INNOVATION & RESEARCH CAUCUS

UNDERSTANDING THE IMPACT OF INNOVATION POLICY ON UK SUPPLY CHAINS

IRC Report No: 037

REPORT PREPARED BY

Dr Xin Deng
University of Manchester

Professor Elvira Uyarra
University of Manchester

Professor Kostas Selviaridis
University of Lancaster

Delivered with ESRC and Innovate UK

CONTENTS

Executive summary *4*

1. Introduction *7*

2. Literature review *8*

2.1 Supplier-enabled innovation in the supply chain **8**

2.2 Innovation diffusion through the supply chain **10**

2.3 Innovation and supply chain resilience **15**

3. Data and UK sample *17*

3.1 Innovate UK innovation product **17**

3.2 UK Supply chain **21**

3.3 Corporate innovation **27**

4. Empirical model and results *28*

4.1 The impact of innovation policy on innovation diffusion **30**

4.1.1 Innovation diffusion along the supply chain 30

4.1.2 The role of innovation policy on innovation diffusion 32

4.2 The impact of innovation policy on the supply chain resilience **35**

5. Conclusion *40*

.... *42*

References *43*

.... **49**

Authors

The core members of the research team for this project were as follows:

- Dr Xin Deng - University of Manchester; Manchester Institute of Innovation Research
- Professor Elvira Uyarra - University of Manchester; Manchester Institute of Innovation Research
- Professor Kostas Selviaridis - University of Lancaster

This document relates to IRC Project FFTwo022: Understanding the impact of innovation policy on UK supply chains

Acknowledgements

This work was supported by Economic and Social Research Council (ESRC) grant ES/X010759/1 to the Innovation and Research Caucus (IRC).

We are very grateful to the project sponsors at UK Research & Innovation (UKRI) for their input into this research. The interpretations and opinions within this report are those of the authors and may not reflect the policy positions of UKRI or its constituent councils. We would also like to acknowledge and appreciate the efforts of the IRC Project Administration Team involved in proofreading and formatting, for their meticulous attention to detail and support.

About the Innovation and Research Caucus

The Innovation and Research Caucus supports the use of robust evidence and insights in UKRI's strategies and investments, as well as undertaking a co-produced programme of research. Our members are leading academics from across the social sciences, other disciplines and sectors, who are engaged in different aspects of innovation and research systems. We connect academic experts, UKRI, IUK and the (ESRC), by providing research insights to inform policy and practice. Professor Tim Vorley and Professor Stephen Roper are Co-Directors. The IRC is funded by UKRI via the ESRC and IUK, grant number ES/X010759/1. The support of the funders is acknowledged. The views expressed in this piece are those of the authors and do not necessarily represent those of the funders.

Cite as: Deng, Uyarra and Selviaridis, 2025. *Understanding the impact of innovation policy on UK supply chains*. Oxford, UK: Innovation and Research Caucus

Executive summary

This report investigates the impact of innovation policy on innovation diffusion along supply chains and on supply chain resilience in the United Kingdom, with a particular focus on the role of Innovate UK programmes in shaping inter-firm knowledge flows and supply network structures. Using a unique dataset that integrates Innovate UK award information with firm-level innovation outputs (patents) and supply chain relationships, the study provides comprehensive empirical assessments of how innovation policy influences both the direction of technological diffusion and the configuration of supply chain networks across the UK economy.

Background and research gaps. Innovation policy is increasingly recognised not only as a tool for stimulating firm-level R&D, but also as a lever for strengthening national and regional innovation systems and ensuring the resilience of critical supply chains. Yet, despite significant government investment through Innovate UK and related programmes, the mechanisms through which such policies shape supply chain-level innovation dynamics remain poorly understood. This study addresses that gap by examining:

- How innovation diffuses along UK supply chains;
- How innovation policy influences the direction and strength of this diffusion; and
- How policy-supported innovation affects firms' supply chain connectivity and resilience.

The analysis builds on a rich theoretical foundation integrating insights from Operations and Supply Chain Management (OSCM) research and the innovation studies literature. Our analytical framework highlights both the relational nature of learning in supply networks and the growing policy emphasis on technological sovereignty, regional development, and systemic resilience.

Data and methodology. We construct an integrated firm-level dataset spanning 2011–2022, combining data sources from Innovate UK on public innovation support with supply chain linkage data and firm characteristics from FAME and patent databases. Descriptive network analyses map the evolution of domestic and international supply relationships, revealing increasing regional diversification and interconnectivity over time. Empirical analyses employ fixed-effects panel regressions and entropy balancing to identify causal effects of policy support on innovation outcomes and network structure.

Key findings. First, we find that innovation diffusion is asymmetric but systematic. Innovation primarily diffuses from customers to suppliers, suggesting that downstream firms act as key initiators and transmitters of technological knowledge upstream the supply chain. Suppliers' innovation exerts weaker effects on their customers, indicating that learning within supply networks is directionally biased and shaped by buyer dominance.

Second, innovation policy alters the direction of diffusion. Innovate UK support significantly boosts firms' own innovation performance, confirming that public funding stimulates inventive activity. However, policy support to customers does not enhance spillovers to suppliers; instead, it may lead to "policy-induced insulation", where subsidised firms internalise R&D and reduce collaborative engagement. In contrast, policy support to suppliers activates reverse diffusion—policy-supported suppliers are better able to influence customer innovation. Public funding thus empowers upstream supplier firms to become sources of technological renewal, transforming supply chains into two-way learning systems.

Third, we document that policy-supported firms become more central and connected. Firms receiving Innovate UK support exhibit higher degree, in-degree, and eigenvector centrality within supply chain networks, indicating increased embeddedness and influence. Policy-supported firms expand both their supplier and customer linkages, enhancing access to knowledge, partners, and markets. Higher network centrality reflects greater supply chain resilience: firms with more diversified and influential connections are better able to absorb shocks and reconfigure supply chain relationships when disruptions occur.

Finally, we find evidence that policy support shapes the geography of supply chain resilience. Supported firms maintain regionally concentrated customer bases but geographically diversified supplier networks. This configuration combines the benefits of local embeddedness (trust, collaboration) with wider supply diversification (redundancy, adaptability). As such, innovation policy fosters relational and geographic resilience, strengthening regional clusters while enhancing systemic flexibility across the UK supply network.

Implications. Our findings highlight that innovation policy operates as a supply network-level mechanism rather than a firm-level intervention alone. By influencing how innovation and information flow across supply chains, policy support contributes to both the diffusion of technological capabilities and the resilience of national production and supply systems. For policymakers, this highlights the need for:

Supply chain–sensitive innovation design, targeting both upstream and downstream firms to enable balanced, bidirectional learning;

Network-oriented policy evaluation, extending beyond firm-level performance metrics to assess structural and relational outcomes at the supply chain level; and

Place-based innovation strategies that link regional industrial strengths to national supply chain resilience objectives.

1. Introduction

Innovation diffusion unfolds as innovations spread within a social system (Rogers, 2003), often facilitated through customer-supplier interactions that drive key improvements (Kline and Rosenberg, 1986). Supply chains—networks of customers and suppliers exchanging goods, services, and knowledge—are critical pathways for innovation diffusion (Kumar et al., 2020). Contemporary Operations and Supply Chain Management and innovation management research emphasise that innovation typically occurs in an “open” and collaborative manner involving suppliers, customers, and partners (Chesbrough, 2003; West and Bogers, 2014). While research on “supplier-enabled innovation” is growing (e.g., Narasimhan and Narayanan, 2013; Suurmond et al., 2020), understanding of how innovation policies influence innovation within supply chains is limited (exceptions include Spring et al., 2017; Selviaridis and Spring, 2022). Policy evaluations often lack a supply chain perspective, focusing on direct impacts on supported firms (e.g., R&D investment, innovation outputs) rather than “systemic” impacts or spillover effects along the supply chain in the innovation ecosystem (Edler and Fagerberg, 2017).

Moreover, collaborative innovation and its diffusion within supply chains strengthen resilience—the ability to persist, adapt and even transform amid disruptions (Wieland and Durach, 2021). This is increasingly vital given disruptions induced by Brexit, COVID-19, and geopolitical tensions (Edler et al., 2023). Innovation fosters resilience by enabling supply chains to adopt new technologies, diversify suppliers, and develop regional production networks (Selviaridis and Spring, 2022). However, prior research has neglected how innovation diffusion through supply chains supports supply chain resilience, particularly the role of innovation policies in driving these effects.

To bridge this knowledge gap and provide evidence-based policy implications, this research creates a comprehensive dataset and analysis framework, offering new insights into the systemic impacts of innovation policies across multiple supply chain tiers. Specifically, we intend to address two key questions: 1) How do innovation policies influence the adoption and diffusion of innovation through supply chains, considering upstream (supplier) and downstream (customer) effects? and 2) To what extent does policy-supported innovation diffusion enhance supply chain resilience? Addressing these significant gaps in supply chain management and innovation literature, we provide actionable, evidence-based recommendations for policymakers, industry leaders, and researchers. The findings improve our understanding of how innovation diffusion occurs along the supply chain, and how to foster robust and adaptive supply chains and advance the UK innovation ecosystem. In the face of global challenges, these insights are essential for building resilient supply chains that drive sustainable economic growth.

2. Literature review

2.1 Supplier-enabled innovation in the supply chain

Within Operations and Supply Chain Management (OSCM) scholarship, it is widely accepted that innovation typically occurs through collaboration between buyers, suppliers, and business partners (e.g., Kumar et al., 2020). This is in line with the open innovation paradigm (Chesbrough, 2003). Specialisation and globalisation trends, coupled with accelerated technological change mean that focal firms increasingly rely on the capabilities of their supply chain counterparts to innovate, and especially those of their suppliers (Arjbjørn and Paulraj, 2013; Oke et al., 2013). Specifically, the OSCM literature on supplier-enabled innovation has shown that access to supplier expertise and novel ideas contributes to value creation for focal buying organisations (Koufteros et al., 2007; Lawson et al., 2015; Wowack et al., 2016). Suppliers possess unique knowledge sets and specialised technological capabilities that help buyers to develop improved products and processes (Johnsen, 2022; Oke et al., 2013). Supplier collaboration increases the effectiveness and efficiency of innovation activity (Suurmond et al., 2020) and can be a source of competitive advantage for the buying organisation (Yan et al., 2017). On the other side, suppliers also benefit by accessing buyer knowledge and using it to develop novel products and services (Kumar et al., 2020; Zaremba et al., 2016).

The literature has also examined the requisite capabilities that focal buying organisations must have to be able to collaborate for innovation with their suppliers, including capabilities in supplier identification, assessment and selection, and supplier relationship management (e.g., Zaremba et al., 2017; Legenvre and Gualandris, 2018; Ketchen and Graighead, 2021; Kurpjuweit et al., 2021). Suppliers also require capabilities such as information-gathering and relationship-building to be able to access buyers' knowledge for innovation purposes (e.g., Kurpjuweit et al., 2018), but research in this area has been limited. These are especially critical when engaging with SME and start-up suppliers, which, despite being vital sources of new technologies, face resource and legitimacy constraints (Zaremba et al., 2016; Legenvre and Gualandris, 2018).

Research has also moved beyond buyer-supplier dyads to examine how and why the structure and complexity of the supply network affect innovation processes and outcomes (e.g., Bellamy et al., 2014; Carnovale and Yeniyurt, 2015; Gao et al., 2015; Yan et al., 2017; Chae et al., 2020; Potter and Wilhelm, 2020; Sharma et al., 2020). Apart from structural characteristics, a small body of work has explored institutional influences on collaborative innovation in the supply chain (e.g., Wang et al., 2016; Yan and Nair, 2016). However, these studies typically emphasise cross-national or sectoral differences and largely overlook how domestic institutional environments and innovation policies shape innovation along the supply chain.

Blind spot 1: how innovation policies and related programmes influence innovation processes and outcomes within the supply chain.

Prior OSCM research has paid limited attention to the role of innovation policy, specifically why and how policies and related programmes can influence innovation processes and outcomes in supply chains. There are three exceptions. Spring et al. (2017) highlighted the role that industrial and innovation policies play in promoting innovation in firms and in supply chains. They illustrated this point by showing how the UK "Catapult Centres" policy initiative incentivises and supports collaborative innovation between buying and supplying firms across sectors and technology domains.

Extending these insights, Selviaridis and Spring (2022) investigated how specific innovation policy instruments – the UK Small Business Research Initiative (SBRI) and regional health innovation agencies acting as intermediaries – influence SME-enabled innovation in the supply chain of the English NHS. They identified three key mechanisms through which innovation policies foster SME innovation: institutional change and mitigation to create an institutional set-up that is conducive to SME innovation development and adoption; SME connectivity to the buying organisation and its incumbent suppliers; and SME supplier development support e.g., through financing, mentoring, and education.

More recently, Selviaridis and Spring (2025) have examined the role of innovation intermediation policies in the UK defence and health sectors in supporting collaborative innovation in the supply chains of the MoD and the NHS, respectively. The study focused on the activities and underlying capabilities that innovation intermediary organisations mobilise to address capability limitations of both the buyer and supplier side – for instance, through creating workspaces for R&D and experimentation; and helping to refine specifications of requirements and de-risk novel solutions. Selviaridis and Uyarra (2025) further examined the role of innovation intermediaries supporting collaborative innovation in the UK MoD's supply chains, shedding light on how intermediary organisations mobilise knowledge management capabilities to de-risk and advance novel solutions. These studies operationalise innovation output mainly in terms of the adoption of novel solutions by focal buying organisations (e.g., Selviaridis and Spring, 2022; 2025), though an increase in collaborative innovation projects also features as an intermediate outcome of innovation policy effectiveness (e.g., Spring et al., 2017).

Despite these valuable insights, we still know relatively little about the role of innovation policy in fostering collaborative (buyer-supplier) innovation in supply chains. Furthermore, the policy-oriented studies above emphasise innovation development and adoption aspects but have not explicitly study how policy-supported novel technologies and products /services can be *diffused* within the supply chain. We have limited understanding of how exactly such innovation diffusion within the supply chain takes place, and the ways in which diffusion through the supply chain can be operationalised and captured – for instance, through patenting patterns and /or flows.

2.2 Innovation diffusion through the supply chain

Diffusion of innovations (DOI) theory (Rogers, 2003) is a well-established perspective that views innovation adoption as a process featuring pre-adoption (knowing about an innovation and forming an opinion about it); adoption (making the decision to adopt it or not); and post-adoption stages (implementation of the innovation and assessment of how it worked). Innovation diffusion can thus be conceived of as a process through which a manager or organisation moves from becoming aware of a novel solution to assessing it, making an adoption or rejection decision, implementing the innovation, and seeking confirmation about the value of the innovation (Rogers, 2003). The rate of adoption of an innovation follows an S-shaped curve over time: early on, only a few individuals or organisations would adopt a novel idea or product. Over time, as more people use it and others observe, its adoption and use increase to the point that it reaches critical mass and becomes self-sustaining (Rogers, 2003).

The diffusion of innovations theoretical perspective has been applied in supply chain contexts, mainly to investigate the adoption and diffusion of emerging technologies such as blockchain and big data analytics within focal firms and their supply chains (e.g., Lai et al., 2018; Moraes et al., 2024). Early research stressed the role that suppliers play in influencing buying organisations to adopt e-procurement, through the internet. Suppliers' offering of training and price discounts and the promotion of convenience benefits of online procurement influence adoption of process innovation adoption by buyers (Deeter-Schmelz et al., 2006).

Subsequent empirical studies uncovered a multitude of technological, organisational, regulatory, and supply chain-level factors that influence adoption and diffusion of new technologies. These include technological complexity, technology scalability, interoperability and usability, organisational capabilities and financial readiness, government regulations, and supply chain connectivity (Hartley et al., 2021; Lai et al., 2018; Moraes et al., 2024). The extent of inter-firm integration within the supply chain also influences the adoption and diffusion of new (to a firm) production methods and processes such as the lean methodology – from an innovation diffusion perspective, IT-enabled supply chain integration increases a focal firm's perceived relative advantage of using lean production methods (So and Sun, 2010).

More generally, however, there has been limited attention to diffusion (through the supply chain) aspects. An exception is Hazen et al. (2012) who focused on the post-adoption decision stage of Rogers' (2003) model and examined what the sub-steps of "acceptance", "routinisation" and "assimilation" mean for innovation diffusion in supply chain settings, and how they relate to the goal of incorporating and using an innovation within an organisation. For instance, factors like performance effect and social influence matter for acceptance, while routinisation hinges on things like employee skills and support to use an innovation and equipment turnover. Assimilation is related to the depth, breadth, and diversity of use of a novel technology (Hazen et al., 2012).

Blind spot 2: how innovation diffusion occurs at the supply chain level (i.e., beyond a focal firm, through buyer-supplier relationships)

Nevertheless, prior research seems to be focusing on the *organisation* as its unit of analysis, and there are limited insights regarding innovation diffusion at the *supply chain level*. Specifically, there is hitherto scant empirical research on the diffusion of supplier-enabled innovations within the supply chain – our relevant literature searches within the OSCM discipline returned near-zero studies. The only OSCM study that comes somewhat close to the issue is Wagner and Bode (2013), who studied the factors influencing a supplier's willingness to share product and process innovations with its customers. They found that suppliers' relationship-specific investments encourage them to share process innovation ideas with buyer firms, but not product innovation ideas. Contractual safeguards and cooperation norms can reduce a supplier's reluctance to share product innovation ideas.

More broadly, research in the information systems domain has stressed that adoption of inter-organisational process innovations in supply chains hinges on the costs involved in developing and implementing such innovations (Bunduchi and Smart, 2010). These include development and initiation costs associated with the stage of generation of an innovation; switching costs and the cost of capital associated with the acceptance stage; and implementation and relational costs associated with the implementation stage.

Blind spot 3: how innovation policy supports innovation diffusion in the supply chain

Overall, there is a dearth of OSCM research on how policies influence the *diffusion* of innovations through the supply chain. Selviaridis and Spring (2022) have shown how innovation policy instruments such as the establishment of regional health innovation agencies (as intermediaries) facilitate adoption of novel solutions by the NHS, but the study offers very limited insights regarding how supplier innovations are actually diffused and used, after the adoption decision is made.

More recently, Wang et al. (2024) identified a positive influence of government subsidies and dynamic carbon trading schemes on the diffusion of novel low-carbon technologies through supply chains. A key conclusion of the study is that dynamic *policy mixes* can be an effective way to accelerate the diffusion of sustainable technologies in supply chains. Despite its usefulness, the study did not focus specifically on innovation policy interventions.

Research on innovation policy and innovation management, on the other hand, offers considerable insights regarding how technology and innovation policies influence diffusion, in general. The STI policy literature has identified several mechanisms through which policy interventions shape innovation diffusion patterns and outcomes.

First, demand-side policies have been shown to play a crucial role in accelerating diffusion. Public procurement policies, in particular, can create lead markets and provide legitimacy signals that facilitate broader adoption (Edler and Georghiou, 2007). Regulatory standards and performance requirements can also stimulate diffusion by creating minimum thresholds and certainty for innovators and adopters alike (Blind, 2012). Second, supply-side policies influence the generation and availability of innovations for diffusion. R&D subsidies and grants can increase the variety and quality of innovations entering the market (Aschhoff, 2009)., while subsidies and tax incentives for adoption reduce the cost barriers faced by potential users, particularly for capital-intensive innovations (Cantner et al., 2016). IP policies, however, present a more complex picture: whilst they may incentivise innovation creation, they can simultaneously create barriers to diffusion through licensing costs and restrictions (Hall and Harhoff, 2012). Third, systemic policy instruments that address failures in innovation systems have gained prominence in diffusion research. Innovation platforms and networks can reduce coordination failures and information asymmetries between innovators and adopters (Bergek et al., 2008). Cluster policies and regional innovation ecosystems create localised environments conducive to knowledge spillovers and rapid diffusion (Asheim and Coenen, 2005). Furthermore, policy mixes that combine multiple instruments in a coordinated manner have been found to be more effective than single instruments in addressing the multifaceted barriers to diffusion (Rogge and Reichardt, 2016).

A sub-set of innovation policy research focusing on diffusion appears to be directly or indirectly related to supply chain-level effects. For instance, Bustamande et al. (2023) examine the impact of patents related to innovations that seek to protect common pool resources (CPRs) such as public health and the environment – they find that for innovations such as vaccines and EVs and their batteries, patents slow the diffusion of innovations across the supply chain and reduce their effectiveness. A major policy implication is that for CPR-protecting innovations subject to positive network externalities, innovation policy should prioritise diffusion outcomes over intellectual protection to incentivise R&D. Alternative policies to patents could be used to stimulate private sector R&D investments.

Colovic et al. (2025) examine how innovation intermediaries facilitate the adoption and diffusion of digital technologies across sectors and supply chain tiers (e.g., SME firms), through their institutional work. Such work focuses on disrupting symbolic systems, creating relational systems and artefacts, and creating and maintaining routines. Intermediaries carry out different kinds of institutional work at different levels of intermediation.

Hotte (2023) studies the impact of Demand-pull (DP) and Technology-push (TP) on growth, innovation, and the factor bias of technological change in a two-layer network of input–output (market) and patent citation (innovation) links among 307 US manufacturing industries. The results support within- and between-layer TP: Industries experiencing an expansion of innovation opportunities grow faster in the market (between-layer TP1) and innovate more (within-innovation TP2). These effects mostly arise from innovation spillovers from upstream industries. The support for these two TP effects is consistent across industries and strongest in patent-intensive industries. The results also support within-market TP2 effects arising from upstream market spillovers, which indicate positive supply shocks in the availability of production inputs. However, within-market TP2 is heterogeneous across industries and upstream network centrality shows a negative effect in some industries. One explanation for the ambiguous role of upstream market linkages lies in their interaction with the position of an industry in the supply chain.

Nelson (2009) examines the effects of patents, licenses, and publications as measures of innovation diffusion (through knowledge spillovers). The results suggest that direct patent citations – the most common measure of knowledge spillovers – appear to be the most restrictive measure of diffusion, capturing the smallest number of organizations. Judged by the licensing data, direct patent citations miss 88% of all organizations building upon a core patent and 82% of those organizations that release a product based on a core patent. Two-step patent citations capture the greatest number of organizations in general and the greatest number of firms, but they still miss the majority of licensing organizations, and they are far less effective than licenses in capturing firms that release products. Licenses provide the only reliable assessment of actual products released. Publication citations are most effective in picking up universities /research orgs and they add a significant number of firms missed by direct patent citations. However, they undercount firms overall and their connection to economically useful innovations is tenuous.

Papazoglou and Spanos (2018) study firm-level factors that influence the breadth of innovation diffusion i.e., those factors that limit or enhance a firm’s capability to develop knowledge that is influential for potential adopters operating in distant technological domains as reflected in the citations its patent(s) receives from subsequent patents located in distant technological areas. Results show that a firm's scientific intensity (i.e., the extent to which it draws upon scientific knowledge), and technological collaborations have a positive effect on breadth of diffusion, while technological diversity of its knowledge base has a negative effect. Internal focus (i.e., the extent to which it builds upon its own technological achievements) does not have any influence.

2.3 Innovation and supply chain resilience

A growing consensus in both policy and academic debates recognises a bidirectional relationship between technological innovation and supply chain resilience. On one hand, resilient supply chains are critical for the successful development and scaling of emerging technologies such as electric vehicles, renewable energy systems, and artificial intelligence, technologies that underpin the UK's net zero, digital transformation, and economic growth agendas (Department for Business and Trade, 2024a). On the other hand, innovation itself can strengthen resilience by enabling supply chains to diversify suppliers, enhance traceability, and adopt circular production models that reduce dependence on critical imports (Department for Business and Trade, 2024b).

Technological innovation, especially in digitalisation, data analytics, and advanced manufacturing plays a key role in building adaptive and robust supply networks. Digital platforms, interoperable telecom infrastructures, and circular economy solutions exemplify how innovation can reduce vulnerabilities, improve visibility, and enhance flexibility across sectors such as life sciences, clean energy, and manufacturing. These dynamics illustrate that the development, adoption, and diffusion of novel technologies are essential mechanisms for promoting resilient supply chains capable of withstanding shocks and disruptions.

Blind spot 4: how technological innovation and its diffusion within the supply chain influences supply chain resilience – and what is the role of innovation policy in this respect, in particular.

It is somewhat surprising, then, that OSCM research focusing on the relationship between supply chain resilience and technological innovation has been relatively limited. Kocabasoglu-Hillmer et al. (2023), for example, conceive of radical innovation – both of product and process innovation type – as a driver of disruption upstream the supply chain. They offer examples of process innovations like the adoption of end-to-end digital platforms to develop and launch new drugs in the pharma industry as well as product innovations such as EVs that disrupt upstream supplier relationships and sourcing patterns. In this respect, radical innovation and the associated technological change negatively influences supply security and stability in supply chains, at least in the short run.

In a more positive fashion, Jiang et al. (2023) examine the role of big data analytics – as an emerging technology – alongside supply chain integration in promoting proactive (i.e., focus on supply continuity based on robustness) and reactive (i.e., focus on quick response, adaptation and fast recovery) supply chain resilience. They identify multiple configurations of antecedent factors influencing supply chain resilience. For example, the core presence of information integration, relational integration, and big data managerial skills, alongside the peripheral presence of data driven-decision culture, lead to high levels of proactive supply chain resilience (measured in terms of how “robust” a supply chain is). High reactive supply chain resilience requires high levels of information and operational integration alongside big data analytics technical and managerial skills.

Several other studies emphasise the role of data analytics technologies (and their applications in supply chain contexts) in strengthening supply chain resilience (e.g., Cadden et al., 2022; Munir et al., 2022; Sturm et al., 2023). Recent research also suggests that the adoption of AI in supply chains can, under certain conditions, promote supply chain resilience. For example, the congruence of AI and explorative learning within firms can boost resilience (Dai et al., 2025); and that both buyer and supplier AI capability orientation can enhance resilience at the supply chain level overall (Lu et al., 2025). More generally, the adoption of digital technologies in supply chains can help both downstream and upstream actors to boost their resilience, albeit in different ways – for instance, in the agri-food sector downstream actors can leverage blockchain and additive manufacturing technologies to build proactive resilience strategies, while smaller upstream suppliers use mobile apps and cloud-based analytics to develop reactive resilience capabilities (Belhadi et al., 2024). In the humanitarian logistics setting, the digital twins technology helps to improve supply chain resilience through increasing real-time sensing capacity and enabling the use of predictive analytics to align processes (Singh, 2025).

Except for investigating the role of emerging technologies in promoting resilience, the burgeoning literature on supply chain resilience (e.g., Ponomarov and Holcomb, 2009; Scholten et al., 2020; Wieland and Durach, 2021; Wieland et al., 2023) has been largely silent on the relationship between resilience and technological innovation. Prior research focuses on researching supply chain resilience strategies, capabilities, processes, and outcomes, including in sectoral settings of relevance (e.g., renewables and automotive), but without considering the role of innovation and – crucially – that of innovation policy interventions. Resilience in supply chains and supply networks has been analysed also in relation to the positioning of a focal firm in the supply network, notably in terms of its centrality and the extensiveness of its links to other nodes in the network (Kim et al., 2015).

In general, there has been very limited focus on the role that *innovation policy interventions* can play in strengthening supply chains that are required to develop and deliver critical technologies. It is imperative that we increase our understanding of this aspect, especially given that an emerging rationale for innovation policymaking emphasises technological sovereignty in critical sectors (e.g., defence and clean tech /energy), seeking to reduce technological dependency on certain sources /countries and to build resilient supply chains (Edler et al., 2023).

3. Data and UK sample

To examine the role of innovation policy in promoting innovation diffusion along the supply chain, we draw on multiple data sources to construct our analytical sample. The following sections provide a comprehensive overview of our data sources and the composition of the UK sample.

3.1 Innovate UK innovation product

First, we collect Innovation support data from Innovate UK's dataset (2004–present). To analyse the role of innovation policy in shaping innovation diffusion through supply chains, we first examine the portfolio composition of Innovate UK (2004–present). The datasets comprise several key policy instruments, including Collaborative R&D (CR&D) projects, Contracts for Innovation (formerly known as Small Business Research Initiative (SBRI) contracts), Feasibility Studies, Knowledge Transfer Partnerships (KTPs), and Innovation Loans. These instruments collectively represent distinct approaches to stimulating innovation across industrial sectors and supply chain tiers, ranging from large-scale, collaborative research consortia to targeted SME support mechanisms.

Figure 1 demonstrates that CR&D accounts for a dominant share of Innovate UK's total funding allocation. In contrast, when examining the distribution of project numbers (see Figure 2), the pattern becomes more diversified. Although CR&D projects continue to represent a substantial portion of activity, Contracts for Innovation and Grant for R&D constitute a significantly larger share of total projects, despite receiving a smaller portion of overall funding.[1]

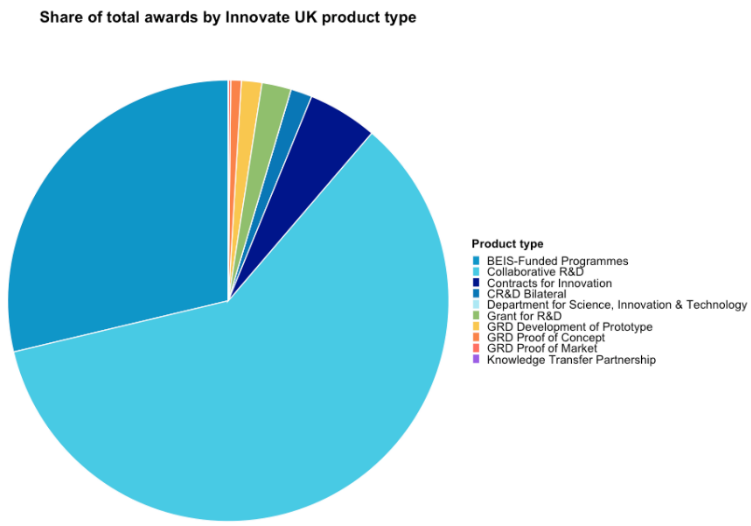

Figure 1: The share of total awards by Innovate UK product type

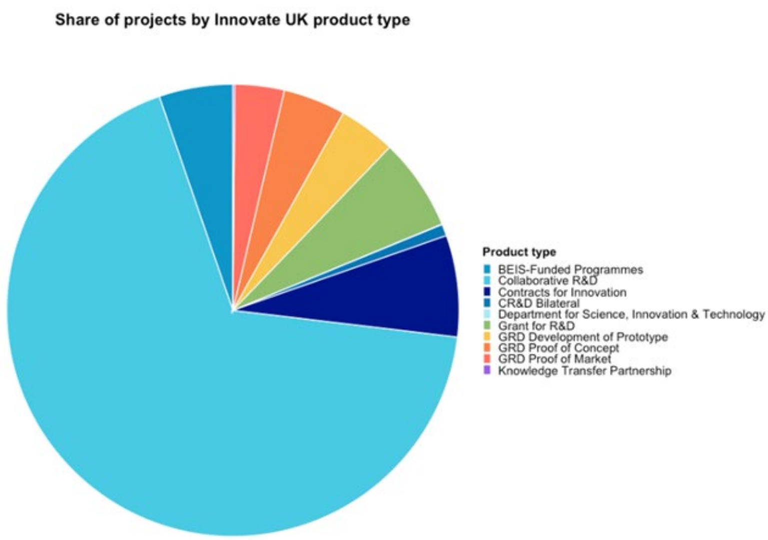

Figure 2: The share of the number of projects by Innovate UK product type

[1] We selected ten specific Innovate UK product types, as depicted in Figure 1 and Figure 2, on the grounds that they are more directly associated with innovation activities and may influence both innovation diffusion and supply chain relationships.

Figure 3 illustrates the temporal evolution of Innovate UK's total financial awards and funded project numbers from 2004 to 2024. Both series reveal a broadly upward trajectory, albeit with some periodic fluctuations. This further highlights the need to examine whether the growing number of awards and projects produces ripple effects throughout the supply chain.

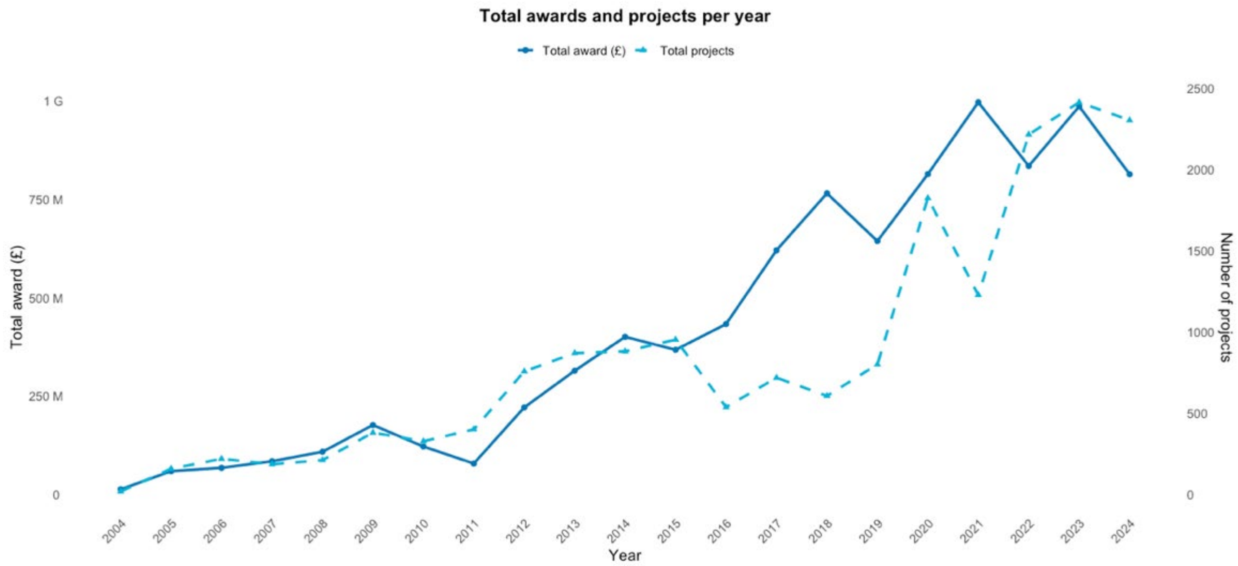

Figure 3: The evolving trends of total awards and projects (2004-2024)

While the above trends indicate overall policy support expansion, Figures 4 and 5 provide a more nuanced view of how the composition of funding instruments has evolved over time. We aggregate the 10 selected Innovate UK project types into four main categories: Collaborative R&D (CRD), including BEIS-Funded Programs, CR&D Bilateral, Collaborative R&D, and Department for Science, Innovation & Technology; Grants for R&D (GRD), comprising Grant for R&D, GRD Development of Prototype, GRD Proof of Concept, GRD Proof of Market and Grant for R&D; Knowledge Transfer Partnership (KTP); and Contracts for Innovation (CTI). Specifically, Figure 4 presents the share of total award value by these four aggregated Innovate UK product types. The results show that CRD has consistently dominated when it comes to the funding provided over the past two decades, accounting for the vast majority of total awards in nearly every year. This sustained dominance indicates that the UK innovation policy mix remains heavily oriented towards large-scale, multi-partner research consortia. Nevertheless, from 2011 onwards, there is a visible though modest diversification, with GRD and SBRI gaining greater proportional shares. The increased presence of contracts for innovation after

2012 reflects growing policy attention to public-sector procurement as a driver of SME innovation.

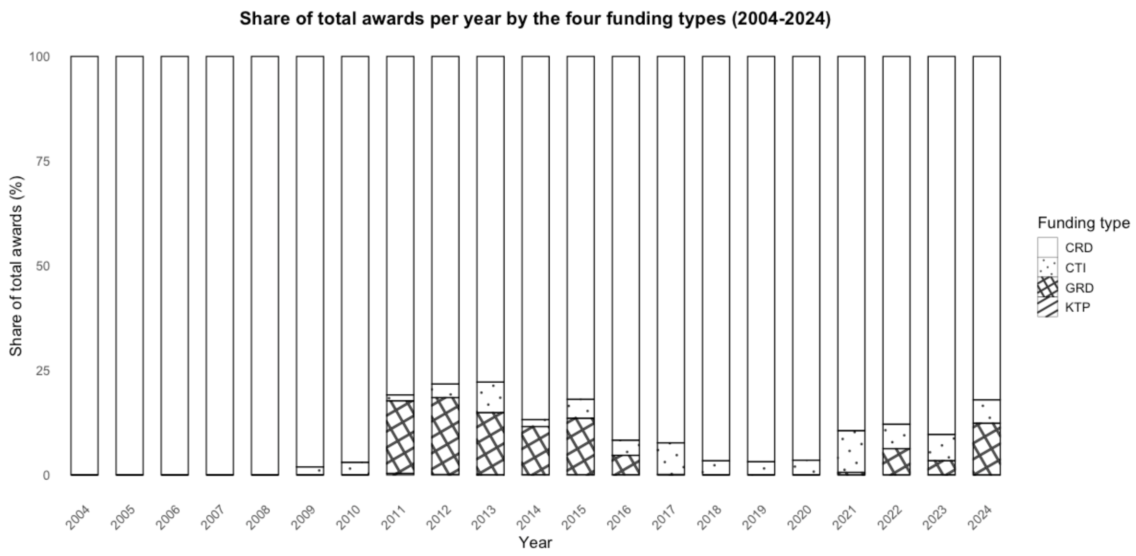

Figure 4: The share of total awards by the four aggregated innovation funding types

Figure 5 further presents the equivalent distribution in terms of unique project count rather than funding value. The picture changes significantly, where the share of GRD and CTI projects expands considerably between 2010 and 2016, indicating that while these schemes involve smaller individual awards, they reach a wider base of participants. KTPs appear as a relatively stable but minor share across the period. The temporal concentration of GRD and CTI projects during certain policy cycles, particularly 2012–2016 and again post-2021, may suggests episodic surges in diffusion-oriented innovation activity, when policy emphasis shifted toward inclusivity, SME engagement, and regional participation.[2]

[2] For instance, Department for Business Innovation & Skills (BIS) in 2011 encourages the diffusion of knowledge and techniques across different sectors, which is detailed in their Innovation and Research Strategy for Growth report.

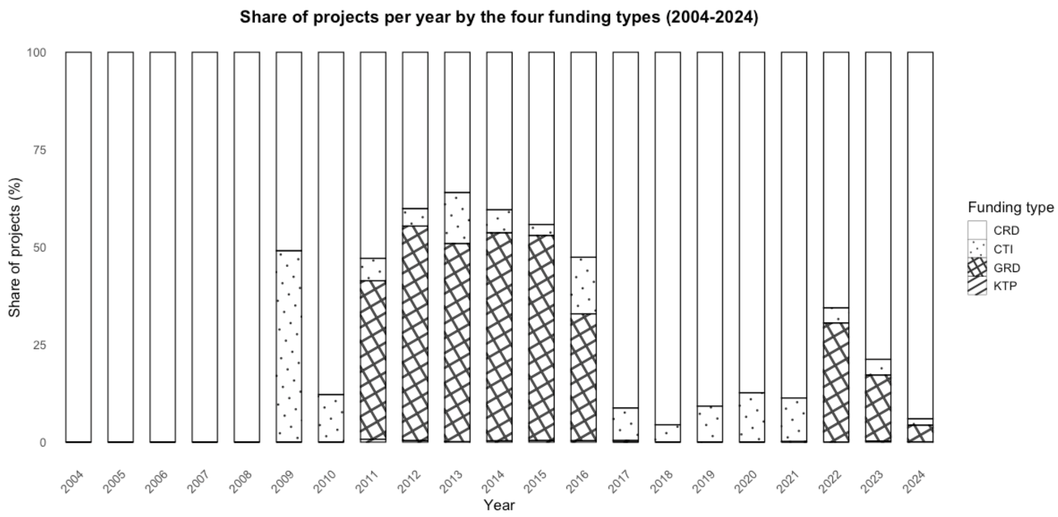

Figure 5: The share of projects by the four aggregated innovation funding types

3.2 UK Supply chain

To understand the effect of innovation policy on innovation diffusion w along the supply chain, we collect supply chain information from the FactSet Revere database which contains the global supply chain data. These relationships are identified using information from company regulatory filings, official websites, and daily updates derived from new disclosures, press releases, and corporate actions. The database captures both relationships reported by the companies themselves and those revealed by their business partners. A key advantage of FactSet's data lies in its extensive coverage of both major and minor private as well as publicly listed customers and suppliers. Overall, there are 219,879 buyer-supplier relationships of 13,468 unique UK private firms between 2016-2023 (June 2023). We use the company names to match the FactSet database to FAME to retrieve company registration numbers, which can be used to link back to Innovate UK data. We manually verify matches using company address, full postcode and industry information. Finally, we are able to match on 12,254 unique company registration numbers.

We first investigate the geographical structure and evolution of UK supply chains, which is critical to situating the diffusion of innovation within the broader production ecosystem. The figures below present trends in the customer and supplier networks associated with UK firms between 2011 and 2022, where we differentiate between domestic and international partners and further examine regional patterns of engagement. Figures 6 and 7 first present the evolution and regional distribution of customers of UK supplier firms. In total, we are able to retrieve 138,102 customer-supplier relationships of 4,554 UK private suppliers from 2011-2022.[3] The data in Figure 6 reveal a strong upward trend in the number of unique customers, followed by a mild stabilisation after 2019 potentially due to the pandemic.[4] In Figure 7, we further disaggregate customer data by world region. The dominant roles of Europe and North America are evident throughout the period, but there is a notable and steady rise in the proportion of customers from Asia, especially after 2015. These regional patterns mirror global shifts in industrial geography and market demand. However, this diversification might also provide a measure of risk dispersion by reducing dependence on any single region, but it also introduces new vulnerabilities linked to geopolitical and logistical uncertainties.

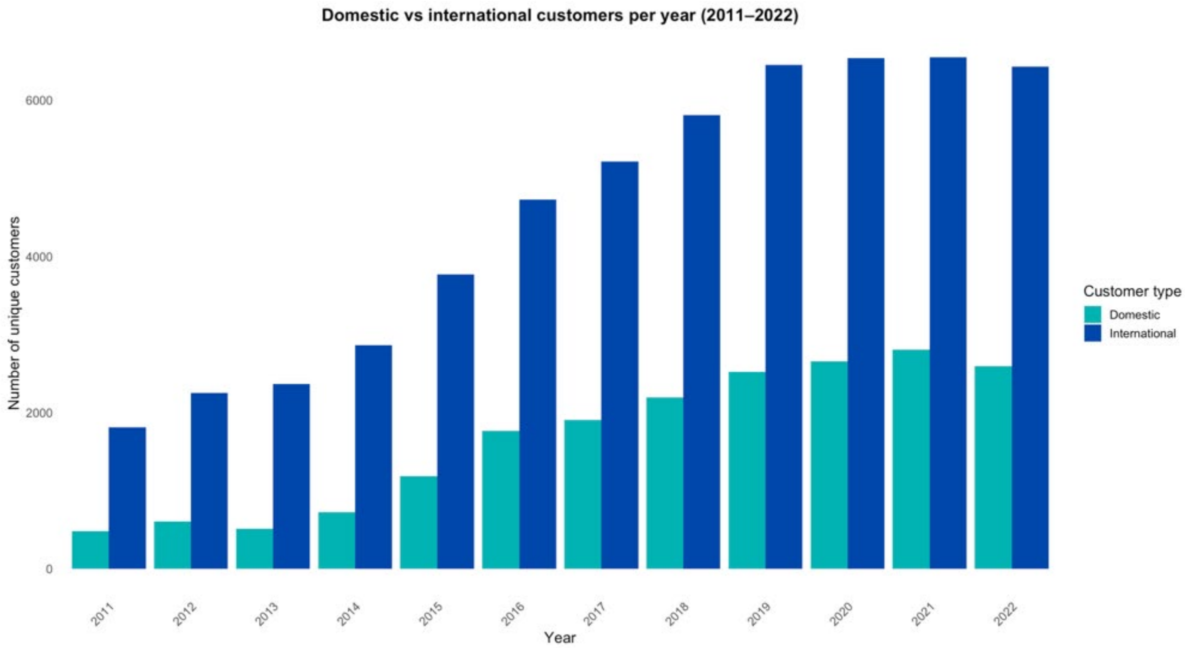

Figure 6: Domestic *vs.* international customers over time (2011-2022)

[3] We remove 2023 given the incompleteness of the FactSet snapshot data.
[4] The large share of international partners may be due to several factors. The FactSet database relies on company disclosures, press releases, and corporate actions, which are more readily available from relatively large or international firms that follow stricter disclosure requirements and receive broader media and analyst coverage. This also likely results in a selection bias toward such firms.

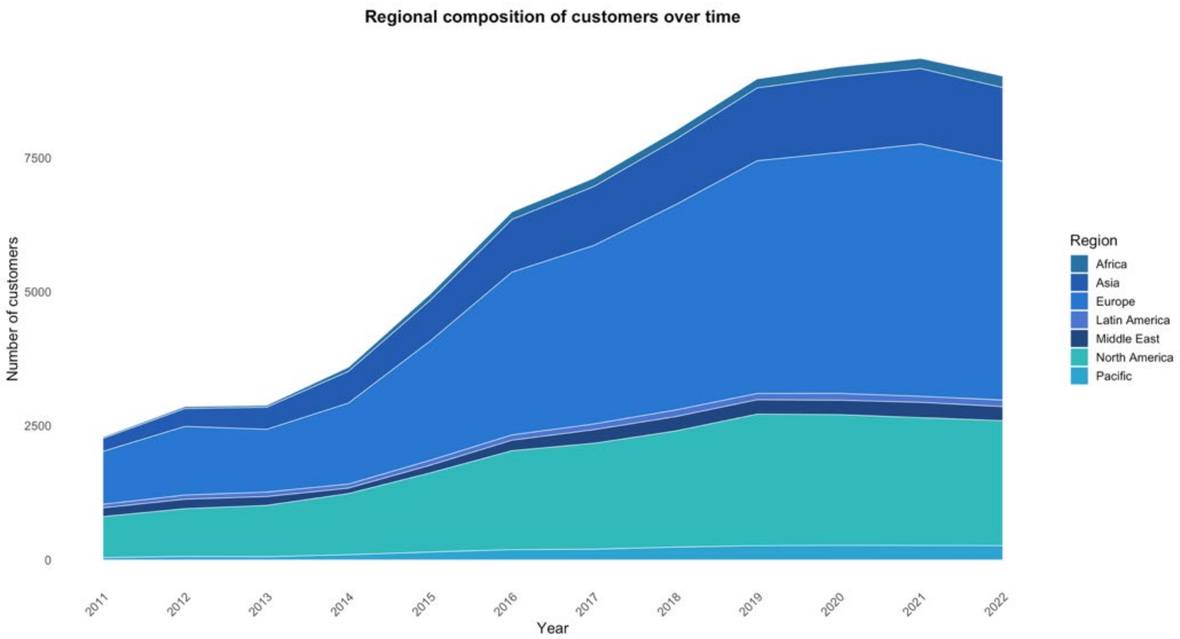

Figure 7: Regional composition of customers over time (2011-2022)

Turning to the supply side, we are able to retrieve 132,613 customer-supplier relationship of 9,359 UK private customers from 2011-2022. Figure 8 presents the number of domestic *vs.* international suppliers over the same period. The pattern broadly parallels that of customers: both domestic and international suppliers increased substantially between 2011 and 2020, with a stabilisation thereafter. Figure 9 further shows the regional breakdown of suppliers. Similar to the customer-side trends, Europe and North America remain dominant, while Asia emerges as a major and growing supplier region, reflecting the centrality of Asian manufacturing hubs in global value chains. The gradual inclusion of suppliers from the Middle East, Africa, and Latin America indicates a modest widening of sourcing geographies and a slow movement toward supply chain diversification.

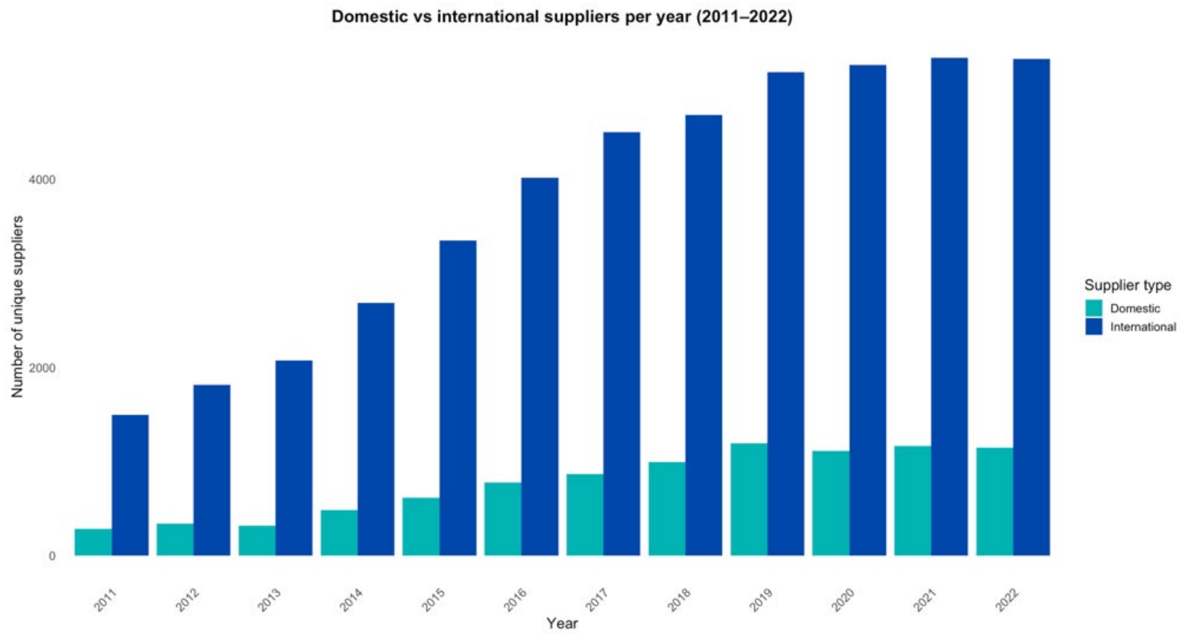

Figure 8: Domestic *vs.* international suppliers over time

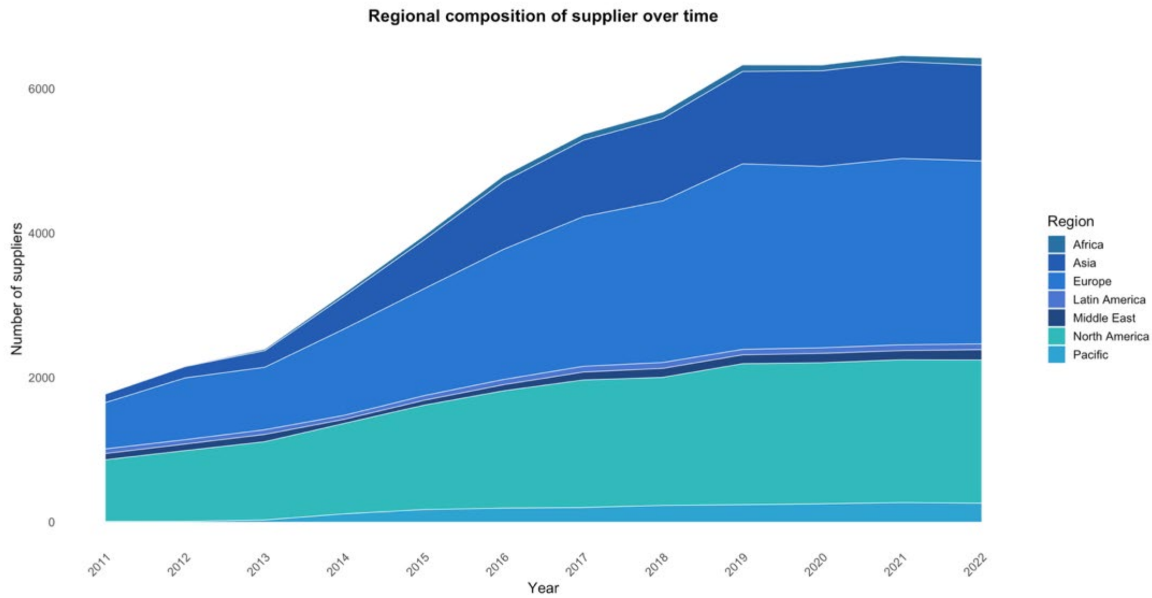

Figure 9: Regional composition of customers over time

Having examined the international structure of UK supply chains, we now focus on domestic supply chain linkages, where both suppliers and customers are UK-registered private firms.

This restricted sample comprises 41,903 supplier–customer relationships connecting 2,052 unique suppliers and 4,815 unique customers. Figures 12 and 13 visualise the regional flows of supply and demand in 2011 and 2021, respectively, highlighting how inter-regional connections have evolved over the decade.

Specifically, in 2011 (Figure 12), the UK domestic supply chain is characterised by a highly centralised structure, with London, the South East, and the North West emerging as dominant regional hubs. London stands out as both a major supplier and customer region, reflecting its centrality in financial, business, and service-oriented supply networks. Substantial flows also connect London with the South East and East of England, which are traditionally associated with knowledge-intensive and high-value-added activities, including technology, pharmaceuticals, and advanced services.

The strong intra- and inter-regional flows within this "southern corridor" (London–South East–East of England) indicate a core–periphery pattern of economic interdependence. These flows suggest a concentration of supplier–customer linkages around the UK's most economically dynamic regions. The Midlands and Northern regions, while present in the network, appear more peripherally connected, implying a lower density of inter-regional exchanges and a greater reliance on a few core customers or suppliers.

Overall, the 2011 structure portrays a UK supply network that is functionally integrated but geographically uneven, with innovation and production linkages concentrated in a limited number of southern and metropolitan areas. This concentration may have facilitated rapid knowledge circulation within the core but limited spillovers to peripheral regions, thereby constraining nationwide diffusion effects.

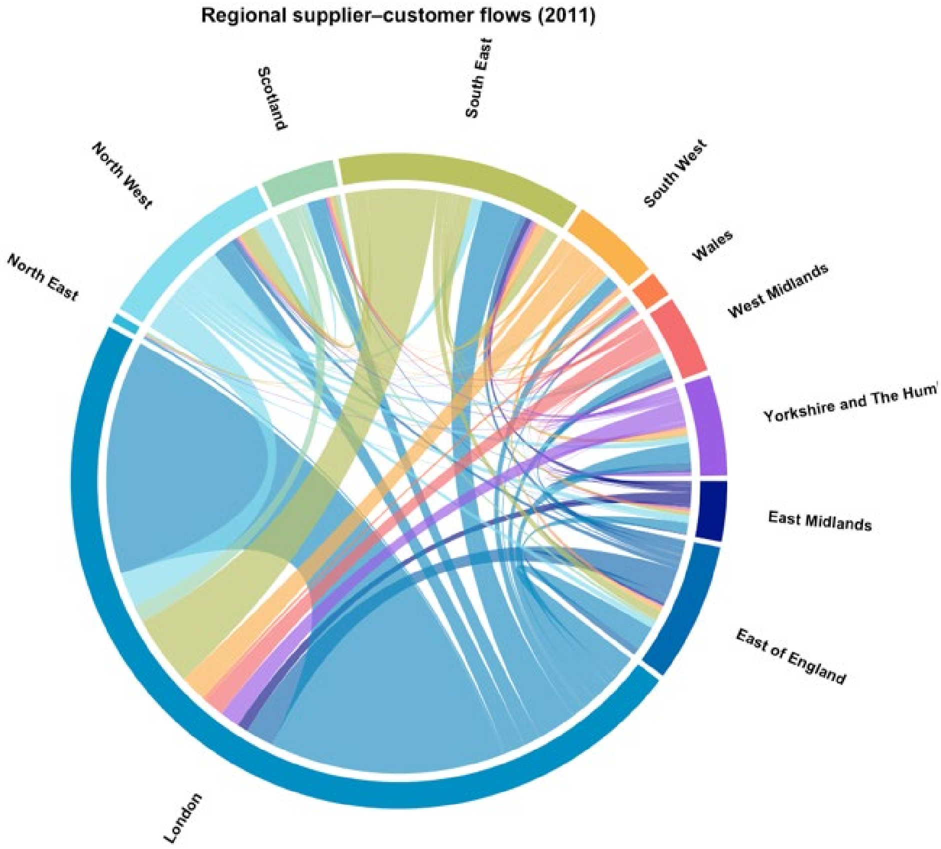

Figure 10: Supplier-customer flows in 2011

In Figure 11, the chord diagram of the UK domestic supply chain in 2021 reveals a significant densification and diversification of inter-regional supply relationships. While London and the South East remain major hubs, their relative dominance appears to have moderated, with other regions, particularly the North West, East Midlands, and Yorkshire and the Humber, displaying stronger outward and inward flows. This pattern suggests the emergence of a more distributed supply chain network, in which multiple regional economies are more actively engaged in national production systems. The strengthening of flows between the Midlands, the North West, and the South East points to a growing integration of manufacturing-intensive and service-intensive regions, which may reflect the diffusion of digital and advanced manufacturing technologies enabling geographically dispersed collaboration. Similarly, regions such as Scotland and Wales show more visible participation in 2021 compared with 2011, indicating the gradual inclusion of regional suppliers and customers in wider domestic networks.

These structural changes might be considered a partial regional rebalancing of UK supply chains. The increased connectivity among non-London regions likely reflects both market-driven restructuring, as firms diversified suppliers and customers in response to Brexit and the pandemic, and policy influences, including regional industrial strategies and targeted innovation programmes promoting inter-regional collaboration. Such developments may enhance the resilience and inclusivity of the UK innovation ecosystem by broadening the base through which innovations can diffuse.

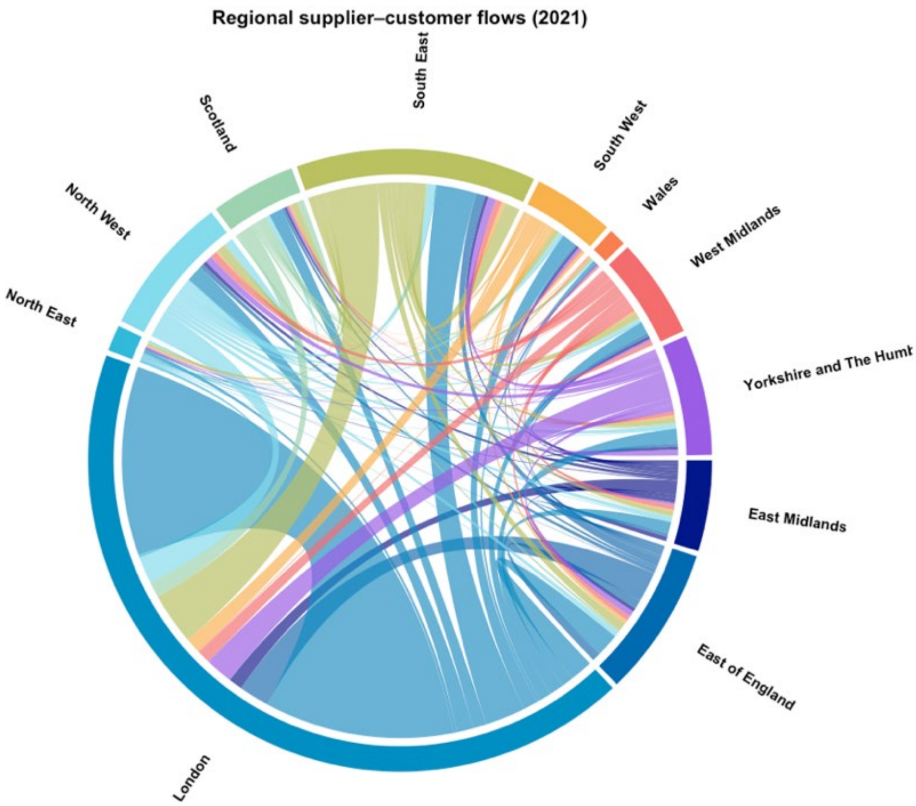

Figure 11: Supplier-customer flows in 2021

3.3 Corporate innovation

In this report, we measure corporate innovation using patent data collected from Orbis Intellectual Property (Orbis IP), which covers all UK patent applicants identified in the database (approximately 82,300 unique UK applicants). Although not exhaustive, patents are a widely recognised as an objective measure of innovation performance due to their relative resistance to subjective biases (Bronzini and Piselli, 2016). They can also provide valuable insights into innovation quality, as each application undergoes rigorous expert scrutiny. While only a subset of inventions is ultimately patented, Griliches (1998) argues that patenting activities can be considered a useful indicator of economically valuable knowledge generation, offering a reliable measure of inventive effort. To capture as many as inventive (patenting) behaviours among UK firms, we focus on all patents filed worldwide by UK private firms. Because a single invention may be filed in multiple jurisdictions, we focus on patent families and identify the earliest filing date within each family. This allows us to measure the timing of innovation based on when the invention was first introduced, rather than when subsequent applications were made. Figure 12 illustrates the temporal trends in the number of patents filed, measured as the earliest individual filing within each patent family. In addition to other offices, UK applicants mainly file their patents with the UK Intellectual Property Office (UK IPO), the United States Patent and Trademark Office (USPTO), and the European Patent Office (EPO), a pattern consistent with findings reported by the IPO (2021).

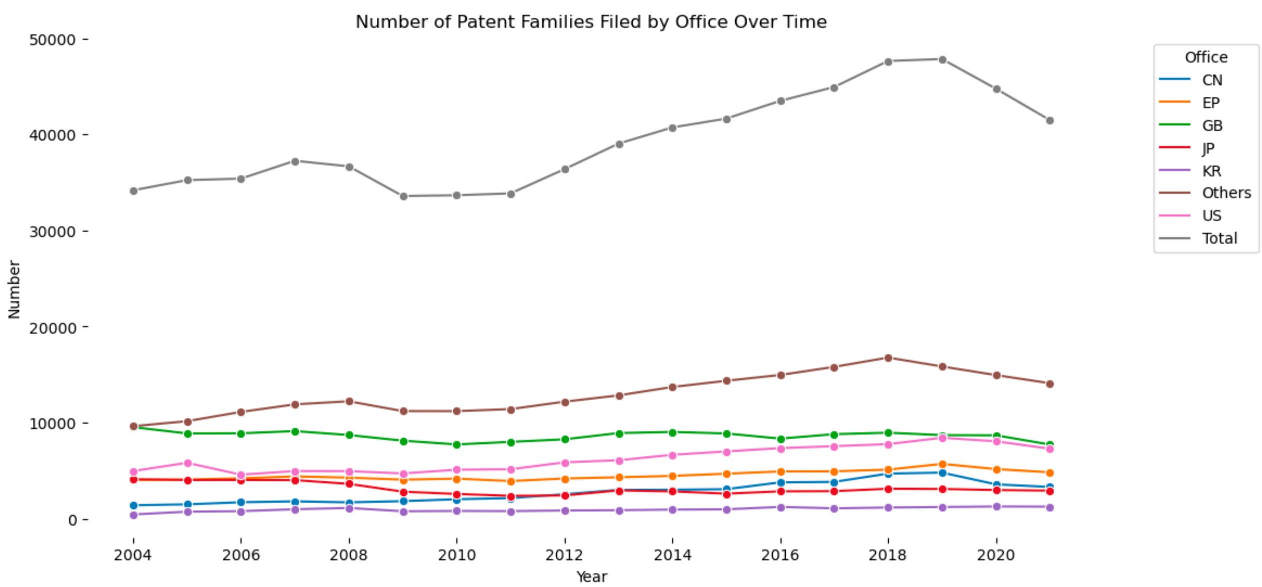

Figure 12: The number of patent families

4. Empirical model and results

To address our two main research questions: (1) How do innovation policies influence the adoption and diffusion of innovation through supply chains, considering both upstream (supplier) and downstream (customer) effects? and (2) To what extent does policy-supported innovation diffusion enhance supply chain resilience? we develop a comprehensive empirical framework that integrates multiple data sources at the firm and network levels.

Specifically, we begin by constructing an integrated firm-level dataset that links information from Innovate UK's innovation support database (2004–present) with granular supply chain linkage data derived from FactSet, covering global buyer–supplier relationships. These data are further merged with patent data from Orbis IP and firms' accounting and financial information from FAME, enabling control for key firm characteristics such as R&D intensity, firm size, and age. This linkage allows us to examine how public innovation support interacts with firms' positions in production networks and affects their subsequent innovation outcomes and resilience.

Given the dual focus of our research questions, we employ two complementary empirical strategies. For the first set of analyses on innovation diffusion (Section 4.1), we develop directed supply chain dyads, identifying each firm alternately as a focal supplier or focal customer depending on the direction of analysis (i.e., customer-to-supplier or supplier-to-customer diffusion). This dyadic design allows us to test whether a firm's innovation activity is influenced by the innovation behaviour of its trading partners, at the same controlling for both firm- and time-specific heterogeneity. Moreover, we explore whether innovation policy support receiving customers (suppliers) will have different an impact on the innovation performance of their suppliers (customers).

For the second research question on policy-supported resilience (Section 4.2), we focus on firms' network positions and domestic supply chain configurations. Network position is measured using global supply chain data from FactSet, capturing each firm's centrality within the global production network. This global perspective allows us to evaluate whether innovation policy support enhances firms' systemic embeddedness and influence across international supply networks. Subsequently, we narrow the scope to the UK domestic supply chain, restricting the analysis to dyads where both suppliers and customers are UK-based private firms. Within this domestic context, we separately analyse customer and supplier compositions, assessing how innovation policy support shapes the geographic distribution and regional concentration of each firm's upstream and downstream relationships.

4.1 The impact of innovation policy on innovation diffusion

4.1.1 Innovation diffusion along the supply chain

To investigate the impact of innovation policy on innovation diffusion, we first examine whether innovation by customers (suppliers) influences innovation by suppliers (customers). Following Isaksson et al. (2016), we estimate the following model:

Eq. (1)

$$Supplier\ (Customer)\ Innovation_{i,(t+1,t+3)} = \alpha_i + \beta Customer\ (Supplier)\ Innovation_{i,t} + Controls_{i,t} + \mu_t + \epsilon_{i,t},$$

where $Supplier\ (Customer)\ Innovation$ represents the number of patent family filed by supplier and customer firms, respectively. Given that inventive process typically extends beyond a single year, consistent with Ellis et al. (2020) and Cornaggia et al. (2015), we address this potential ambiguity in the timing of patenting filings relative to firms' underlying innovation activities by aggregating the earliest-filed patents over years t to *t+3*. The key variable of interest is the customers or suppliers' innovation (i.e. $Customer\ (Supplier)\ Innovation_{i,t}$) taken from previous year *t*, which helps mitigate the simultaneity concerns of the analysis.

$Controls_{i,t}$ represents the set of firm-level control variables that may influence a firm's innovation activities. Given the data quality and coverage available from FAME, we include *R&D intensity*, measured as R&D expenditure over sales. Missing R&D expenditure values are replaced with the corresponding industry-year mean. Firm age (*Age*) is measured as the natural logarithm of one plus the number of years since incorporation, and firm size (*Size*) is the natural logarithm of total assets. We also include a dummy variable (*Missing R&D*) that equals 1 if a firm's R&D expenditure is missing, and 0 otherwise. Finally, we also account for the innovation policy support received by each focal firm, measured as *Supplier (Customer) Award*. Specifically, following Dimo and Vorley (2023), we calculate the total value of awards received by a firm in a given year. The Innovate UK dataset does not record the exact timing of grant disbursements to businesses. However, since the duration of each funded project is available, we uniformly allocate the total grant amount across the months within the project period. As firms may receive multiple Innovate UK grants within a single year, we aggregate all grants received that year, for each firm.

As usual, $\epsilon_{i,t}$ denotes the error term. To account for unobserved, time-invariant heterogeneity, we employ a within (fixed-effects) estimator. This approach captures within-firm variation over time, therefore controlling for all firm-specific characteristics that do not change during the sample period – such as geographic location, corporate culture, industry affiliation, and other pre-existing firm attributes. We further cluster standard errors at the firm level to account for potential serial correlation and heteroskedasticity in the error terms within firms over time.

Table 1 presents the estimation results of Eq. (1) examining the direction and magnitude of innovation spillovers along supply chains. Columns (1)-(3) show the effects of customer innovation on supplier innovation, while columns (4)-(6) present the reverse direction, from suppliers to customers. The analysis in columns (1)-(3) is based on a final sample of 1,381 unique supplier firms, whereas the models in columns (4)-(6) draw on 2,709 unique customer firms. In columns (1) and (4), we begin with parsimonious pooled regression models without control variables or firm fixed effects. We then progressively introduce additional controls and fixed effects in the subsequent columns.

In columns (1)-(3), the coefficient on *Customer (Supplier) Innovation* is positive and statistically significant. The estimated coefficients indicate that higher customer innovation activity is associated with a subsequent increase in supplier patenting, suggesting that customer innovations stimulate suppliers' own inventive efforts. This finding further aligns with Isaksson et al. (2016), who find that buyer innovation positively affects supplier innovation through vertical knowledge spillovers. Innovation therefore tends to diffuse downstream, from technologically advanced customers to their suppliers, as suppliers adapt to new product or process requirements and benefit from learning-by-interacting mechanisms within established relationships. Columns (4)-(6) examine the effects of suppliers' innovation on their customers' innovation. In the pooled sample, there is a positive but weak correlation between supplier and customer innovation. However, after controlling for time-invariant firm characteristics, there is little evidence of systematic upstream (supplier-to-customer) spillovers. This may suggest that innovation diffusion within the supply chain is asymmetric in terms of strength, with knowledge primarily flowing from customers to suppliers.

Regarding the control variables, our results are largely in line with prior literature. Specifically, R&D intensity is positively related to innovation output. Firm age and firm size are also positively and significantly associated with innovation, consistent with the notion that larger and more established firms possess stronger absorptive capacities. More importantly, we find that the *Supplier (Customer) Award* is positive and statistically significant across specifications, which indicates that Innovate UK policy support has a beneficial effect on the inventive performance of recipient firms.

Taken together, our results provide strong evidence that customer-driven innovation plays a central role in stimulating suppliers' technological activity, consistent with the supply-chain knowledge-spillover mechanism proposed by Isaksson et al. (2016). Our findings further suggest that learning within supply networks might be asymmetric in magnitude, where downstream firms act as key innovation drivers, and upstream firms primarily serve as absorbers and implementers of new technologies.

Table 1: Innovation diffusion along the supply chain

	Customers → Suppliers			Suppliers → Customers		
	(1)	(2)	(3)	(4)	(5)	(6)
Customer (Supplier) Innovation	0.068**	0.055**	0.046**	0.079*	0.056	0.048
	(2.348)	(2.401)	(2.038)	(1.772)	(1.152)	(1.010)
Supplier (Customer) Award	0.070***	0.049***	0.040***	0.063***	0.050***	0.042***
	(3.600)	(3.191)	(2.630)	(4.828)	(5.438)	(4.679)
R&D Intensity			0.034**			0.020
			(2.062)			(1.451)
Age			0.076***			0.036**
			(3.051)			(2.554)
Size			0.034***			0.028***
			(3.091)			(5.144)
Missing R&D			-0.192***			-0.219***
			(-3.641)			(-4.460)
Constant	0.340***	0.210***	-0.052	0.240***	0.126***	0.064
	(5.736)	(11.139)	(-0.539)	(6.209)	(10.994)	(1.063)
Observations	4,979	4,726	4,726	8,355	7,922	7,922
R-squared	0.066	0.241	0.273	0.080	0.244	0.282
Year FE	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
Firm	*NO*	*YES*	*YES*	*NO*	*YES*	*YES*
Robust t-statistics in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

4.1.2 The role of innovation policy on innovation diffusion

Building on the evidence of innovation diffusion established above, we further examine whether this diffusion is influenced by innovation policy support. To investigate this, we estimate the following model:

Eq. (2)

$$Supplier\ (Customer)\ Innovation_{i,(t+1,t+3)} = \alpha_i + \beta Customer\ (Supplier)\ Innovation_{i,t} \#\ Customer\ (Supplier)\ Award_{i,t-1} + Controls_{i,t} + \mu_t + \epsilon_{i,t},$$

Where we include the moderating variable $Customer\ (Supplier)\ Award_{i,t-1}$ taken from year *t*-1. This model is then designed to test whether receiving innovation policy support in the previous year enhances or alters the extent to which customer (supplier) innovation influences supplier (customer) innovation. In other words, we examine whether firms that benefited from Innovate UK awards are more effective in transmitting or absorbing innovation along the supply chain. The estimation results are presented in Table 2. Columns (1)-(2) examine the diffusion from customers to suppliers, while Columns (3)-(4) capture the reverse direction from suppliers to customers.

In columns (1), we find that customer innovation remains positive and statistically significant. Customer innovation continues to stimulate suppliers' subsequent innovation activity. However, we do not find a significant effect of innovation policy support on innovation diffusion (*Customer Innovation* × *Customer Award*). In columns (2), instead of measuring the total amount of the awards a firm receives per year, we calculate the total number of unique projects that involved the focal firms. Our results remain unchanged. This pattern may imply that innovation policy targeted at customers (often large downstream firms) may have limited spillover benefits for their suppliers. Policy-supported customers might internalise R&D processes and become less dependent on suppliers for technological input, thereby reducing opportunities for inter-organisational learning. These findings resonate with earlier studies indicating that the expected positive effects of innovation policy support might be weak or absent in practice, contingent on factors such as firms' size, market orientation and resource profile (e.g., Busom and Fernández-Ribas, 2008; González and Pazó, 2008; Jourdan and Kivleniece, 2017).

Interestingly, columns (3) and (4) reveal a completely different dynamic. Without considering interaction effects, supplier innovation alone has no significant impact on customer innovation, consistent with the earlier finding that knowledge diffusion tends to be asymmetric and downstream-oriented. However, the interaction term *Supplier Innovation* × *Supplier Award* is statistically significant and positive, which indicates that policy support received by suppliers strengthens their ability to influence customers' innovation. This finding may suggest that innovation policy can activate reverse knowledge transfer within the supply chain. Policy-supported suppliers, potentially through enhanced absorptive capacity, improved technological legitimacy, and participation in funded R&D programs, are better positioned to disseminate knowledge upstream to customers. As a result, supplier innovation becomes more visible and valuable to customers, facilitating upstream-to-downstream learning.

Overall, these findings reveal an asymmetric but policy-contingent pattern of innovation diffusion. In the absence of policy support, innovation predominantly diffuses downstream from customers to suppliers. However, while supplier innovation typically has little influence on customers, policy-supported suppliers develop the capacity and capability to affect their customers' innovation, thereby enabling reverse knowledge flows.

Table 2: The role of innovation policy on innovation diffusion

	Customers → Suppliers		Suppliers → Customers	
	(1)	(2)	(3)	(4)
Customer (Supplier) Innovation	0.074**	0.083**	0.000	-0.042
	(2.276)	(2.223)	(0.005)	(-1.226)
Supplier (Customer) Award (t-1)	-0.000		0.008	
	(-0.034)		(1.070)	
Customer (Supplier) Innovation # Customer (Supplier) Award (t-1)	-0.004		0.012*	
	(-1.237)		(1.956)	
Supplier (Customer) Award	0.028*	0.028*	0.040***	0.040***
	(1.800)	(1.800)	(4.091)	(4.097)
Supplier (Customer) Project (t-1)		0.011		0.104
		(0.479)		(1.220)
Customer (Supplier) Innovation # Customer (Supplier) Project (t-1)		-0.034		0.134***
		(-1.625)		(2.675)
R&D Intensity	0.033*	0.033*	0.024	0.024
	(1.678)	(1.676)	(1.281)	(1.260)
Age	0.091***	0.091***	0.044**	0.044**
	(2.932)	(2.923)	(2.326)	(2.337)
Size	0.031**	0.031**	0.027***	0.027***
	(2.424)	(2.407)	(4.173)	(4.171)
Missing R&D	-0.198***	-0.197***	-0.225***	-0.224***
	(-3.221)	(-3.210)	(-3.553)	(-3.544)
Constant	-0.080	-0.081	0.048	0.047
	(-0.662)	(-0.676)	(0.610)	(0.600)
Observations	3,416	3,416	5,304	5,304
R-squared	0.286	0.286	0.328	0.330
Year FE	*YES*	*YES*	*YES*	*YES*
Firm FE	*YES*	*YES*	*YES*	*YES*

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4.2 The impact of innovation policy on the supply chain resilience

In this section, we address our second research question: To what extent does policy-supported innovation diffusion enhance supply chain resilience? To examine this, we focus on node-level social network characteristics that capture how firms are positioned and connected within the supply chain and how innovation policy support affects their connectivity and network diversity. A resilient supply chain is not only one that withstands shocks but also one that maintains connectivity to ensure redundancy (e.g., multiple sourcing), adapts through diversified relationships, and reconfigures supply linkages in response to disruptions. Therefore, we consider focal firms' network centrality and composition as key indicators of resilience: firms that are more connected, less regionally concentrated, and embedded in diverse customer-supplier relationships are better able to adapt to external changes and disruptive events.

We first analyse degree centrality as well as in-degree and out-degrees to examine whether innovation policy support affects a firm's supply network position and influence. The degree centrality of firm *i* in year *t* is measured by the number of direct linkages it maintains in that year. High degree centrality reflects a greater number of trading relationships, implying that the firm occupies a more central position within the supply chain network and can more easily access or disseminate information (Freeman, 1978; Marsden, 2002). Central firms are typically more resilient because they have multiple alternative customers and /or suppliers, and are less vulnerable to localised disruptions. Following Kim et al. (2011), we normalise degree centrality by the total number of firms *g* in the network so that it represents the percentage of firms observed in FactSet that directly connect to firm *i*:

Eq. (3)

$$Normalised\ Dcentrality = \frac{\sum_{j \neq i} x_{i,j,t}}{g-1} \times 100,$$

where $x_{i,j,t}$ is a binary variable equal to 1 if a link exists between firm *i* and *j* in year *t*. Given our focus on supply chain relationships, we further decompose degree centrality into in-degree and out-degree centrality. In this context, in-degree centrality measures the number of suppliers connected to firm *i*, reflecting its supply-side diversity and capacity to source from multiple upstream partners. Conversely, out-degree centrality measures the number of customers that firm *i* serves, indicating its demand-side breadth and market reach. Lastly, in addition, we calculate eigenvector following Bonacich (1987, 2007):

Eq. (4)

$$\lambda C_{eigen} = AC_{eigen},$$

where C_{eigen} is a vector of firm centralities; *A* is the adjacency matrix representing network connections, and λ is the largest eigenvalue of *A*. Eigenvector centrality captures not just the number of connections a firm has, but also the importance of those it is connected to. Firms with high eigenvector centrality are embedded within influential network clusters and can access critical information and resources, contributing to greater systemic resilience.

Moreover, when focusing on domestic supply chains as depicted in Figures 10 and 11, we examine whether innovation policy support influences a firm's customer and supplier composition. We consider two aspects, namely, regional proportion and concentration. The former measures the share of customer or suppliers located within the same regions (at the NUT1 level), while the latter captures the extent to which a firm's customers or suppliers are concentrated geographically. We adopt the Herfindahl-Hirschman Index (HHI) to measure this concentration. Specifically, for each firm *i*, we calculate the customers or suppliers' concentration across all regions in year *t* as follows:

Eq. (5)

$$Region\ Customer\ (Supplier)\ Concentraion_{i,t} = \sum_{j=1}^{J} \left(\frac{Customer\ (Supplier)_{i,k,t}}{Customer\ (Supplier)_{i,t}}\right)^2,$$

where $Customer\ (supplier)_{i,k,t}$ is the number of customers (suppliers) of firm *i* in region *k* during year *t*, and $Customer\ (supplier)_{i,t}$ is the total number of domestic customers (suppliers) of firm *i* in year *t.*

To identify the causal effect of Innovate UK policy support on firms' network positions and relationship composition, we employ Entropy Balancing (EB) (Hainmueller, 2012). Unlike conventional matching techniques such as Propensity Score Matching (PSM), which approximate a randomised experiment, EB more closely emulates randomisation by eliminating observable differences in firm-level characteristics between treatment and control groups. Importantly, EB achieves balance not only in the means of covariates, as is typical with

PSM, but also across higher-order moments such as variances. Furthermore, EB does not require iterative model specification or rematching; instead, it directly computes a set of optimal weights that ensure the best possible covariate balance between treated and untreated units from the outset. These weights can subsequently be used to draw causal inferences. In our analysis, we balance a set of key firm-level variables previously discussed, i.e., R&D intensity, firm age, firm size, missing R&D, and innovation output (the dependent variable in Equations (1) and (2), measured by the number of patent families), which are likely to influence participation in Innovate UK programmes. In addition to these firm-specific characteristics, we include controls for region, industry, and year of observation, following Dimo and Vorley (2023). The balancing is performed on the first two moments of the covariate distributions, namely the mean and variance.

After obtaining the weights from the EB procedure that ensure covariate balance, we incorporate these weights into a firm fixed-effects regression model, as described below. In Eq. (6), $Network\ Centrality$ is captured by the normalised degree centrality, in-degree centrality, out-degree centrality, and eigenvector centrality measured in year *t*+1 for each firm. $Award_{i,t}$ is the total value of Innovate UK awards received by firm *i* in year *t*. In Eq. (7), We further examine the effect of innovation policy support on domestic network composition, focusing on the proportion and regional concentration of both customers and suppliers, as previously discussed. Specifically, we consider the domestic customer proportion, customer regional concentration, supplier proportion, and supplier regional concentration as the dependent variables. For each specification, $Customer\ (Supplier)\ Award_{i,t}$ represents the total value of awards received by the focal customer (supplier) firm in year *t*. As discussed before, in both equations, $Controls_{i,t}$ include R&D intensity, Age, Size, Missing R&D as well as Innovation (measured by the number of patent families).

Eq. (6)

$$Network\ Centrality_{i,t+1} = \alpha_i + \beta Award_{i,t} + Controls_{i,t} + \mu_t + \epsilon_{i,t}.$$

Eq. (7)

$$Customer\ (Supplier)\ Composition_{i,t+1} = \alpha_i + \beta Supplier\ (Customer)\ Award_{i,t} + Controls_{i,t} + \mu_t + \epsilon_{i,t}$$

Table 3 presents the estimation results for Eq. (6). The final sample contains 2,974 unique firms. Across all specifications, the coefficient on *Award* is positive and statistically, which indicates that firms receiving innovation policy support tend to become more central within the supply chain network. Specifically, the results suggest that policy-supported firms exhibit higher in-degree centrality, meaning they form more total connections and attract a larger number of suppliers. Moreover, the positive and significant coefficients for out-degree imply that these firms also expand their customer base, while higher eigenvector centrality indicates greater embeddedness within influential clusters of the supply network. Overall, these findings suggest that innovation policy enhances a firm's network visibility, attractiveness, and integration within the broader supply ecosystem.

Increased centrality implies that policy-supported firms occupy structurally advantageous positions, enabling them to access diverse resources, information, and supply chain partners. High in-degree centrality (more suppliers) enhances supply-side flexibility and redundancy, reducing exposure to input disruptions. High out-degree centrality (more customers) improves demand diversification, reducing dependence on specific buyers. Finally, higher eigenvector centrality indicates that supported firms are connected to other central supply chain actors, which amplifies their access to knowledge and adaptive capacity across the supply network. Thus, innovation policy support appears to foster network-based resilience, enabling firms to better absorb and adapt to supply chain shocks.[5]

[5] These findings may further align with some expected goals of several previous and more recent calls by Innovate UK related to supply chain and supply chain resilience。 For instance, the funding competition "Manufacturing made smarter: digital supply chain, industrial research" specifically stated that "*Your project must help UK manufacturing supply chains to develop digital technologies to become more efficient, productive, flexible, resilient*." . More recent calls, such as "Modelling UK supply chains as complex systems for resilience" and "Enhancing medical supply chain resilience with drones" also place significant emphasis on strengthening supply chain resilience. Our results offer a preliminary examination of the potential funding effect on the supply chain resilience in the UK.

Table 3: Innovation policy support and network centrality

	(1)	(2)	(3)	(4)
	Degree	Out-degree	In-degree	Eigenvector
Award	0.001**	0.0004**	0.0003**	0.001**
	(2.306)	(2.074)	(2.067)	(2.011)
R&D Intensity	0.001**	0.000	0.001***	0.001
	(2.229)	(1.152)	(3.127)	(1.627)
Age	-0.001	0.000	-0.001	-0.000
	(-0.456)	(0.285)	(-1.460)	(-0.223)
Size	0.007***	0.003***	0.004***	0.005***
	(8.050)	(4.677)	(9.276)	(6.525)
Missing R&D	0.001	-0.001	0.003**	-0.001
	(0.530)	(-0.294)	(2.160)	(-0.207)
Innovation	0.003	0.001	0.003***	0.001
	(1.597)	(0.621)	(3.060)	(0.742)
Constant	-0.018**	-0.006	-0.012***	-0.012*
	(-2.331)	(-1.096)	(-3.175)	(-1.865)
Observations	8,271	8,271	8,271	8,271
R-squared	0.507	0.378	0.536	0.415
Year FE	*YES*	*YES*	*YES*	*YES*
Firm FE	*YES*	*YES*	*YES*	*YES*

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4 presents the results for our Eq. (7). Columns (1)-(2) focuses on the customer regional distribution of supplier firms. Our results show that policy support does not significantly affect the proportion of domestic customers (customers in the same NUT1 region) but has a positive and significant effect on customer regional concentration. This suggests that policy-supported firms tend to maintain a geographically more localised customer base. While this concentration may promote collaboration and trust within regional clusters, it could also reduce geographical diversification, potentially limiting resilience to region-specific shocks.

Columns (3)-(4) present the results on the supplier regional distribution of customer firms. These results show an interestingly different pattern. Although innovation policy does not significantly change the overall proportion of domestic suppliers, it significantly reduces supplier regional concentration. This may imply that policy-supported firms diversify their supplier base across regions, reducing dependence on any single geographic area. Such diversification enhances supply-side resilience, as firms become less vulnerable to localised disruptions in relation to production, logistics, or changes in regulation.

Taken together, the results from Tables 3 and 4 demonstrate that innovation policy support not only strengthens firms' structural positions within supply networks but also improves the diversity and adaptability of their upstream supply relationships. While customer networks remain regionally focused, likely due to market and institutional embeddedness, supplier networks become more geographically dispersed, which can potentially enhance supply robustness and systemic resilience.

Table 4: Innovation policy support and network composition

	Customer distribution		Supplier distribution	
	(1)	(2)	(3)	(4)
	Proportion	Concentration	Proportion	Concentration
Award	-0.006	0.008**	0.003	-0.008**
	(-1.330)	(2.470)	(0.805)	(-2.387)
R&D Intensity	0.027	0.024	-0.038	-0.069
	(1.070)	(1.133)	(-0.490)	(-1.179)
Age	-0.040*	0.000	-0.011	0.033
	(-1.738)	(0.018)	(-0.600)	(1.576)
Size	0.008	-0.019**	-0.014	-0.063***
	(0.692)	(-2.410)	(-1.605)	(-9.129)
Missing R&D	0.040	0.054	0.014	0.013
	(0.836)	(1.565)	(0.406)	(0.454)
Innovation	0.063**	0.022	-0.019	0.001
	(2.339)	(1.357)	(-0.943)	(0.032)
Constant	0.329***	0.730***	0.496***	0.914***
	(2.488)	(7.862)	(5.581)	(10.224)
Observations	3,709	3,709	1,866	1,866
R-squared	0.439	0.281	0.554	0.502
Year FE	*YES*	*YES*	*YES*	*YES*
Firm FE	*YES*	*YES*	*YES*	*YES*

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5. Conclusion

This report examines how innovation policy influences innovation diffusion along the supply chain and how it influences supply chain resilience within the UK. Drawing on an integrated dataset linking Innovate UK policy support with firm-level patenting and supply chain network data, we provide novel insights on the systemic and networked impacts of innovation policy, extending beyond traditional firm-level evaluations. Our findings highlight the critical importance of considering supply chains not merely as conduits of production, but as mechanisms for knowledge exchange and innovation propagation.

First, we find evidence that innovation diffuses along supply chains in a relatively asymmetric manner. Customer innovation exerts a strong and positive influence on supplier innovation, which indicates that downstream firms act as key transmitters of technological knowledge to their suppliers. However, suppliers' innovation exerts much weaker effects on their customers, implying that vertical knowledge spillovers tend to flow downstream-to-upstream. These findings further corroborate theoretical perspectives on "learning by interacting" ("learning by supplying") (e.g., Arrow, 1962; Penner-Hahn and Shaver, 2005; Alcacer and Oxley, 2013).

Moreover, we show that innovation policy support moderates the strength and direction of these diffusion processes. While policy support to customers does not significantly enhance their spillover effects on suppliers, targeted support to suppliers enables reverse diffusion, allowing upstream firms to influence customer innovation. This demonstrates that public funding can alter the power and learning dynamics within supply chains, enabling smaller or less central firms to become active contributors to technological development. In this respect, innovation policy can help transform unidirectional knowledge flows into reciprocal, multi-tier learning systems, amplifying the reach and inclusivity of innovation diffusion across the supply chain.

Lastly, we show that policy-supported firms become more central, connected, and influential within supply chain networks. Firms receiving Innovate UK awards exhibit higher degree, in-degree, and eigenvector centrality, suggesting that policy support enhances their embeddedness and visibility within industrial ecosystems and supply networks more specifically. This greater network centrality improves access to diverse knowledge sources and supply chain partners, facilitating both innovation and resilience. Moreover, policy-supported firms tend to diversify their supplier base across regions, reducing regional concentration and therefore strengthening supply-side redundancy and improved adaptability to shocks through diversification, while maintaining regionally concentrated customer networks that foster trust and collaboration. These combined effects indicate that innovation policy contributes not only to firm-level competitiveness but also to systemic supply chain resilience.

Overall, this report provides robust empirical support for the argument that innovation policy has multi-scalar effects: it shapes firm-level innovation behaviour, inter-firm knowledge flows, and the structural configuration of national supply networks. By embedding innovation within relational and geographic contexts, policy interventions can enhance the adaptive capacity of the broader economy. Innovation policy support in the UK is not restricted to stimulating firm-level innovation. Instead, it has the potential to reconfigure the social and structural fabric of supply chains, shaping how knowledge travels, how firms connect, and how the economy adapts to disruption. As global challenges such as technological sovereignty, sustainability transitions, and geopolitical uncertainty intensify, understanding and leveraging these systemic effects will be crucial for building a resilient, innovative, and regionally balanced UK economy.

Please tell us what you thought of this report?

Now you have read our report we would love to know if our research has provided you with new insights, improved your processes, or inspired innovative solutions.

Please let us know how our research is making a difference by completing our short feedback form via this link

Thank you

The Innovation & Research Caucus

References

Alcacer, J., & Oxley, J. (2014). Learning by supplying. Strategic Management Journal, 35(2), 204-223.

Arjbjørn, J.S. & Paulraj, A. (2013). Special topic forum on innovation in business networks from a supply chain perspective: Current status and opportunities for future research. Journal of Supply Chain Management, 49 (4), 3-11.

Arrow, K. J. (1962). The economic implications of learning by doing. The Review of Economic Studies, 29(3), 155-173.

Aschhoff, B. (2009). The effect of subsidies on R&D investment and success. Research Policy, 38(5), 797-809.

Asheim, B. T., & Coenen, L. (2005). Knowledge bases and regional innovation systems. Research Policy, 34(8), 1173-1190.

Bellamy, M., Gosh, S. & Hora, M. (2014). The influence of supply network structure on firm innovation. Journal of Operations Management, 32, 357-373.

Blind, K. (2012). The influence of regulations on innovation. Research Policy, 41(2), 391-400.

Bergek, A., Jacobsson, S., Carlsson, B., Lindmark, S., & Rickne, A. (2008). Analyzing the functional dynamics of technological innovation systems. Research Policy, 37(3), 407-429.

Bonacich, P. (1987). Power and centrality: A family of measures. American Journal of Sociology, 92(5), 1170-1182.

Bonacich, P. (2007). Some unique properties of eigenvector centrality. Social networks, 29(4), 555-564.

Bronzini, R., Piselli, P. (2016). The impact of R&D subsidies on firm innovation. Research Policy, 45(2), 442-457.

Busom, I., & Fernández-Ribas, A. (2008). The impact of firm participation in R&D programmes on R&D partnerships. Research Policy, 37(2), 240-257.

Bustamande, J., Oughton, C., Pesque-Cela, V., Tobin, D. (2023). Resolving the patents paradox in the era of COVID-19 and climate change: Towards a patents taxonomy. Research Policy, 52 (9), 104850.

Cantner, U., Graf, H., Herrmann, J., & Kalthaus, M. (2016). Inventor networks in renewable energies. Research Policy, 45(6), 1165-1184.

Carnovale, S., & Yeniyurt, S. (2015). The role of ego network structure in facilitating ego network innovations. Journal of Supply Chain Management, 51 (2), 22-46.

Cornaggia, J., Mao, Y., Tian, X., & Wolfe, B. (2015). Does banking competition affect innovation? Journal of Financial Economics, 115(1), 189-209.

Chae, S., Yan, T., & Yang, Y. (2020). Supplier innovation value from a buyer–supplier structural equivalence view: Evidence from the PACE awards in the automotive industry. Journal of Operations Management, 66 (7-8), 820-838.

Chesbrough, H. W. (2003). Open innovation: The new imperative for creating and profiting from technology. Harvard Business School.

Colovic, A., Caloffi, A., Rossi, F., Russo, M. (2025). Institutionalising the digital transition: The role of digital innovation intermediaries. Research Policy. 54 (1), 105146.

Department of Business and Trade. (2024a). Invest 2035: The UK's modern industrial strategy. London, October 2024.

Department of Business and Trade. (2024b). Critical Imports and Supply Chains Strategy. London, January 2024.

Dimos, C., Vorley, T. (2023, November). Innovate UK Grants and R&D Returns: Impact on Business and Economy. Innovation Caucus.

Edler, J., & Georghiou, L. (2007). Public procurement and innovation. Research Policy, 36(7), 949-963.

Edler, J., Blind, K., Kroll, H., Schubert, T. (2023). Technology sovereignty as an emerging frame for innovation policy. Defining rationales, ends and means. Research Policy, 52(6), 104765.

Edler, J., Fagerberg, J. (2017). Innovation policy: what, why, and how. Oxford Review of Economic Policy, 33(1), 2-23.

Ellis, Jesse, Jared Smith, and Roger White. "Corruption and corporate innovation." Journal of Financial and Quantitative Analysis 55, no. 7 (2020): 2124-2149.

Freeman, L. C. (1978). Centrality in social networks conceptual clarification. Social Networks, 1(3), 215-239

Gao, G, Xie, E. & Zhou, K. (2015). How does technological diversity in supplier network drive buyer innovation? Relational process and contingencies. Journal of Operations Management, 36, 165-177.

González, X., & Pazó, C. (2008). Do public subsidies stimulate private R&D spending?. Research Policy, 37(3), 371-389.

Griliches, Z. (1998). Patent statistics as economic indicators: a survey. In R&D and productivity: the econometric evidence (pp. 287-343). University of Chicago Press.

Hall, B. H., & Harhoff, D. (2012). Recent research on the economics of patents. Annual Review of Economics, 4(1), 541-565.

Hazen, B., Overstreet, R., Cegielski, C. (2012). Supply chain innovation diffusion: going beyond adoption. The International Journal of Logistics Management (2012) 23 (1): 119–134.

Hainmueller, J. (2012). Entropy balancing for causal effects: A multivariate reweighting method to produce balanced samples in observational studies. Political Analysis, 20(1), 25-46.

IPO (2021) Analysing the global filing activities of UKpatent applicants. Available at: https:// assets. publi shing.servi ce. gov. uk/ media/6110c e42e9 0e070 6c71e d838/Analy sing-the-globa l-filin g-activ ities -of-UK-paten t-appli cants. pdf.

Isaksson, O. H., Simeth, M., & Seifert, R. W. (2016). Knowledge spillovers in the supply chain: Evidence from the high tech sectors. Research Policy, 45(3), 699-706.

Jiang, L., Feng, T., Huang, Y. 2024. Antecedent configurations toward supply chain resilience: The joint impact of supply chain integration and big data analytics capability. Journal of Operations Management. 70 (2), 257-284.

Johnsen, T. (2009). Supplier involvement in new product development and innovation: Taking stock and looking to the future. Journal of Purchasing and Supply Management, 15, 187-197.

Jourdan, J., & Kivleniece, I. (2017). Too much of a good thing? The dual effect of public sponsorship on organizational performance. Academy of Management Journal, 60(1), 55-77.

Ketchen, D.J., & Craighead, C.W. (2020). Research at the intersection of entrepreneurship, supply chain management and strategic management: Opportunities highlighted by COVID-19. Journal of Management, 46 (8), 1330-1341.

Ketchen, D.J., & Craighead, C.W. (2021). Toward a theory of supply chain entrepreneurial embeddedness in disrupted and normal states. Journal of Supply Chain Management, 57 (1), 50-57.

Kim, Y., Choi, T. Y., Yan, T., & Dooley, K. (2011). Structural investigation of supply networks: A social network analysis approach. Journal of Operations Management, 29(3), 194-211.

Kim, Y., Chen, Y., Linderman, K. (2015). Supply network disruption and resilience: A network structural perspective. Journal of Operations Management, 33-34, 43-59.

Kline S. J., Rosenberg N. (1986), ‘An Overview of Innovation’, in R. Landau and N. Rosenberg (eds), The Positive Sum Strategy: Harnessing Technology for Economic Growth, Washington, DC, National Academy Press, 275–304.

Kocabasoglu-Hillmer, C., Roden, S. Vanpoucke, E., Son, B-G., Lewis, M. (2023)Radical innovations as supply chain disruptions? A paradox between change and stability. Journal of Supply Chain Managment. 59 (3), 3-19.

Koufteros, X., Cheng, T.C., & Lai K-H. (2007). ‘‘Black box’’ and ‘‘grey-box’’ supplier integration in product development: Antecedents, consequences and the moderating role of firm size. Journal of Operations Management, 25, 847-870.

Kumar, S., Narayanan, S., Salvador, F. (2020). Innovation in supply networks: A research framework and roadmap. Journal of Operations Management, 66, 754-767.

Kurpjuweit, S., Reinerth, D. & Wagner, S.M. (2018). Supplier innovation push: Timing strategies and best practices. Research-Technology Management, 61 (2), 47-55.

Kurpjuweit, S., Wagner, S.M., & Choi, T.Y. (2021). Selecting startups as suppliers: A typology of supplier selection archetypes. Journal of Supply Chain Management, 57 (3), 25-49.

Lai, Y., Sun, H., Ren, J. (2018). Understanding the determinants of big data analytics (BDA) adoption in logistics and supply chain management: An empirical investigation. The International Journal of Logistics Management (2018) 29 (2): 676–703.

Lawson, B., Tyler, B., & Potter, A. (2015). Strategic suppliers’ technical contributions to new product advantage: Substitution and configuration options. Journal of Product Innovation Management, 32 (5), 760-776.

Legenvre, H., & Gualandris, J. (2018). Innovation sourcing excellence: Three purchasing capabilities for success. Business Horizons, 61, 95-106.Marsden, P. V. (2002). Egocentric and sociocentric measures of network centrality. Social Networks, 24(4), 407-422.

Moraes, K., Ganga. G., Filho, M., Santa-Eulalia, L., Tortorella, T. (2025). Overcoming technological barriers for blockchain adoption in supply chains: a diffusion of innovation (DOI)-informed framework proposal. Supply Chain Management: An International Journal (2025) 30 (1): 19–49.

Narasimhan, R., Narayanan, S. (2013). Perspectives on supplier network-enabled innovation. Journal of Supply Chain Management, 49 (4), 27-42.

Oke, A., Prajogo, D. & Jayaram, J. (2013). Strengthening the innovation chain: The role of internal innovation climate and strategic relationships with supply chain partners. Journal of Supply Chain Management, 49 (4), 43-58.

Papazoglou, M., Spanos, Y. (2018). Bridging distant technological domains: A longitudinal study of the determinants of breadth of innovation diffusion. Research Policy. 47 (9), 1713-1728.

Penner-Hahn, J., & Shaver, J. M. (2005). Does international research and development increase patent output? An analysis of Japanese pharmaceutical firms. Strategic Management Journal, 26(2), 121-140.

Ponomarov, S. Y., & Holcomb, M. C. 2009. Understanding the concept of supply chain resilience. International Journal of Logistics Management, 20 (1): 124–143.

Rogers, E. M. (2003). Diffusion of innovations (5th ed.). Free Press. (Original work published 1962)

Rogge, K. S., & Reichardt, K. (2016). Policy mixes for sustainability transitions. Research Policy, 45(8), 1620-1635.

Scholten, K., Stevenson, M. & van Donk, D.P. 2020. Dealing with the unpredictable: supply chain resilience. International Journal of Operations & Production Management, 40 (1): 1-10.

Scholten, K., & Schilder, S. 2015. The role of collaboration in supply chain resilience. Supply Chain Management: An International Journal, 20 (4): 471–484.

Selviaridis, K. Uyarra, E. (2025). How intermediaries manage knowledge to support public procurement of innovation: The case of UK defence. Research Policy, 54 (10), 105335.

Selviaridis, K., Spring, M. (2022). Fostering SME supplier-enabled innovation in the supply chain: The role of innovation policy. Journal of Supply Chain Management, 58 (1), 92-123.

Selviaridis, K., Spring, M. 2025. Innovation intermediation in supply networks: Addressing shortfalls in buyer and supplier capabilities for collaborative innovation. Journal of Operations Management, 71 (1), 40-80.

Sharma, A., Pathak, S., Borah, S., & Adhikary, A. (2020). Is it too complex? The curious case of supply network complexity and focal firm innovation. Journal of Operations Management, 66 (7-8), 839-865.

Spring, M., Hughes, A., Mason, K., McCaffrey, P. (2017). Creating the competitive edge: A new relationship between operations management and industrial policy. Journal of Operations Management, 49, 6-19.

Suurmond, R., Wynstra, F., Dul, H. (2020). Unravelling the dimensions of supplier involvement and their effects on NPD performance: A meta-analysis. Journal of Supply Chain Management, 56 (3), 26-46.

Van Echtelt, F., Wynstra, F., Van Weele, A., & Duysters, G. (2008). Managing supplier involvement in new product development. Journal of Product Innovation Management, 25, 180-201.

West, J., Bogers, M. (2014). Leveraging external sources of innovation: A review of research on open innovation. Journal of Product Innovation Management, 31(4), 814-831.

Wang, J., Li, J. & Chang, J. (2016). Product co-development in an emerging market: The role of buyer-supplier compatibility and institutional environment. Journal of Operations Management, 46, 69-83.

Wang, Z., Feng, Y., Yao, N., Lin, O., Li, Q., Liu, B. 2024. Impact of policy interventions on low-carbon technology innovation diffusion in supply networks. Managerial and Decision Economics. 45 (7), 5040-5053.

Wieland, A., Durach, C. F. (2021). Two perspectives on supply chain resilience. Journal of Business Logistics, 42(3), 315-322.

Wieland, A., Stevenson, M., Melnyk, S. A., Davoudi, S., Schultz, L. (2023). Thinking differently about supply chain resilience: What we can learn from social-ecological systems thinking. International Journal of Operations and Production Management, 43(1), 1-21.

Wowack, K., Craighead, C., Ketchen, D., & Hult, T. 2016. Toward a theoretical toolbox for the supplier-enabled fuzzy front end of the new product development process. Journal of Supply Chain Management, 52 (1), 66-81.

Yan, T., & Nair, A. (2016). Structuring supplier involvement in new product development: A China-U.S. study. Decision Sciences, 47 (4), 589-627.

Yan, T., Yang, S., & Dooley, K. (2017). A theory of supply network-based innovation value. Journal of Purchasing and Supply Management, 23, 153-162.

Zaremba, B.W., Bode, C., & Wagner, S. (2016). Strategic and operational determinants of relationship outcomes with new venture suppliers. Journal of Business Logistics, 37 (2), 152-167.

Zaremba, B.W., Bode, C., & Wagner, S. (2017). New venture partnering capability: An empirical investigation into how buying firms effectively leverage the potential of innovative new ventures. Journal of Supply Chain Management, 53 (1), 41-64.

www.ircaucus.ac.uk

Email info@ircauscus.co.uk Twitter @IRCaucus

INNOVATION & RESEARCH CAUCUS

Delivered with ESRC and Innovate UK