

Entrepreneurship in Focus

FGF-Forschungsnetzwerk Entrepreneurship, Innovation und Mittelstand e.V. and IfM Bonn

Issue 01/2026

Vocational Qualifications in the Context of Innovation: Does Firm Size Matter?

Jörg Thomä

Summary

Vocational education and training (VET) is more than securing the supply of skilled labour – it also strengthens firms' innovative capacity. A study on the German manufacturing sector shows that innovation is particularly likely to emerge where academic and vocational qualifications interact within firms. Especially in small and medium-sized enterprises (SMEs), VET-qualified employees play a key role in developing new ideas, solving problems, and successfully implementing them.

Innovation is widely regarded as a key driver of economic competitiveness. In policy debates and academic research, attention often centres on research and development (R&D) activities and academic qualifications, while the contribution of the VET workforce receives comparatively little attention. This is despite the fact that firms' innovation practices rely heavily on the knowledge and experience of vocationally qualified employees.

Against this background, Matthies and Thomä (2025) examine the contribution of the VET workforce – such as employees with initial VET training, master craftsmen, or technicians – to innovation processes in manufacturing, compared to academically qualified employees, and analyse how these contributions vary by firm size. The study is based on individual-level data from the BIBB/BAuA Employment Surveys and examines participation in different stages of the firm-level innovation process, ranging from idea generation to the introduction of new products, services, or production and process technologies.

The data stem from representative surveys regularly conducted among employed people in Germany by the Federal Institute for Vocational Education and Training (BIBB) in cooperation with the German Federal Institute for Occupational Safety and Health (BAuA). Methodologically, the study applies multinomial and binary logistic regression models to analyse innovation activities as a function of qualification, firm size, and their interaction, using predicted probabilities.

Key Findings

The results show that innovation does not originate solely from R&D but is broadly embedded within firms. While university graduates dominate the research-intensive phases of idea and concept development, vocationally qualified employees also make substantial contributions throughout the innovation process. Skilled employees trained in the dual system are particularly active in the implementation phase, for example when introducing new machinery, equipment, or technologies. Master craftsmen and technicians are involved in idea development to a similar extent as

academically qualified employees and act as important interfaces between R&D and operational implementation. In this way, they foster the interaction of different types of knowledge and learning modes within firms' innovation processes.

Overall, the findings confirm that interaction between qualification groups is especially conducive to innovation. Academic qualifications are primarily oriented towards analytical knowledge and research-based learning, whereas vocational qualifications rely more strongly on synthetic knowledge derived from experience-based learning in the workplace (see Figure). A key reason why the combination of both types of knowledge is particularly successful in countries with a dual training system is that the systematic integration of practical and theoretical learning components is already embedded in initial vocational education and training. This facilitates communication and interactive learning between academically qualified staff and vocationally qualified employees.

Learning- and innovation-related complementarities between academic and vocational qualifications



The Role of Firm Size

The study by Matthies and Thomä (2025) further shows that the allocation of innovation-related tasks across qualification groups depends on firm size. In large

firms, the division of labour between academically and vocationally qualified employees is most pronounced. By contrast, the innovative potential of vocationally qualified employees is particularly strong in SMEs, where individuals often take on multiple innovation-related tasks simultaneously. In addition, German SMEs rely heavily on the vocational education and training system to meet their demand for skilled labour.

In smaller firms, innovative capacity often depends less on dedicated R&D departments and more on practice-oriented learning and continuous improvement processes. Vocationally qualified employees play a key role in this context, for example by developing innovative solutions for customer-specific requirements through interaction and feedback loops. Where R&D does take place in SMEs, it is usually less formalised and more closely integrated into other areas of the firm. This facilitates the interaction of academic and vocational competences and supports the innovation-enhancing combination of theoretical knowledge and practical experience. Under these conditions, vocationally qualified employees make valuable contributions to innovation in SMEs through their applied knowledge of production processes, customer needs, and technical solutions.

These findings complement the results of Matthies et al. (2025), which show that participation in dual vocational training has a positive effect on the innovative capacity of smaller training firms.

Implications

The results highlight the importance of understanding vocational and academic qualifications as complementary components of firm-level innovation processes. The specific innovation contributions of different workforce groups should be recognised and actively supported. This includes creating workplace structures that enable interactive learning between vocationally qualified employees and university graduates, thereby unlocking the innovation potential of a diversely qualified workforce.

It also becomes clear that promoting vocational education and training should be understood not only as an education or labour market policy issue, but also as an integral part of a broad-based innovation policy. Investments in the vocational education and training system strengthen not only the skills base but also firms' innovative capacity. SMEs in particular depend on a strong VET system to remain innovative in the long term.

In practice, this implies further strengthening advanced vocational pathways such as master craftsperson or technician training as bridges between vocational and academic qualification groups. In addition, knowledge transfer in SMEs should be supported by intensifying exchange between universities, research institutes, and firms embedded in the VET system. Targeted continuing training and networking formats can help firms

to better integrate academic and VET types of knowledge and learning modes.

Especially with regard to SMEs, vocational education and training institutions should be seen as integral components of regional innovation systems. Their active inclusion can support the spatial diffusion of new technologies as well as successful forms of learning and collaboration – for example between dual-trained skilled workers, master craftspersons, technicians, and university graduates. Ideally, this can encourage further firms and regions to adopt new technologies and innovative approaches.

Conclusion

The study's findings confirm the innovation relevance of vocational education and training. Innovations do not arise solely in R&D departments, but also in other areas of firms such as production, where vocationally qualified employees contribute their knowledge and experience to innovation processes. Vocational and academic education should therefore be understood as complementary pillars of a strong innovation system and be deliberately interconnected.

Jörg Thomä is a researcher at the ifh Göttingen.

References:

Backes-Gellner, U.; Lehnert, P. (2023): Berufliche Bildung als Innovationsstreiber: Ein lange vernachlässigtes Forschungsfeld, in: Perspektiven der Wirtschaftspolitik 24 (1), p. 85–97.

Matthies, E.; Thomä, J.; Bizer, K. (2025): A hidden source of innovation? Revisiting the impact of initial vocational training on technological innovation, in: Journal of Vocational Education & Training, 77 (2), p. 276–296.

Matthies, E.; Thomä, J. (2025): Task allocation and innovation: revisiting the role of vocational education and training in manufacturing firms, in: Economics of Innovation and New Technology, <http://dx.doi.org/10.1080/10438599.2025.2575020>.

Thomä, J.; Bizer, K. (2021): Governance mittelständischer Innovationsfähigkeit – Implikationen des Doing-Using-Interacting-Modus, in: Perspektiven der Wirtschaftspolitik, 22 (4), p. 350–369.

Imprint

The authors of the individual articles are responsible for the content of their articles.

Editors: **Prof. Dr. Dr. h.c. Friederike Welter** (IfM Bonn, Universität Siegen)
Prof. Dr. Matthias Baum (FGF e.V., Universität Bayreuth)

V.i.S.d.P.: **Dr. Jutta Gröschl** (IfM Bonn).
Dr. Madlen Schwing (FGF e.V.)

Websites: www.ifm-bonn.org

www.fgf-ev.de