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Public Procurement of Innovation: Impacts, Evidence, and Methodological challenges

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Executive Summary

- Public procurement, representing around 12% of GDP in OECD countries, is increasingly recognized as a powerful tool for driving not only innovation but also broader goals like sustainability and economic development.
- The brief synthesizes research findings on the impacts of PPI, looking at both theoretical and empirical evidence, as well as methodological challenges in studying its effects.
- Public procurement has the potential to shape innovation by:
 - Creating demand for new technologies and services (demand-pull effects).
 - Facilitating the diffusion of innovations.
 - Encouraging firm-level investment in R&D.
 - Influencing market structures to support new products and innovations.
- Studying PPI involves several complexities, including:
 - Defining what constitutes innovation-oriented procurement.
 - Establishing clear causality between procurement actions and innovation outcomes.
 - Addressing issues related to data access and transparency.
- Further research should aim to:
 - Improve data collection and linkages.
 - Focus on long-term impacts.
 - Explore the effects of PPI across different regions and sectors.

Introduction

Public procurement has attracted growing interest from policymakers and scholars as a demand-side instrument to stimulate innovation and address societal challenges. This renewed focus stems from a perceived underperformance of traditional supply-side innovation policies and a broader shift in innovation policy discourse towards more systemic and mission-oriented approaches (Edler & Georghiou, 2007; Mazzucato, 2018).

This research brief synthesizes recent research on public procurement of innovation (PPI), drawing on two recent publications that seek to provide a conceptual and empirical overview of the literature on public procurement of innovation:

- Uyarra et al. (2023) provides an overview of the innovation-promoting impacts of public procurement. It traces the evolution of academic and policy interest in PPI, discusses key theoretical rationales, and reviews empirical evidence on impacts.
- Kundu et al. (2024) offers a methodological review of empirical research on PPI impacts. It analyses data sources and methodological approaches used in recent studies, highlighting challenges and suggesting directions for future research.

Together, these publications examine the theoretical foundations linking procurement to innovation, key mechanisms and effects, empirical findings on impacts, methodological challenges in studying PPI, and provide directions for future research and practice.

Overview of the PPI: Evolution, rationales and typologies

Interest in the innovation impacts of public procurement can be traced back to studies in the late 20th century exploring the role of government demand in technological development. Early work by researchers like Geroski (1990) and Dalpé et al. (1992) documented the market-shaping influence of government procurement and its role in the

emergence of strategic technologies. The literature has evolved alongside shifts in innovation policy discourse - from a narrow focus on R&D and market failure in the 1980s, to national innovation systems approaches in the 1990s and 2000s, to more recent framings around transformative change and grand societal challenges (Schot & Steinmueller, 2018).

Several theoretical justifications have been used to support the use of public procurement as an innovation policy tool. The market failure perspective argues that innovation involves risk and uncertainty, leading to suboptimal private investment. Public procurement can correct this by providing demand and reducing market uncertainty (Edler & Georghiou, 2007). Systems of innovation approaches view procurement as a demand-side policy tool within a broader innovation system, helping to articulate needs and facilitate user-producer interactions (Edquist & Hommen, 1999). Evolutionary perspectives emphasize procurement's role in shaping market selection environments by supporting niche development and influencing technological trajectories (Bleda & Chicot, 2020). More recently, mission-oriented innovation frameworks position procurement as a tool to drive innovation towards complex societal challenges like climate change (Mazzucato, 2018).

Scholars have highlighted several mechanisms through which public procurement influences innovation. Demand-pull effects include creating or enlarging markets for new products and technologies, providing demand certainty to stimulate private R&D investment, and signalling future needs to shape innovation directions (Geroski, 1990; Edler & Georghiou, 2007). Procurement can also support innovation diffusion, with government acting as a lead user demonstrating benefits of new technologies, supporting creation of standards, and facilitating knowledge spillovers between public and private sectors (Dalpé et al., 1992; Edquist & Hommen, 2000). Additionally, procurement can shape market structures and competitive dynamics, influencing incentives for innovation through contract design and supplier selection (Cabral et al., 2006)..

The literature also features multiple typologies and conceptualizations of PPI. Edler (2013) distinguishes between general procurement with innovation as an additional criterion and strategic procurement where innovation is an explicit goal. Edler and Georghiou (2007) differentiate direct procurement for public use from catalytic procurement aimed at private markets. Edquist and Hommen (2000) contrast developmental procurement of new solutions with adaptive procurement of existing innovations. While these typologies help make sense of different procurement approaches, the proliferation of terms poses challenges for building a cohesive evidence base.

Evidence of impact of PPI: key empirical challenges

A growing body of empirical research examines the impacts of public procurement on innovation outcomes. Early studies primarily relied on case studies and qualitative methods to explore the role of procurement in supporting specific technologies or sectors. Increasingly, quantitative approaches are leveraging larger datasets and more sophisticated econometric techniques (see Figure 1).

For instance, studies using innovation surveys like the Community Innovation Survey (CIS) have been common since the late 2000s. These typically employ econometric techniques such as probit models or propensity score matching to analyse the relationship between procurement participation and innovation outcomes. Aschhoff and Sofka's 2009 study and Ghisetti's 2017 work exemplify this approach, both finding positive effects of procurement on innovation outputs and R&D spending. More recent studies have utilized administrative data on procurement spending, often linked with patent data or firm-level financial information. These allow for more granular analysis of procurement impacts across different sectors and types of firms, as well as geographies. Slavtchev and Wiederhold's 2016 study and Orsatti et al.'s 2020 research are prime examples, both showing positive impacts of procurement on private R&D and patenting activity. Finally, some researchers combine quantitative analysis with qualitative case studies to provide a more comprehensive understanding of procurement impacts and mechanisms.

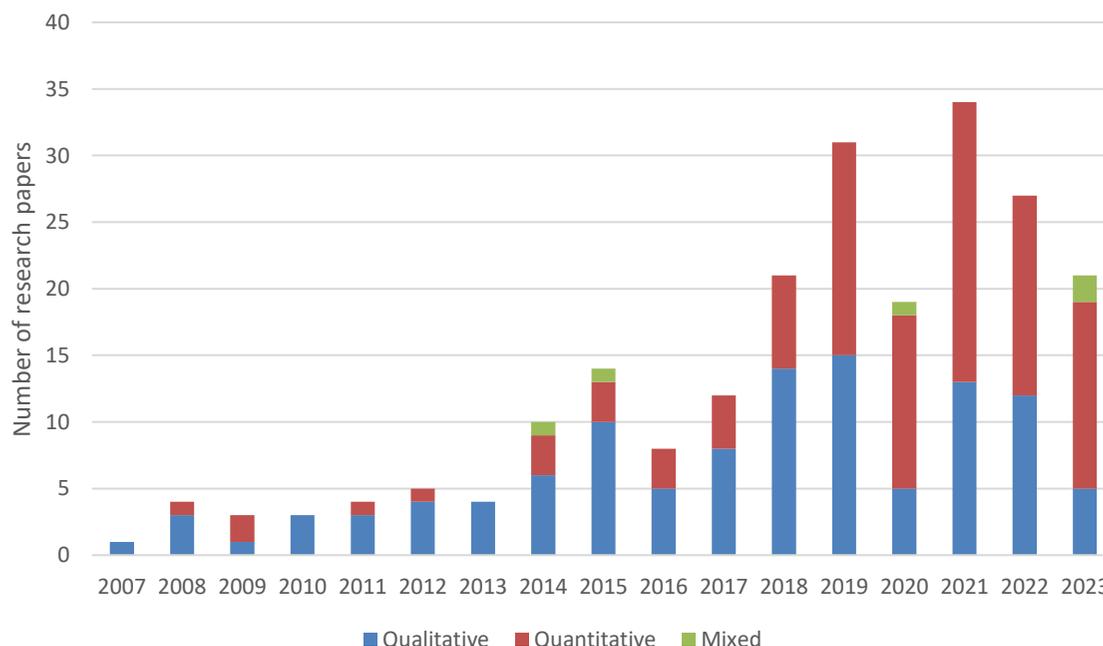


Figure 1. Distribution of journal articles by research method over time (n = 221). Source: Kundu et al. (2024)

There are advantages and limitations of understanding PPI impact with different data sources and methodological approaches, as discussed in Table 1. Across these various methodologies, several key findings have emerged. Generally, studies find positive impacts of procurement on innovation, with some evidence suggesting that procurement may have stronger innovation effects compared to supply side policy instruments such as R&D subsidies, as demonstrated by Guerzoni and Raiteri in 2015. However, these impacts are not uniform. Effects appear to vary across sectors, firm types, and procurement approaches. For instance, Uyarra et al. (2023) note that impacts may be stronger in certain technology-intensive sectors or for small and medium-sized enterprises.

Despite these advances, limitations in the current evidence base remain. As Kundu et al. (2024) point out, most research focuses on short-term impacts, with less evidence on long-term effects on technological trajectories or market development. There's also a geographical bias in the literature, with the majority of studies focusing on developed countries, particularly in Europe and North America. Evidence from the developing countries remains scarce. Furthermore, many studies concentrate on easily measurable outcomes like patents or R&D spending, potentially overlooking broader impacts on public sector innovation or societal challenges. Methodological challenges persist, including issues of selection bias and difficulty in identifying causal relationships.

Kundu et al. (2024) provide a detailed analysis of the methodological challenges complicating efforts to evaluate PPI impacts. Addressing these issues is important for understanding the effectiveness of public procurement as a policy instrument for achieving wider societal and economic objectives. They identify three main issues:

1. Defining and identifying PPI: A key

challenge is distinguishing "regular" procurement from innovation-oriented procurement. Approaches include self-reporting by firms in surveys, focus on specific PPI schemes or programs, and analysis of tender documents using text mining (a nascent approach, building on advances in computational text analysis).

2. Establishing causality is challenging due to selection bias, unobserved firm characteristics, and difficulty separating procurement effects from other policy influences. Researchers have employed various econometric techniques to address these issues, including propensity score matching, instrumental variables, and difference-in-differences approaches (Guerzoni & Raiteri, 2015; Caravella & Crespi, 2020).
3. Data limitations pose significant obstacles, including lack of longitudinal data linking procurement to firm outcomes over time, limited information on procurement characteristics in innovation surveys, and difficulties matching tender/contract data to firm-level innovation data. Additionally, most studies focus on firm-level innovation outputs, with less evidence on broader economic and social impacts, effects on public sector innovation, and long-term impacts on technological trajectories.

Data sources	Case study	Firm-level surveys	Administrative data
Procurement captured through ...	public procurement projects	Firm participation in public sector contracts	Tender, contract award notice, procurement expenditure
Public procurement and innovation (PPI) distinguished	not clear – although the complexity of the products or services being purchased sometimes suggests a departure from regular procurement	asking if public contracts required innovation	text analysis of notices (esp. description of procurement objectives) to identify the expression of innovation concepts
Impact is understood as ...	Cost-savings; better knowledge co-creation; innovation adoption; improved organizational practices	firm turnover; introduction/ adoption of product, process, or environmental innovation	Innovation adoption; SME participation; private R&D expenditure; patents
Advantages	In-depth analysis of the conditions and policy decisions affecting PPI implementation	simple and direct instrument; extensively piloted and reliable; accessible	information at the level of contracts; identify different procurement practices, contract design, and qualitative aspects of contracts; differentiate procurement by regions or economic sectors
Limitations	Context-specific, lack of generalizability	anonymized; lacks information on the size of government support; self-identification can create variability; difficult to find large panels to analyze medium and long-term impacts of procurement; lacks information of regional/ local procurement	resource-intensive (volume of data requires sampling or automated analysis); challenges in linking notices (intentions) with outcomes

Table 1. Summary of the main approaches adopted in empirical PPI research. Source: Kundu et al. (2024)

Suggestions for Further Research and Practice

To address these challenges, future research should focus on developing linked datasets combining procurement, innovation, and firm performance data. Improving measurement of procurement characteristics and conducting longitudinal studies to examine medium and long-term impacts are also crucial. Mixed methods approaches combining quantitative analysis with in-depth case studies can provide a more comprehensive understanding of PPI impacts.

Research directions should include examining PPI impacts in diverse geographical and sectoral contexts, studying interactions between procurement and other innovation policy instruments, and investigating effects of different procurement practices and contract designs. Assessing broader societal and economic impacts beyond firm-level innovation is also important.

For practitioners, improving data collection and sharing on procurement activities and outcomes is essential. Developing standardized approaches for identifying innovation-oriented procurement and building evaluation into PPI program design from the outset can enhance learning and effectiveness. Fostering knowledge-sharing on effective practices across procurement organizations can help spread best practices.

Conclusion

Public procurement of innovation holds significant potential as a demand-side policy tool, but realizing this potential requires addressing key knowledge gaps. Improved data, rigorous evaluation methods, and continued research can help build the evidence base needed to inform effective policy and practice. By addressing these challenges, policymakers and researchers can better harness the power of public procurement to drive innovation and address pressing societal challenges.

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