shaping incentives, bureaucratic accountability and the scope for long-term planning. In this context, France and Italy present two contrasting case studies that illuminate how different financing models affect defence sustainability and performance.

Table 1: Typology of Public Financing models

Model Type	Key Features	Common Example
Tax – Based	Stable funding, strong alignment with planning	France
Debt – Financed	Flexible but risks fiscal sustainability	United States
Hybrid	Balances short – term flexibility and long – term	Italy

Based on table 1 categorizes three dominant public financing models used in defence systems: tax – based, debt – financed and hybrid. Tax – based systems, as exemplified by France, offer stable and predictable funding streams aligned with long – term strategic planning. Debt – financed models, such as that of the United States, provide flexibility but increase vulnerability to fiscal stress. Hybrid systems, seen in countries like Italy, attempt to combine the benefits of both but often suffer from reduced coherence and planning challenges. These typologies help contextualize how fiscal architecture affects defence effectiveness and institutional stability.

France: Centralized, Tax-Based Defence Financing

France's defence financing system is highly centralized, with a strong reliance on general taxation and integrated national planning. The French Ministry of Armed Forces operates within a multi-year military programming law (Loi de programmation militaire – LPM) [8], which sets fixed budgetary ceilings and investment priorities over five-year periods. This framework allows for medium-term fiscal predictability and ensures alignment between defence planning and public resource allocation [6].

Key features of the French model include:

- Strategic coherence between funding and operational goals.
- A robust institutional apparatus for procurement and R&D investments.
- Reduced exposure to market fluctuations due to limited reliance on public debt.

Table 2: France's Defence Spending Allocation

Category	Budget Share (%)
Personnel	45 %
Operations	25 %
Procurement	20 %
R&D	10 %

As shown in Table 2, France allocates a significant portion of its defence budget to personnel and operations, reflecting a well – staffed and operationally active military. Procurement and R&D maintain strong roles, demonstrating France's commitment to innovation and long – term technological development. This balanced allocation is made possible by centralized, tax – based financing model, which allows France to engage in long – term defence programming with minimal fiscal volatility. Data from NATO and OECD indicates that France has maintained defence spending at or above the 2% of GDP benchmark since 2019, with a significant portion directed toward modernization and technological innovation. Centralized model supports consistency in military procurement cycles, defence innovation (for example nuclear deterrence and aerospace) and personnel planning. However, the model's rigidity can limit adaptability during fiscal or geopolitical shocks, requiring extraordinary budgetary measures for unexpected interventions [9].

Italy: Hybrid Model with Fiscal Constraints

Italy employs a hybrid financing model drawing on both general taxation and debt issuance to fund defence operations. Unlike France, Italy defence budget is fragmented across multiple ministries and subjected to frequent adjustments due to broader fiscal instability. Defence allocations are determined annually, with limited multi-year commitment frameworks. This results in weaker strategic coherence and greater susceptibility to political volatility [10].

Key characteristics of Italian model include:

- High dependence on public debt and EU

fiscal flexibility mechanisms.

- Fragmented decision-making and weak long-term investment planning.
- Greater exposure to austerity measures and fiscal consolidation pressures.

Italy has historically struggled to meet NATO's 2% spending guideline, averaging around 1.5% of GDP. Funding volatility affects procurement cycles, leading to delays in modernization programs and capability gaps. Furthermore, reliance on off-budget mechanisms creates transparency challenges and reduces fiscal accountability [1]. However, Italy also demonstrates adaptive strengths, such as the use of co-financing mechanisms through EU defence initiatives (for example Permanent Structured Cooperation – PESCO), which offer alternative funding sources while enhancing multilateral coordination.

Table 3: Italy's Defence Spending Allocation

Category	**Budget Share (%)**
Personnel	55 %
Operations	20 %
Procurement	15 %
R&D	10 %

Table 3 illustrates Italy's defence spending pattern, where personnel costs dominate, indicating a higher structural burden relative to France. The shares for procurement and R&D are comparatively lower, highlighting the constraints imposed by Italy's fragmented, debt-influenced financing system. The relatively low operational and modernization investment reflects challenges in strategic coordination and fiscal stability, which impact Italy's defence readiness and innovation capacity.

3.2. Comparative Discussion of Findings

The comparative analysis of France and Italy reveals important insights into how public financing models shape defence outcomes. France's tax-based, centralized system supports fiscal discipline, long-term planning and institutional integration capabilities. However, this model may lack agility during times of rapid crisis escalation or sudden budgetary needs.

In contrast, Italy's hybrid approach provides short-term fiscal flexibility but often undermines strategic coherence and institutional performance. Frequent budgetary revisions and debt dependence limit the predictability of defence investments and complicate procurement planning. These weaknesses reduce the overall sustainability and effectiveness of Italy's defence apparatus, particularly in times of prolonged economic strain.

This comparison confirms the importance of institutional design, budgeting frameworks and political commitment in determining the effectiveness of defence financing. While France benefits from structural coherence and strategic foresight, Italy illustrates institutional risks of fiscal fragmentation and over – reliance on debt. These findings align arguments that fiscal architecture plays a pivotal role in shaping both capacity and sustainability of national defence systems.

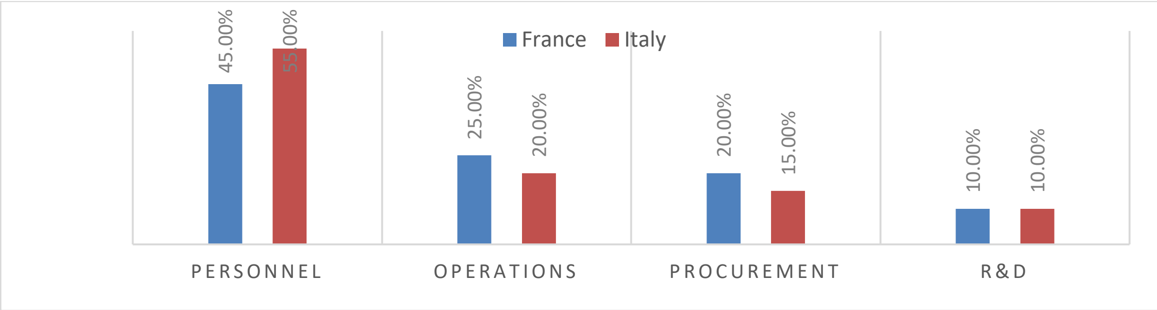

Figure : Comparative Defence Spending Allocation: France vs. Italy

Figure 2 presents a comparative visualization of defence spending distribution in France and Italy. France exhibits a more balanced budget structure, with significant investments in both operational readiness and modernization. In contrast, Italy's spending skews heavily toward personnel, with less emphasis on procurement and operational deployment. These disparities underscore effects of financing models on strategic capabilities: centralized and tax – based systems support modernization and readiness, while debt – dependent models often limit flexibility and long – term defence performance.

4. Conclusions and Policy Implications

4.1. Summary of Key Findings

This study explored how different public sector financing models affect the sustainability and effectiveness of national defence. Focusing on France and Italy as case studies, the analysis demonstrated that the structure and stability of defence financing are essential for ensuring strategic readiness, fiscal responsibility and institutional resilience within NATO and EU member states.

Comparative assessment of France and Italy highlights how differing public sector financing models affect defence system sustainability. France's centralized, tax – based model supports strategic coherence and long – term planning, enabling consistent investment in innovation and operational readiness. Conversely, Italy's hybrid approach, combining tax and debt financing, suffers from fiscal fragmentation and instability, resulting in underinvestment in modernization and a disproportionate focus on personnel costs. These structural weaknesses hinder Italy's defence sustainability and effectiveness over time.

4.2 Policy Implications and Limitations of the Study

Findings of this study hold several implications for defence policymakers and public finance institutions across NATO and EU member states:

- Institutional Design Matters: Countries with integrated and centrally coordinated defence financing frameworks are better positioned to align resources with strategic objectives. Multi – year programming laws, as seen in France, provide a model for enhancing planning certainty and fiscal discipline.
- Transparency and Accountability: Transparent budgeting processes and adherence to fiscal rules are essential for public legitimacy and international credibility. Defence sectors that rely on ad hoc or off – budget financing risk undermining institutional trust and policy effectiveness.
- Modernization through Fiscal Sustainability: Sustainable defence requires a consistent investment in modernization, R&D and technological adaptation. As shown in this study, tax-based systems are more likely to fund such priorities due to their structural alignment with long – term planning.
- Flexibility in Crisis Planning: While tax – based models offer stability, debt – financed or hybrid systems may offer short-term responsiveness. Therefore, the challenge is to balance fiscal flexibility with strategic predictability, particularly considering rapidly evolving geopolitical threats.

- EU and NATO Coordination: As defence increasingly becomes a shared European and transatlantic concern, harmonizing financing standards and promoting shared fiscal guidelines could improve interoperability, burden – sharing and joint capability development.

While this research contributes valuable insights into the relationship between public financing and defence system performance, several limitations should be acknowledged:

- The case study approach, while rich in context, limits generalizability. Additional cases from Central and Eastern Europe or smaller NATO states could yield broader applicability.
- Quantitative data limitations – particularly concerning R&D outcomes and long – term defence effectiveness – restrict the scope of direct performance correlations.
- Institutional and political variables (for example leadership stability, civil – military relations) are only partially addressed and could affect defence outcomes independently of financing models.

4.3. Recommendations for Future Research

Future research should explore several promising avenues:

- Cross-national panel studies involving a broader range of EU and NATO countries to assess the statistical significance of financing models on defence outputs.
- In-depth institutional studies on defence budgeting practices and procurement cycles to better understand internal mechanisms of efficiency and waste.
- Integration with climate and energy security financing, as emerging threats will require adaptive, cross-sectoral budgeting frameworks.
- Scenario-based modelling to assess how different financing models respond under stress conditions such as economic crises, armed conflict or cyberattacks.

In conclusion, sustainability of national defence systems is closely tied to the architecture of public sector financing. By situating defence economics within a broader framework of institutional design and fiscal governance, this study underscores necessity for coherent, transparent and future-oriented financing strategies. Such approaches are not only essential for national security but also for maintaining public accountability and ensuring strategic autonomy in an increasingly complex global landscape.

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