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A Bretton Woods Moment for Productive Security

Converting Economic Capability into Strategic Power

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Abstract

The international security environment is undergoing a structural transformation that challenges the institutional foundations of the post-Cold War order. Strategic competition, economic coercion, technological rivalry, supply-chain disruption and the growing weaponisation of economic interdependence have blurred the distinction between economic policy and national security. At the same time, rising defence expenditure across allied economies has exposed persistent weaknesses in productive capacity, industrial resilience and the ability of existing institutions to convert financial resources into long-term strategic capability.

This paper develops the concept of **Productive Security**, defined as the capacity of an economy, society or alliance to generate, sustain, adapt and mobilise the productive capabilities required to achieve long-term security objectives. Drawing upon endogenous growth theory, National Systems of Innovation research, entrepreneurial finance, economic security and defence economics, the paper argues that security increasingly depends not simply upon military expenditure or procurement, but upon the interaction of innovation systems, financial systems, industrial ecosystems and institutional architectures.

Comparative evidence from Germany, Sweden, Norway, South Korea and the United Kingdom demonstrates a common challenge across allied economies: the difficulty of translating innovation into productive capacity at scale. This is conceptualised as a **Productive Capacity Gap**, extending the historical lineage of the Macmillan Gap, Equity Gap and Funding Escalator into the domain of economic security and capability formation. The paper further argues that the principal constraint is not capital scarcity but capital allocation. Global financial markets contain substantial liquidity, yet institutional mechanisms capable of directing capital towards strategically important productive capability remain underdeveloped.

The analysis introduces the concept of **Open Source Economic Intelligence (OSEINT)** as a framework for identifying emerging vulnerabilities, strategic dependencies and systemic risks across interconnected economic, technological, environmental and social systems. It also extends the concept of resilience beyond Critical National Infrastructure to encompass **Critical Social Infrastructure**, recognising the role of public trust, social cohesion and economic participation in sustaining long-term security.

The paper argues that the emerging concept of an Allied Defence Market should be complemented by a broader framework of Productive Security that links demand coordination with innovation, finance and capability formation. In this context, institutions such as the Allied Defence Market (ADM), Multilateral Defence Mechanism (MDM) and Defence, Security and Resilience Bank (DSRB) are understood as complementary elements within a wider ecosystem of capability creation rather than as alternative policy solutions.

The historical significance of Bretton Woods lay not in the creation of individual institutions but in the establishment of an institutional architecture capable of aligning finance, productive development and international cooperation. The paper concludes that allied economies face a similar challenge today. The defining strategic question of the coming decades may not be whether sufficient resources exist, but

whether institutions can be designed that transform economic strength into productive capability, productive capability into strategic power, and strategic power into long-term prosperity, resilience and security.

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Chapter 1: Why This Is a Bretton Woods Moment

Introduction

The international economic and security environment is undergoing a profound structural transformation. Across advanced economies, policymakers face a convergence of challenges that increasingly defy traditional distinctions between economic policy, industrial policy and national security. Strategic competition between major powers has intensified. Armed conflict has returned to Europe. Economic coercion, export controls, sanctions and technology restrictions have become routine instruments of statecraft. At the same time, governments face mounting fiscal pressures associated with demographic change, climate adaptation, technological transformation and rising defence expenditure (Farrell and Newman, 2019; Harding and Harding, 2017; Harding and Harding, 2019; Harding, 2025).

Individually, none of these developments is unprecedented. Collectively, however, they raise fundamental questions about the institutions through which advanced economies organise growth, security and international cooperation. The challenge is not simply one of allocating additional resources. Increasingly, it is one of institutional design.

The institutions that shaped the post-Cold War era were largely constructed around assumptions of efficiency, liberalisation and deepening economic integration. These assumptions reflected the dominant economic thinking of the period, which emphasised comparative advantage, global value chains and the productivity gains associated with market integration (Porter, 1990; Hirst and Thompson, 1999; Rodrik, 2011). Their success was considerable. Globalisation contributed to significant increases in trade, investment and living standards across much of the world economy.

Yet these same institutions were not designed for a world characterised by persistent geopolitical competition, economic coercion and strategic fragmentation. The increasing weaponisation of trade, finance, technology and supply chains has altered the relationship between economics and security in ways that challenge many of the assumptions underpinning the post-Cold War settlement (Farrell and Newman, 2019; Harding and Harding, 2017; Harding and Harding

As the September 2025 Draghi report pointed out, Europe itself has a competitiveness and productivity gap with the United States that was, it argued, existential for the European project; a productivity gap that could only be closed with public and private investment of nearly 5% of European GDP, a strong focus on innovation in critical technologies, a more integrated single market, streamlined regulation, a shift in industrial policy to create ‘European champions’, and a clear focus on energy transition and security to reduce dependency on Russian supplies (Draghi 2025).

In short, while the principles of ever-closer integration through business, and specifically trade, will create economic prosperity and prevent war between European nations, at present, those institutions are neither preventing war, nor are they providing Europe with the competitiveness that allows it to deliver the defence and security capability or adaptiveness that allows its industrial base and supply chains to adapt to a world in which trade and supply chains and the interdependencies that underpin them through data, finance and technologies are themselves weaponised and a source of coercive power. The same might be said of the World Trade Organisation’s capacity to prevent war, or indeed power projection through international trade.

The question confronting policymakers today is therefore not entirely dissimilar to that faced by those gathered at Bretton Woods in 1944 around the institutional architecture required to sustain prosperity, resilience and security under fundamentally altered geopolitical conditions?

The argument developed throughout this paper is that answering this question requires a shift in perspective. The challenge confronting allied economies is not simply how to finance defence or increase military expenditure. It is how to generate, sustain and mobilise offensively as well as defensively the productive capabilities upon which long-term security increasingly depends.

Economic security as well as defence and security will depend on the development of “Productive Security” whose objective is not merely to create an economy capable of withstanding shocks and uncertainty but also to create sustainable strategic advantage through innovation, productive capability and trusted economic relationships.

From Bretton Woods to the Political Economy of Capability and Productive Security

The significance of Bretton Woods is frequently understood in monetary and financial terms. The conference established the foundations of the post-war international financial system and led to the creation of institutions such as the International Monetary Fund and the International Bank for Reconstruction and Development, later the World Bank (Keynes, 1944; Kindleberger, 1973; Eichengreen, 2008; Helleiner, 2014).

Its deeper significance, however, lay in a broader recognition that markets alone could not generate the investment, productive capacity and international cooperation required to sustain long-term stability following a systemic shock. The architects of Bretton Woods understood that reconstruction required more than capital. It required institutions capable of mobilising resources, coordinating investment and supporting economic transformation over time (Keynes, 1944; Helleiner, 2014).

The World Bank was conceived not merely as a source of finance but as a mechanism for rebuilding productive economies. Similarly, the institutions that would subsequently evolve into the European Union reflected an understanding that industrial cooperation, economic integration and shared prosperity were central components of long-term peace and stability. The objective was not simply recovery but the creation of economic systems capable of sustaining prosperity and reducing the conditions under which conflict might emerge.

In this sense, Bretton Woods was not primarily a financial settlement. It was an exercise in institutional design. Its central insight was that prosperity, productive capacity and security were interconnected. Sustainable stability required institutions capable of supporting all three simultaneously.

The challenge confronting allied economies today differs in important respects from that faced in 1944. Nevertheless, the underlying question remains remarkably similar. How can institutions be designed to support productive capability under conditions of strategic uncertainty and systemic change?

TABLE 1.1: FROM BRETTON WOODS TO PRODUCTIVE SECURITY

Physical reconstruction	Capability formation
Capital scarcity	Capital allocation
National industrial rebuilding	Allied industrial resilience
Monetary stability	Economic security
Reconstruction finance	Productive Security finance
National recovery	Allied capability ecosystems
Bretton Woods institutions	ADM, MDM, DSRB and related institutions

The purpose of this comparison is not to suggest a direct equivalence between the post-war era and the contemporary security environment. Rather, it highlights a common challenge: periods of structural transformation frequently expose weaknesses in existing institutional arrangements and create pressures for new forms of cooperation, coordination and collective investment.

Productive Security - from Efficiency to Resilience

The post-Cold War period was characterised by a remarkable expansion of international economic integration. Firms reorganised production across borders, supply chains became increasingly global and inventory systems were optimised around efficiency and cost reduction. These developments generated significant productivity gains and contributed to rising living standards across many economies (Porter, 1990; Rodrik, 2011).

However, the same processes also generated new forms of vulnerability. The concentration of manufacturing capability in particular geographies, dependence upon critical imports and the increasing strategic use of economic interdependence have exposed weaknesses within existing economic models. The COVID-19 pandemic, disruptions to energy markets following Russia’s invasion of Ukraine and growing tensions surrounding semiconductors, critical minerals and advanced technologies have demonstrated the extent to which resilience has become a strategic concern (Farrell and Newman, 2019; Harding, 2025).

Governments therefore increasingly assess economic relationships through the lens of resilience as well as efficiency. The central question is no longer simply where goods can be produced most cheaply, but whether economies possess sufficient capability to withstand disruption and adapt to changing geopolitical conditions.

This shift has important implications for how security itself is understood. Security can no longer be viewed solely through military assets, defence budgets or operational readiness. Increasingly, it depends upon productive capability, technological capacity, innovation systems, resilient supply chains and the ability to mobilise investment under conditions of uncertainty.

The challenge is therefore not simply one of deterrence. It is one of capability formation. In short, it is a core need to define and deliver productive security – the capacity of an economy, society or alliance to convert economic strength into long-term resilience, prosperity and strategic advantage through the coordinated mobilisation of productive, financial, technological, informational and social capabilities.

A Note on Productive Security and Critical Social Infrastructure

The post-war system was built upon assumptions that prosperity would generate stability. More importantly than this, as globalisation after the end of the Cold War, there was a broad assumption amongst so-called “Western” countries that nations who had hitherto been excluded from the capitalist system of international trade would want the same outcomes societally as well as economically.

Contemporary experience suggests the relationship is more. Food systems, energy systems, digital infrastructure, health systems, transport networks and access to finance have become critical determinants of societal resilience. Productive Security therefore extends beyond Critical National Infrastructure to encompass Critical Social Infrastructure: the systems through which economic participation, social stability and public trust are maintained.

This point is critical since the process of globalisation has given rise to a sense of “haves” and “have nots” – that there is a disconnect between the people who have access to the resources of the global economy and those who are excluded because of threats to their jobs, rising prices and deteriorating public infrastructure. A growing sense of injustice amongst voters has led to a loss of political legitimacy in main stream politics giving rise to extremes and a trade-based rhetoric which is weaponised but useful for governments wanting to capture the attention of voters through economic nationalism: “I export more, they export less. I win, they lose.”

Bretton Woods, it seems, failed to communicate its own benefits to the people who engage in the democratic process to maintain it. Yet now, in an era where the breakdown of economic security is resulting in the need to spend more on defence and security, the importance of communicating the risks associated with these institutional vulnerabilities is essential to justify increased expenditure.

Rather than productivity, in other words, the debate needs to move towards one of productive security. This is not just critical to resilience – it is also critical to preparedness and power since it is, by definition, the creation of capability and not simply deterrence or defence. In other words, productive Security is not merely the capacity to withstand shocks. It is the capacity to shape economic relationships in ways that create sustainable strategic advantage.

The Emergence of the Allied Defence Market

It is against this backdrop that proposals for an Allied Defence Market (ADM) have emerged.

While differing in emphasis, these proposals share a common diagnosis. Fragmented procurement systems, duplicated programmes, inconsistent standards and insufficient coordination have reduced the effectiveness of defence expenditure across allied economies. Greater cooperation, interoperability and market integration are therefore required if allies are to respond effectively to a more demanding security environment.

The ADM framework represents an important contribution to this debate. By focusing on demand coordination, procurement integration, standards harmonisation and trusted industrial relationships, it seeks to create a more coherent market for defence and security capabilities across allied nations.

The significance of this approach should not be underestimated. It reflects an important recognition that military capability increasingly depends upon industrial systems as much as operational systems. The effectiveness of defence expenditure depends not simply upon the volume of spending but upon the ability of industrial ecosystems to respond. Recent work by both policymakers and industry highlights the importance of integrated ecosystems involving governments, prime contractors, SMEs, research institutions and financiers in generating capability at scale (European Commission, 2026; BAE Systems, 2025).

Yet the emergence of ADM proposals also raises a further question: if demand can be coordinated more effectively, how will productive capacity respond? This question lies at the heart of the argument developed throughout this paper.

The Missing Supply-Side Question

Much of the contemporary debate surrounding defence finance and collective security focuses upon the demand side of the equation. Governments increase defence expenditure, procurement systems generate larger order books and common standards facilitate greater market integration. The implicit assumption is that industrial capacity will subsequently expand in response.

Economic theory suggests that this assumption should be treated with caution.

A substantial body of research demonstrates that productive capacity emerges not simply from expenditure but from the interaction of innovation, finance, entrepreneurship, skills and institutional capability (Arrow, 1962; Romer, 1990; Aghion and Howitt, 1992; 1998). Similarly, the literature on National Systems of Innovation argues that competitiveness depends upon relationships between firms, research institutions, governments and financial systems rather than upon investment levels alone (Freeman, 1987; Lundvall, 1992; Nelson, 1993; Edquist, 1997).

The comparative evidence examined throughout this paper reinforces this conclusion. Despite significant differences in industrial structures and policy frameworks, Germany, Sweden, Norway and South Korea have each developed institutional arrangements that connect finance, innovation and industrial capability in distinctive ways. Germany's industrial ecosystem combines long-term finance, applied research institutions and specialised SMEs. South Korea illustrates the importance of strategic coordination between government, finance and industry. Sweden's defence sector benefits from dense networks of

innovative firms and research organisations, while Norway demonstrates how smaller economies can develop specialised capabilities through targeted investment and integration into allied networks (Harding and Paterson, 2000; Harding, 2000; Harding, 2001; Harding, 2007; Harding, 2026a-d).

The common lesson is that productive capacity is not simply purchased.

It is created through ecosystems.

This conclusion is reinforced by evidence emerging from Ukraine. The increasing importance of autonomous systems, software-defined capability, rapid innovation cycles and distributed production networks suggests that modern warfare increasingly favours agile ecosystems capable of adapting quickly to technological change. SMEs, dual-use technology firms and specialised suppliers are becoming increasingly important components of defence capability alongside traditional prime contractors (Watling and Reynolds, 2026; Slusher, 2025).

The challenge confronting allied economies is therefore not simply how to create larger defence markets, but how to ensure that those markets generate the productive capabilities upon which long-term security depends.

Towards Productive Security

Economic capability should be understood not only as a source of resilience but as a source of strategic influence.

Throughout the twentieth century, security policy and economic policy were frequently treated as distinct domains. Contemporary conditions increasingly make such distinctions difficult to sustain. Economic capability, technological capability and military capability have become progressively intertwined and, most importantly, a source of economic power and coercion. The ability to innovate, manufacture, adapt and scale production is increasingly central to strategic effectiveness and influence.

Productive Security provides a framework for understanding this relationship. It draws together insights from endogenous growth theory, National Systems of Innovation, entrepreneurial finance and the emerging literature on economic security, while building upon earlier research into technology transfer, venture capital systems, competitiveness and institutional adaptation (Freeman, 1987; Lundvall, 1992; Romer, 1990; Aghion and Howitt, 1998; Harding, 2000; Harding, 2001; Harding, 2002; Harding, 2007; Farrell and Newman, 2019).

Importantly, this paper does not argue that defence expenditure automatically generates economic growth. The empirical literature remains mixed, and caution is warranted when drawing causal connections between military spending and long-term economic performance (Ramey and Zubairy, 2018; Becker and Dunne, 2023; Olejnik, 2023; SUERF, 2025). However, the literature on endogenous growth suggests that investments which strengthen innovation systems, productive capacity, technological diffusion and industrial resilience may contribute to wider economic performance over time (Romer, 1990; Aghion and Howitt, 1998).

The possibility that such effects might ultimately generate broader economic benefits—a Defence Growth Dividend—should therefore be understood as a conditional proposition rather than an automatic outcome. It is not defence expenditure itself that matters, but the institutions through which that expenditure is translated into productive development.

The framework developed in this paper draws upon my own research since my doctorate looking at comparative national systems of innovation, technology transfer, entrepreneurial finance and competitiveness. My subsequent research explored economic security, trade and strategic competition. While these strands were originally developed within distinct academic and policy communities, increasingly we need to see contemporary security challenges as interdependent. Productive Security is proposed as a framework through which these relationships can be understood.

Conclusion

This chapter has argued that the contemporary security environment presents a challenge that is fundamentally institutional in nature. Just as the architects of Bretton Woods sought to construct institutions capable of supporting prosperity and stability following a period of systemic disruption, allied economies today face the task of designing institutions capable of supporting capability formation under conditions of strategic uncertainty.

The emergence of the Allied Defence Market represents an important contribution to this debate. However, the analysis presented here suggests that demand coordination alone is unlikely to be sufficient. The critical challenge concerns the productive systems that underpin capability formation and the institutions through which innovation, finance and industrial capacity are connected.

The concept of Productive Security has been introduced as a framework for understanding this challenge. The chapters that follow explore how capability is created, why productive capacity matters, how finance influences security outcomes and what forms of institutional architecture may be required if allied economies are to sustain prosperity, resilience and security simultaneously.

Chapter 2: Research Approach and Analytical Framework

Introduction

The central argument developed throughout this paper is that the challenge confronting allied economies is not simply one of defence expenditure, but one of capability formation. The question is not merely how resources are allocated to security, but how those resources are transformed into innovation, productive capacity, resilience and long-term strategic effectiveness.

This distinction has important methodological implications. The relationship between defence expenditure, innovation, productive capacity, economic growth and institutional design spans multiple disciplines and levels of analysis. It cannot be adequately understood through the lens of defence economics alone, nor through a single dataset, theoretical framework or empirical model. The processes

through which capability is created involve interactions between innovation systems, financial systems, industrial ecosystems and security institutions. Understanding these interactions requires an approach that is multidisciplinary, comparative and institutionally grounded.

The purpose of this chapter is therefore not simply to describe a methodology. It is to explain how the concept of Productive Security emerged from the convergence of several previously distinct research traditions and to establish the analytical framework through which capability formation is examined throughout the remainder of the paper.

Intellectual Foundations of Productive Security

The analytical framework draws upon six interconnected bodies of literature. Each addresses a different dimension of capability formation, yet together they provide a coherent framework for understanding the relationship between innovation, finance, industrial development and security.

TABLE 2.1: INTELLECTUAL FOUNDATIONS OF PRODUCTIVE SECURITY

National Systems of Innovation	Freeman (1987); Lundvall (1992); Nelson (1993); Harding and Paterson (2000); Harding (2000; 2001)	Capability formation and innovation ecosystems
Endogenous Growth Theory	Arrow (1962); Romer (1990); Aghion and Howitt (1992; 1998)	Growth through knowledge, innovation and technological change
Entrepreneurial Finance	Mason and Harrison (1995); Harding (2000; 2002); Harding and Cowling (2006)	Funding Escalator, scale-up finance and productive-capacity constraints
Economic Security	Harding and Harding (2017; 2019); Farrell and Newman (2019); Harding (2025)	Productive Security and economic statecraft
Defence Economics	Barro and Redlick (2011); Ramey and Zubairy (2018); Becker and Dunne (2023)	Defence expenditure, productive capability and growth
Development Finance and Institutional Design	Humphrey (2014); Broccolini et al. (2020); Griffith-Jones and Naqvi (2021); Joint MDB Task Force (2023)	Capital mobilisation, risk-sharing and institutional architecture

Taken together, these literatures suggest that capability does not emerge from expenditure alone. Rather, it emerges from interactions between institutions, finance, innovation and production. This proposition forms the intellectual foundation of Productive Security.

Research Design

The paper adopts a mixed-methods research design combining theoretical analysis, documentary research, comparative case studies, participant observation and meta-synthesis.

TABLE 2.2: RESEARCH DESIGN

Literature Review	Establish theoretical foundations
Documentary Analysis	Examine policy, institutional and strategic developments
Comparative Case Studies	Identify recurring patterns across national systems
Participant Observation	Capture emerging institutional developments and practitioner perspectives
Meta-Synthesis	Integrate findings across multiple disciplines and methods

The rationale for combining these approaches is straightforward. Contemporary security challenges involve complex interactions between institutions, markets, technologies and policy systems. Quantitative approaches are valuable for identifying broad relationships but often struggle to capture institutional evolution and policy innovation. Qualitative approaches provide deeper insight into organisational and institutional dynamics but may be limited in their generalisability. A mixed-methods framework therefore offers a more robust basis for understanding capability formation than any single methodological approach.

FIGURE 2: RESEARCH APPROACH

The objective is not to test a single hypothesis through a single empirical model. Rather, it is to identify recurring patterns across multiple forms of evidence and to develop a framework capable of explaining how productive capability is generated, financed and sustained.

Literature Review

The theoretical foundations of the paper draw upon six principal bodies of literature.

The first is endogenous growth theory, which emphasises the role of knowledge, innovation and technological change in shaping long-term economic performance (Arrow, 1962; Romer, 1990; Aghion and Howitt, 1992; 1998). Unlike traditional growth models, endogenous growth theory treats innovation as an internal feature of economic systems rather than an exogenous force. This distinction is particularly important because it highlights the role of institutions, incentives and investment in shaping productive outcomes.

The second body of literature concerns National Systems of Innovation. Freeman (1987), Lundvall (1992), Nelson (1993) and Edquist (1997) emphasise the importance of relationships between firms, universities, governments and financial institutions in generating and commercialising knowledge. Earlier research on German technology policy, technology transfer and industrial development similarly demonstrated the importance of institutional interactions in shaping productive capability (Harding, 2000; Harding, 2001; Harding and Paterson, 2000).

The third concerns entrepreneurship, knowledge spillovers and regional innovation systems (Audretsch and Feldman, 1996; Audretsch and Keilbach, 2004). This literature highlights the role of smaller firms and entrepreneurial ecosystems in translating innovation into economic activity.

The fourth focuses upon entrepreneurial finance and SME growth. Research on venture capital markets, equity gaps and growth-company finance demonstrated that financing constraints frequently limit the ability of innovative firms to scale production and commercialise technology (Mason and Harrison, 1995; Harding, 2000; Harding, 2002; Harding and Cowling, 2006). These insights underpin the Funding Escalator framework discussed in later chapters.

The fifth body of literature concerns economic security and economic statecraft. This literature examines the growing strategic importance of trade, finance, technology and supply chains and the increasing use of economic relationships as instruments of geopolitical influence (Farrell and Newman, 2019; Harding and Harding, 2017; Harding and Harding, 2019; Harding, 2025).

The sixth concerns defence economics and development finance. Defence economics highlights the complex relationship between expenditure, capability and economic performance (Barro and Redlick, 2011; Ramey and Zubairy, 2018; Becker and Dunne, 2023), while the development-finance literature emphasises the role of institutions in mobilising capital, sharing risk and supporting productive investment (Massa, 2011; Humphrey, 2014; Broccolini et al., 2020; Griffith-Jones and Naqvi, 2021).

No single theoretical framework is privileged. Rather, the paper seeks to identify recurring themes and areas of convergence across these literatures.

Documentary Analysis and Comparative Research

The empirical component of the research incorporates extensive documentary analysis of policy documents, industrial strategies and institutional proposals. Sources include NATO assessments, European Defence Agency reports, the European Defence Industrial Strategy, the EU Defence Industry Transformation Roadmap, national defence-industrial strategies, the UK Strategic Defence Review, multilateral development-bank research and proposals relating to ADM, MDM and DSRB.

A central component of the analysis is the comparative study of defence-industrial ecosystems in Germany, Sweden, Norway and South Korea. These countries were selected because they represent distinct institutional approaches to capability formation while facing broadly similar strategic challenges.

TABLE 2.3: COMPARATIVE CASE STUDY FRAMEWORK

Germany	Manufacturing depth, applied research institutions and specialised SMEs	Finance-industry relationships and productive capacity
Sweden	Innovation-intensive defence ecosystem	Technology development and SME participation
Norway	Small-state resilience and specialisation	Niche capability formation and allied integration
South Korea	Strategic state-industry coordination	Industrial scaling and export competitiveness

The objective is not to identify a single optimal model. Rather, it is to identify recurring constraints and institutional characteristics that influence productive capability across different national contexts.

Participant Observation and Practitioner Research

In addition to documentary and comparative analysis, the research draws upon participant observation undertaken through direct engagement with governments, defence firms, financial institutions, multilateral organisations, industry associations and policy networks between 2023 and 2026.

This engagement occurred through advisory activities, policy-development processes, industry consultations, conference participation and the development of institutional proposals relating to defence finance, economic security and allied capability formation. Such engagement provides insight into emerging institutional developments and evolving practitioner perspectives that are often not yet reflected within the academic literature.

Participant observation is particularly valuable in areas characterised by rapid technological and institutional change. While such evidence cannot substitute for systematic empirical analysis, it can illuminate emerging challenges, policy innovations and practical constraints that may not yet be visible within formal datasets.

Meta-Synthesis and Pattern Identification

Rather than relying upon a single dataset or empirical model, the paper adopts a meta-synthesis approach that seeks to identify recurring patterns across multiple forms of evidence.

This approach is particularly appropriate because the relationship between defence expenditure, productive capacity and economic performance spans multiple disciplines and institutional contexts. The objective is therefore not to isolate a single causal mechanism, but to identify common findings emerging across different bodies of research.

Several recurring themes emerge:

1. Innovation depends upon ecosystems rather than isolated investments.
2. Financing constraints frequently limit the ability of firms to scale productive capacity.
3. Supply-chain resilience increasingly influences both economic and security outcomes.
4. Expenditure alone does not guarantee capability formation, productivity growth or resilience. Finally, institutional design shapes the effectiveness with which resources are translated into productive outcomes.

These findings provide the foundation for the concept of Productive Security developed in later chapters.

Scope and Limitations

The methodological approach adopted in this paper offers several advantages, but also involves important limitations.

TABLE 2.4: SCOPE AND LIMITATIONS

Integrates multiple disciplines	No single causal model
Combines theory and empirical evidence	Limited number of country cases
Incorporates original participant observation	Potential interpretation bias
Examines emerging institutional proposals	Limited historical data for some mechanisms
Focuses on institutional design	Cannot directly prove growth effects

Several points are particularly important.

First, the paper does not claim a direct causal relationship between multilateral financial institutions and economic growth. The empirical literature remains limited and attribution challenges remain significant (Massa, 2011; Haini, 2020).

Second, the paper does not argue that defence spending automatically generates economic growth or positive spillovers. The evidence suggests that outcomes depend significantly upon institutional design, productive capacity, industrial structure and financing mechanisms (Ramey and Zubairy, 2018; Becker and Dunne, 2023; SUERF, 2025).

Third, while the comparative case studies identify recurring patterns, they do not constitute a statistically representative sample of all defence-industrial systems. The conclusions should therefore be understood as propositions concerning institutional design rather than deterministic predictions.

The objective of the paper is therefore not to establish universal causal relationships, but to develop a theoretically informed and empirically grounded framework for understanding capability formation. The conclusions should be interpreted as propositions concerning institutional design and policy architecture rather than deterministic forecasts.

Analytical Framework

The central proposition developed throughout this paper is that capability formation emerges through the interaction of five interconnected systems: security systems, financial systems, innovation systems, industrial systems and institutional architectures.

TABLE 2.5: PRODUCTIVE SECURITY ANALYTICAL FRAMEWORK

Security System	Defines strategic requirements	Demand
Financial System	Mobilises and allocates capital	Investment
Innovation System	Generates knowledge and technology	Innovation
Industrial System	Converts innovation into productive output	Productive Capacity
Institutional Architecture	Coordinates interactions between systems	Resilience
Productive Security	Integrates all five systems	Long-term capability

This framework highlights an important distinction. Contemporary debates concerning collective security frequently focus upon the upper layers of the capability process, particularly defence expenditure, procurement and demand coordination. These issues are important and initiatives such as the Allied Defence Market represent valuable contributions in this regard.

However, the evidence reviewed throughout this paper suggests that equal attention must be devoted to the mechanisms through which investment is transformed into innovation, productive capacity and resilience. It is within this supply-side architecture that the foundations of long-term capability ultimately reside.

The chapters that follow examine these relationships in greater detail and explore how institutional architectures can be designed to strengthen the productive foundations of security.

Chapter 3: Innovation Systems, Productive Capacity and Capability Formation

Introduction

The previous chapter argued that capability formation emerges through the interaction of innovation systems, financial systems, industrial systems and security institutions. It also suggested that contemporary security challenges cannot be understood through expenditure alone. Rather, they require an understanding of the institutional processes through which knowledge, investment and industrial capacity are transformed into capability.

This chapter examines the empirical evidence supporting that proposition. Drawing upon comparative research undertaken across Germany, Sweden, Norway, South Korea and the United Kingdom, it explores how different institutional arrangements influence the generation, scaling and mobilisation of productive capability. These countries differ substantially in economic structure, industrial organisation, financial systems and policy traditions. Yet despite these differences, a striking pattern emerges.

The principal constraint affecting capability formation is rarely the generation of innovation itself. Instead, it concerns the ability to translate innovation into productive capacity at scale.

This finding has important implications for contemporary debates concerning security, defence finance and industrial policy. If capability increasingly depends upon the effectiveness of productive ecosystems, then the challenge confronting allied economies is not simply how to increase expenditure, but how to strengthen the institutional mechanisms through which innovation becomes capability.

Capability Formation and Innovation Systems

The proposition that productive capability emerges through institutional relationships rather than isolated investments is well established within the innovation literature. National Systems of Innovation research emphasises that innovation depends upon interactions between firms, universities, governments and financial institutions (Freeman, 1987; Lundvall, 1992; Nelson, 1993; Edquist, 1997). Similarly, endogenous growth theory identifies knowledge creation, technological learning and human capital as fundamental drivers of long-term economic performance (Arrow, 1962; Romer, 1990; Aghion and Howitt, 1992; 1998).

The contribution of these literatures is not simply to explain economic growth. They provide a framework for understanding capability formation. Modern military capability increasingly depends upon technologies whose origins lie within broader innovation ecosystems. Artificial intelligence, autonomous systems, advanced materials, cyber technologies, advanced manufacturing and quantum applications all emerge through interactions between civilian and defence sectors.

Consequently, the effectiveness of defence systems increasingly reflects the effectiveness of innovation systems.

This conclusion is reinforced by evidence emerging from Ukraine. The growing importance of software-defined capability, autonomous systems, rapid adaptation cycles and distributed production networks suggests that military effectiveness increasingly depends upon the capacity of innovation ecosystems to evolve and respond under conditions of uncertainty (Watling and Reynolds, 2026; Slusher, 2025).

The question, therefore, is not whether innovation matters for security. The evidence increasingly suggests that it does. The more important question is how innovation becomes capability.

Comparative Evidence from Allied Economies

To explore this question, the research examined defence-industrial ecosystems in Germany, Sweden, Norway, South Korea and the United Kingdom. These countries were selected because they represent distinct approaches to innovation, industrial development and capability formation while operating within broadly comparable security environments.

TABLE 3.1: COMPARATIVE CAPABILITY ECOSYSTEMS

Germany	Applied innovation and research networks	Long-term industrial finance	Manufacturing depth and engineering capability	SME scaling and mobilisation speed
Sweden	Technology-intensive innovation ecosystem	Innovation and export support mechanisms	Specialist defence capability	Scale-up finance
Norway	Niche technological innovation	Targeted public support mechanisms	Specialised industrial capability	Growth capital
South Korea	Strategic innovation and industrial policy	Coordinated industrial finance	Rapid industrial scaling	SME integration and diversification
United Kingdom	World-class research and defence science	Strong venture-capital ecosystem	Advanced defence and aerospace capability	Innovation-to-scale transition

Source: Harding and Paterson (2000); Hall and Soskice (2001); Harding (2000; 2001; 2007); Harding and Cowling (2006); Harding (2026a–f).

At first glance, these countries appear fundamentally different. Germany relies upon manufacturing depth and institutional coordination. Sweden emphasises technological innovation and specialist capability. Norway pursues niche specialisation. South Korea demonstrates strategic coordination between government, industry and finance. The United Kingdom combines research excellence with a globally significant defence sector.

Yet a closer examination reveals remarkable consistency.

In each case, productive capability emerges where innovation systems, financial systems and industrial systems reinforce one another. Equally, in each case, the principal challenge concerns the transition from innovation to scale.

TABLE 3.2: COMMON PATTERNS ACROSS ALLIED ECONOMIES

Strong innovation capability	Difficulty scaling production
High-quality SME ecosystems	Financing gaps
Advanced technological expertise	Working-capital shortages
Research excellence	Long certification and procurement cycles
Growing defence demand	Productive-capacity constraints
Strong industrial capabilities	Supply-chain vulnerabilities

The consistency of these findings is significant. Although institutional arrangements differ substantially, the constraints affecting capability formation are strikingly similar.

The challenge is not the generation of ideas, rather, the challenge is the conversion of ideas into productive output.

National Models of Capability Formation

The German case demonstrates the importance of institutional coordination. Long-term industrial finance, applied research institutions, vocational training systems and specialised SMEs combine to create considerable manufacturing depth (Streeck, 1997; Hall and Soskice, 2001; Harding and Paterson, 2000). Institutions such as the Fraunhofer network facilitate the translation of research into industrial application, while regional banking systems and KfW support long-term investment. Yet even within this highly coordinated system, CES research identifies constraints affecting lower-tier suppliers and growth-stage firms seeking to expand productive capacity rapidly (Harding, 2026a).

Sweden illustrates a different model, characterised by dense networks linking universities, specialist firms and larger defence companies. Innovation performance is exceptionally strong, and knowledge diffusion mechanisms function effectively. However, Swedish firms frequently encounter difficulties accessing the capital required to commercialise technologies and expand production (Harding, 2026b). The challenge is not innovation itself but industrial scaling.

South Korea demonstrates the benefits of strategic coordination between government, finance and industry. Long-term industrial policy, export-oriented growth and targeted financial support have enabled rapid industrial upgrading and substantial defence-industrial expansion. Yet even here, financing constraints affecting smaller suppliers remain significant as technologies become increasingly complex and supply chains more specialised (Harding, 2026c).

Norway offers a contrasting model based upon specialisation rather than scale. Norwegian firms compete successfully through advanced niche capabilities integrated into wider allied supply chains. This strategy has generated considerable technological sophistication. However, growth capital and working-capital constraints continue to limit the speed with which productive capacity can expand in response to changing demand (Harding, 2026d).

The United Kingdom perhaps illustrates the challenge most clearly. The UK possesses world-leading universities, advanced research institutions, strong venture-capital markets and globally competitive defence firms. Yet research on entrepreneurial finance has repeatedly identified persistent difficulties in moving firms from innovation to industrial scale (Harding, 2000; Harding, 2002; Harding and Cowling, 2006). Similar patterns are increasingly visible within defence supply chains, where firms frequently succeed in developing technologies but struggle to access the capital required for certification, commercialisation and production expansion (Harding, 2026f).

Taken together, these cases suggest that the central challenge confronting allied economies is not innovation failure. It is scale failure.

From Innovation to Capability

The comparative evidence points towards a broader conclusion. Capability does not emerge automatically from research expenditure, defence expenditure or technological innovation. It emerges through a sequence of institutional processes that transform knowledge into productive output.

TABLE 3.3: FROM INNOVATION TO CAPABILITY

Research	Universities, laboratories and R&D institutions
Innovation	Entrepreneurial ecosystems and technology firms
Commercialisation	Growth finance and investment mechanisms
Production	Industrial capacity and supply chains
Scaling	Long-term capital, skills and workforce development
Capability	Integrated innovation, finance and industrial ecosystems

This framework helps explain why many defence-industrial systems experience similar difficulties despite substantial differences in structure and policy:

1. Investment in research does not guarantee production.
2. Innovation does not guarantee scale.
3. Demand does not guarantee capability.

Each stage depends upon different institutions, different financing mechanisms and different organisational capabilities. Weaknesses at any point in the process may constrain the ability of economies to generate productive capability regardless of the level of demand.

Productive Capacity as a Strategic Asset

The evidence reviewed in this chapter suggests that productive capacity should be understood as a strategic asset in its own right.

Historically, defence policy has often focused upon procurement outcomes and military capabilities. Increasingly, however, the ability to generate, expand and adapt productive capacity may be equally important. The lessons emerging from Ukraine reinforce this conclusion. Military effectiveness increasingly depends upon the ability to replenish equipment, adapt technologies, integrate new capabilities and respond rapidly to changing operational requirements (Watling and Reynolds, 2026; Slusher, 2025).

This shifts attention from procurement to production, and from expenditure to ecosystems.

The challenge confronting allied economies is therefore not simply to create demand through mechanisms such as the Allied Defence Market. It is to ensure that innovation systems, financial systems and industrial systems possess the capacity to respond.

Conclusion

The comparative evidence presented in this chapter suggests that capability emerges from ecosystems rather than expenditure alone.

Germany, Sweden, Norway, South Korea and the United Kingdom differ substantially in institutional structure, industrial organisation and policy tradition. Yet all demonstrate the importance of linking innovation systems, financial systems and industrial systems. Equally, all reveal persistent challenges in translating innovation into productive capacity.

The central lesson is therefore not that one national model should be replicated. Rather, it is that capability formation depends upon institutional relationships that connect knowledge creation, financing and production. The recurring constraint across all five cases is not the generation of innovation but its translation into industrial scale.

This finding has important implications for the broader argument developed throughout the paper. If capability emerges through ecosystems, finance becomes a critical mechanism through which those ecosystems expand, adapt and respond to strategic demand. The next chapter therefore examines the role of finance in capability formation and explores how capital allocation influences the productive foundations of security.

Chapter 4: Financing Capability: From the Equity Gap to the Productive Capacity Gap

Introduction

The previous chapter demonstrated that capability emerges from ecosystems rather than expenditure alone. Comparative evidence from Germany, Sweden, Norway, South Korea and the United Kingdom showed that successful defence-industrial systems depend upon interactions between innovation systems, financial systems and industrial systems. While these countries differ substantially in institutional structure, they share a common challenge: the translation of innovation into productive capacity.

This observation raises an important question. If governments are increasing defence expenditure and innovation ecosystems continue to generate new technologies, why do productive-capacity constraints persist? Why do supply-chain bottlenecks emerge? Why do firms struggle to scale production in response to rising demand? Why does increased expenditure frequently contribute to inflationary pressures rather than expanded capability?

The answer lies not in a shortage of innovation, nor in a shortage of capital. Global financial markets contain unprecedented pools of liquidity. Pension funds, sovereign wealth funds, insurers, banks, private-credit providers and asset managers collectively manage hundreds of trillions of dollars in assets. The challenge confronting allied economies is therefore not the availability of capital in aggregate, but the mechanisms through which capital is allocated.

This distinction is fundamental. Throughout this paper, the argument has been that the critical issue is not how much money is spent, but how resources are translated into productive capability. Finance occupies a pivotal position within this process because it provides the bridge between innovation and production, between demand and scale, and ultimately between expenditure and capability.

Capital Is Not the Same as Capability

Conventional discussions of defence spending frequently assume a relatively straightforward relationship between expenditure and capability. Governments increase budgets, procurement systems place orders and industrial capacity responds accordingly. Yet the evidence presented in Chapter 3 suggests that this process is considerably more complex.

The existence of productive capacity depends upon the ability of firms to invest, expand facilities, recruit skilled labour, increase inventories and absorb new technologies. These activities require access to finance. Consequently, the relationship between expenditure and capability is mediated by financial systems.

TABLE 4.1: FROM SPENDING TO CAPABILITY

More spending creates more capability	Spending must be translated into productive capacity
Capital availability is the key challenge	Capital allocation is the key challenge
Success measured through expenditure	Success measured through capability creation
Procurement drives outcomes	Finance and production shape outcomes
Demand is sufficient	Demand and productive capacity must evolve together

Where productive capacity is constrained, rising demand may contribute to inflation, delivery delays and supply shortages rather than expanded capability. The issue is therefore not expenditure itself but the ability of productive systems to absorb and respond to expenditure.

The Funding Escalator and Capability Formation

The relationship between finance and productive capacity has long been recognised within the literature on entrepreneurial growth (Storey, 1994; Mason and Harrison, 1995; Harding, 2000; Harding, 2002; Harding and Cowling, 2006).

The Funding Escalator emerged from the observation that firms require different forms of finance at different stages of development. Early-stage firms typically rely upon founders, angel investors and venture capital. Growth-stage firms require scale-up capital. More mature firms require debt finance, private credit and institutional investment. Growth depends not simply upon the availability of capital, but upon access to the right form of capital at the right stage of development.

Viewed through the lens of Productive Security, the same principle applies to capability formation.

TABLE 4.2: FROM THE FUNDING ESCALATOR TO CAPABILITY FORMATION

Start-up	Research and innovation	Seed finance and venture capital
Early growth	Technology development	Growth capital
Expansion	Industrialisation and production	Working capital and private credit
Mature production	Capability delivery	Commercial finance
Ecosystem development	National and allied capability	Development and multilateral finance

The significance of this framework is that it shifts attention away from individual financing instruments towards the wider financing ecosystem required to support capability formation.

Why Defence Is Different

The financing challenge becomes more acute within defence-industrial ecosystems.

Modern warfare increasingly favours rapid technological adaptation, shorter innovation cycles, autonomous systems, software-defined capability and distributed production networks (Watling and Reynolds, 2026; Slusher, 2025). These characteristics increase the importance of SMEs, dual-use technology firms and specialist suppliers within defence supply chains.

Yet these same firms frequently possess characteristics that conventional finance struggles to accommodate. Long certification cycles, dependence upon government procurement, uncertain demand patterns and limited collateral make them difficult to assess using traditional risk models.

TABLE 4.3: WHY DEFENCE SMES ARE DIFFICULT TO FINANCE

Long development and certification cycles	Delayed revenues
Dependence upon government procurement	Demand uncertainty
Specialist technologies	Limited collateral
Security requirements	Higher operating costs
Small customer base	Revenue concentration risk
Export controls	Reduced market flexibility

The result is a structural mismatch between the firms that increasingly generate capability and the institutions that traditionally allocate capital.

From the Equity Gap to the Productive Capacity Gap

The origins of this challenge can be traced to the Macmillan Committee (1931), which identified persistent financing constraints affecting smaller firms. Subsequent research expanded this analysis through the concepts of the Equity Gap and the Funding Escalator (Mason and Harrison, 1995; Harding, 2000; Harding and Cowling, 2006).

The contemporary defence challenge can be understood as the latest stage in this evolution.

TABLE 4.4: THE EVOLUTION OF FINANCING CONSTRAINTS

Macmillan Gap	Access to finance for smaller firms
Equity Gap	Growth capital for scaling businesses
Funding Escalator	Matching finance to stages of growth
Defence Finance Gap	Financing strategic industries
Productive Capacity Gap	Scaling capability ecosystems

The Productive Capacity Gap emerges when innovation, demand and strategic necessity exist, but the institutional mechanisms required to convert those assets into productive scale remain insufficiently developed. The challenge is no longer merely entrepreneurial, it is strategic.

Evidence from Allied Economies

Evidence from Germany, Sweden, Norway, South Korea and the United Kingdom reveals recurring financing constraints despite substantial differences in institutional design (Harding, 2026a–d; 2026f).

TABLE 4.5: THE EMERGING PRODUCTIVE CAPACITY GAP

Scale-up finance	High	High	High	Medium	High
Working capital	Medium	Medium	High	Medium	High
SME integration	Medium	Medium	Medium	High	High
Innovation-to-production transition	Medium	High	Medium	Medium	High
Supply-chain resilience	Medium	Medium	Medium	Medium	High

The consistency of these findings suggests that the challenge is structural rather than national. Innovation ecosystems are functioning. Demand is growing. Capital is abundant. Yet productive expansion remains constrained.

Beyond Market Failure

These challenges are frequently described as market failures. While useful, that description may understate their strategic significance, not least because they originate in an assumption that policy can adjust demand and the rest will follow. This creates a demand-side bias that is itself a market failure.

Investment in defence-industrial ecosystems generates benefits that extend beyond commercial returns. Productive capacity contributes to resilience, deterrence, technological sovereignty and supply-chain security. These wider benefits are rarely captured fully by private investment decisions.

Consequently, there may be a role for institutions capable of aligning private incentives with strategic objectives.

This does not imply replacing markets. Rather, it suggests creating mechanisms that enable markets to support capability formation more effectively.

Implications for the Allied Defence Market

The Allied Defence Market represents an important response to fragmentation within defence procurement. By coordinating demand and strengthening interoperability, ADM can improve investment signals across allied economies.

However, the evidence reviewed in this chapter suggests that demand coordination alone is unlikely to resolve productive-capacity constraints.

TABLE 4.6: FROM DEMAND TO CAPABILITY

Demand	Fragmented markets	Allied Defence Market
Procurement	Coordination failures	Multilateral Defence Mechanism
Liquidity	Capital mobilisation	Defence, Security and Resilience Bank
Industrial scaling	Growth finance and working capital	National resilience-finance mechanisms
Capability	Ecosystem integration	Productive Security architecture

The supply-side challenge identified throughout this paper should therefore be understood not as an alternative to ADM, but as a necessary complement to it.

Conclusion

The evidence reviewed in this chapter suggests that the challenge confronting allied economies is not primarily a shortage of innovation, nor even a shortage of capital. Rather, it is a shortage of mechanisms capable of allocating capital to productive capability.

The evolution from the Macmillan Gap to the Equity Gap, the Funding Escalator and ultimately the Productive Capacity Gap reflects a common theme: innovative firms frequently struggle to secure the resources required to scale.

The comparative evidence from Germany, Sweden, Norway, South Korea and the United Kingdom suggests that defence-industrial ecosystems are no exception. Despite significant institutional differences, all face challenges in translating innovation into productive capacity.

If capability emerges through ecosystems, finance becomes the mechanism through which those ecosystems expand. Understanding how financial systems influence security outcomes therefore becomes central to understanding capability formation itself.

The next chapter broadens the discussion further by examining how productive capability forms part of the wider architecture of economic security and strategic statecraft.

Chapter 5: Economic Statecraft and the Foundations of Strategic Capability

Introduction

The previous chapters have demonstrated that capability emerges through productive ecosystems and that finance plays a critical role in determining whether those ecosystems are able to scale. The comparative evidence from Germany, Sweden, Norway, South Korea and the United Kingdom suggests that the principal constraint confronting many defence-industrial systems is not the generation of innovation itself, but the ability to convert innovation into productive capacity.

This observation has implications that extend far beyond industrial policy or defence economics. It suggests that economic capability itself increasingly constitutes a source of strategic power. The ability to innovate, mobilise capital, scale production and adapt industrial systems is no longer simply a determinant of economic performance. It increasingly shapes the strategic options available to governments. As such, it turns the debate around productivity from an economic growth one to one of economic security.

The purpose of this chapter is therefore to examine the relationship between economic capability and strategic capability. It argues that economic statecraft should be understood not only as the protection of economic assets but as the mobilisation of financial, technological and industrial resources in pursuit of strategic objectives. In this sense, the challenge confronting allied economies is not simply how to fund defence, but how to transform financial resources into productive capability.

Economic Capability and Strategic Power

The relationship between economic capability and strategic influence is not new. Throughout modern history, financial strength, industrial capacity and technological leadership have played decisive roles in shaping geopolitical outcomes. Industrialisation underpinned the emergence of great powers during the nineteenth century. The mobilisation of industrial and financial resources proved critical during the major conflicts of the twentieth century. The institutions established after 1945 reflected a recognition that economic strength and security were fundamentally interconnected (Kindleberger, 1973; Gilpin, 1987; Eichengreen, 2008).

What has changed is the form that economic capability increasingly takes.

During much of the industrial era, strategic advantage was associated primarily with scale. Industrial output, access to raw materials and manufacturing capacity were central determinants of national power. While these factors remain important, contemporary capability increasingly depends upon innovation, technological adaptation and the ability to integrate knowledge rapidly into productive systems. Strategic advantage is determined not simply by what economies produce, but by how rapidly they can develop, scale and deploy new capabilities.

Economic capability should therefore be understood as a strategic asset in its own right. Its significance lies not merely in what it produces but in what it enables. Innovation creates technological opportunity. Industrial systems transform opportunity into output. Financial systems determine the speed and scale at which this process occurs. Together, these capabilities shape the strategic choices available to states.

TABLE 5.1: ECONOMIC CAPABILITY AS STRATEGIC CAPABILITY

Innovation Systems	Technological advantage
Industrial Capacity	Capability production
Financial Systems	Capital mobilisation
Supply Chains	Operational resilience
Human Capital	Adaptability and learning
Institutions	Capability coordination

The implication is that security increasingly depends upon economic systems that were traditionally viewed as separate from defence policy. Economic capability, that is productivity, becomes a component of preparedness rather than merely a contributor to prosperity.

The Changing Character of Capability

The importance of economic capability has been reinforced by changes in the character of warfare itself.

Historically, military power was often associated with industrial scale. The ability to produce ships, aircraft, armoured vehicles and munitions in large quantities was a decisive determinant of strategic success. While industrial scale remains important, contemporary warfare increasingly rewards adaptability, technological iteration and rapid capability development.

Evidence emerging from Ukraine suggests that military effectiveness increasingly depends upon the ability of innovation ecosystems to respond quickly to operational requirements. Autonomous systems, software-defined capability, artificial intelligence and distributed production networks have shortened innovation cycles and increased the importance of SMEs, specialist suppliers and dual-use technology firms (Watling and Reynolds, 2026; Slusher, 2025; European Commission, 2026).

These developments place increasing pressure upon defence-industrial systems. Technologies become obsolete more quickly. Capability must be updated more frequently. Supply chains must adapt rapidly to changing operational requirements. The result is that productive ecosystems become as important as individual programmes or platforms.

This represents a significant departure from traditional defence-industrial models. Capability increasingly emerges through networks of primes, SMEs, universities, research institutions and financial actors rather than through large-scale production systems alone (BAE Systems, 2025). Strategic advantage therefore depends not simply upon industrial capacity, but upon the ability of ecosystems to innovate, adapt and scale.

The challenge confronting allied economies is no longer solely one of mobilisation in the traditional sense. It is one of continuous adaptation.

From Efficiency to Capability

For much of the post-Cold War period, economic policy was organised around the pursuit of efficiency. Global supply chains became increasingly specialised, production was distributed internationally and firms optimised operations around cost minimisation. These developments generated significant gains in productivity and living standards through trade, specialisation and global value-chain integration (Porter, 1990; Rodrik, 2011). We can contend of course that the failure of both Bretton Woods and the subsequent globalisation was the failure to communicate these benefits adequately.

Nowhere are these vulnerabilities exposed more than through subsequent shocks which have revealed the limitations of an efficiency-only approach and translated into a visceral disconnect between the political rhetoric aligned with neo-classical economics and the lived reality of price rises and job insecurity. The COVID-19 pandemic, disruptions to energy markets, shortages of critical technologies and growing geopolitical tensions demonstrated that highly efficient systems are not always highly resilient. Supply chains optimised for cost may prove vulnerable to disruption. Production concentrated in a limited number of locations may create strategic dependencies. Capital allocated according to short-term commercial criteria may not support long-term capability development or economic security.

As a consequence, governments increasingly assess economic relationships through the lens of capability as well as efficiency in order to scale and address the reality of the current era. This underpins the increased focus on industrial policy and sovereign capability.

This shift does not imply abandoning market principles or rejecting globalisation. Rather, it reflects a growing recognition that economic systems must also support resilience, adaptability and long-term strategic effectiveness. The objective is not to replace efficiency with resilience but to balance the two more effectively.

The critical question therefore becomes one of capability creation. The challenge is no longer simply where goods can be produced most cheaply, but whether productive systems possess the capacity to respond to strategic requirements under conditions of uncertainty.

From Bullion to Bullets

The role of finance within this process deserves particular attention.

Historically, discussions of defence mobilisation have focused upon governments, armed forces and industrial production. Yet the ability of productive systems to respond to strategic demand depends fundamentally upon the mobilisation of capital. Factories cannot be expanded, technologies cannot be commercialised and supply chains cannot be scaled without access to finance.

This relationship may be understood through the concept of moving from bullion to bullets.

The phrase captures the process through which financial resources are transformed into productive capability. Capital is mobilised through financial institutions. Investment supports innovation, productive expansion and industrial development. These activities generate the capabilities upon which military effectiveness ultimately depends.

TABLE 5.2: FROM BULLION TO BULLETS

Capital Mobilisation	Investment
Investment	Innovation
Innovation	Productive Capacity
Productive Capacity	Military Capability
Military Capability	Strategic Credibility

The significance of this framework is that it places capital mobilisation at the centre of capability formation. Financial systems influence the cost of capital, determine access to investment and shape the ability of firms to scale production. In an era characterised by rapid technological change and increasingly dynamic forms of warfare, the ability to mobilise capital effectively may become one of the most important determinants of strategic effectiveness.

Viewed in this way, finance should not be understood merely as a supporting function. It becomes part of the capability ecosystem itself.

Economic statecraft is therefore not simply about protecting existing assets or mitigating vulnerabilities. It is also about ensuring that financial systems contribute to the creation of future capability.

Intelligence and Economic Security

The growing integration of economics and security creates a corresponding challenge for intelligence systems. Traditional intelligence architectures were designed primarily to identify military threats, monitor political developments and assess the intentions and capabilities of state and non-state actors. While these functions remain essential, contemporary security increasingly depends upon the ability to identify

emerging economic vulnerabilities before they manifest as strategic crises. As the relationship between economic capability and strategic capability becomes more closely intertwined, the ability to understand the operation of economic systems becomes an increasingly important component of national and allied resilience.

This requirement extends beyond the collection of economic data or the monitoring of markets. Productive Security depends upon the ability to identify the interactions between economic, technological, environmental and social systems, and to understand how seemingly isolated developments can generate wider strategic consequences. Economic shocks rarely remain confined to the sectors in which they originate. Food insecurity may emerge from disruptions in fertiliser markets before manifesting as inflation, migration pressures or political instability. Energy disruptions may begin as shipping constraints before affecting industrial production, financial markets and public confidence. Trade restrictions may originate in commercial disputes before reshaping technological ecosystems, strategic dependencies and geopolitical relationships. The strategic significance of such developments often lies not in the initial event itself but in the second and third-order consequences that follow.

This paper therefore proposes the concept of Open Source Economic Intelligence (OSEINT). OSEINT may be defined as the systematic collection, analysis and interpretation of publicly available economic, financial, technological, environmental and social information in order to identify emerging vulnerabilities, strategic dependencies, capability constraints and opportunities that may affect long-term economic security and resilience. Unlike traditional economic analysis, which frequently focuses on economic performance, forecasting or market behaviour, OSEINT is concerned with the identification of weak signals, emerging risks and systemic interdependencies that may alter the strategic environment.

In this respect, OSEINT occupies a position analogous to that of intelligence within traditional security institutions. Just as military intelligence seeks to identify threats before they become operational realities, OSEINT seeks to identify economic-security risks before they become strategic crises. Its purpose is not prediction in the conventional sense but the development of situational awareness. It seeks to understand what is changing, why it matters and how developments in one domain may create consequences in another.

Three characteristics distinguish OSEINT from conventional approaches to economic monitoring. First, it focuses upon signals rather than events. The objective is to identify indicators of systemic change before those changes become widely recognised or reflected in official statistics. Second, it prioritises second and third-order effects. A policy announcement, market movement, technological development or regulatory intervention may have consequences that extend far beyond its immediate area of application. Third, it examines interdependencies across systems. Economic security increasingly emerges from the interaction of climate systems, food systems, energy networks, transport infrastructure, financial markets, digital systems and international supply chains rather than from any individual domain in isolation.

TABLE 5.3: ILLUSTRATIVE OSEINT SIGNALS AND STRATEGIC INTERPRETATION

Expansion of China's LOGINK platform	Trade facilitation initiative	Strategic data acquisition and supply chain intelligence capability
Rising gold prices and central bank gold accumulation	Commodity market development	Changing confidence in monetary systems and reserve assets
Fertiliser price increases	Agricultural input cost pressure	Food insecurity, inflation, migration and social stability risks
Increases in war-risk insurance premiums	Insurance market adjustment	Trade disruption, supply chain financing stress and economic fragmentation
New Arctic shipping routes	Logistics and trade opportunity	Geopolitical influence, trade diversion and monetary power implications
Withdrawal of insurers from climate-exposed regions	Insurance sector issue	Long-term economic viability and population displacement risks
Satellite or GPS disruption	Technical systems failure	Vulnerability of transport, communications and financial infrastructure
Export controls on advanced semiconductors	Trade policy measure	Strategic technology competition and capability constraints
AI-driven market volatility	Financial market anomaly	Systemic risks to capital allocation and confidence in markets
Sudden shortages of critical minerals	Supply chain issue	Defence-industrial bottlenecks and strategic dependency exposure
Entity level anomalies (market signals)	Altered competitive or ownership position	Economic security vulnerability or potential threat vector

Source: Author's framework based on OSEINT methodology used in CES wargaming

The examples illustrate a central characteristic of OSEINT. The strategic significance of an event often lies not in the event itself but in the wider consequences that emerge through interconnected economic systems. The purpose of OSEINT is therefore to identify the relationships between signals, vulnerabilities and strategic outcomes before those relationships become visible through conventional policy or market analysis.

Viewed through this lens, the challenge confronting policymakers is not simply one of information availability. Contemporary societies generate unprecedented quantities of data. The challenge is the ability to convert information into strategic insight. The growing complexity of modern economic systems means

that vulnerabilities frequently emerge at the intersections between sectors, institutions and geographies. Understanding these interactions requires analytical frameworks capable of crossing traditional policy boundaries and recognising the interconnected nature of contemporary economic security.

The development of Productive Security therefore implies a parallel requirement for an Allied Economic Intelligence Architecture capable of providing shared situational awareness across climate security, food systems, energy networks, water resources, transport infrastructure, digital systems, financial markets and international trade. Such a capability would not replace existing intelligence functions. Rather, it would complement them by providing a common understanding of the economic foundations upon which resilience, prosperity and strategic capability increasingly depend. In an era where economic capability has become a source of strategic power, intelligence concerning the operation of economic systems becomes a core component of national and allied security.

Economic Statecraft, Productive Security and the Defence Dividend

This perspective suggests a broader understanding of economic statecraft. Much of the contemporary economic-security debate has focused upon defensive measures. Governments seek to reduce strategic dependencies, protect critical infrastructure, strengthen supply-chain resilience and limit exposure to economic coercion. These objectives are important and increasingly necessary.

However, a purely defensive conception of economic security is incomplete. Economic capability is not only something that must be protected. It is also something that can be mobilised. Innovation systems, financial systems and productive capacity constitute strategic assets in their own right. Economic statecraft therefore involves not only safeguarding existing capability but actively creating new capability. This distinction has important implications for debates concerning defence expenditure and growth.

The empirical evidence provides little basis for assuming that higher levels of defence expenditure automatically generate stronger economic performance (Ramey and Zubairy, 2018; Becker and Dunne, 2023; Olejnik, 2023; SUERF, 2025). However, the literature on endogenous growth and innovation systems suggests that investments which strengthen productive capability, technological development, knowledge diffusion and industrial resilience may contribute to wider economic performance over time (Romer, 1990; Aghion and Howitt, 1998; Freeman, 1987; Lundvall, 1992).

The critical variable is therefore not expenditure itself but the institutions through which expenditure is allocated and translated into productive development.

Under these conditions, security-related investment may generate wider economic benefits through innovation, supply-chain development, SME growth and technological diffusion. This possibility has been described throughout this paper as a Defence Growth Dividend. Equally, investments that strengthen industrial resilience, reduce strategic vulnerabilities and improve the adaptability of productive systems may generate broader economic benefits through enhanced stability and reduced disruption. These outcomes may be understood as a Resilience Dividend.

Neither outcome is automatic. Both depend upon institutional design, capital allocation and the effectiveness of the ecosystems through which capability is generated.

Economic Statecraft and Institutional Design

The implications of this analysis are significant.

If economic capability increasingly underpins strategic capability, and if capability emerges through interconnected financial, industrial and innovation systems, then economic statecraft becomes fundamentally concerned with institutional design.

The challenge is not simply one of increasing expenditure or expanding procurement. It is one of constructing institutions capable of mobilising capital, supporting innovation, strengthening productive capacity and enhancing resilience simultaneously.

This observation returns the analysis to a theme that has appeared repeatedly throughout the paper. The most important strategic question may not be how much money governments spend, but how effectively institutions transform resources into capability.

The historical significance of Bretton Woods lay not simply in the creation of new financial institutions, but in the creation of an institutional architecture capable of supporting reconstruction, investment and growth. The contemporary challenge is different in form but similar in principle. Allied economies increasingly require institutional architectures capable of supporting innovation, productive capability and long-term resilience.

The concept of Productive Security represents one possible framework through which this challenge may be understood. By focusing on the relationships between finance, innovation, industrial capacity and security, it shifts attention away from expenditure alone and towards the mechanisms through which capability is created.

Conclusion

This chapter has argued that economic capability should be understood as a source of strategic capability. Innovation systems, financial systems, industrial capacity and security institutions together form a Strategic Capability Ecosystem through which economic resources are transformed into strategic outcomes.

The concept of moving from bullion to bullets captures the central role of capital mobilisation within this process. The ability to transform financial resources into productive capability increasingly determines the effectiveness with which states can respond to technological change, industrial disruption and evolving security challenges.

Economic statecraft should therefore be understood not only as the protection of economic assets but as the mobilisation of economic capability. The challenge confronting policymakers is not merely how to spend more, but how to design institutions capable of converting capital into innovation, innovation into productive capacity and productive capacity into long-term strategic effectiveness.

The next chapter develops this argument further through the concept of Productive Security and explores how institutional architectures can be designed to support capability formation across allied economies.

Chapter 6: The Allied Defence Market and the Emergence of Productive Security

Introduction

The preceding chapters have argued that military capability cannot be understood independently of the economic systems that support it. Innovation ecosystems, financial structures, industrial organisation and productive capacity all influence the ability of states to generate and sustain effective military power. The resulting picture differs significantly from the assumptions that informed much defence-industrial policy during the post-Cold War period. Rather than emerging primarily from expenditure or procurement, capability increasingly appears to be shaped by the interaction of institutions, markets and productive systems.

It is within this context that proposals for an Allied Defence Market (ADM) have emerged. The central insight underpinning ADM is that fragmented defence markets impose significant costs upon allied economies. Duplication of effort, limited interoperability, fragmented procurement and inconsistent demand signals reduce the effectiveness of defence expenditure and weaken collective capability. By promoting greater industrial integration, procurement coordination and market interoperability, ADM seeks to create a more coherent framework for capability generation across allied economies.

This chapter argues that ADM represents an important and necessary response to these challenges. However, the analysis developed throughout the preceding chapters suggests that the evolving nature of warfare and industrial production raises a wider question. If military capability increasingly depends upon innovation, adaptability and productive capacity, then the challenge extends beyond procurement coordination alone. The concept of Productive Security is introduced to capture this broader relationship between economic capability and strategic effectiveness.

The Changing Nature of Capability

For much of the twentieth century, military capability was associated primarily with scale. Defence planning focused upon platforms, inventories and the mobilisation of industrial resources. Industrial systems evolved accordingly. Production was concentrated amongst large firms operating within relatively stable supply chains, while technological change often occurred over extended periods.

The contemporary security environment increasingly challenges these assumptions.

Technological change is accelerating. Software-defined systems, autonomous technologies, artificial intelligence, advanced manufacturing and digital networks are altering the character of military capability. Recent conflicts have demonstrated the growing importance of adaptability, resilience and the ability to modify systems rapidly in response to operational experience. The lessons emerging from Ukraine are particularly significant in this regard. They suggest that military effectiveness increasingly depends upon the capacity to innovate, adapt and scale production at speed rather than simply upon the possession of large inventories of equipment (Watling and Reynolds, 2026; Slusher, 2025).

The implication is that capability is becoming increasingly dynamic. Strategic advantage derives not simply from what can be produced most cheaply or at the greatest scale, but from what can be upgraded, modified and replaced most rapidly. Competitive advantage increasingly reflects the ability to absorb new knowledge, integrate technological innovation and adapt industrial systems to changing operational requirements.

TABLE 6.1: THE EVOLUTION OF DEFENCE CAPABILITY

Long technology cycles	Rapid technology cycles
Platform-centric capability	System-centric capability
Scale as primary advantage	Adaptability as primary advantage
Large prime contractors dominate	Networks of specialised firms
Periodic upgrades	Continuous iteration
Predictable procurement cycles	Dynamic operational requirements
Industrial concentration	Distributed capability ecosystems
Production efficiency	Innovation and resilience

The significance of these changes extends beyond military doctrine. They imply a corresponding transformation in the industrial and financial systems that underpin capability. The institutions that proved effective in supporting large-scale industrial production during earlier eras may not be sufficient to support capability systems characterised by rapid technological iteration, distributed innovation and shorter product lifecycles.

Innovation, Adaptability and the Growing Importance of SMEs

One of the most striking findings emerging from both recent conflicts and the comparative country studies undertaken throughout this research is the growing importance of SMEs within defence-industrial ecosystems.

Innovation research has long highlighted the contribution of entrepreneurial firms to technological development and knowledge diffusion (Freeman, 1987; Audretsch and Feldman, 1996; Lundvall, 1992). However, the changing character of warfare appears to be increasing their strategic significance.

Across Germany, Sweden, Norway and South Korea, SMEs occupy critical positions within innovation ecosystems, specialised manufacturing networks and defence supply chains (Harding, 2026a-d). Their importance derives not from scale but from flexibility. Smaller firms are often better able to respond rapidly to technological opportunities, develop specialist capabilities and adapt products to evolving requirements.

Yet the increasing strategic importance of SMEs creates a corresponding challenge. The firms that increasingly generate innovation and adaptability are often those that face the greatest barriers to finance, certification, scaling and market access. The capability ecosystem is therefore becoming more dependent upon actors that traditional industrial and financial structures frequently struggle to support.

This observation provides an important bridge between the earlier discussion of the Productive Capacity Gap and the institutional questions addressed later in the paper.

The Limits of a Demand-Side Approach

ADM addresses several important challenges facing allied economies. Greater procurement coordination, improved interoperability and larger integrated markets have the potential to reduce fragmentation and strengthen collective capability. In economic terms, ADM seeks to improve the efficiency of defence expenditure by creating clearer market signals and reducing duplication.

These objectives are significant. However, the preceding chapters suggest that they may not be sufficient.

The evidence from defence inflation provides one indication of the problem. Increased expenditure does not automatically generate increased capability if productive capacity remains constrained. Additional demand can lead to higher prices, longer delivery times and increased dependence upon external suppliers rather than increased output (Becker and Dunne, 2023; Harding, 2026e). Similarly, endogenous growth theory emphasises that innovation and productivity depend upon investments in knowledge, skills, technology and institutional capability rather than demand alone (Romer, 1990; Aghion and Howitt, 1998):

1. Demand creates opportunity.

2. Capability requires productive systems capable of responding to that opportunity.

This distinction is fundamental because it highlights the difference between market creation and capability creation. ADM contributes significantly to the former. The challenge confronting allied economies increasingly concerns the latter.

Defining Productive Security

The concept of Productive Security emerges directly from this observation. Productive Security may be defined as:

The capacity of an economy, or group of allied economies, to generate, sustain, adapt and mobilise the productive capabilities required to achieve long-term security objectives.

The concept draws upon several strands of economic thought. Endogenous growth theory emphasises the importance of knowledge creation, innovation and human capital in generating long-term economic performance (Romer, 1990; Aghion and Howitt, 1992; 1998). National Systems of Innovation research highlights the role of institutions linking firms, universities, governments and financial systems (Freeman, 1987; Lundvall, 1992; Nelson, 1993). Economic-security research has demonstrated the growing strategic significance of economic networks, technological capability and productive assets (Farrell and Newman, 2019; Harding and Harding, 2019; Harding, 2025).

Taken together, these literatures suggest that security increasingly depends upon the ability to generate productive capability rather than simply consume it.

TABLE 6.2: TRADITIONAL SECURITY AND PRODUCTIVE SECURITY

Military assets	Capability ecosystems
Defence budgets	Productive capacity
Procurement	Innovation systems
Platforms	Supply chains
Stockpiles	Adaptability
Deterrence	Resilience
Defence finance	Capital mobilisation
National capability	Allied capability
Consumption of capability	Creation of capability

The purpose of Productive Security is not to replace traditional security concepts but to extend them. It shifts attention from capability as an output to capability as a process, highlighting the role of innovation, finance, industrial organisation and institutional design in shaping strategic outcomes. Thus, productive seucirty should not be understood solely through the lens of defence capability. The same productive systems that generate military resilience also underpin food security, energy resilience, digital sovereignty, transport continuity and social stability.

Productive Security and the Fifth Pillar of ADM

The significance of Productive Security becomes apparent when considered alongside the objectives of ADM.

ADM addresses important challenges relating to procurement, interoperability, industrial cooperation and market integration. These functions are essential because they create the demand environment within which capability can develop.

However, the preceding analysis suggests that a complementary objective is required.

TABLE 6.3: PRODUCTIVE SECURITY AS THE FIFTH PILLAR OF ADM

Demand Coordination	Create market certainty	Improved investment signals
Procurement Integration	Achieve scale efficiencies	Reduced duplication
Interoperability	Strengthen collective capability	Improved operational effectiveness
Industrial Cooperation	Integrate allied supply chains	Stronger industrial networks
Productive Security	Strengthen innovation, finance and productive-capacity formation	Long-term capability, resilience and growth

Importantly, Productive Security is not simply an additional programme or policy initiative. It represents the outcome that the wider architecture seeks to achieve.

The first four pillars address the mechanisms through which capability can be coordinated and deployed. Productive Security focuses upon the conditions under which capability can be generated, adapted and sustained over time.

In this sense, Productive Security introduces a fifth dimension to ADM that has been largely absent from previous discussions: growth.

This is not growth in the narrow sense of increasing expenditure or expanding defence budgets. Rather, it reflects the insight that investments which strengthen innovation systems, productive capacity, technological capability and industrial resilience may also strengthen long-term economic performance. The potential benefits are therefore not confined to military effectiveness alone. Under appropriate institutional conditions, capability formation may generate wider economic benefits through innovation, supply-chain development, technological diffusion and industrial upgrading.

The relationship is not automatic, and the evidence remains contingent upon institutional design. Nevertheless, it suggests that security and economic development should increasingly be understood as mutually reinforcing rather than competing objectives.

Productive Security and Institutional Design

The emergence of Productive Security has important implications for institutional design.

If capability increasingly depends upon innovation ecosystems, productive capacity and capital mobilisation, then security policy cannot focus exclusively upon procurement and expenditure. Equal attention must be devoted to the institutions that connect finance, innovation and industry.

This observation links directly to the arguments developed in Chapters 3, 4 and 5. Innovation must be translated into productive capacity. Productive capacity requires finance. Finance must be allocated in ways that support long-term capability formation. The challenge is therefore not simply one of markets or governments acting independently, but of creating institutions capable of coordinating their interaction.

Productive Security therefore provides the conceptual bridge between the demand-side objectives of ADM and the financial architecture examined in the following chapters.

Conclusion

The Allied Defence Market represents an important response to the fragmentation that has characterised defence-industrial cooperation across many allied economies. By strengthening interoperability, improving procurement coordination and creating clearer market signals, it addresses several important barriers to collective capability.

Yet the changing nature of warfare suggests that capability increasingly depends upon factors extending beyond procurement and market integration alone. Innovation, adaptability, industrial resilience and productive capacity have become central determinants of strategic effectiveness. The growing importance of SMEs within defence-industrial ecosystems further reinforces this trend.

The concept of Productive Security has been introduced to capture this challenge. It reflects the growing recognition that long-term security depends not only upon the ability to procure capability, but upon the ability to generate it. Productive Security therefore extends the ADM framework by focusing attention upon the innovation systems, financial structures and productive ecosystems through which capability ultimately emerges.

The next chapter examines the financial implications of this shift and considers how capital can be allocated more effectively throughout capability ecosystems in order to support innovation, productive capacity, resilience and long-term growth.

Chapter 7: From Capital Allocation to Capability Ecosystems: Financing Productive Security

Introduction

The previous chapter argued that Productive Security should be understood as the fifth pillar of an Allied Defence Market. The concept reflects the growing recognition that military capability increasingly depends upon innovation ecosystems, productive capacity, technological adaptation and resilient industrial networks. As warfare becomes more dynamic and innovation-intensive, the economic systems that generate capability become increasingly important determinants of strategic effectiveness.

This observation immediately raises a further question. If Productive Security depends upon the ability of economies to generate, sustain and adapt productive capability, how should those capabilities be financed?

The conventional answer is often framed in terms of expenditure. Debates concerning defence capability frequently focus upon spending targets, budget allocations and fiscal commitments. While these issues remain important, they do not fully address the challenge identified throughout the preceding chapters. The evidence from defence inflation, innovation systems and defence-industrial development suggests that capability depends not simply upon the volume of resources committed, but upon the institutions through which those resources are allocated.

This distinction is particularly important because the changing nature of warfare is simultaneously changing the nature of the firms that generate capability. As innovation cycles shorten and military effectiveness increasingly depends upon adaptability, software-defined systems and distributed production networks, the challenge confronting policymakers is no longer simply one of funding defence. It is one of ensuring that financial systems are capable of supporting the ecosystems through which capability is created.

Capability, Warfare and Finance

The emergence of Productive Security reflects a broader transformation in the organisation of defence-industrial ecosystems. The increasing importance of autonomous systems, artificial intelligence, software-defined capability and rapid technological adaptation has elevated the role of specialist manufacturers, technology firms and SMEs within capability ecosystems. Recent experience in Ukraine has reinforced this trend, demonstrating that military effectiveness increasingly depends upon the ability to innovate, adapt and scale production rapidly in response to changing operational requirements (Slusher, 2025; Watling and Reynolds, 2026).

This represents a significant departure from traditional defence-industrial models. Historically, capability was often generated through large prime contractors operating within relatively stable procurement environments and long technology cycles. Contemporary capability ecosystems increasingly depend upon networks of specialist suppliers, dual-use technology firms, software developers and advanced manufacturers operating within far more dynamic environments.

The consequence is that the firms increasingly responsible for generating capability often possess financing requirements that differ fundamentally from those associated with traditional defence production. Many operate at the intersection of defence and commercial markets. Their technologies may require extended periods of testing, certification and qualification before reaching operational deployment. Revenue streams may be uncertain, procurement cycles prolonged and collateral limited. Technologies can become obsolete rapidly, requiring continuous reinvestment and adaptation. These characteristics make such firms strategically important yet financially difficult.

TABLE 7.1: THE DEFENCE SME FINANCING CHALLENGE

Rapid innovation	Uncertain commercial outcomes
Specialised technologies	Limited collateral
Long testing and certification cycles	Delayed revenues
Dependence on procurement contracts	Demand uncertainty
Supply-chain integration	Working-capital requirements
Industrial scaling	Growth-capital requirements
Continuous technology upgrades	Ongoing investment needs

The implication is significant. Capability formation increasingly depends upon firms operating in precisely those areas where financing constraints are most acute.

From Capital Scarcity to Capital Allocation

It would be misleading, however, to describe this challenge as a shortage of capital.

Global financial markets contain substantial pools of liquidity. Pension funds, sovereign wealth funds, insurers, private-credit providers and institutional investors collectively manage assets measured in the tens of trillions of dollars. The challenge confronting allied economies therefore concerns not the availability of capital in aggregate but the mechanisms through which that capital is allocated.

This distinction echoes a longstanding theme within economic development and innovation policy. Endogenous growth theory emphasises that long-term economic performance depends upon investments in knowledge, innovation and productive capability rather than the accumulation of capital alone (Romer, 1990; Aghion and Howitt, 1992; 1998). Similarly, National Systems of Innovation research highlights the importance of institutions that connect finance, research, entrepreneurship and production (Freeman, 1987; Lundvall, 1992; Nelson, 1993).

The same principle applies to Productive Security. The strategic challenge is not simply mobilising more capital but ensuring that capital reaches the firms, technologies and industrial ecosystems that generate capability.

TABLE 7.2: CAPITAL AVAILABILITY VERSUS CAPITAL ALLOCATION

Concerned with volume of capital	Concerned with destination of capital
Focuses on aggregate investment levels	Focuses on productive outcomes
Assumes capital reaches viable opportunities	Recognises institutional barriers
Measures resources committed	Measures capability created
Emphasises funding	Emphasises productive capacity

This distinction is central to the argument developed throughout this paper. Security outcomes depend not simply upon how much money is spent but upon the institutions that govern how resources are deployed.

From the Equity Gap to the Productive Capacity Gap

The relationship between finance and productive capacity has long been recognised within the literature on entrepreneurial growth (Storey, 1994; Mason and Harrison, 1995; Harding, 2000; Harding, 2002; Harding and Cowling, 2006).

The origins of the challenge can be traced to the Macmillan Committee (1931), which identified persistent financing constraints affecting smaller firms. Subsequent research expanded this analysis through the concepts of the Equity Gap and the Funding Escalator. The core insight was that firms require different forms of finance at different stages of development. Early-stage firms typically rely upon founders, angel investors and venture capital. Growth-stage firms require scale-up capital. More mature firms require debt finance, private credit and institutional investment. Growth depends not simply upon the availability of capital, but upon access to the right form of capital at the right stage of development.

The contemporary defence challenge represents the latest stage in this evolution.

TABLE 7.3: THE EVOLUTION OF FINANCING CONSTRAINTS

Macmillan Gap	Access to finance for smaller firms
Equity Gap	Growth capital for scaling businesses
Funding Escalator	Matching finance to stages of growth
Defence Finance Gap	Financing strategic industries
Productive Capacity Gap	Scaling capability ecosystems

The Productive Capacity Gap emerges when innovation, demand and strategic necessity exist, but the institutional mechanisms required to convert those assets into productive scale remain insufficiently developed. The challenge is no longer merely entrepreneurial. It is strategic.

Viewed through the lens of Productive Security, the Funding Escalator applies not just to individual firms but to capability ecosystems as a whole.

TABLE 7.4: THE FUNDING ESCALATOR FOR PRODUCTIVE SECURITY

Research and innovation	Grants, venture finance, seed capital
Technology development	Growth capital, private investment
Certification and qualification	Patient capital, blended finance
Industrial scaling	Working capital, supply-chain finance
National capability	Development finance, export finance
Allied capability	Multilateral financing and capital mobilisation

The significance of this framework is that it shifts attention away from individual financing instruments towards the wider financing ecosystem required to support capability formation. Capability formation is a process rather than an event. Different stages require different forms of financial support, and weaknesses at any point in the process can constrain overall capability development.

Evidence from Germany, Sweden, Norway, South Korea and the United Kingdom reveals recurring financing constraints despite substantial differences in institutional design (Harding, 2026a–d; 2026f). The consistency of these findings suggests that the challenge is structural rather than national. Innovation ecosystems are functioning. Demand is growing. Capital is abundant. Yet productive expansion remains constrained.

Beyond Market Failure: The Institutional Challenge

These challenges are frequently described as market failures. While useful, that description understates their strategic significance.

Investment in defence-industrial ecosystems generates benefits that extend beyond commercial returns. Productive capacity contributes to resilience, deterrence, technological sovereignty and supply-chain security. These wider benefits are rarely captured fully by private investment decisions. Consequently, there may be a role for institutions capable of aligning private incentives with strategic objectives — not replacing markets, but creating mechanisms that enable markets to support capability formation more effectively.

This is the concept of Sovereign Resilience Finance: financial mechanisms designed to mobilise private capital towards productive capabilities that generate both commercial and strategic value. Such mechanisms may include public guarantees, first-loss capital, co-investment structures, development-finance vehicles, export-credit support and resilience-focused investment funds. Their purpose is to bridge the gap between private incentives and public objectives — crowding capital into productive activity rather than substituting for private investment (Humphrey, 2014; Broccolini et al., 2020; Griffith-Jones and Naqvi, 2021).

The importance of such mechanisms increases as warfare becomes more innovation-intensive and capability increasingly depends upon firms operating at the technological frontier.

The Capability Ecosystem and Its Actors

The challenge confronting allied economies is therefore not primarily a shortage of capital. Rather, it is the absence of institutional mechanisms capable of directing capital towards the forms of productive capability increasingly required by modern warfare. Understanding this requires a wider view: not just of financing instruments in isolation, but of the full ecosystem through which capability is generated.

Modern capability increasingly emerges through networks of primes, SMEs, universities, specialist suppliers, financiers and public institutions. Large firms remain critical — they provide systems integration, programme management and industrial scale. However, they increasingly depend upon ecosystems of smaller firms that provide innovation, technological specialisation and adaptability (BAE Systems, 2025). Capability therefore emerges not from individual organisations but from relationships between organisations.

TABLE 7.5: THE CAPABILITY ECOSYSTEM

Governments	Strategic direction and demand
ADM	Market integration and interoperability
MDM	Procurement coordination and demand certainty
Prime Contractors	Systems integration and scaling
SMEs	Innovation and adaptability
Universities and Research Institutes	Knowledge creation and technology development
Financial Institutions	Capital allocation
DSRB	Liquidity mobilisation and risk sharing
Productive Security Framework	Ecosystem coordination

No individual actor generates capability independently. Each performs a distinct function within a wider ecosystem, and the effectiveness of the whole depends upon the coherence of the relationships between its parts.

Institutional Complementarity, not Substitution

The debate surrounding ADM, MDM and DSRB has frequently treated them as alternative institutional solutions. The analysis developed throughout this paper suggests that this is a false distinction. Each institution addresses a different stage of capability formation.

ADM addresses market fragmentation. MDM addresses procurement coordination and demand certainty. DSRB addresses liquidity mobilisation and capital allocation. National resilience-finance mechanisms, export-credit agencies and development institutions support productive-capacity development at national level. Viewed individually, each institution addresses only part of the problem. Viewed collectively, they form an ecosystem of capability generation.

TABLE 7.6: PRODUCTIVE SECURITY AS AN INSTITUTIONAL ECOSYSTEM

Fragmented defence markets	Lack of scale and coordination	Allied Defence Market (ADM)
Uncertain future demand	Weak investment signals	Multilateral Defence Mechanism (MDM)
SME financing gaps	Limited access to growth capital	Sovereign Resilience Finance, private credit and growth-capital mechanisms
Productive-capacity constraints	Underinvestment in industrial capability	National development institutions and export-finance mechanisms
Capital-allocation failures	Insufficient mobilisation of private capital	Defence, Security and Resilience Bank (DSRB)
Ecosystem fragmentation	Weak coordination across institutions	Productive Security framework

The challenge confronting allied economies is therefore not a single market failure but a series of interconnected market failures operating across different stages of capability formation. No individual institution can resolve all of these simultaneously. Effective capability generation depends upon institutional complementarity rather than institutional substitution.

This observation returns the analysis to a theme that has appeared repeatedly throughout the paper. The most important strategic question may not be how much money governments spend, but how effectively institutions transform resources into capability.

Capital Allocation and the Defence Growth Dividend

This perspective also helps clarify the relationship between Productive Security and economic growth.

The literature on defence spending and economic performance remains mixed. While defence expenditure may generate economic activity, the empirical evidence does not support simple assumptions that higher defence spending automatically produces stronger economic growth (Ramey and Zubairy, 2018; Becker and Dunne, 2023; Olejnik, 2023; SUERF, 2025).

The Defence Growth Dividend proposed in earlier CES research should therefore be understood differently. The central proposition is not that defence expenditure necessarily generates growth. Rather, investments that strengthen innovation systems, productive capacity, technological diffusion, workforce development and industrial resilience may produce wider economic benefits over time. This argument is consistent with endogenous growth theory, which emphasises the importance of knowledge accumulation, innovation and productive capability as drivers of long-term economic performance (Romer, 1990; Aghion and Howitt, 1998).

The critical variable is therefore not defence expenditure itself but the allocation of capital within capability ecosystems. Where investment strengthens innovation systems, productive capacity and industrial resilience, wider economic benefits may emerge through technological spillovers, supply-chain development and enhanced productive capability. Security and growth become mutually reinforcing outcomes rather than competing objectives.

Conclusion

The changing character of warfare has increased the strategic importance of innovation-intensive firms, specialist manufacturers and defence SMEs. At the same time, many of these firms continue to face persistent barriers in accessing finance. The challenge confronting allied economies is therefore not primarily one of capital scarcity but one of capital allocation.

The concept of Productive Security highlights the importance of directing capital towards the productive capabilities that underpin long-term security. The Funding Escalator, extended from individual firms to the full capability ecosystem, provides a framework for understanding how different forms of finance support different stages of capability formation — from innovation and technological development through to industrial scaling and allied capability.

Financing Productive Security therefore requires more than additional expenditure. It requires institutions capable of allocating capital effectively across capability ecosystems and translating financial resources into productive capability. The question is not whether resources exist, but whether mechanisms exist to convert those resources into innovation, industrial capacity and strategic effectiveness.

This is fundamentally an institutional challenge rather than a financial one. The next chapter therefore examines the broader institutional architecture required to meet that challenge at allied scale, developing the concept of a Bretton Woods for Productive Security.

Chapter 8: Towards a Framework for Productive Security

Introduction

This paper began by suggesting that the international economy may be entering a moment analogous to Bretton Woods. The comparison was not intended to imply a simple repetition of the post-war settlement. The geopolitical, technological and economic circumstances of the twenty-first century differ fundamentally from those of 1944. Nevertheless, the underlying challenge is remarkably similar. Periods of profound structural change frequently expose weaknesses in existing institutions and create pressures for new forms of cooperation, coordination and collective action.

The architects of Bretton Woods recognised that prosperity and security depended not simply upon markets, governments or individual institutions operating in isolation. Stability emerged from the interaction of institutions capable of performing complementary functions. The International Monetary Fund, the World Bank, the General Agreement on Tariffs and Trade and a wide range of national institutions together formed an ecosystem that supported reconstruction, investment, economic integration and long-term growth (Kindleberger, 1973; Eichengreen, 2008; Helleiner, 2014).

The argument developed throughout this paper is that a comparable institutional challenge is emerging today. The changing nature of warfare, technological competition and economic interdependence is transforming the foundations upon which capability rests. The central question confronting allied economies is therefore not simply how much they spend on security, but whether they possess the institutions required to generate, sustain and mobilise the productive capabilities upon which long-term security increasingly depends.

Capability Formation in the Twenty-First Century

A recurring theme throughout this analysis has been the changing character of military capability itself. Much of the defence-industrial architecture inherited from the twentieth century was designed around assumptions of scale, predictability and relatively stable technological trajectories. Contemporary conflicts suggest that these assumptions are becoming increasingly difficult to sustain.

The experience of Ukraine, the rapid diffusion of autonomous systems and the accelerating pace of technological change all point towards a model of capability characterised by adaptability, innovation and resilience. Military effectiveness increasingly depends upon the ability to incorporate new technologies rapidly, modify systems in response to operational experience and scale production within compressed timeframes. Capability is becoming more dynamic, more distributed and more dependent upon innovation ecosystems than at any point in recent history (Slusher, 2025; Watling and Reynolds, 2026).

One consequence of this transformation has been the growing importance of SMEs, specialist manufacturers and technology-intensive firms within defence-industrial ecosystems. The comparative research undertaken across Germany, Sweden, Norway and South Korea demonstrated that these firms frequently occupy critical positions within innovation systems, supply chains and specialised manufacturing networks (Harding, 2026a-d). Their strategic importance derives not from scale alone but from their ability to innovate, adapt and respond rapidly to changing technological requirements.

Yet the same characteristics that make such firms valuable from a capability perspective frequently make them difficult to finance. The result is a persistent tension between the requirements of modern capability formation and the institutions through which capital is traditionally allocated.

This observation has important implications for both security policy and economic policy. It suggests that capability can no longer be understood solely through the lens of procurement or defence expenditure. Increasingly, it depends upon the wider economic systems through which innovation, finance and productive capacity are generated.

Productive Security and the Defence Growth Dividend

The concept of Productive Security was introduced in response to this challenge.

Productive Security shifts attention from the consumption of capability towards the creation of capability. It emphasises the importance of innovation systems, productive capacity, technological development, financial institutions and industrial resilience in shaping long-term security outcomes. In doing so, it draws together insights from endogenous growth theory, National Systems of Innovation research and the emerging literature on economic security (Freeman, 1987; Lundvall, 1992; Nelson, 1993; Romer, 1990; Aghion and Howitt, 1992; 1998; Farrell and Newman, 2019).

The implications of this perspective extend beyond security policy alone. Throughout the paper, the concept of a Defence Growth Dividend has been discussed as a potential consequence of institutions that successfully connect security investment to productive development.

This is an area where caution remains necessary. The empirical literature concerning defence expenditure and economic growth remains mixed, and there is little consensus regarding the magnitude, direction or persistence of any growth effects associated with higher defence spending (Ramey and Zubairy, 2018; Becker and Dunne, 2023; Olejnik, 2023; SUERF, 2025).

The argument developed here is therefore more modest but, arguably, more important.

This paper does not suggest that increased defence expenditure automatically generates economic growth. Indeed, the evidence reviewed throughout the manuscript demonstrates that expenditure directed into constrained industrial systems may contribute to inflationary pressures, supply bottlenecks and increased dependence upon imports rather than productive expansion. The experience of defence inflation observed across Europe and North America serves as an important reminder that expenditure and capability are not synonymous.

However, the evidence does suggest that investments which strengthen innovation systems, productive capacity, technological capability, workforce development and industrial resilience may increase the likelihood that security expenditure generates wider economic benefits. This proposition is consistent with the broader literature on endogenous growth, which emphasises the role of knowledge accumulation, innovation and productive capability in shaping long-term economic performance (Romer, 1990; Aghion and Howitt, 1998).

The Defence Growth Dividend should therefore be understood not as an automatic consequence of higher defence spending, but as a potential outcome of institutions that successfully connect security investment to productive development. Under these conditions, security and prosperity become mutually reinforcing rather than competing objectives.

The Principles for Productive Security

The central argument of this paper is that allied economies face a challenge that is fundamentally institutional in nature. The question is no longer simply how much governments spend on defence, resilience or infrastructure. Rather, it concerns whether existing institutions are capable of converting economic strength into the productive capabilities required to sustain prosperity, resilience and security under conditions of strategic uncertainty.

The architects of Bretton Woods recognised that the stability of the post-war order depended upon institutions capable of aligning finance, production and international cooperation. The challenge confronting allied economies today is different in form but similar in principle. Economic systems have become theatres of strategic competition. Trade, technology, finance, information, supply chains and critical infrastructure increasingly influence national and collective security outcomes. Security can no longer be understood solely through military capability. It must also be understood through the productive systems that sustain economic and societal resilience.

The Bretton Woods negotiations did not begin with institutions. They began with shared principles regarding reconstruction, monetary stability, development and international cooperation. Institutions followed from those principles.

In the same way, Productive Security requires agreement on the principles through which allied economies understand capability, resilience, growth and strategic power. The concept is built on trusted economic relationships rather than economic isolation. Allied prosperity and security depend upon open markets, trusted partners and resilient supply chains. The objective is not to reduce interdependence but to create forms of interdependence that strengthen collective resilience, innovation and strategic stability.

The following principles are therefore proposed as a foundation for a future institutional architecture.

Principle One: Economic Security as a Core Function of Government

The distinction between economic policy and national security policy is becoming increasingly difficult to sustain. Economic coercion, supply-chain disruption, technology restrictions, sanctions, cyber threats and financial instability can generate consequences that are strategic in nature even when they originate outside traditional security domains.

Allied economies should therefore establish permanent economic security functions capable of assessing vulnerabilities, coordinating responses and integrating domestic resilience, international economic statecraft and national security objectives. The purpose is not the militarisation of economic policy, but the recognition that economic capability has become a strategic asset in its own right.

Principle Two: Managing Strategic Dependencies

The objective of Productive Security is not economic self-sufficiency. Modern prosperity depends upon international trade, investment and interconnected supply chains. However, interdependence creates relationships of dependency, and dependency can become a source of influence, vulnerability or coercion.

Allied economies should therefore develop common frameworks for identifying, assessing and managing strategic dependencies across critical technologies, energy systems, critical minerals, digital infrastructure, finance and supply chains. The objective is to strengthen trusted interdependence while reducing exposure to coercive leverage and systemic concentration risk.

Principle Three: Allied Economic Intelligence and Situational Awareness

Security increasingly depends upon the ability to understand emerging economic risks before they become systemic crises. Climate disruption, food insecurity, energy shocks, financial instability, supply-chain failures and cyber disruption are often interconnected and rarely respect institutional boundaries.

A Productive Security architecture therefore requires multilateral frameworks for economic intelligence and data sharing. These should provide a common operating picture across climate security, food systems, energy networks, water resources, transport systems, digital infrastructure, trade flows and supply chains. Just as military alliances depend upon shared intelligence, resilient economies increasingly depend upon shared economic situational awareness.

Principle Four: The Productive Security Funding Escalator

Capability formation depends upon the successful translation of innovation into productive capacity. Yet evidence from across allied economies demonstrates that financing constraints continue to limit the ability of firms and supply chains to scale in response to strategic demand.

Governments, financial institutions and institutional investors should therefore agree common principles for a Productive Security Funding Escalator that supports firms and ecosystems throughout the capability lifecycle. Public finance should seek to crowd private capital into productive capability rather than substitute for it. The objective is to strengthen innovation, industrial resilience, supply-chain security and long-term growth simultaneously.

Principle Five: Digital Money and Strategic Finance

The evolution of digital currencies, stablecoins and new forms of financial intermediation raises fundamental questions concerning sovereignty, resilience and strategic autonomy. The institutions governing money, capital markets and long-term investment increasingly form part of the security architecture of modern economies.

Allied economies should therefore establish common principles governing digital money, strategic capital mobilisation and resilience finance. This includes consideration of the role of central bank digital currencies, stablecoins, pension capital, institutional investment and long-term financing mechanisms capable of supporting productive capability and resilience.

Principle Six: Critical Social Infrastructure

The resilience of modern societies depends not only upon critical national infrastructure but also upon the systems that sustain economic participation, social cohesion and public wellbeing. Food systems, healthcare, transport, communications, financial access, housing and digital connectivity increasingly influence the ability of societies to withstand disruption and recover from shocks.

Productive Security therefore extends beyond military capability and industrial capacity to encompass Critical Social Infrastructure. The objective is not merely to protect assets but to preserve the conditions under which prosperity, stability and democratic legitimacy can endure during periods of stress.

Principle Seven: Civil Society, Trust and Strategic Communications

The effectiveness of institutions ultimately depends upon public confidence in their legitimacy and competence. Recent crises have demonstrated that resilience is shaped as much by trust, communication and social cohesion as by physical infrastructure or financial resources.

Governments, business and civil society should therefore develop common principles for strategic communications during periods of disruption and crisis. Productive Security requires trusted mechanisms through which information can be communicated, uncertainty managed and collective action sustained.

Together, these principles provide the foundation for a broader institutional architecture of Productive Security. They do not prescribe a single institutional model. Rather, they establish a framework through which allied economies can coordinate capability formation, resilience, innovation and economic statecraft. Just as Bretton Woods sought to align finance and reconstruction in support of long-term stability, a Bretton Woods for Productive Security seeks to align productive capability, economic resilience and strategic advantage in support of long-term security and prosperity.

Capital Allocation, Fiscal Constraints and Capability

A central finding of this paper has been that the principal challenge confronting allied economies is not capital scarcity but capital allocation.

Global financial markets contain substantial pools of liquidity. Pension funds, insurers, sovereign wealth funds, banks and asset managers collectively manage assets measured in the tens of trillions of dollars. The challenge is therefore not the mobilisation of resources in aggregate, but the creation of institutions capable of directing those resources towards productive capability.

This challenge becomes particularly significant in the context of contemporary fiscal constraints. Across many allied economies, debates concerning security expenditure are increasingly framed as a choice between higher taxation and higher public borrowing. While fiscal sustainability remains an important consideration, this framing risks overlooking the role that institutions play in shaping how resources are mobilised and deployed.

A central argument of this paper has been that institutional design influences not only the effectiveness of security expenditure but also its fiscal characteristics.

This observation is particularly relevant in relation to multilateral financial institutions. Under established international accounting frameworks, paid-in capital subscriptions to multilateral institutions are generally treated as the acquisition of a financial asset rather than as current expenditure (International Monetary Fund, 2014; Eurostat, 2003). Such transactions therefore differ in important respects from conventional expenditure financed through taxation or sovereign borrowing. While they do not remove fiscal constraints, they create public assets capable of supporting lending, guarantees and capital mobilisation over extended periods.

The distinction is important because it broadens the range of policy instruments available to governments seeking to strengthen capability within constrained fiscal environments. The question is not simply how much money governments spend, but how institutions enable that capital to be leveraged, recycled and mobilised in support of productive development.

This observation reinforces a broader theme running throughout the paper. The challenge confronting allied economies is not merely how to finance security, but how to design institutions capable of transforming financial resources into productive capability.

TABLE 8.1: FROM BRETTON WOODS TO PRODUCTIVE SECURITY

Reconstruction	Capability formation
Capital scarcity	Capital allocation
National recovery	Allied resilience
Industrial rebuilding	Innovation ecosystems
Development finance	Capability finance
Economic growth	Productive Security
Bretton Woods institutions	ADM–MDM–DSRB ecosystem

An Institutional Architecture for Productive Security

The analysis developed throughout the preceding chapters suggests that no single institution can perform this function alone.

The Allied Defence Market addresses an important challenge by reducing fragmentation and creating a more coherent market environment for defence capability. The Multilateral Defence Mechanism contributes by strengthening demand certainty through procurement coordination and sovereign-risk sharing. The Defence, Security and Resilience Bank addresses a different but equally important challenge by mobilising capital, crowding in private investment and supporting productive-capacity expansion across allied economies.

National development institutions, export-finance agencies, private-credit markets, venture-capital funds, innovation agencies and resilience-financing mechanisms perform additional functions at different stages of capability formation. Their significance lies not in their individual characteristics but in their collective interaction.

Throughout the paper, the concept of a Funding Escalator for Productive Security has been used to describe the sequence of financial and institutional mechanisms required to support capability formation. Just as firms require different forms of finance at different stages of growth, capability ecosystems require different institutions at different stages of development.

The lesson is therefore one of institutional complementarity rather than institutional substitution

TABLE 8.2

Economic Security	National Economic Security Offices
Strategic Dependency	NATO Economic Security Function
Intelligence	Allied OSEINT Network
Capital Mobilisation	DSRB
Procurement	MDM
Market Integration	ADM
Critical Social Infrastructure	Resilience Framework
Public Trust	Strategic Communications Framework

This insight brings the analysis full circle. The central question is not whether ADM, MDM, DSRB or national institutions represent the correct solution. Rather, it is how these institutions can operate together as part of a wider ecosystem capable of supporting innovation, productive capacity and long-term security.

The challenge confronting allied economies is therefore not the mobilisation of resources in aggregate. The resources already exist. The challenge is the ability to transform financial capital into productive capability.

The process described throughout this paper as moving from bullion to bullets captures this relationship. Strategic effectiveness increasingly depends upon institutions capable of converting capital into innovation, innovation into production and production into capability. The effectiveness of future security architectures may therefore depend less upon the volume of resources available than upon the quality of the institutions through which those resources are mobilised.

Conclusion

The central finding of this paper is that the challenge confronting allied economies is not simply one of defence expenditure. It is one of capability formation.

As warfare becomes increasingly adaptive, innovation-driven and dependent upon resilient industrial ecosystems, security outcomes depend ever more heavily upon the productive capabilities that sit behind military assets. The capacity to innovate, manufacture, adapt and scale production has become a strategic resource in its own right.

Productive Security has been proposed as a framework for understanding this relationship. It emphasises the importance of innovation systems, productive capacity, financial institutions and industrial resilience in shaping long-term security outcomes. In doing so, it provides a bridge between the literatures on endogenous growth, economic security, innovation systems, entrepreneurial finance and defence economics.

The significance of this perspective lies in its focus on institutions. Security, resilience and growth do not emerge automatically from expenditure. They emerge from institutions capable of allocating resources towards productive ends. The challenge confronting allied economies is therefore not simply how much they spend on security, nor even how they procure it. The more fundamental question concerns whether they possess the institutional architecture required to transform capital into innovation, innovation into productive capability and productive capability into long-term strategic effectiveness.

The institutions of the post-war era were designed to support reconstruction, investment and growth in an industrial age. The challenge of the twenty-first century is to develop institutions capable of supporting innovation, resilience and capability in an age of strategic competition.

Productive Security is proposed as a framework through which that challenge can be understood. Whether allied economies are able to create the institutions required to transform capital into capability may prove one of the defining strategic questions of the coming decades. In that sense, the search for a Bretton Woods for Productive Security is not simply a question of institutional reform. It is a question of how modern economies convert economic strength into strategic credibility, and ultimately how they secure both prosperity and security in an increasingly uncertain world.

The challenge of the twenty-first century is no longer simply the creation of wealth, nor merely the protection of wealth, but the conversion of economic strength into sustainable strategic advantage. Productive Security provides a framework through which that challenge can be understood

Appendix A: Intellectual Foundations of Productive Security

The concept of Productive Security developed in this paper draws upon several established strands of economic, innovation and security research. It is positioned at the intersection of endogenous growth theory, National Systems of Innovation, entrepreneurial finance, economic security, defence economics

and institutional finance. Productive Security is not intended as a replacement for these traditions. Rather, it seeks to integrate insights from each in order to explain how productive capability becomes a strategic asset.

At its core, the framework addresses a question that has received increasing attention across both policy and academic communities: how do economies convert innovation, capital and industrial capacity into long-term security outcomes? The argument developed throughout this paper is that security increasingly depends upon productive systems rather than expenditure alone. Understanding this relationship requires drawing together insights from several previously distinct literatures.

TABLE A1: INTELLECTUAL FOUNDATIONS OF PRODUCTIVE SECURITY

Endogenous Growth Theory	Arrow (1962); Romer (1990); Aghion and Howitt (1992; 1998)	Establishes the role of knowledge, innovation and technological change in long-term economic performance and capability formation
National Systems of Innovation	Freeman (1987); Lundvall (1992); Nelson (1993); Edquist (1997); Harding and Paterson (2000); Harding (2000; 2001)	Demonstrates how institutions connect firms, finance, skills, research and production in the creation of productive capability
Entrepreneurial Finance and SME Development	Macmillan Committee (1931); Mason and Harrison (1995); Harding (2000; 2002); Harding and Cowling (2006)	Provides the intellectual foundations of the Funding Escalator, the Equity Gap and the scale-up challenge
Economic Security and Economic Statecraft	Gilpin (1987); Farrell and Newman (2019); Harding and Harding (2017; 2019); Harding (2025)	Frames trade, finance, technology and productive capability as instruments of strategic power
Defence Economics	Barro and Redlick (2011); Ramey and Zubairy (2018); Becker and Dunne (2023); Olejnik (2023); SUERF (2025)	Provides evidence on defence expenditure, fiscal multipliers and the relationship between security investment and economic performance
Development Finance and Institutional Design	Kindleberger (1973); Eichengreen (2008); Helleiner (2014); Humphrey (2014); IMF (2014); Eurostat (2003)	Supports the argument that institutional architecture influences capital mobilisation, risk sharing and productive investment
Multilateral Development Bank Literature	Massa (2011); Broccolini et al. (2020); Griffith-Jones and Naqvi (2021); Joint MDB Task Force (2023); Hou (2025)	Demonstrates how development-finance institutions mobilise capital, crowd in private investment and support productive transformation
Original CES and Rebeccanomics Research	Harding (2025; 2026a–h)	Provides empirical evidence on defence-industrial ecosystems, SME finance, defence inflation, Productive Security, ADM, MDM and DSRB

The contribution of this paper lies in bringing these traditions together within a common analytical framework.

The endogenous growth literature explains why knowledge, innovation and technological diffusion matter for long-term economic performance. National Systems of Innovation research explains why institutions determine the ability of economies to commercialise and scale knowledge. The entrepreneurial-finance literature explains why firms frequently struggle to move from innovation to production, giving rise to

persistent financing gaps and the need for a Funding Escalator. The economic-security literature demonstrates why these productive capabilities have become strategically significant in an era of increasing geopolitical competition.

Defence economics provides an important cautionary perspective. The evidence does not support simple assumptions that higher levels of defence expenditure automatically generate economic growth or productive development. Rather, outcomes depend upon the institutional mechanisms through which resources are allocated. This insight provides a direct link to the literature on development finance and institutional design, which emphasises the role of institutions in mobilising capital, reducing risk and supporting productive investment.

Productive Security therefore describes the capacity of an economy, or group of allied economies, to generate, sustain, adapt and mobilise the productive capabilities required to achieve long-term security objectives. Its central proposition is that security outcomes depend not simply upon expenditure, but upon the institutional systems through which capital, innovation and industrial capacity are transformed into capability.

This perspective also explains why the Allied Defence Market (ADM), the Multilateral Defence Mechanism (MDM), the Defence, Security and Resilience Bank (DSRB) and related financing mechanisms should not be viewed as competing proposals. They address different dimensions of the same institutional challenge: creating demand certainty, allocating capital, supporting productive scale, strengthening resilience and enabling capability formation.

In this sense, Productive Security may be understood as an extension of earlier work on innovation systems, entrepreneurial finance and economic statecraft into the domain of collective security. The framework provides a means of analysing how innovation, finance, industrial capacity and institutional design interact to shape the productive foundations of strategic capability in the twenty-first century.

Appendix B: The Productive Security Architecture

The analysis developed throughout this paper suggests that contemporary capability formation should be understood as an ecosystem rather than a sequence of isolated policy interventions. Productive Security emerges through the interaction of innovation systems, industrial ecosystems, financial institutions and security architectures. No individual institution is sufficient on its own. Capability is generated through the relationships between institutions operating at different stages of development.

The purpose of this appendix is to summarise the architecture proposed throughout the paper and demonstrate how its constituent elements interact.

TABLE B1: THE PRODUCTIVE SECURITY ARCHITECTURE

Knowledge Creation	Technology generation	Universities, research institutes, laboratories	Research funding, innovation policy
Innovation	Commercialisation of ideas	Start-ups, SMEs, entrepreneurs	Venture capital, angel finance, innovation grants
Scale-Up	Transition from innovation to production	Growth-stage firms, specialist manufacturers	Growth capital, private equity, resilience finance
Industrialisation	Productive-capacity expansion	SMEs, primes, supply chains	Working capital, supply-chain finance, export finance
National Capability	Strategic industrial resilience	Governments, development institutions	Sovereign Resilience Finance
Allied Capability	Market fragmentation and demand uncertainty	Allied governments, defence ministries	Allied Defence Market (ADM), Multilateral Defence Mechanism (MDM)
Capital Mobilisation	Liquidity and risk-sharing constraints	Institutional investors, MDBs, governments	Defence, Security and Resilience Bank (DSRB)
Productive Security	Long-term capability formation	Entire ecosystem	Integrated institutional architecture

The framework highlights a central proposition of the paper. Capability formation is not a single event and cannot be reduced to defence expenditure alone. It is a process through which knowledge, innovation, finance and industrial capacity are progressively transformed into strategic capability.

TABLE B2: INSTITUTIONAL FUNCTIONS WITHIN PRODUCTIVE SECURITY

Universities and Research Institutes	Knowledge creation
SMEs	Innovation and adaptability
Prime Contractors	Systems integration and scaling
Financial Institutions	Capital allocation
Sovereign Resilience Finance	National productive-capacity support
ADM	Market integration and interoperability
MDM	Demand certainty and procurement coordination
DSRB	Capital mobilisation and liquidity provision

The analysis developed throughout the paper suggests that these institutions should not be viewed as substitutes for one another. Rather, they perform complementary functions within a wider capability ecosystem.

This insight helps explain why debates that position ADM, MDM and DSRB as alternative proposals are potentially misleading. Each addresses a different stage of capability formation. ADM addresses market fragmentation. MDM addresses demand uncertainty. DSRB addresses capital mobilisation. National resilience-finance mechanisms support productive-capacity development. Together, these institutions form an integrated architecture designed to support capability formation across allied economies.

FIGURE B1: FROM BULLION TO BULLETS

The concept of moving from bullion to bullets captures the central argument developed throughout this paper. The challenge confronting allied economies is not primarily one of resource scarcity. Capital exists in abundance. The challenge is institutional: creating mechanisms capable of transforming financial resources into productive capability.

The concept of Productive Security is proposed as a framework through which this challenge can be understood. It emphasises that security increasingly depends upon productive systems rather than expenditure alone, and that the effectiveness of future security architectures may depend less upon the volume of resources available than upon the quality of the institutions through which those resources are mobilised.

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