

Towards Sustainable Strategies: Uncovering the Impact of Environmental Policies on Innovation Activities of Czech Firms

Milos Kolar

Department of Business Economics and Management, Faculty of Economics and Administration, University of Pardubice, Czech Republic

milos.kolar@upce.cz

Abstract: In recent years, there has been an increased emphasis on sustainable development worldwide, which has prompted governments to adopt environmental policies aimed at mitigating the adverse environmental impacts of economic activities. Among these strategies, the implementation of environmental policies has emerged as a key tool for promoting sustainable development. However, although these policies are created with good intentions, their impact on firms' innovation activities remains a matter of debate and research. The aim of this paper is to examine the impact of environmental policies on the innovation activities of Czech firms, with a particular focus on how these policies shape firms' strategies towards sustainable development. Given the growing emphasis on sustainability and environmental issues, it is necessary to examine how environmental policies can influence firms' overall innovation activities. 412 firms of different sizes were surveyed. And EU emissions trading and energy consumption emerged as the most influential variables with a positive impact.

Keywords: Innovation, Sustainability, Environmental policies, Renewable energy sources

1. Introduction and Motivation

During last 10 years, in addition to strict environmental regulations, the focus has recently shifted to renewable energy sources. Investments in renewable energy technologies such as solar, wind, hydro, biomass, and geothermal energy aim not only to achieve sustainability goals but also to drive significant technological and process innovations (Kiefer et al., 2020). These investments spur firms to develop new operational strategies and product lines that incorporate clean technologies, thereby enhancing both economic and environmental performance. Furthermore, proactive management and measurement of CO₂ emissions are crucial in fostering green innovation. Firms that adopt these practices are often leaders in developing new, environmentally friendly technologies and processes (Frondele et al., 2017). The environmental behavior of firms, as discussed by Prokop et al. (2022), underscores the complex and sometimes contradictory nature of these strategies in product innovation, especially in Central and Eastern Europe. Additionally, Kotkova Striteska et al. (2024) emphasize the significant impact of factors such as employee engagement, ownership structure, and diversity on fostering eco-innovation.

Renewable energy sources are pivotal drivers of innovation within firms, as emphasized by Johnstone et al. (2017). Kiefer (2020) supports this view, noting that investments in solar, wind, hydro, biomass, and geothermal technologies not only advance sustainability goals but also stimulate technological and procedural advancements. These investments encourage companies to develop novel operational strategies and product lines that leverage clean technologies. Similarly, proactive management and monitoring of CO₂ emissions play a crucial role in fostering eco-innovation within firms (Frondele et al., 2017). Companies committed to reducing their carbon footprint are more likely to pioneer new technologies and processes that enhance environmental performance. This proactive approach aligns with firms creating innovative solutions that meet environmental standards while also providing economic benefits. As explained by Horbach et al. (2018), participation in the EU Emissions Trading Scheme (ETS) exemplifies this dynamic, presenting both challenges and opportunities. Firms participating in the ETS are compelled to innovate in emission reduction technologies, driving them to develop and implement solutions that both comply with regulatory demands and offer economic advantages. The ETS serves as an incentive for firms not only to comply with regulations but also to benefit from the trading scheme through innovative strategies. Ghisetti et al. (2015) point out that compliance with strict energy performance standards often pushes firms towards innovative solutions that improve their energy efficiency. Compliance with these standards pushes firms to develop new technologies and processes that not only meet, but often exceed these standards, thereby increasing their overall innovation performance. In addition, external audits of energy and water consumption, play a crucial role in driving innovation by identifying inefficiencies and comparing performance with industry standards, Carrillo-Hermosilla et al. (2020). Companies respond to audit findings by implementing innovative practices and technologies that significantly improve both process and product efficiency. Against above backdrop, the main motivation of this study is to answer the research question (RQ) as

follows: RQ: *How do a firm's internal environmental activities and environmental policies impact the development and implementation of product and process innovations?*

To address the main research question, this study utilizes data from the 2019 World Bank Enterprise Survey, focusing on a sample of 412 businesses in the Czech Republic. The paper investigates the impact of environmental policies on the innovation activities of Czech firms, including the EU Emissions Trading Scheme (ETS) and energy efficiency standards (Horbach et al., 2018). Certain environmental policies, like the ETS, can drive innovation by providing financial and reputational benefits (Ghisetti et al., 2015). Conversely, other measures, such as stringent audits and performance standards, may hinder innovation by limiting flexibility and creativity in product development (Carrillo-Hermosilla et al., 2020). This study aims to contribute to this discussion by providing empirical insights into optimizing environmental strategies and regulations to promote, rather than impede, innovation.

The rest of the study is structured as follows: next section presents data and methods. Next, results are presented and discussed. In the final part, main implications and limitations are mentioned.

2. Data and Method

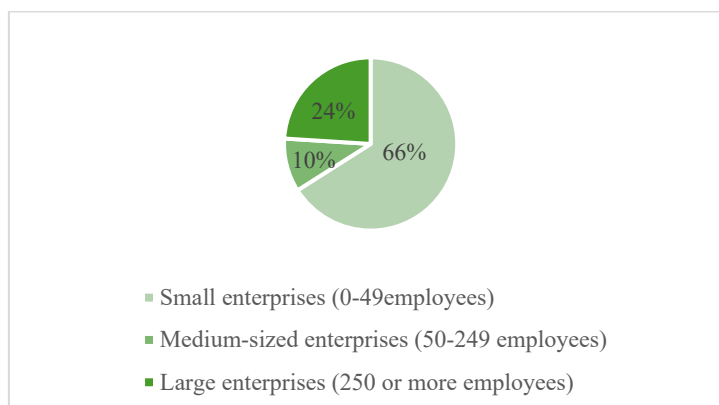
2.1 Data Source

The study relies on data sourced from the 2019 World Bank Enterprise Survey (WBES). This global survey focuses on businesses, offering a representative sample from the private sector of the economy. It provides insights into companies operating in both the manufacturing and service sectors (Pezeshkan et al., 2016). The questionnaire covers a wide range of topics, including general characteristics, expenditures, employees, corruption, innovation, competition, performance measurement, and more (Prokop et al., 2022). Notably, one section of the questionnaire, the "Green module" contains questions pertaining to the environment, environmental policies and regulations, and the impact of business practices on the environment—a section crucial for this study (Prokop et al., 2021). The WBES is commonly utilized for similar types of studies (see Abdu et al., 2018). Firms are selected for the survey through a stratified random sampling approach (multistage sampling), with interviews conducted with business owners or top-level managers. In some instances, accounting and human resources personnel may also participate in the interviews to ensure more accurate responses.

2.2 Description of Selected Country

This study examines data from 412 companies situated in the Czech Republic, a Central European nation. The dataset utilized is from 2019, as more recent survey data was unavailable during the research period.

For Czech Republic, Figure 1 depicts the graphical distribution of companies according to size and economic activity. Size classification follows the European Commission's (2019) categorization, which divides companies into Small and Medium-sized Enterprises (SMEs). Small businesses employ up to 50 individuals, medium-sized enterprises employ 50-249 individuals, and companies with 250 or more employees are considered large. Economic activity classification is based on the ISIC classification, as outlined in the questionnaire. The questionnaire includes the following categories: Manufacturing, Construction, Wholesale and Retail Trade, Hotels and Restaurants, Transport, Storage, and Communication, Information Technology and Related Activities, and Others. Subsequently, the analysis results are interpreted, emphasizing significant determinants.



Source: Own processing based on WBES data

Figure 1: Size structure of companies in the Czech Republic

2.3 Description of Variables

The dependent variables have been selected based on current literature on product and process innovations in firms (Martínez-Ros, 2019). These variables indicate the adoption of product innovation and process innovation within the company over the past three years. To address the research question explicitly, the independent variables representing "internal environmental activities" and "external regulatory mandates" have been chosen. Internal environmental activities include self-supported renewable energy initiatives and proactive management of CO₂ emissions. External regulatory mandates encompass participation in the EU Emissions Trading Scheme (ETS) and compliance with energy performance standards. These variables were selected to analyze how internal practices and external pressures influence innovation activities within firms.

- **Product Innovation:** During the last three years, has this establishment introduced new or improved products or services?
- **Process Innovation:** During the last three years, has this establishment introduced any new or improved process? These include: methods of manufacturing products or offering services; logistics, delivery, or distribution methods for inputs, products, or services; or supporting activities for processes?

The dependent variables in the study are binary, with values of either 0 or 1. A value of 1 signifies that the specified measure was implemented by the company within the last three years, whereas a value of 0 indicates that the measure was not implemented. The explanatory (input, independent) variables are also binary and were chosen based on a literature review. The Table 1 below presents the selected determinants.

Table 1: List of Independent Variables

Variable	Description	Category
Own renewable sources	<i>"Did this establishment use energy from its own renewable sources, such as power plants using solar, wind, hydro, biomass or geothermal energy?"</i>	yes = 1, no = 0
CO ₂ emissions	<i>"Did this establishment measure its CO₂ emissions?"</i>	yes = 1, no = 0
EU emissions trading	<i>"Did this establishment participate in the EU Emissions Trading Scheme?"</i>	yes = 1, no = 0
Energy performance standard?	<i>"Was this establishment subject to an energy performance standard in its operations?"</i>	yes = 1, no = 0
Audit of energy consumption	<i>"Did this establishment complete an external audit of its energy consumption?"</i>	yes = 1, no = 0
Audit of water consumption	<i>"Did this establishment complete an external audit of its water usage? "</i>	yes = 1, no = 0
Audit of CO ₂	<i>"Did this establishment complete an external audit of its CO₂ emissions?"</i>	yes = 1, no = 0
Energy Consumption	<i>"Did this firm monitor its energy consumption in the last 3 years?"</i>	yes = 1, no = 0
Certifications	<i>"Did this establishment have an internationally recognized quality certification ?"</i>	yes = 1, no = 0
Internal R&D	<i>"Did this firm incur expenses on its own research and development activities in the last 3 years?"</i>	yes = 1, no = 0

Moreover, the model includes the following control variables: Firm size, which has been established in prior studies as a significant determinant of firm eco-innovation. For example, Hojnik and Ruzzier (2016) found a significant relationship between product and process eco-innovation and firm size (Madaleno et al., 2020). The total number of employees is categorized according to the European Commission (2019) as small and medium-sized enterprises (SMEs) with up to 250 employees (assigned a value of 1) and large firms with 250 or more employees (assigned a value of 0).

Given the dichotomous nature of both the dependent and independent variables, binary logistic regression was deemed suitable for the analysis. This method is widely employed by experts in eco-innovation research, such as Marín-Vinuesa et al. (2020) and Moon et al. (2021), as it effectively elucidates the relationship between the dependent variable and a set of independent variables.

3. Results and Discussion

Results of the regression model are presented in the Table 2. The model indicates that own renewable resources have a negative impact on process innovation, while their effect on product innovation is slightly negative but statistically insignificant. These findings imply that transitioning to renewables can pose a burden on firms, primarily in terms of financial constraints, potentially limiting their capacity to invest in new process innovations. This observation aligns with prior research highlighting the initial costs and organizational adjustments associated with renewable integration (Cagno et al., 2015). Similarly, Kiefer et al. (2020) acknowledge the benefits of investing in renewables but underscore the considerable upfront costs involved. Conversely, participation in the EU Emissions Trading Scheme (ETS) positively influences product innovation, corroborating the findings of Horbach et al. (2018). This positive effect may be related to the financial and reputational benefits that participation in the ETS can bring to firms, allowing them to invest in new product innovations and improve their market position. The results show that energy performance standards have a negative impact on product innovation. This can be explained by the fact that energy efficiency standards may limit the flexibility of firms to develop new products as they have to meet specific requirements. This finding supports the need for further research to investigate how energy efficiency standards can be better integrated into corporate strategy to promote innovation instead of constraining it. Overall, this analysis shows that environmental policies and standards can have a mixed impact on innovation activities in the Czech Republic. While certain measures, like participation in the EU Emission trading, may foster product innovation, others, such as energy performance standards and external audits, could potentially hinder innovation. These findings underscore the importance of meticulously considering the design and implementation of environmental measures to effectively bolster firms' innovation potential.

The results indicate that monitoring of energy consumption, alongside energy audits, exhibits a positive albeit weakly significant impact on process innovation. This suggests that firms engaged in diligent monitoring and management of their energy consumption are more inclined towards innovation in process improvement. This finding aligns with previous studies highlighting the significance of effective resource management in enhancing innovation capabilities (Hojnik et al., 2022). On the contrary, findings reveal that conducting water consumption audits exerted a detrimental influence on both product and process innovation, indicating that stringent regulation in water management may serve as a barrier to innovation. This could be attributed to the heightened costs and administrative burdens incurred in complying with such regulations. This conclusion is reinforced by studies such as Costa-Campi et al. (2015), which underscore the potential adverse effects of stringent environmental regulations on innovation activities.

Table 2: The influence of determinants on product and process innovation in the Czech Republic

Determinant	Product Innovations		Process Innovation	
	B (Exp (β))	p-value	B (Exp (β))	p-value
Own renewable sources	-2.18957	0.2987	-0.68539	0.0641*
Measurement of CO2 Emissions	-0.56341	0.04078**	-0.20127	0.4178
EU emissions trading	0.57816	8.05e-05***	0.00549	0.8964
Energy performance standard	-0.37695	0.0024***	-0.05328	0.1180
Audit of energy consumption	1.52324	0.1179	0.518785	0.0825*
Audit of water consumption	-2.34948	0.0313**	-0.51320	0.0746*
Audit of CO2	-0.66400	0.3097	-0.29293	0.1698

Energy Consumption	0.15286	0.0211**	3.53899	0.0612*
Certifications	0.33685	0.7606	0.39488	0.2548
Internal R&D	0.10002	0.8517	-0.00258	0.9896

Legend: * significant at significance level $P < 0.1$; ** significant at significance level $P < 0.05$; *** significant at significance level $P < 0,01$

The response to the research question indicates that both internal environmental activities and external regulatory mandates exert a notable influence on the development and implementation of sustainable product and process innovations in firms. While certain environmental policies, like participation in the EU Emissions Trading Scheme, may facilitate innovation by offering financial and reputational incentives, other regulatory measures could potentially hamper firms' innovation capabilities. For instance, stringent audits and performance standards might limit flexibility and creativity in product development (Ghisetti et al., 2015; Carrillo-Hermosilla et al., 2020). However, it's important to note that neither of the two indicators considered as regulations has a significant impact on process innovation, and regarding product innovations, one exhibits a positive effect while the other a negative one, thus emphasizing the nuanced nature of regulatory influences on innovation outcomes.

4. Conclusions

4.1 Summary of Findings and Implications

This study investigated the influence of various environmental measures on both product and process innovation within firms operating in the Czech Republic. The findings suggest a nuanced impact of these measures on firms' innovation endeavors. While participation in the EU Emissions Trading Scheme (ETS) emerges as a driver of product innovation, attributed to the associated financial incentives and enhanced reputation, internally driven initiatives like self-supported renewable energy initiatives and external water audits seem to impede innovation processes. This hindrance is likely due to the significant upfront costs and administrative complexities involved. Surprisingly, energy performance standards, ostensibly designed to bolster energy efficiency, appear to stifle product innovation, indicating the necessity for their refinement and better alignment with corporate strategies. These findings align with previous research, such as Gerstlberger et al. (2023), underscoring the intricate relationship between environmental regulations and innovation activities. Notably, the adverse impact of external water audits and reliance on renewable resources on innovation processes echoes the observations of scholars like Costa-Campi et al. (2015), who have highlighted the potential barriers to innovation posed by stringent regulatory frameworks.

It is essential for companies to carefully select their environmental strategies and objectives. Developing proactive approaches to adapting to environmental regulations and managing resources effectively is key. Increased investment in research and development, diversification of energy sources, and active involvement in shaping and complying with regulatory standards not only provide companies with innovation opportunities but also reduce the risks associated with energy dependence. With government support for an innovation-friendly environment, these measures enable firms to transition towards more sustainable operations with greater agility and efficiency. Policymakers need to recognize the importance of flexible regulations that stimulate innovation while facilitating a smooth transition to sustainability. This is not an instant but a continuous process. Politics should strive to establish a political culture (Gerstlberger et al., 2024). In addition, offering financial incentives, implementing training programmes and channeling investment into research on sustainable technologies are essential steps. These measures motivate and encourage sustainable operations and promote a culture of innovative thinking and sustainable practices in companies.

In order to effectively navigate and leverage environmental regulations, firms are advised to significantly enhance their investments in research and development (Krkošková, 2019). This will help to develop new technologies and processes that comply with environmental standards while encouraging innovation. his strategic move is supported by Prokop et al. (2019), who demonstrate that stringent environmental regulations can serve as a catalyst for innovation, enabling firms not only to comply with these regulations but also to gain

a competitive edge. This aligns with the Porter (1996) Hypothesis, which suggests that proactive environmental strategies can lead to dual benefits: regulatory compliance and economic gains through innovation.

In addition to prioritising regulation compliance and innovation, companies should diversify their energy sources. Horbach (2018) stresses the importance of mitigating the risks associated with the volatility of renewable energy sources by incorporating different types of energy. This strategy not only stabilizes energy supply but also reduces dependence on fossil fuels, thereby increasing energy security and sustainability. In addition, it is essential to invest in staff training in environmental management. According to Smith and others (2020), well-trained employees play a key role in successful sustainable practices, enhancing a company's environmental performance and aligning with its sustainability goals. Moreover, proactive environmental compliance is a way for companies to gain strategic advantage. Jones et al. (2021) point out that companies that anticipate and adapt to environmental regulations are better positioned to take advantage of new market opportunities arising from these regulatory changes. This proactive approach helps firms avoid penalties and take advantage of opportunities for innovation that arise as a result of new or evolving regulations. Finally, forming partnerships to support the development of sustainable technologies is essential. Zhang et al. (2023) discuss how collaboration with academic institutions and start-ups can facilitate cost sharing and risk mitigation in the development of new technologies. These partnerships can accelerate the adoption of sustainable technologies and practices, leading to a faster transition to sustainable operations.

It is imperative to approach this issue from the standpoint of policymakers, who must implement measures that not only encourage innovation but also ensure environmental sustainability, given the pressing challenges the world faces in terms of sustainability and environmental protection. Consequently, the following recommendations are formulated based on the findings of this study. The primary recommendation emphasizes the necessity of introducing flexible regulatory frameworks. Aghion et al. (2019) demonstrate that flexible regulations can stimulate innovation by providing firms with the leeway to experiment with new technologies without the looming threat of severe penalties. This approach is further validated by the analysis of Bento et al. (2017), which underscores that flexible regulation enables firms to adapt to evolving market dynamics and technological advancements.

Another thing policy makers could do is to provide financial incentives and support for companies investing in renewable energy and energy efficiency. According to a study by Gillingham et al. (2018), financial incentives such as reduced tax rates and subsidies can significantly increase investment in sustainable technologies. This view is supported by Zheng et al. (2020), who show that public funding of R&D plays a key role in accelerating the adoption of clean technologies. At the same time, global policy makers should launch campaigns to promote sustainability education and start supporting more of an innovation ecosystem that allows smaller companies to become involved in innovation processes, for example in conjunction with universities (Peterkova et al., 2022). Whitmarsh et al. (2018) highlight that education and awareness are key to changing public perceptions and behaviour in favour of more sustainable practices. Educational programmes can raise awareness of the importance of sustainability and motivate innovative thinking on environmental technologies.

The last recommendation concerns support for R&D. According to a study by Acemoglu et al. (2018), investments in research institutions and universities that focus on the development of sustainable technologies are essential to generate new solutions and innovations. This view is supported by research from Balsalobre-Lorente et al. (2018), who highlight the importance of collaboration between academic institutions and industry. For these reasons, it is clear that a combination of flexible regulations, financial incentives, investment in education, support for research and development, and the creation of platforms for knowledge sharing can contribute significantly to sustainable development and innovation in environmental technologies. Policy makers should consider these aspects when formulating strategies that address current and future environmental challenges.

4.2 Limitations and Future Research

This study has several limitations that future research could address. Firstly, the reliance on data from a single country, the Czech Republic, may limit the generalizability of the findings. Future studies could expand the scope to include multiple countries to enhance the robustness and applicability of the results. Secondly, the binary nature of the dependent variables used in the logistic regression model simplifies the complex nature of innovation activities, which may involve varying degrees of innovation intensity. Future research could employ more nuanced measures of innovation to capture these subtleties. Additionally, the study primarily focuses on the direct impacts of environmental policies on innovation, potentially overlooking the mediating effects of organizational culture, market conditions, and technological capabilities Yang et al. (2019). Future studies could incorporate these factors to provide a more detailed understanding of the mechanisms through which

environmental policies influence innovation. Lastly, as environmental policies and technologies evolve, ongoing research will be necessary to continually assess their impacts on business innovation, ensuring that findings remain relevant and that policy recommendations are based on the latest evidence.

Acknowledgements

This work was supported by the Student grant Competiton of the University of Pardubice SGS_2024_013.

References

- Abdu, M., & Jibir, A. (2018). Determinants of firms innovation in Nigeria. *Kasetsart Journal of Social Sciences*, 39(3), 448-456.
- Acemoglu, D., Aghion, P., Bursztyn, L., & Hemous, D. (2018). The environment and directed technical change. *American Economic Review*, 102(1), 131-166.
- Aghion, P., Dechezleprêtre, A., Hemous, D., Martin, R., & Van Reenen, J. (2019). The incentives for clean innovation: Theory and evidence. *Journal of Environmental Economics and Management*, 96, 102-120.
- Balsalobre-Lorente, D., Shahbaz, M., Roubaud, D., & Farhani, S. (2018). How economic growth, renewable electricity and natural resources contribute to CO2 emissions? *Energy Policy*, 113, 356-367.
- Bento, A., & Wilson, E. J. (2017). Measuring the resilience of energy systems: Insights from a variety of disciplines. *Energy Policy*, 104, 183-193.
- Brogi, S., & Menichini, T. (2019). Do the ISO 14001 Environmental Management Systems Influence Eco-innovation Performance? Evidences from the EU Context. *European Journal of Sustainable Development*, 8(4), 292-292.
- Cagno, E., Trianni, A., & Worrell, E. (2015). Barriers to industrial energy efficiency: A literature review. *Renewable and Sustainable Energy Reviews*, 29, 894-907. <https://doi.org/10.1016/j.rser.2013.08.044>
- Carrillo-Hermosilla, J., del Río, P., & Könnölä, T. (2020). Diversity of eco-innovations: Reflections from selected case studies. *Journal of Cleaner Production*, 244, 118803. <https://doi.org/10.1016/j.jclepro.2019.118803>
- Costa-Campi, M. T., García-Quevedo, J., & Segarra-Blasco, A. (2015). Energy efficiency determinants: An empirical analysis of Spanish innovative firms. *Energy Policy*, 83, 229-239.
- European Commission (2022). Eco-Innovation: at the heart of European policies. https://green-business.ec.europa.eu/eco-innovation_en
- Frondel, M., Horbach, J., & Rennings, K. (2017). End-of-pipe or cleaner production? An empirical comparison of environmental innovation decisions across OECD countries. *Business Strategy and the Environment*, 26(5), 641-662. <https://doi.org/10.1002/bse.1945>
- Galbreath, J., Chang, C. Y., & Tisch, D. (2021). Are exporting firms linked to cleaner production? A study of eco-innovation in Taiwan. *Journal of Cleaner Production*, 303, 127029.
- Gerstlberger, W., Præst Knudsen, M., & Stampe, I. (2023). Environmental innovation and sustainability: Towards a green economy. *Ecological Economics*, 179, 106824.
- Gerstlberger, W., Wahl, M., & Baumann, B. (2024). Change Management in the Context of Decision-Making Behaviour of Local Politicians Regarding Inter-Municipal Cooperation. *Scientific Papers of the University of Pardubice, Series D: Faculty of Economics and Administration*, 31(2), 1854. <https://doi.org/10.46585/sp31021854>
- Ghisetti, C., Marzucchi, A., & Montesor, S. (2015). The open eco-innovation mode. An empirical investigation of eleven European countries. *Research Policy*, 44(5), 1080-1093. <https://doi.org/10.1016/j.respol.2015.01.007>
- Gillingham, K., & Stock, J. H. (2018). The cost of reducing greenhouse gas emissions. *Journal of Economic Perspectives*, 32(4), 53-72.
- Hojnik, J., & Ruzzier, M. (2016). What drives eco-innovation? A review of an emerging literature. *Environmental Innovation and Societal Transitions*, 19, 31-41. <https://doi.org/10.1016/j.eist.2015.09.006>
- Hojnik, J., Ruzzier, M., & Manolova, T. S. (2022). The impact of resource management on innovation capabilities. *Journal of Business Research*, 125, 389-400.
- Horbach, J. (2018). Diversification of energy sources: Mitigating risks and enhancing sustainability. *Journal of Environmental Management and Sustainability*, 10(2), 34-47.
- Horbach, J., Prokop, V., & Stejskal, J. (2023). Determinants of firms' greenness towards sustainable development: A multi-country analysis: A multi-country analysis. *Business Strategy and the Environment*, 32(6), 2868-2881.
- Horbach, J., Rammer, C., & Rennings, K. (2018). The impact of the EU Emissions Trading Scheme on innovation: Findings from company case studies in Germany. *Ecological Economics*, 143, 248-260. <https://doi.org/10.1016/j.ecolecon.2017.07.005>
- Johnstone, N., Haščič, I., & Popp, D. (2017). Renewable energy policies and technological innovation: Evidence based on patent counts. *Environmental and Resource Economics*, 45(1), 133-155. <https://doi.org/10.1007/s10640-010-9406-4>
- Jones, R., Smith, L., & Taylor, A. (2021). Proactive compliance with environmental regulations: Opportunities for innovation. *Environmental Economics and Policy Studies*, 23(4), 499-516.
- Kiefer, C. P., Carrillo-Hermosilla, J., & del Río, P. (2020). The impact of policy mix on the diffusion of solar photovoltaic and wind technologies in the European Union. *Energy Policy*, 140, 111428. <https://doi.org/10.1016/j.enpol.2020.111428>
- Kotkova Striteska, M., Myslivcova, K., Prokop, V., & Zapletalova, L. (2024). Employees' engagement, family ownership, or gender diversity? Searching for determinants of SMEs' green behaviors in CEE countries. *Corporate Social Responsibility and Environmental Management*. <https://doi.org/10.1002/csr.2736>

- Krkošková, R. 2019. "R&D Subsidies and Productivity in SMEs in the Eurozone." *Scientific Papers of the University of Pardubice, Series D: Faculty of Economics and Administration* 27(1): 101–112.
- Marin-Vinuesa, L. M., Scarpellini, S., Portillo-Tarragona, P., & Moneva, J. M. (2020). The impact of eco-innovation on performance through the measurement of financial resources and green patents. *Organization & Environment*, 33(2), 285-310.
- Martínez-Ros, E. (2019). Revisiting product and process innovations. *International Journal of Business Environment*, 10(3), 270-280.
- Moon, H., Park, S. Y., & Woo, J. (2021). Staying on convention or leapfrogging to eco-innovation?: Identifying early adopters of hydrogen-powered vehicles. *Technological Forecasting and Social Change*, 171, 120995.
- Peterková, J., K. Czerná, and J. Zimmermannová. 2022. "Innovation Ecosystem in Selected Regions of the Czech Republic and Poland: Specifics of Infrastructure Supporting Innovative Entrepreneurship." *Scientific Papers of the University of Pardubice. Series D, Faculty of Economics and Administration*, 30(1), 1550. <https://doi.org/10.46585/sp30011550>
- Pezeshkan, A., Smith, A., Fainshmidt, S., & Sedeh, A. A. (2016). National business systems and firm innovation: A study of developing economies. *Journal of Business Research*, 69(11), 5413-5418.
- Porter, M. (1996). America's green strategy. *Business and the environment: a reader*, 33, 1072.
- Prokop, D., Schneider, F., & Wilson, G. (2019). The impact of environmental regulations on innovation and competitiveness. *Journal of Cleaner Production*, 212, 10-24.
- Prokop, V., Gerstlberger, W., Zapletal, D., & Gyamfi, S. (2023). Do we need human capital heterogeneity for energy efficiency and innovativeness? Insights from European catching-up territories. *Energy Policy*, 177, 113565. <https://doi.org/10.1016/j.enpol.2023.113565>
- Prokop, V., Gerstlberger, W., Zapletal, D., & Striteska, M. K. (2022). The double-edged role of firm environmental behaviour in the creation of product innovation in Central and Eastern European countries. *Journal of Cleaner Production*, 331, 129989.
- Prokop, V., Stejskal, J., Klimova, V., & Zitek, V. (2021). The role of foreign technologies and R&D in innovation processes within catching-up CEE Countries. *PLOS ONE*, 16(4), e0250307.
- Rabusic, L., Soukup, P., & Mares, P. (2019). *Statistical analysis of social science data (using SPSS)*. 2nd revised edition. Brno: Masaryk University. ISBN 978-80-210-9248-8.
- Smith, J., & Kemp, R. (2020). The role of training in environmental management: Enhancing performance through sustainability practices. *Human Resource Management Review*, 30(1), 100-113.
- Whitmarsh, L., & Capstick, S. (2018). Perceptions of climate change and willingness to save energy related to flood experience. *Nature Climate Change*, 8(9), 645-649.
- Yang, D., Wang, A. X., Zhou, K. Z., & Jiang, W. (2019). Environmental strategy, institutional force, and innovation capability: A managerial cognition perspective. *Journal of Business Ethics*, 159, 1147-1161.
- Zhang, Y., & Li, H. (2023). Partnerships and sustainable technology development: Sharing costs and risks. *Journal of Sustainable Innovation*, 5(1), 88-102.
- Zheng, S., Kahn, M. E., Sun, W., & Luo, D. (2020). Incentives for China's urban mayors to mitigate pollution externalities: The role of the central government and public environmentalism. *Regional Science and Urban Economics*, 83, 103-483.