

**Petr David, Hana Vránová (eds.)**

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## PEFnet 2023

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# OPEN SOURCE COMPLIANCE IN SMART HOMES: A STUDY OF FOSSOLOGY AND SPDX

Ashish Bakshi<sup>1</sup>, Andreas Kotulla<sup>2</sup>, Oldřich Faldík<sup>1</sup>, Oldřich Trenz<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

<sup>2</sup>*Bitsea GmbH, Sankt Augustin, Germany*

## KEY WORDS

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Smart Homes, FOSSology, SPDX (Software Package Data Exchange)

## JEL CODES

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L8, O3

## 1 INTRODUCTION

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Smart Homes refer to interconnected systems enhancing living spaces through automation, optimizing comfort, security, and energy efficiency [1]. This domain often relies on extensive software stacks, leveraging open-source code for improved productivity, cost-efficiency, and quicker market releases. However, the heavy reliance on open-source components introduces risks such as security vulnerabilities [2] and potential legal challenges due to license non-compliance. Infringements can lead to legal disputes,

financial penalties, security issues for consumers, and even withdrawal of products from the market [3]. To this end, our research paper aims to provide

- The effectiveness and limitations of FOSSology and the Software Package Data Exchange (SPDX) in addressing open-source compliance issues in the smart homes ecosystem.
- How can developers and manufacturers ensure comprehensive open-source license compliance in the smart home ecosystem?

## 2 MATERIAL AND METHODS

---

We chose the Home Assistant Operating System from GitHub (<https://github.com/home-assistant/operating-system>) for its popularity and integrated tech suite, aiming to evaluate its open-source license compliance and pinpoint any inconsistencies. FOSSology Analysis: Using FOSSology [4], an open-source compliance toolkit, we conducted license, copyright, and export control scans on the Home

Assistant Operating System's codebase. The toolkit evaluated each file and cataloged licensing data. SPDX Report: Post-scan, we compiled the findings into a Software Package Data Exchange (SPDX) report [5]. This standardized format offers a clear, unified view of software licensing, with our report presenting a comprehensive Bill of Materials (BOM) based on the FOSSology findings.

### 3 RESULTS

A scan was conducted on the Home Assistant repository using FOSSology version 4.2.1.5. Subsequently, an SPDX report was generated, offering the following insights: Package Information: Name, Version, and Supplier: Specific details of each software package/component. Checksum: Either SHA1 or SHA256 for the package. URL: Direct source link for the package. License Information: Declared licenses for the package and their respective locations. The primary license identified for the repository was

“Apache License Version 2.0”. Notably, a stricter license, “GPL”, was associated with the package “PulseAudio” during the scan.

Additionally, a manual review was performed to validate the findings of the automated analysis. Relationships: Information about the relationship between various components or files. For example, one package may be a dependency of another, or a file might be generated from another file.

```

FileName: operating-system-dev.zip/operating-system-dev/buildroot-external/rootfs-overlay/etc/dbus-1/system.d/pulseaudio-system.conf
SPDXID: SPDXID-1000000
FileChecksum: SHA1: 1a569742123bc15a467c09e05cd3333e8d8639
FileChecksum: SHA256: 4c6bca85de3a7608916e0349cd1f9b9a338f887f5ea1aa51680d51c61828b5
FileChecksum: MD5: 7232eb8c85d9d27e24bd9d6d82b2884
LicenseConclInfo: NOASSERTION
LicenseInfoFile: LGPL-2.1+
FileCopyrightText: NOASSERTION

```

Fig. 1: SPDX Report showing licenses and its associated file

### 4 CONCLUSIONS

Upon analyzing the Home Assistant version 11.0 with FOSSology version 4.2.1.5 and generating an SPDX report, we have derived the following insights: The repository primarily operates under the “Apache License Version 2.0”. A more stringent “GPL” license was identified in the “PulseAudio” package. The integration of tools like FOSSology into the CI/CD toolchain allows for real-time license detection. This immediate feedback can prompt developers to consult legal teams or implement fixes, streamlining

the development process and minimizing potential costs. Both FOSSology and SPDX offer a comprehensive view of open-source compliance analysis. While there are other tools available; commercial options like BlackDuck and Reverera, and open-source alternatives such as ORT (oss-review-toolkit) and ScanCode. In future studies, we intend to explore and compare other freely available tools to further enhance our understanding of open-source compliance.

### 5 REFERENCES

- [1] M.R. ALAM, M.B.I. REAZ, M.A.M. ALI. *A review of smart homes - past, present, and future* (2012); IEEE, <https://ieeexplore.ieee.org/document/6177682>.
- [2] KARIM R. LAKHANI, ROBERT G. WOLF. *Why hackers do what they do: understanding motivation and effort in free/open source software projects* (2005), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=443040](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=443040).
- [3] BALTES S., DIEHL S. *Usage and attribution of stack overflow code snippets in github projects* (2019); <https://www.doi.org/10.1007/s10664-018-9650-5>
- [4] ROBERT GOBEILLE. *The fossology project* (2008); ACM; <https://dl.acm.org/doi/10.1145/1370750.1370763>
- [5] F. MANCINELLI, J. BOENDER, R. DI COSMO, J. VOUILLON, B. DURAK, X. LEROY, R. TREINEN. (2006); *Managing the complexity of large free and open source package based software distributions*; <https://www.scopus.com/record/display.uri?eid=2-s2.0-34547484783&origin=inward&txGid=f2c5c22f6004fed6133c4cb1b47855bf>

# CLICKING WITH THE EYES: PUPILLOMETRY IN THE RESEARCH OF ONLINE NATIVE ADS BANNER HEADLINE PREFERENCES

Bilguun Bayarmagnai<sup>1</sup>, Stanislav Mokrý<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

---

pupillometry, marketing, native advertising, eye-tracking

## JEL CODES

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M31, M37

## 1 INTRODUCTION

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The pupil is a fundamental component of the human eye. Located at the centre of the iris, the pupil acts as an aperture, regulating the amount of light entering the eye. Proper pupil function is crucial for maintaining visual acuity, allowing us to perceive the world with clarity and detail. Pupillometry is the science of measuring pupil diameter in response to various stimuli. Iris dilator muscle causes pupil dilation. This phenomenon is called mydriasis. The opposite of mydriasis is miosis, which happens when muscles around the pupil tighten. A dark environment, fear, excitement or cognitive load can commonly cause a change in pupil diameter [1]. To measure this, an eye-tracker device, which emits infrared light captured by a camera or sensor, is used, creating an image that allows software to calculate the pupil's pixel count. The first pupillometer, along with its initial measurements, originated in the 1950s [2]. Since then, there have been significant advancements

in the technology and analysis methods used in pupillary measurements, leading to a diversification in its applications. This technology is getting more low-cost and may be integrated into our displays [3]. Eye-tracker captures visual perspective directly from the user's point of view. Providing valuable insights into the user's experience. This information helps in developing competitive and innovative products [4].

In this study, we utilized data from an eye-tracking experiment involving 100 participants, focusing on four native advertising ads. Initially, participants were required to decide which native ads article was most appealing based on the banner headline, and then open the selected articles in a new web browser window by clicking on them. We used an eye-tracker to record both gaze data and pupil size reactions. This paper primarily concentrates on analyzing pupil reactions in relation to the banner headline text of the selected articles.

## 2 MATERIAL AND METHODS

---

In the experiment, we utilized the Eye-Link 1000 Plus eye-tracking device to measure eye activity and pupil dilation. Participants were presented with four hed-

line text presented on the Seznam.cz web portal, with the order of the headline being randomly generated. Our objective is to determine whether a relationship

exists between headline preference, indicated by the initial mouse click, and the pupil's reaction. For our dataset, we used data extracted from interest areas representing the text headlines of articles. Each area included information about the Average Pupil Size, calculated in arbitrary units (pixels). A series

of ANOVA tests was used to compare participants' pupil sizes across different text prompts, determining whether there are statistically significant differences in reactions to different prompts. A proportion test then assessed whether article selection was random or in conjunction with pupil reactions to the prompts.

### 3 RESULTS

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To examine the relationship between changes in pupil size and preference in the selection of linked articles, we conducted a series of ANOVA tests. First, we tested whether pupil size differed between the four text prompts. According to the  $p$ -value of 0.9261, there is no significant difference in pupil size across all headline selections. We then tested differences in pupil size individually for groups of participants who selected (and clicked on) identical items. All four ANOVA tests conducted indicate that there are no statistically significant differences in the average pupil sizes of participants responding to different headlines ( $p$ -values: 1\_headline = 0.998, 2\_headline

= 0.972, 3\_headline = 0.903, 4\_headline = 0.988). This suggests that none of the headlines elicited a stronger response in terms of larger pupils than the others. Therefore, the results do not support the hypothesis that the type of headline influences participants' pupil size. The proportion test was conducted to assess whether the headline chosen most frequently corresponded with the one associated with the largest average pupil size. With a  $p$ -value of 0.1097, the test did not provide sufficient evidence to conclude that the article selection corresponds to the largest pupil size measured on article.

### 4 CONCLUSIONS

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The lack of significant findings in our study could be attributed to various factors. Measuring pupil reactions alongside article headline selection might have introduced complexity, as both cognitive and decision-making processes influence article choice. Additionally, testing four different areas of interest within a single stimulus could lead to divided attention among participants, possibly overshadowing the

influence of headline order or pupil size reactions. The diverse content of the headline texts might also elicit varied levels of interest or engagement, further complicating the interpretation of results. These considerations suggest that multiple influences could be at play in participants' responses and physiological measurements, making it challenging to isolate the effects of interest in this study.

### 5 REFERENCES

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- [1] SEBASTIAAN MATHOT, Pupillometry: Psychology, Physiology, and Function. *Journal of Cognition* vol. 1 (2018), article 16.
- [2] IRENE E. LOEWENFELD, *THE PUPIL: ANATOMY, PHYSIOLOGY, AND CLINICAL APPLICATIONS* (1999), first page–last page.
- [3] PER BÆKGAARD, SHAHRAM JALALINIYA, JOHN PAULIN HANSEN, Pupillary measurement during an assembly task. *Journal Human Factors in Technology and Society* vol. 75 (2019), 99-107
- [4] SOUSSAN DJAMASBI, Eye Tracking and Web Experience. *AIS Transactions on Human-Computer Interaction* vol. 16 (2014), 37-54

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# QUANTITATIVE AND QUALITATIVE ANALYSIS OF THE DEVELOPMENT OF NON-FINANCIAL INFORMATION IN THE CZECH REPUBLIC

Soňa Bieliková<sup>1</sup>, Anna Danihelová<sup>1</sup>, Klára Klíčnicková<sup>1</sup>, Edita Komárková<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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non-financial reporting, sustainability, ESG, environment, social, governance

## JEL CODES

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M41, M40, M48, Q56

## 1 INTRODUCTION

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The paper deals with the assessment of the level of reporting of non-financial information in the Czech Republic. The paper focuses on the evaluation of the quantity and quality of information reported by the ten largest Czech companies according to the Coface database (2022). Reporting of non-financial information became mandatory for selected companies under Directive 2014/95/EU, in 2017. This directive was replaced, in 2022, by Directive 2022/2464/EU, under which the obligation to report

non-financial information is going to be extended to other companies in three phases, starting in 2024. The aim of implementing this directive is to achieve transparency, providing relevant information about environmental, social, governance and management issues to all stakeholders, while eliminating the associated threats. The aim of this paper is to assess the trend in the reporting of non-financial information and its quality over the last years.

## 2 MATERIAL AND METHODS

---

In a situation where there is not yet a unified standard for sustainability reporting (reporting of non-financial information) in 2023, an analysis was made in particular of annual reports (or reports potentially containing non-financial information). The analysis evaluates the 10 largest companies operating in the Czech Republic, which were selected on the basis of the Coface database (2022). In the first phase, a quantitative analysis was carried out on the basis of a conceptual content analysis. 30 annual reports (2017, 2019 and 2021), nine keywords and

their equivalents were analysed. The second phase focused on qualitative analysis. The level of reporting of this information was evaluated in five areas of non-financial reporting based on a 0–2 point scale. A value of zero indicated no reporting in this area, a value of two indicated more sophisticated reporting. In the third stage, information on turnover, assets and number of employees were identified for each company for the year 2021. Thereafter, potential linkages in relation to reporting were identified.

### 3 RESULTS

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The output of the quantitative analysis shows a clear increasing trend in the occurrence of the keywords over the years. At the same time, however, no correlation was found between the criteria defining the size of the company and the number of words reported. The output of the qualitative analysis shows that the monitored companies are reporting better quality information over the years. Also, in the case of the qualitative analysis, there is no clear

correlation between the criteria defining the size of the enterprise and the quality of the information reported. However, it was also found that companies with a higher number of employees tend to report better quality information. The data analysis also revealed that there are large differences in the reporting of non-financial information between the analysed companies, which is also due to the different sectors within which the companies operate.

### 4 CONCLUSIONS

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The reporting of non-financial information was found to be on an increasing trend over the years. Of the areas observed – environment, social issues, employees, respect for human rights and the fight against

corruption and bribery – the environment is the most well reported, particularly under the criterion of reducing negative impacts on the environment.

### 5 REFERENCES

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- [1] DARNALL, N., et al. Do ESG reporting guidelines and verifications enhance firms' information disclosure? *Corporate Social Responsibility and Environmental Management*. 2022 [online] p. 1214-1230. Available at: <https://onlinelibrary.wiley.com/doi/epdf/10.1002/csr.2265>.
- [2] LENOX, M. J. and NASH, J. Industry self-regulation and adverse selection: A comparison across four trade association programs. In: *Business Strategy and the Environment*, 2003, p. 343-356 [online]. Available at: <https://onlinelibrary.wiley.com/doi/10.1002/bse.380>.
- [3] MINUTIELLO, V. and TETTAMANZI, P. The quality of nonfinancial voluntary disclosure: A systematic literature network analysis on sustainability reporting and integrated reporting. In: *Corporate Social Responsibility and Environmental Management*, 2021, p. 1-18. [online]. Available at: <https://doi.org/10.1002/csr.2195>.
- [4] Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting (Text with EEA relevance). In: *Official Journal*, L 322, 16.12.2022, p. 15-80. Available at: <http://data.europa.eu/eli/dir/2022/2464/oj>.
- [5] Directive 2014/95/EU of the European Parliament and of the Council of 22 October 2014 amending Directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups Text with EEA relevance. In: *Official Journal*, L 330, 15.11.2014, p. 1-9. Available at: <http://data.europa.eu/eli/dir/2014/95/oj>.

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# INEQUALITIES ON THE LABOUR MARKET IN THE AGE OF DIGITALIZATION

Zuzana Cagánová<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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Digital transformation, labour market, inequalities

## JEL CODES

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M14, M15, M19

## 1 INTRODUCTION

---

The current period represents a digital revolution with significant implications for the nature of work as well as for society. Digitalisation and artificial intelligence are significantly changing the labour market. Professions that involve repetitive and routine tasks like data entry or work on an assembly line, are more susceptible to automation through artificial intelligence (Seokoma, 2023). Artificial intelligence is not only a threat to the low-skilled workforce, but also has the potential to automate certain tasks that are currently performed by professionals. Professions requiring more complex and creative tasks may be less at risk, but experts warn that

these professions will require active collaboration with artificial intelligence (Pennington, 2022). For that reason, it is important to develop digital skills and critical thinking. Digitalisation has both positive and negative impacts, and it is therefore essential effectively harness the benefits and minimise the negatives (Mok and Zinkula, 2023). Experts predict that the use of AI in a larger scale will bring up to \$15.7 trillion dollars to the global economy by 2030. As artificial intelligence changes the way how (human) societies operate, is expected that it will also change who does the work.

## 2 MATERIAL AND METHODS

---

For achieving the stated aim of the paper will be used domestic and foreign literature, research papers and online academic journals, quantitative research in questionnaire form and semi-structured interviews with managers of selected companies who are actively engaged in digital transformation in their home companies.

The aim of the paper is to design and prepare a self-assessment questionnaire for some concrete company to find out what are its weaknesses in the field of digital transformation. Quantitative

data will be obtained by analysing the quantitative research already conducted in the questionnaire form. The survey was targeted on Slovak micro, small and medium-sized enterprises. Data collection was conducted online via the structured questionnaire in February 2023 and there were involved a total of 517 subjects. The target group was consisted from owners, directors and managers of these enterprises with no more than 250 employees.

Qualitative data will be obtained by using the method of semi-structured interviews, where will be

approached and interviewed experts who deal with digital transformation. Experts like managers of a consulting company dedicated to digital transformation, directors of selected enterprises, experts at

the Ministry of Informatization, who had prepared the strategy and action plan for the digital transformation in Slovakia. The qualitative data will be processed by Altas.ti or Maxqda programme.

### 3 RESULTS

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The output of the paper will be the self-assessment questionnaire for the concrete company to find out what are its weaknesses in the area of the digital transformation. Based on the results of the questionnaire, the company will use the proposed set of recommendations, presenting specific practices

and steps that will help the company improve preparation and successfully managing of the digital transformation. We anticipate that the set of actions will be consisted from 30 recommendations divided into 6 areas.

### 4 CONCLUSIONS

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The aim of the paper is to present and describe in more detail way how some company can prepare itself for the digital transformation and manage it. So that

it will not be a scarecrow for the company, but an opportunity to be more competitive on the market.

### 5 REFERENCES

---

- [1] COST Action. (2022). *Work inequalities in later life redefined by digitalization (DIGI-net)* [online]. 2022. Available at: <https://www.cost.eu/actions/CA21107/>
- [2] MOK A., ZINKULA J. (2023). ChatGPT may be coming for our jobs. Here are the 10 roles that AI is most likely to replace, *Business Insider* [online]. 2023. Available at: <https://www.businessinsider.com/chatgpt-jobs-at-risk-replacement-artificial-intelligence-ai-labor-trends-2023-02>
- [3] PENNINGTON, A. (2022) *AI's Threat to Jobs Might Be Real ... But There's Actually Value in Just Being Human* [online]. 2022. Available at: <https://amplify.nabshow.com/articles/ic-ais-threat-to-jobs-may-be-real-but-finally-theres-value-in-just-being-human/>
- [4] SEOKOMA M. (2023). *The Impact of Artificial Intelligence on the Job Market: Is AI a Threat to Professionals* [online]. 2023. Available at: <https://www.linkedin.com/pulse/impact-artificial-intelligence-job-market-ai-threat-mphashe-seokoma>

# ECONOMIC IMPACT OF THE FAST FASHION SECTOR ON THE GERMAN CLOTHING MARKET: AN ANALYSIS

Jan Peter Danz<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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Economics, Economic Development, Business Economics

## JEL CODES

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M10, M20

## 1 INTRODUCTION

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In the German clothing market, various developments in terms of structures and orientations can be seen due to many external and internal influences. Market movements can be observed, which are increasingly becoming apparent through the formation of various specializations. These focuses are characterized in extremely different and diverse areas.

A very current example of such developments is the “fast fashion” industry. This area of the clothing industry is characterized by various features. The term “fast fashion” describes a business model in the clothing industry in which collections are designed very quickly in line with trends and are produced and sold at very low prices. This industry is characterized by quick and short-term action. In contrast to a previously “normal” collection cycle, which basically consisted of spring/summer and fall/winter cycles, in the area of fast fashion it is normal to produce

new collections in a weekly or monthly rhythm. The customer should not get the feeling that they have already seen a piece of clothing on sale before and feel that they are being addressed in a new way at any time by low prices and new goods. These facts should encourage them to buy and therefore generate sales in this industry segment. The market in the clothing industry is thereby accelerated in its actions.

This system is largely followed by very large and well-known clothing companies. Their strategy often involves copying luxury brands and thereby setting new trends. This is a point that often makes these companies very popular with customers.

These developments make it obvious that economic parts of the German clothing market are being heavily influenced. This will be explored in more detail here and is very important for this industry segment.

## 2 MATERIAL AND METHODS

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The research question of the study is: “What economic impact does the fast fashion sector have on the German clothing market?”. To answer the research question of this research work, various methods are used here.

In order to better focus and define the term “economic impact”, Michael E. Porter’s “Five Forces” model should be used. In principle, an industry structure analysis should be carried out to show the possible effects. Using the Porter’s Five Forces

model, the investigation focuses on the following areas: “Competitive rivalry”, “Threat of substitute products”, “Bargaining power of suppliers”, “Bargaining power of customers” and “Threat of new entrants”. In these areas, economic elements such as market demand, market supply, corporate policy, trade policy, globalization, labor market and tax policy should also be included. Since the German clothing industry is one of the largest German consumer goods industries, the B2C area is also at the forefront of research.

The research in this work focuses on two surveys. One survey is to be addressed to companies in the German clothing market. The aim of this survey is to research how the companies are developing in relation to the defined elements and how these are changing. These developments are then researched both in terms of the current status and in relation to current handling and, if necessary, future changes.

### 3 RESULTS

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In addition to very well-structured explanations, the results of the research related to this topic should also be presented in various drawings and diagrams. It is important to work in a structured manner and to proceed with a clear scheme. The results should then be presented according to the different areas of the

The second survey is aimed at customers in the German clothing industry and is intended to show the research from a different perspective.

In addition to the two surveys in the German clothing industry, interviews with experts and visits to trade fairs and congresses are also planned, where experts can be interviewed about these topics. Current literature sources that deal with this topic are also important for research.

In addition, the research that is taking place in relation to the economic areas described should also find out how the fast fashion sector deals with the two points “production conditions” and “environmental conditions”. These areas are often in focus in the fast fashion industry and should be given special consideration. MAXQDA should be used to analyze the researched data. If necessary, you can include connection analyses, regression analyzes or interaction analyses.

### 4 CONCLUSIONS

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After showing the results into which the economic impacts of this work were divided, it is now important to show here what conclusions these lead to. The aim

defined economic model. It can be assumed that the economic impact of the fast fashion sector will tend to become more important in the future and that it will therefore become more and more specialized in the market and in relation to customers.

### 5 REFERENCES

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- ABDELMEGUID, AYA et al (2022). Investigating the challenges of applying the principles of the circular economy in the fashion industry: A systematic review. *Sustainable Production and Consumption* 32, p.505-518, doi.org/10.1016/j.spc.2022.05.009
- BOCKHOLDT, KATRIN et al (2020). Private label shoppers between fast fashion trends and status symbolism – A customer characteristics investigation. *Journal of Retailing and Consumer Services* Volume 52, doi.org/10.1016/j.jretconser.2019.07.008

is to create a connection between the results in the individual areas. It is also possible to derive future developments and limit them.

- CENTOBELLI, PIERA et al (2022). Slowing the fast fashion industry: an all-round perspective. *Current Opinion in Green and Sustainable Chemistry* 2022, 38:100684, p.1-9, doi.org/10.1016/j.cogsc.2022.100684

# ENHANCING MARKET VALUE ESTIMATION FOR PRIVATELY HELD COMPANIES: DIFFERENTIATED MULTIPLIERS IN THE CZECH BREWING INDUSTRY

Michal Drábek<sup>1</sup>, Pavel Syrovátka<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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privately held company, valuation, industry multiplier, differentiated multipliers, Czech breweries valuation

## JEL CODES

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G12, G32

## 1 INTRODUCTION

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In this paper, we advance the development of a methodology aimed at deriving differentiated multipliers tailored for private company valuations by Drábek and Syrovátka (2022). Our focus is on utilizing publicly available data concerning industry multipliers sourced from publicly traded companies. While an aggregate (industry) multiplier, whether represented as an industry average or median, imparts valuable valuation insights for a given industry, it may not accurately capture the intricacies of a

specific privately held company (Chen et al., 2015). Hence, this paper proceeds to refine differentiated estimates of valuation multipliers designed for private companies within a targeted industry. The unique financial attributes of the subject company are employed to differentiate these multiplier estimates. The primary aim of this differentiation lies in achieving reduced deviations in the valuation of the particular company, compared to using the standard industry multiplier in its average or median form.

## 2 MATERIAL AND METHODS

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The analyzed sample consists of the fifty most important enterprises (according to the sum of sales) with a turnover of more than 99% of the relevant market. The data include financial reports (P&L, balance sheet, annual report) for the 2015–2020 period. For the market value assessment, the discounted cash flow method is used (the procedure according to Damodaran, 2012).

Based on the collected financial data, we first computed the industry P/BV multiplier in two forms.

We distinguished the aggregate industry level and industry median. In order to align the industry multiplier more closely with the economic reality of the evaluated brewing company, the initial industry multipliers underwent a transformation, resulting in the emergence of differentiated multipliers.

To assess the effectiveness of the differentiation approach, we compare the differentiated multipliers with the undifferentiated multipliers both in relation to the actual P/BV multiplier of each brewery

(for both years 2019 and 2020). This allows us to measure the extent of deviation between the differentiated and undifferentiated estimations. We

use the absolute value of the relative deviation as the evaluation metric for both the industry median and the aggregated industry multiplier.

### 3 RESULTS

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When analyzing the data for individual companies, we observed significant differences between the majority of medium and small breweries (44 in total) and the top 6 breweries in the industry under investigation and divided the sample according to size and also profitability (due to a going concern premise).

We calculate the differentiated and undifferentiated P/BV ratios based on the industry median and the aggregate P/EAT ratios for each brewery. Afterwards we computed the ARDs between these multipliers and the actual P/BV ratios for individual companies.

Differential valuation does not consistently provide more accurate estimates of companies' market value in all cases, but for the core sample (small profitable breweries) the differentiation leads to more accurate results.

The results indicate a refinement ranging from approximately 44% to 50% for both studied years. This refinement is almost comparable between the full and reduced samples of profitable SME companies. On an aggregate basis of industry multiplier, the refinement rate is 27.77% in 2019 and 22.15% in 2020 for the reduced sample of profitable SME companies. However, when the top 6 companies are included, the refinement rate increases significantly to 75-78%.

### 4 CONCLUSIONS

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Our research demonstrates that implementing a differentiated approach to assess a company's market value using industry multipliers significantly enhances the accuracy of the estimate. The improvement ranges from 40% to 50% when using the median

industry multiplier and approximately 22% to 78% when using the aggregate industry multiplier. We believe this contribution is of great significance to all involved in the methodological and practical aspects of business valuation.

### 5 REFERENCES

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- [1] CHEN, L. et al., 2015. Risk, illiquidity or marketability: What matters for the discounts on private equity placements? *Journal of Banking & Finance* 57 (1), 41-50. DOI: <https://doi.org/10.1016/j.jbankfin.2015.03.009>.
- [2] DAMODARAN, A., 2012. *Investment valuation: Tools and techniques for determining the value of any asset*. Hoboken, New Jersey: Wiley, ISBN 978-1-118-01152-2.
- [3] DRÁBEK, M., and P. SYROVÁTKA, 2022. Differentiated Estimates of Valuation Multipliers based on Price-to-Book Ratio for the Czech Brewing Industry. *Acta Univ. Agric. Silvic. Mendel. Brun.*, 70(3), 131-145. DOI: [10.11118/actaun.2022.011](https://doi.org/10.11118/actaun.2022.011).

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# ACTUAL CHALLENGES IN FOOD SECURITY: THE CASE OF UKRAINE

Oksana Dubanych<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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food bank, food waste, sustainability, supply chain, food security

## JEL CODES

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O13, Q18

## 1 INTRODUCTION

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The aim of this article is to present the problem of food waste with a particular emphasis on the social aspect of the problem. Food occupies a special place among human needs. Every day a considerable amount of food is wasted, i.e. the food is treated as waste, while still being ideally suited for consumption. Food waste is an environmental and ethical problem as well as an economic and social issue. This article will be presented you the issues of food banks and food chains and to evaluate the key financial criteria for the effective creation of a network of food banks in Ukraine, as part of it post-war reconstruction. [5], [6].

The problematic framework of the activity of food banks in the European area can be identified primarily in a wide range of areas for managerial solutions, which include, on the one hand, the financing of this type of activity with regard to the necessity of compliance with hygiene regulations. food donation standards (e.g. [1], [2], [3]). Although food is provided to these banks free of charge, their operation depends on subsidies from the state budget.

Specifically, these are operating and investment subsidies, especially from the budget chapter of the Ministry of Agriculture of the Czech Republic [4].

## 2 MATERIAL AND METHODS

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In order to properly analyze the financial situation of food banks in Ukraine (and rather the price development of individual foods), in the first Order of magnitude I selected characteristics by which I will be able to assess the current situation of food security. The chosen indicators are the purchasing power parity of Ukraine and the Visegrad Group, as well as Du Pont's breakdown of the return on equity of Ukraine's food business. All necessary data for

calculating profitability are drawn from the ORBIS database.

Enterprises of the Ukrainian food sector at first were divided into three groups: very large companies, large and medium. With the help of such a distribution was easily obtained financial indicators from systems of proportional indicators. The development of profitability over time and the most affecting components will be studied in the period before year 2022.

### 3 RESULTS

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Monitoring the decomposition of profitability of equity will help to assess the financial situation of enterprises in the Ukrainian food sector. It will also be shown the issue of price developments of economically largest enterprises (e.g. very large enterprises), which set a fairly high price and are not limited by legislation.

The current protracted energy crisis, influenced by the military conflict in Ukraine, causes a further increase in the number of clients in material need. These people then turn to food banks again. These factors affect the need for additional sources of funding for food banks, but also the growing need for voluntary work.

### 4 CONCLUSIONS

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Current situation in financial support for ensuring the activities of food banks from the government authorities is overall stabilized, but there exist a growing effort to change the funding scheme for food banks in countries like the Czech Republic. In Ukraine situation is absolutely different. Today, when Ukraine is in a war conflict, it is even more evident that the Ukrainian system of food banks works thanks to volunteer help and donations.

The first food bank has already been created in Ukraine, which operates on a volunteer basis in Lviv. Products are purchased for charitable contributions and given out free of charge to needy city dwellers or delivered to war zones. Despite formal statements

and reports about the poverty of the Ukrainian population, society supported the majority of the needy, not resorting to coordinating its charitable activities at the level of European food banks. In the conditions of war, the bridge between the concepts of “one who needs help” and “needy” falls very quickly, so anyone can find themselves among this category of the population. Therefore, business in cooperation with volunteers and the state can and probably should organize food banks in Ukraine according to the principles that have already proven their effectiveness in the European countries. (for example, the Czech Republic, Hungary, Slovakia or Poland). [7]

### 5 REFERENCES

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- [1] GRACJASZ, A., GRASSENI, C. Food-gifting in Gdańsk: between food not bombs and the food bank. *Ethnologia Polona*, 41, (2020), 33–50.
- [2] NIKOLOV, R. Waste Management Projections in Bulgaria, *Proceedings of Agribusiness And Rural Areas - Economy, Innovation And Growth 2021*, Yogyakarta, August 25-26th, 2021.
- [3] PETROVICI, D. A., GORTON, M. An evaluation of the importance of subsistence food production for assessments of poverty and policy targeting. *Food Policy*, 30(2), (2005), 205–223.
- [4] Ministry of Agriculture. *Ministerstvo zemědělství podporuje a i nadále bude podporovat potravinové banky. Ještě letos se bude snažit o navýšení finanční podpory.* (©2019).
- [5] MIROSLAWA JANOŚ-KRESŁO, ANNA DĄBROWSKA. Marnowanie żywności jako problem społeczny. *Handel Wewnętrzny* 4:15-27, 2013.
- [6] WILEY ONLINE LIBRARY. *The War in Ukraine, Food Security and the Role for Europe.* 2023. [cit. 2023-10-20]. <https://onlinelibrary.wiley.com/doi/10.1111/1746-692X.12389>
- [7] Ukrajinsky tyzhden. *Prodovolcha bezpeka. Chomu Ukraini vzhe zaraz potribni banku yizhi.* 2023. [cit. 2023-10-20]. <https://tyzhden.ua/prodovolcha-bezpeka-chomu-ukraini-vzhe-zaraz-potribni-banky-izhi/>

# NAVIGATING UNCERTAINTY WITH BAYESIAN-ENHANCED MULTI-FACTOR MODELS IN ADAPTIVE ASSET PRICING

Michal Dufek<sup>1</sup>, Jiří Štastný<sup>1</sup>

<sup>1</sup>Mendel University in Brno, Czech Republic

## KEY WORDS

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bayesian inference, factor models, uncertainty

## JEL CODES

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C6, C11, C8

## 1 INTRODUCTION

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Multi-factor investment models are pivotal in the realm of asset pricing, offering insights into the dynamics of asset returns [1]. However, traditional multi-factor models often lack the ability to adapt to market regime changes and efficiently handle uncertainty [2]. This research paper introduces a sophisticated framework incorporating Bayesian feature selection, penalized linear models, Bayesian

neural networks, and Dynamic Model Averaging (DMA) [3]. This work fits into the broader context of Stochastic Optimal Control in Asset Pricing, which explores various methods for cross-sectional asset pricing under uncertainty, such as Bayesian approaches and advanced machine learning techniques like deep reinforcement learning using hierarchical graphs and graph attention networks [4].

## 2 MATERIAL AND METHODS

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The analysis employs a comprehensive dataset containing various financial factors like size, value, growth, momentum, and quality.

Upon feature selection, the framework employs penalized linear regression models, specifically LASSO, to further refine the model. The linear model serves as a simpler, interpretable baseline that captures the linear relations between selected factors and asset returns.

Upon feature selection, the framework employs penalized linear regression models, specifically LASSO,

to further refine the model. The linear model serves as a simpler, interpretable baseline that captures the linear relations between selected factors and asset returns.

For capturing non-linear dependencies, Bayesian neural networks are used. Unlike traditional neural networks, Bayesian neural networks offer posterior distributions over their parameters, providing a natural way to quantify uncertainty.

### 3 RESULTS

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Initial experiments indicate the Bayesian feature selection successfully identifies a reduced set of impactful factors. Subsequent models, both penalized linear and Bayesian neural networks, show improved prediction accuracy and out-of-sample robustness.

Furthermore, the DMA layer shows a considerable improvement in adapting to market regime changes, as evidenced by various financial metrics like the Sharpe ratio and maximum drawdown.

### 4 CONCLUSIONS

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This research contributes a novel, multilayered framework for multi-factor investment modeling that effectively handles dimensionality, captures both linear and non-linear relationships, and adapts to

market dynamics [3]. This work is part of a broader initiative on Stochastic Optimal Control in Asset Pricing, which aims to develop robust methods for asset pricing under uncertainty [4].

### 5 REFERENCES

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- [1] FAMA, E. F., FRENCH, K. R. Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics* 33, 1 (1993), 3–56.
- [2] ANG, A.: *Asset Management: A Systematic Approach to Factor Investing*. Oxford University Press, Oxford, 2014.
- [3] CARVALHO, C. M., POLSON, N. G., SCOTT, J. G.: The horseshoe estimator for sparse signals. *Biometrika* 97, 2 (2010), 465–480.
- [4] BERTSEKAS, D.: *Dynamic Programming and Optimal Control, Vol. II*. Athena Scientific, Belmont, MA, 2012.
- [5] SUTTON, R. S., BARTO, A. G.: *Reinforcement Learning: An Introduction*. MIT Press, Cambridge, MA, 2018.

# ANALYSIS OF FONT PROPERTIES BASED ON THE RELATIONSHIP BETWEEN RESOLUTION AND FONT GRADE

Aleš Ďurčanský<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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OCR, Font, Resolution, Analysis

## JEL CODES

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C60, C61, C63

## 1 INTRODUCTION

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The subject of the investigation was the analysis of the relationship between resolution and font grade in optical text recognition using freely available software. Sample data was compiled and tested. The analysis also addresses differences between and within font families, diacritical marks and other symbols depending on the settings of the software.

The aim of the investigation is to determine the recognition curve for selected cuts of single

letter families from the freely available TEX Gyre font family and to prepare detail reports of the percentage of matching of each tested sample of letter cuts with the sample data. The added value of this analysis is the ability to establish hypotheses about the behavior of specific cuts of given type families in the optical recognition of input samples and to confirm or refute them.

## 2 MATERIAL AND METHODS

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Optical Character Recognition (OCR) is a process that converts an image of text into a machine-readable format. For example, if you scan a form or a receipt, the computer saves the scan as an image file. You cannot use a word processor to edit, search, or count words in an image file. However, using OCR, we can convert an image into a text document with the content stored as text data.

The research was divided into determining a test sample of the input data, examining the individual font families, and then evaluating the resulting data.

Before starting the research on individual font families and their sections, a test sample of data had to be determined. This test sample was subsequently planted in all the letter families under investigation and the outputs projected in clear graphs.

### 3 RESULTS

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To plot the recognition curve based on the degree and resolution of the recognized text, data with the values of the percentage matches to the pattern for each cut of the font families that were analyzed were used. Rounding of no more than ten-hundredths of a percent was used in scaling each marker of the graph (percentage match values). The actual determination of the curve is oriented to divide the area of the graph into two parts. The part to the right of the curve represents cases where a pattern matching output above 90% is provided.

Here, there is a tolerance of at most one single case that may provide a worst-case matching result above 80%. The part to the left of the curve represents cases

where less than 90% matching was achieved with a tolerance of one occurrence of lower matching. If the values obtained cannot be used to divide the area of the graph so that the right-hand part achieves the described parameters, the curve is not determined.

It is these curves that present us with a representation of the degree-resolution relationship of the pi- sem, thanks to all the analysis performed. For example, the bold cut of the font Termes represents the most successful font in recognition. The Latin Modern basic cut achieved quite mediocre results compared to the others, and the Chorus font in its special medium italic cut proved to be a completely unsuitable font for OCR.

### 4 CONCLUSIONS

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ABBYY FineReader 15 was used for the research and proved to be the most suitable during my previous research. Testing the font families with this recognition tool provided a detailed overview of the recognizability of each reading sample. This overview of the recognizability of each cut of all the analyzed letter families is interpreted in the form of tables that show the percentage match to the pattern for each sample.

These tables were subsequently used as source information to generate graphs of text recognizability based on OCR grade and resolution. A recognizabil-

ity curve was then plotted in these graphs to divide the graph area into two parts. The part above the curve indicates cases of only high pattern matches.

The data obtained by testing the font families and the findings from the recognition comparisons can serve as a baseline for conducting further research on other font families or OCR software. Other situations arise that would be worthy of separate investigation. For example, the decomposition of capitalized accented characters into two output characters, or other output data whose exact origin could be clarified by further research.

### 5 REFERENCES

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- [1] RAVINA, M. SUPRIYA, I. NILAM, D.: Optical Character Recognition. *International Journal of Recent Technology and Engineering* vol., 2 (2013), 64–71.
- [2] GUST: Polska Grupa Użytkowników Systemu TeX.: *e-foundry: what's this?* vol. 1 (2014)
- [3] TAYLOR, KELSEY: *Best Open Source OCR Tools and Software*. <https://www.hitechnectar.com/blogs/open-source-ocr-tools/>, 2022.

# PROFITABILITY OF INSURANCE COMPANIES DEPENDING ON THE QUALITY OF THE INSTITUTIONAL ENVIRONMENT

Jan Dvořáček<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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Institutional environment, profitability, ROE, Insurance, financial analysis, insurance industry

## JEL CODES

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B5, B25, C10, C33, G22

## 1 INTRODUCTION

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In recent years, new trends have emerged in the insurance industry that are affecting the profitability of insurance companies. One of these trends is the changing quality of the institutional environment. (Tallman & Li, 1996), (Alesina et al., 1996) It also determines the amount of risk that economic agents take in their business in a given country. (Chien-Chiang Lee & Chun-Wei Lin, 2016), (Venard &

Hanaffi, 2008) We will focus on the impact of the quality of the institutional environment in the areas of the quality of the judiciary, the level of the tax burden, corruption, the degree of financial freedom and the enforceability of property rights in a given country. With this focus, we will add new insights to existing studies on a similar topic.

## 2 MATERIAL AND METHODS

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The dataset that will be used for the analysis consists of data for the time period 2009–2018 and covers 13 865 insurers from the European Union and the United States of America.

The data concerning the institutional environment was obtained from the official website of the Heritage Foundation. Microeconomic data was obtained from the database Orbis. All data have an annual frequency in cross-sectional and time-series data format,

where panel data was subsequently created. For the microeconomic data, the indicators were created. In addition, the variable Growth in premiums received was adjusted for outliers below the 10th and above the 90th percentile. The problem of skewness and peakedness was addressed by logarithmizing the Total Assets variable due to the acquisition of high values. The indices relating to the institutional environment were retained in their original form.

## 3 RESULTS

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Based on the empirical analysis, it was found that only some determinants that are specific to insurance companies and only one indicator of the institutional environment have a statistically significant effect on

the profitability of insurance companies as the dependent variable. More specifically, if we talk about microeconomic indicators, statistical significance was found for underwriting profits, growth in premiums

received and partially for investment performance. An interesting finding was that investment performance for insurance companies is only a kind of ancillary income, therefore this determinant is not statistically significant at the 1% significance level. Further, that total assets are not statistically significant, probably because a large insurance company does not have a significant comparative advantage (in the insurance industry) over a small one. With the successive addition of indices representing the institutional environment, the assumed signs were confirmed, but statistical significance was shown only for the judiciary index. For the microeconomic specifications of insurance companies in each model with the institutional environment indices, slight differences were observed for statistical significance, but the expected signs were again confirmed.

After splitting into groups of smaller, larger insurers and adding the individual indices, relatively large changes in the statistical significance of the microeconomic specifications for an insurer were observed. In any case, among the group of

variables specifying the quality of the institutional environment, only the quality of the judicial system had a demonstrable effect on the profitability of the insurance companies we studied. When the two models taking into account the judicial system index were analyzed in more detail, differences in the significance of the microeconomic variables with respect to the dependent variable were observed. In the case of smaller insurers, the judicial index appears to be insignificant for the insurers we studied because smaller insurers tend to operate in smaller specific regions where the index has the same level. Therefore, it is critical for an insurer to make underwriting profits and grow premiums received to cover as much of this market as possible.

In contrast, for larger insurers, the main determinants of profitability are the quality of the institutional environment in the justice sector (good law enforcement, quick and fair court decisions, low levels of corruption in the judiciary, etc.) and investment performance.

## 4 CONCLUSIONS

Based on the literature, theoretical assumptions, and empirical analysis, the quality of the institutional environment in the justice sector was generally found to have a significant effect on the profitability of insurance companies from the European Union and the United States. This finding is consistent with hypothesis H1. As for the other areas of institutional environment quality, they were not found to have an effect on the insurance companies we studied. Among other things, a relatively stable significant effect of underwriting profit, growth in premiums received and an already less stable effect of investment perfor-

mance on the profitability of insurance institutions were found.

Larger insurers should operate primarily in states with highly efficient court systems, and focus on investment performance, since according to the results of this paper, these two factors are key to making a profit. In the case of small insurers, their opportunities for risk diversification are not as great, as they mostly operate in a small specific region where the quality of the judicial system is the same everywhere. For this reason, these smaller insurers should focus primarily on underwriting profits and growth in premiums received.

## 5 REFERENCES

- TALLMAN, STEPHEN, JIATAO LI., 1996 Effects of International Diversity and Product Diversity on the Performance of Multinational Firms. *Academy of Management Journal*, <https://doi.org/10.5465/256635>
- ALESINA, A., ÖZLER, S., ROUBINI, N. et al., 1996, Political instability and economic growth. *J Econ Growth*, <https://doi.org/10.1007/BF00138862>
- CHIEN-CHIANG LEE, CHUN-WEI LIN, 2016, Globalization, political institutions, financial liberalization, and performance of the insurance industry, *The North American Journal of Economics and Finance*, Volume 36, <https://doi.org/10.1016/j.najef.2016.01.007>
- VENARD, B., HANAFI, M., 2008, Organizational Isomorphism and Corruption in Financial Institutions: Empirical Research in Emerging Countries. *J Bus Ethics* 81, <https://doi.org/10.1007/s10551-007-9519-9>

# EVALUATION OF THE TRANSPORT EFFICIENCY IN SOUTH MORAVIAN REGION

Nino Gochitidze<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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Transport, South Moravian Region, Efficiency, DEA

## JEL CODES

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C44, R40, L91

## 1 INTRODUCTION

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The presented paper discusses the possibility of applying the DEA methodology for determining the efficiency of South Moravian residents' movements. In recent years, there has been a considerable growth in the number of passengers transported among regions. Based on the latest data, transported passengers among regions have increased from 118 to 740 million passenger kilometers during the period 2004–2022. Along with the increase in the flow of passengers, the standards for efficiency evaluation also change. Hence, it is necessary to take innovative

measures to halt the progress of the mentioned event by increasing the efficiency of the existing movement possibilities. The aim of this contribution is to: (i) identify the frequency of single transport and their alternative combinations usage; (ii) identify the main evaluation criteria of transport efficiency from the perspective of SMR passengers; (iii), by using Data Envelopment Analysis (DEA), find an efficient transport design and discuss the methods' suitability to solve the transportation issue.

## 2 MATERIAL AND METHODS

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In this article, the DEA method was used to evaluate the efficiency of single transports and their alternative combinations. There are dozens of studies where the current approach shows quite representative results. The method is widely used to gauge efficiency in a variety of fields. The main advantage of the model is its non-parametric character, which allows its use without knowledge of functional dependencies between outputs and inputs (different measure units). Four key indicators were chosen for transport efficiency evaluation. Vehicle carbon footprint, travel

time, and travel cost as inputs, and frequency of transport usage (single and alternative combinations) as an output. Each piece of data was calculated for a specific vehicle, and an average amount was chosen. A total of nine single types of transport and eight different transport combinations were chosen as a sample for the analysis. Based on studies [1] and [2] for research, the CCR and Super-SBM DEA models were chosen. The efficiency score is calculated via DEA Solver.

### 3 RESULTS

The results of the efficiency of individual transports and their alternative combinations are recorded in Tab. 1. The combination of the highest efficiency score and the lowest ranking number indicated DMUs as efficient. The efficiency score differs depending on the model's characteristics. Both models

(CCR and SMB) estimated the following single transports, DMU3 and DMU8, as efficient. Moreover, in transport combinations, models also identified the same effective combinations, namely: DMU1, DMU2, and DMU8.

Tab. 1: Efficiency of the single transports and their alternative combinations

DMUs	Single Transport	Efficiency Score		Transport combination	Efficiency Score	
		CCR-O	Super SBM-O-C		CCR-O	Super SBM-O-C
DMU <sub>1</sub>	Brno City Public Transport	0.8231	0.8231	Regional Transport & Brno City Public Transport	1	1.6307
DMU <sub>2</sub>	Regional Transport	0.4790	0.4794	Regional Transport & Walk (<1 km/15 min)	1	1.5617
DMU <sub>3</sub>	Own car	1	5.2633	Regional Transport & Bicycle	0.1724	0.1724
DMU <sub>4</sub>	Motorbike	0.0143	0.0143	Regional Transport & Shared e-car/car/Taxi	0.1211	0.1211
DMU <sub>5</sub>	Shared e-car/car	0.0289	0.0289	Own car & Brno City Public Transport	0.5979	0.5979
DMU <sub>6</sub>	Own Bicycle	0.1989	0.1989	Own car & Shared e-car/car/Taxi	0.7671	0.7671
DMU <sub>7</sub>	Shared e-bike/e-Scooter	0.0255	0.0255	Own car & e-bike/e-Scooter/Hoover Boards etc.	0.2422	0.2422
DMU <sub>8</sub>	Walk (<1 km/15 min)/own e-bike/e-Scooter/Hoover Boards etc.	1	9.4800	Own car & Walk (<1 km/15 min)	1	1.2819
DMU <sub>9</sub>	Taxi	0.0043	0.0043			

### 4 CONCLUSIONS

This paper represents preliminary research that applies Data Envelopment Analysis (output-oriented CCR and Super SBM models) to find an efficient transport design for the South Moravian Region. The results show that both models represented the same accurate results (as for singles as well as for transport combinations); accordingly, both models would be relevant and acceptable to use. Nine single transports and eight different combinations were selected for estimation. Both models simultaneously revealed private car and walking as the most effective movement possibilities. Three effective combinations were identified: DMU1, DMU2, and DMU8. The efficiency of the combinations can be affected by below-average input data and above-average output data. Namely, the frequency of this transport combination

is above average; it emits average carbon emissions, requires comparable less travel time, and is quite budget-friendly. In the case of DMU8, the variables of the input data are quite high, and the output is the highest. Regardless of the fact that private cars have the highest carbon footprint and are relatively expensive, their usage frequency (output) is high, and this causes their high effectiveness. Our results suggest that car is a prominent means of transport that require a specific efficiency evaluation. For future research, we shall focus in the first stage only on comparisons of combinations of transportation means that are better comparable. Only after this analysis further research will be done, analysing the efficiency of single means of transportation using more complex multiple criteria.

### 5 REFERENCES

- [1] FITZOVÁ, H., MATULOVÁ, M. Comparison of urban public transport systems in the Czech Republic and Slovakia: Factors underpinning efficiency. *Research in Transportation Economics*, Volume 81, (2020), ISSN 0739-8859 <https://doi.org/10.1016/j.retrec.2020.100824>.
- [2] MA, F.; WANG, W.; SUN, Q.; LIU, F.; LI, X. Integrated Transport Efficiency and Its Spatial Convergence in China's Provinces: A Super-SBM DEA Model Considering Undesirable Outputs. *Applied Sciences*. (2018), 8(9), 1698 <https://doi.org/10.3390/app8091698>.

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# AUGMENTED REALITY MANUALS: COMPETITION OF MOBILE PLATFORMS

Andrej Gono<sup>1</sup>, David Procházka<sup>1</sup>, Tomáš Šmerda<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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Augmented reality, Object detection, Mobile devices, Computer vision, Cloud application

## JEL CODES

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L63, L86

## 1 INTRODUCTION

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Augmented reality can greatly simplify the interaction and maintenance of common devices, from coffee machines to large industrial tools [1, 2]. Instead of studying complicated manuals or searching for

instructional videos, a user points a mobile phone or tablet at a specific device and gains instant access to control the device through augmented reality.

## 2 MATERIAL AND METHODS

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To deploy an augmented reality solution for mobile devices, a number of issues must be resolved. Certain mobile devices may not possess enough computing power to identify real-life objects using computer vision. By contrast, some other devices are sufficiently powerful to detect objects independently. In order to detect them, these devices require a server to which they transfer photos of the detected object. Therefore, a suitable architecture that effectively merges both approaches is required. Notably, there exists a significant variance between the Google Android and Apple iOS/iPadOS platforms. The (“Pro”) range devices from Apple are furnished with a LiDAR tool

that facilitates 3D object detection. Conversely, the Android system is exclusively oriented towards 2D computer vision using a standard camera.

Another issue with augmented reality applications is their closed nature, which means that the content is only accessible within the application itself and cannot be used in other applications. To address this problem, our aim was to create an open-standard and API-based application from the outset. To store the 3D models illustrated within the manuals, we plan to employ standards including glTF [3] and 3D Commerce [4].

### 3 RESULTS

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Our solution provides support for both cloud-based (“online”) and device-based (“offline”) object detection. The offline approach is particularly advantageous due to several factors:

- Firstly, it does not require an internet connection, as all necessary content is downloaded and saved locally upon initial use.
- Additionally, the application operates more efficiently in offline mode, resulting in better performance overall. As the object detection occurs locally, the application could provide more rapid response times and improved overall performance.

However, it is also crucial to ensure that devices with lower computing power can detect objects by utilizing the cloud server. The main benefits of this approach are:

- Always up-to-date content: Updating the application on a device is not required as new machine learning models or other content is immediately accessible to all users.
- All data, including machine learning models, is stored solely on the cloud resulting in minimal device storage needs.

### 4 CONCLUSIONS

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We developed a testing version of our iOS and Android mobile applications, along with a cloud service for data provisioning. For Android devices, we employed the Tensor Flow algorithm for object detection [5]. Nevertheless, there are issues with varying viewing angles. We took images of each real-world object from slightly different angles to train our

machine learning model. The algorithm fails to detect objects from significantly diverse angles beyond the ones found in the training set. On the other hand, the detection on iOS/iPadOS platform can be based also in 3D matching [6]. This approach is obviously suitable for detection even from completely different angles.

### 5 REFERENCES

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- [1] DORIS ASCHENBRENNER, MARC ERICH LATOSCHIK, and KLAUS SCHILLING (2016) Industrial maintenance with augmented reality: two case studies. In *Proceedings of the 22nd ACM Conference on Virtual Reality Software and Technology (VRST '16)*. Association for Computing Machinery, New York, NY, USA, 341–342.
- [2] MICHELE FIORENTINO, RAFAEL RADKOWSKI, ANTONIO BOCCACCIO, and ANTONIO EMMANUELE UVA. (2016) Magic Mirror Interface for Augmented Reality Maintenance: An Automotive Case Study. In *Proceedings of the International Working Conference on Advanced Visual Interfaces (AVI '16)*. Association for Computing Machinery, New York, NY, USA, 160–167.
- [3] Khronos (2023) *glTF* [online]. Accessed: 2023-10-19. Available from: <https://www.khronos.org/glTF/>
- [4] Khronos (2023) *3D Commerce* [online]. Accessed: 2023-10-19. Available from: <https://www.khronos.org/3dcommerce/>
- [5] *Tensor Flow: For mobile and Edge* [online]. Accessed: 2023-10-19. Available from: <https://www.tensorflow.org/lite/>
- [6] Apple (2023) *Scanning and detecting 3D objects* [online]. Accessed: 2023-10-19. Available from: [https://developer.apple.com/documentation/arkit/arkit\\_in\\_ios/content\\_anchors/scanning\\_and\\_detecting\\_3d\\_objects](https://developer.apple.com/documentation/arkit/arkit_in_ios/content_anchors/scanning_and_detecting_3d_objects)

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# UNDERSTANDING THE IMPACT OF FRAMING EFFECT ON GENERATION Z'S PURCHASING DECISIONS FOR UTILITARIAN PRODUCTS

Andrej Grajciar<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

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## KEY WORDS

framing effect, attribute framing, goal framing, consumer behaviour, decision making

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## JEL CODES

M31, D91

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## 1 INTRODUCTION

While it is assumed in the theory of rational decision making that people's decisions remain consistent and predictable even when the same information is presented in various forms, in reality consumers' decisions are impacted by their unique traits, expectations, and prior experiences, along with the limits of human cognitive processes. The key objective of this study is to investigate the influence of framing, particularly attribute framing and goal

framing, on the purchasing decisions of members of Generation Z, with a particular focus on utilitarian products. Understanding the nuances of decision-making becomes essential as the Generation Z will soon make up more than one-third of the global population. It is crucial to comprehend, or at the very least become familiar with, their environment and lifestyle (Cervi, 2021) [1].

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## 2 MATERIAL AND METHODS

After examining the framing effect, it was discovered that positive framing of attributes increased purchase preference more than neutral and negative framing (Zubair, 2020) [2]. In terms of goal framing, ads that emphasize avoiding a negative outcome or prevention are more effective when paired with a loss frame (Lee & Pounders, 2019) [3].

In order to comprehend how customers make decisions, this study used a quantitative method with an emphasis on the framing impact. A structured questionnaire was the main tool utilized. A total of 198 participants were recruited for this study. The sample comprised both males and females.

Participants belonged to the Generation Z, aged between 18 to 26 years and all were students of Economics Faculty.

To understand the influence of framing on purchasing decisions, two versions of the questionnaire were developed. One version had a positive framing for each product, while the other had a negative framing. Participants were randomly assigned to one of the two versions, ensuring that the effects of framing could be isolated and examined.

Logistic regression analyses were carried out to investigate the effects of framing and gender on the likelihood of product purchase. For binary outcome

logistic regression is particularly well suited. The framing (positive or negative) and gender were the independent variables in models. The p-value was used to assess each independent variable's significance, with a cutoff of 0.05. This threshold was used to determine whether variables were statistically

significant for determining the likelihood of a product purchase. Furthermore, the percentage of cases that the models accurately predicted was used to evaluate their predictive ability. The explanatory power of the model was evaluated at a 60% threshold.

### 3 RESULTS

Tab. 1: Results of logit regression each of the products

Product	Constant	Framing Coef	Gender Coef	Framing p-value	Gender p-value	% Predicted
Meat	-0.982	1.069	0.97	0.0005	0.0017	64.65%
Cleaner	-1.379	2.206	-0.362	<0.0001	0.2986	74.24%
Apple	0.954	0.468	-0.09	0.1763	0.7924	75.25%
Milk	0.837	-0.312	-0.253	0.3043	0.4079	64.14%
Coffee	0.462	-1.249	0.015	<0.0001	0.9618	64.65%
Mattress	-0.389	-0.171	0.651	0.5655	0.029	58.08%

### 4 CONCLUSIONS

In this study, we focused on the impact of both positive and negative framing to better understand Generation Z customer choices to buy utilitarian products.

As attribute framing was used for the first three goods, we anticipated that positive framing would have a stronger impact on consumer choices based on the body of existing literature. This anticipation was somewhat supported by our results, particularly for "Meat (Mäso)" and "Cleaner (Čistič)". The item "Apple (Jablko)" broke from this pattern, showing

that neither framing nor gender had a significant impact.

On the other hand, we anticipated that negative framing would predominate in the case of the last three goods, where goal framing was applied. The outcomes for "Coffee (Káva)" met this prediction, demonstrating the potency of negative framing. However, the results for "Milk (Mlieko)" and "Mattress (Matrac)" were more complex and did not quite match our expectations based on earlier investigations.

### 5 REFERENCES

- [1] CERVI, L. (2021). Tik Tok and Generation Z. *Theatre, Dance and Performance Training*, 12, 198 - 204. <https://doi.org/10.1080/19443927.2021>
- [2] ZUBAIR, M., WANG, X., IQBAL, S., AWAIS, M., & WANG, R. (2020). Attentional and emotional brain response to message framing in context of green marketing. *Heliyon*, 6(9).
- [3] LEE, S., & POUNDERS, K. R. (2019). Intrinsic versus extrinsic goals: The role of self-construal in understanding consumer response to goal framing in social marketing. *Journal of Business Research*, 94, 99-112.

# LEVEL OF DIGITALIZATION IN TOURISM IN SOUTH MORAVIA

Marek Grill<sup>1</sup>, Samuel Sakala<sup>1</sup>, Šimon Balga<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

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## KEY WORDS

Digital services, Destination management company, Online communication, South Moravia, Visitor satisfaction

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## JEL CODES

L83, O33

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## 1 INTRODUCTION

Today, the digitalization of tourism and destination management plays a key role in increasing the competitiveness of tourist areas and is also undeniably one of the most important sectors of visitor services at the moment. In the context of university research, this study analyses the association between the level of digitisation of six regional destination companies in the South Moravian Region and the level of visitor satisfaction in mid-2022.

The aim of this research work is to test whether a higher level of digitisation of a given destination

means a higher satisfaction of visitors to that destination. To achieve this goal, we collected primary data through a face-to-face questionnaire survey conducted in the main tourist season of 2022 in selected tourist locations in South Moravia.

One of the key components of the research was also the creation of an evaluation scale of destination companies' websites, which allowed us to objectively assess their digital presentation and accessibility of information for visitors.

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## 2 MATERIAL AND METHODS

In order to achieve the set objectives, we used a comprehensive methodology that included primary data collection in the form of a face to face questionnaire survey, which was conducted in the main tourist season of 2022 in selected tourist destinations in South Moravia. The questionnaires were carefully constructed to ensure that the responses received best reflected the digital products and services provided within the destinations.

The analysis phase involved a thorough selection and sorting of the questionnaire responses, focusing exclusively on information related to digital aspects.

This data was further subjected to basic statistical methods in order to identify possible links between the digitalisation of destinations and visitor satisfaction levels.

Approximately 360 questionnaires were collected in each tourist area. In the area of Brno and its surroundings, approximately 450 questionnaires were collected due to the inclusion of tourist destinations within the city of Brno. This paper deals with a dataset containing 1920 questionnaires.

As another source of data, we approached the regional destination companies of the South Mora-

vian Region, five out of six of which participated by completing a specific questionnaire focused on the evaluation of work and readiness in the area of digital resources and services provided in the online environment.

The interviews were scored and subsequently processed in the analytics software Atlas, which

provided further valuable insights and an assessment of the digital approach within the destinations.

As part of the analysis of the destination management companies' websites, a rating scale was created to give us a comprehensive view of the digital presence of these destinations, as well as allowing for comparison between respondents.

### 3 RESULTS

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Ratings were made on a scale of 1 (best) to 5 (worst). Znojmo and Podyjí received the best average rating. On the other hand, the Pálava and LVA regions and the Moravian Karst and surroundings received lower average ratings, which may indicate the need to improve digital services in these destinations. Overall, the results suggest that there is room for improvement of digital services and their adaptation to the needs of visitors in South Moravian tourist areas.

We also conducted guided interviews with DMO representatives to supplement the questionnaire

data. We coded the transcripts in ATLAS.ti, which helped us understand their issues and priorities. We found that DMOs have different approaches to digital tools.

In the last section, we found a high correlation between website quality and information uptake. In content analysis and technology analysis, the site scored highest. The display of user reviews needs to be improved. There are differences in user friendliness and usability. WCAG principles are not sufficiently met and new EU legislation from 2024 may therefore pose a risk.

### 4 CONCLUSIONS

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The conclusion of the research suggests important insights into visitor satisfaction with digital services in different tourist areas. Overall, it suggests that there is room for improving digital services and adapting them to the needs of visitors in South Moravian tourist areas.

Overall, it can be concluded that the digitalisation of tourism in South Moravia is still in the process of

improvement and there is room for further innovation and optimisation of digital services, especially in regions with lower ratings. Improvements in terms of technology, accessibility and website content can lead to higher visitor satisfaction and enhance the attractiveness of this tourist destination.

### 5 REFERENCES

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- [1] LAW, R., QI, S., BULHALIS, D.: Progress in tourism management: A review of website evaluation in tourism research. *Tourism management* 31. (2010), 297–313.
- [2] POPESCU, M., A., NICOLAE, F., V., PAVEL, M., I.: Tourism and hospitality industry in the digital era: General overview. In *proceedings of the 9th International Management*
- [3] ŠTUMPF, P., JANEČEK, P., VOJTKO, V.: Is Visitor Satisfaction High Enough? A Case of Rural Tourism Destination. *European countryside*. 2022, 346-362.
- [4] MORRISON, A., M.: *Marketing and Managing Tourism Destinations*. Routledge, London, 2013, ISBN 978-0-415-67250-4.

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# SHAPING THE ENTREPRENEURIAL PERSONALITY: INFLUENTIAL FACTORS AND THEIR IMPACT ON BUSINESS SUCCESS

Wolfgang Hagenauer<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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Entrepreneur/Unternehmer, Personality/Persönlichkeit, Entrepreneur success factors/Unternehmer Erfolgsfaktoren, Influence factor success/Einflussfaktoren Erfolg, Traits/Persönlichkeitsprofil

## JEL CODES

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L26, M13, J24, J16, Z13

## 1 INTRODUCTION

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This study delves into the various factors that influence business start-ups, extending beyond the scope of merely the business plan, product, or target market. It underscores the profound impact of a founder's background, origins, and life experiences, all of which collectively mold the entrepreneurial personality, thereby swaying business outcomes. The research differentiates between innate factors, those intrinsic qualities determined by one's birth and individual nature, and experiential factors that are

sculpted by the entrepreneur's life circumstances and environmental interactions. Subsequent sections elucidate the personality traits pivotal to entrepreneurial success, buttressed by insights from trait research. In summation, the research amplifies the critical role of these diverse influencing elements in business inception and advocates for a more nuanced exploration of personality traits within start-up advisory contexts, aiming to forestall potential business downtrends.

## 2 MATERIAL AND METHODS

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The literature review method hinged primarily on sources from Google Scholar, enriched with pertinent books and articles from established publications. A precise array of keywords guided the search strategy, securing an exhaustive aggregation of relevant literature. Although the inquiry didn't confine traits-related topics to a specific timeframe, it concentrated on literature from 1991 to 2021 for other themes, prioritizing current insights. The literature consolidation centered on unchangeable factors pivotal to entrepreneurial triumph, encompassing age, gender, health, and cultural considerations. This

compilation underwent a systematic scrutiny to distill recurrent themes and patterns, deepening the exploration into the entrepreneurial persona's influential factors. The study synthesized these insights, forging a holistic comprehension of the subject matter to respond to the research queries. By adopting a systematic literature review approach, this study probes the multitude of elements bearing on entrepreneurial dispositions and consequent business performance, ensuring methodological rigor through the subsequent analysis steps.

## 3 RESULTS

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The complex influences that mold entrepreneurial personalities and outcomes are intricately tied to factors extending beyond immediate personal control or change. One prominent factor is age, with studies indicating

that older entrepreneurs tend to have a higher rate of business success and longevity, likely attributable to their accumulated life experiences and established professional networks (Zhao et al. 2021, S. 1–20). Generational

shifts also impact entrepreneurship, as the intrinsic values and societal priorities characteristic of different generations—particularly evident in Generation Y<sup>1</sup>, —shape entrepreneurial objectives and strategies (Layr und Bäumel 2020, S. 1–48).

Gender disparities pose challenges in the entrepreneurial landscape, notably for women, who often encounter greater financial hurdles. Furthermore, research indicates that women entrepreneurs frequently prioritize achieving a work-life balance, which can influence their business strategies and objectives differently compared to those who may prioritize financial gain (see Käufer und Conell 2020, S. 1–32). Managing health, a critical aspect often overlooked, bears similarities to the challenges encountered by elite athletes; entrepreneurs frequently compromise their well-being due to intense work-related demands, potentially impacting their venture's success (Alstete 2008, S. 584–594; Rau et al. 2008, S. 115–125).

## 4 CONCLUSIONS

This research highlights the complexity of factors contributing to entrepreneurial success, extending beyond innate traits to encompass generational, societal, and environmental influences. The findings indicate that traditional measures of entrepreneurial potential—such as inherent personality traits—are insufficient predictors of success, given the impactful role of external factors. Therefore, startup consulting requires a holistic approach, acknowledging the multifaceted nature of entrepreneur-

ship. Family dynamics serve as a double-edged sword in entrepreneurship: while a stable home environment, positive role models, and inherited social capital can substantially bolster entrepreneurial efforts, dependencies or internal family conflicts pose significant risks (Parasuraman et al. 1996, S. 275–300). Entrepreneurial trends are additionally shaped by cultural, regional, and governmental contexts, wherein certain environments encourage a thriving entrepreneurial culture, whereas others hinder it through restrictive norms or insufficient support mechanisms (Röhl 2016, S. 1–41).

Ultimately, while inherent personality traits such as innovativeness, resilience, and openness are common among successful entrepreneurs, they do not singularly predict success (Herron 1994, S. 1–101). These traits, part of a broader, intricate array of factors, highlight the complexity of the entrepreneurial journey—a path defined by the interplay between innate characteristics and external forces.

It suggests the necessity for a support system that considers broader personal and societal dynamics, enhancing an entrepreneur's capacity to navigate challenges and reducing the likelihood of business failure. This nuanced understanding advocates for a more comprehensive form of entrepreneurial guidance, prioritizing individual context and environmental nuances over conventional, trait-focused advisement.

## 5 REFERENCES

- ALSTETE, JEFFREY W. (2008): Aspects of entrepreneurial success. In: *Journal of Small Business and Enterprise Development* 15 (3), S. 584–594. DOI: 10.1108/14626000810892364.
- HERRON, L. (1994): *Do skills predict profits? A study of successful entrepreneurship*. New York: Garland (Garland studies in entrepreneurship).
- KÄUFER, THERESA; CONELL, MOLLY (2020): *Startup Quarterly - Q2 2020. Statista DossierPlus zum Gründungsgeschehen im zweiten Quartal 2020*. Hg. v. Statista Research Department. Statista; startupdetector.
- LAYR, WOLFGANG; BÄUMEL, MONIKA (Hg.) (2020): *Volksbank UnternehmerInnen-Studie 2020. Ein persönlicher Blick auf das Leben der Unternehmerinnen und Unternehmer in Österreich*. Volksbank Wien AG.
- PARASURAMAN, SAROJ; PUROHIT, YASMIN S.; GODSHALK, VERONICA M.; BEUTELL, NICHOLAS J. (1996): Work and family variables, entrepreneurial career success, and psychological well-being. In: *Journal of vocational behavior* 48 (3), S. 275–300. DOI: 10.1006/jvbe.1996.0025.
- RAU, RENATE; HOFFMANN, KATJA; METZ, ULRIKE; RICHTER, PETER GEORG; RÖSLER, ULRIKE; STEPHAN, UTE (2008): Gesundheitsrisiken bei Unternehmern. In: *Zeitschrift für Arbeits- und Organisationspsychologie A&O* 52 (3), S. 115–125. DOI: 10.1026/0932-4089.52.3.115.
- RÖHL, KLAUS-HEINER (2016): *Unternehmensgründungen: Mehr innovative Startups durch einen Kulturwandel für Entrepreneurship?* Institut der deutschen Wirtschaft (IW). Köln (IW Policy Paper, 2). Online verfügbar unter <http://hdl.handle.net/10419/127488>, zuletzt geprüft am 22.01.2021.
- SCHNETZER, SIMON (2020): *Generation XYZ - Definition, Merkmale und Unterschiede verständlich erklärt*. Online verfügbar unter <https://simon-schnetzer.com/generation-xyz/>, zuletzt aktualisiert am 26.11.2020, zuletzt geprüft am 09.01.2021.
- ZHAO, HAO; O'CONNOR, GINA; WU, JIHONG; LUMPKIN, G. T. (2021): Age and entrepreneurial career success: A review and a meta-analysis. In: *Journal of Business Venturing* 36 (1), Artikel 106007, S. 1–20. DOI: 10.1016/j.jbusvent.2020.106007.

<sup>1</sup>Generational designations and corresponding birth years: Traditionalists (1922–1954), Baby Boomers (1955–1964), Generation X (1965–1979), Generation Y (1980–1994), Generation Z (1995–2009), Generation Alpha (2010–2024), Generation Beta (from 2025) Schnetzer 2020, S. 1–7.

# ESTIMATED VAT GAPS IN SELECTED EU MEMBER STATES

Iva Hasíková<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

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## KEY WORDS

VAT gap, determinants of VAT gap, efficiency of VAT collection in EU, MIMIC model, structural equation model

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## JEL CODES

C39, C51, H26

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## 1 INTRODUCTION

Value added tax (“VAT”) is one of the most important tax revenues in all countries of the European Union (“EU”). However, it is often linked to and threatened by tax evasion. According to 2020 EU estimates, the total loss due to tax evasion was €93 billion, representing a loss to EU member states’ public budgets of €3,000 for every second of 2020 [1].

When studying tax evasion and trying to improve the efficiency of tax collection, the tax gap can provide a lot of important information. In the case of VAT, it is the VAT gap that becomes an indicator of tax evasion [2], even though its extent is not only affected by tax evasion. The VAT gap includes

the loss of tax revenue due to tax fraud, but also bankruptcies, insolvency of taxpayers and errors in calculating tax liability [3].

In this research, the VAT gap is calculated in selected EU Member States for period 2009–2021. The time series was also chosen in view of the gradual enlargement of the EU, with the last post-communist countries of the former Eastern bloc joining the EU in 2007, marking the conclusion of one of the largest EU enlargements. Thus, 23 member countries are participating in the survey; some countries had to be excluded from the survey due to the unavailability of certain input data.

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## 2 MATERIAL AND METHODS

The MIMIC (multiple indicators multiple causes) model is based on the statistical theory of the unobserved variable; which is measured by multiple measurable causes and indicators. Multiple causes lead to inefficient VAT collection, while multiple indicators of the presence of this inefficiency can be observed.

The MIMIC model is a specific type of structural equations model and consists of two models, a structural model and a measurement model. In a structural model, the latent variable is the depen-

dent variable that is influenced by the measurable variables entering the model (causes). In this model, unemployment, gross capital formation, openness of the economy, index of economy freedom, general government expenditure, final consumption and e-government development index (EGDI) are causes. For the measurement model, the hidden variable is independent, while the measurable variables entering (indicators) the model are dependent on it. Growth of GDP per capita and VAT revenue are indicators of this model. In short, the first step is to confirm

or refute the hypotheses indicating the relationship between the VAT gap (hidden variable) and its causes and indicators. Once this relationship is confirmed by the MIMIC model, the MIMIC index will be calculated according to the structural model equation, which is presented as equation 1.

$$\tilde{\eta}_t = \gamma x_{1t} + \gamma x_{2t} + \dots + \gamma x_{qt}. \quad (1)$$

### 3 RESULTS

The resulting MIMIC model contains only those variables, which are significant on 5% level or less. Both indicators in final model, VAT revenue and GDP per capita, are significant at 1% level. Final model contains openness of economy, EGDI, final consumption, gross capital formation and general government expenditure as significant causes. These significant causes formulated MIMIC index, which estimated the year-on-year evolution of the VAT gap as function of changes in significant variables.

### 4 CONCLUSIONS

The MIMIC model was used to quantify the VAT gap in selected EU Member States for period 2009–2021. Over this period the VAT gap has been more or less stable, with the exception of 2010 and 2011, when the VAT gap grew by about 3–4 percentage points, especially in transitive countries.

Statistically significant causes of VAT gap include final consumption, general government expenditures, openness of the economy, gross capital formation and EGDI. Recommendations on the further development

The MIMIC index expresses only the relative evolution of the latent variable, in this case the VAT gap. In order to calibrate relative values to absolute values, a base variable determined by another method must be used. In this research, the baseline variable was the VAT gap estimate for 2008 by Barbone et al. [4].

For this period 2009–2021 the lowest values are estimated for the Netherlands and Sweden, while the highest VAT gap value is estimated for Romania. However, this value exceeds the second highest VAT gap by 7 percentage points. The second highest VAT gap is estimated in Slovakia and Greece. Most transition economies are clustered in the third quartile, with the exception of Poland, whose average VAT gap of 9% puts it in the first quartile, overtaking developed EU countries such as Germany, Austria and Belgium.

of indirect tax policy should have reflected the statistically significant sources of inefficiencies in VAT collection. The recommendation arising from this research is to focus more on the digitisation of tax offices and public administration as a whole; digitisation will lead to an increase in the efficiency of VAT collection. Digitisation can also simplify cooperation between Member States' tax authorities, which can help eliminate the factor openness of the economy.

### 5 REFERENCES

- [1] BAERT, P. (2023). *VAT in the digital age*. European Parliamentary Research Service. Retrieved from [https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/739371/EPRS\\_BRI\(2023\)739371\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/739371/EPRS_BRI(2023)739371_EN.pdf)
- [2] MORAVEC, L., HINKE, J., & BORSICZKÁ, M. (2021). VAT Gap Estimation and Influence of Selected Methods of Financial Administration on its Reduction. *DANUBE*, 12(1), 45-60.
- [3] JONSKI, K., & GAJEWSKI, D. J. (2022). 'VAT Gap' Estimation: Distinguishing Between Informality and Fraud. *EC Tax Review*, 31(3), 124-130.
- [4] BARBONE, L., BELKINDAS, M., BETTENDORF, L., BIRD, R. M., BONCH-OSMOLOVSKIY, M., & SMART, M. (2013). Study to Quantify and Analyse the VAT Gap in the EU-27 Member States. *SSRN Electronic Journal*. doi:10.2139/ssrn.2365189

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# LARGE-SCALE GENOMIC DATA STORAGE AND MANAGEMENT

Jan Havlík<sup>1</sup>, Jiří Štastný<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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DNA, Bioinformatics, Database, Storage

## JEL CODES

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C63, C88

## 1 INTRODUCTION

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Technology advancement in human genetics provides us with wealthy genome sequencing data which are accessible on public platforms. The rising necessity of efficient storage, management and analysis of Human genome has risen with the introduction of Telomere-To-Telomere (T2T) human genome project which marks the completion of the first gapless

sequence of a human genome [1]. The project helps to improve understanding of complex genomic regions such as telomeres, centromeres or G-quadruplexes [2]. Acquiring and processing human whole-genome sequencing data is financially demanding, so the focus is on developing data formats and software that can handle whole-genome sequencing.

## 2 MATERIAL AND METHODS

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In order to talk about the processing of the T2T human genome, we need to specify the parts that will be stored. A genome is the whole of the genetic information of an organism (in this case a human being). Each genome then consists of four nucleotides – Adenine, Guanine, Cytosine and Thymine – which are represented with letters A, C, T, G. Each human chromosome is represented in this way as a text file ready to be processed with additional metadata such as genes or various nucleic acid structures which are identified by location in specified genome.

The main challenges in large-scale genomic data storage are database selection – identifying the use case of data access and maintenance, data compression and optimisation of the data stored in the database, this includes data extraction and the process of manipulating the raw genomic data, workflow management and streamlining – means of modifying the data (facilitating the data manipulation process for the end users).

## 3 RESULTS

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Dealing efficiently with large amounts of genomic data is key to advancing genomic research and getting to the genomic information you need quickly. Our study looked at several important factors when working with genomic data, such as how quickly new genomic annotations can be added and how quickly multiple regions of chromosomes can be selected and accessed. Among the various databases we looked at, NoSQL databases, particularly columnar databases like Apache Cassandra, stood out as performing better in key areas that are critical for managing and working with genomic data. [3]. There are several methods for compressing genomic data without losing information, but our analysis showed that compressing and then decompressing the entire dataset doesn't really help to get to the data faster. This is mainly because the specific genomic structures we are interested in are only

small portions (tens of thousands of nucleotides) of the original chromosome, making the cost of decompression higher than simply retrieving the data from NoSQL databases. To get around this, we aim to reduce the size of the input data (such as annotations and genes) by converting the text data to the FASTQ file format and then moving it into the database through well-designed workflows. [4]. This setup ensures that the end user doesn't notice any difference and can easily update the pipelines with any newly discovered annotations or genes, which are then updated in the databases. The workflows we have set up provide a powerful way of updating the databases with new genomic knowledge, ensuring that the databases remain up to date and that data retrieval remains fast. The API for communicating with the databases is available at <https://github.com/jan-havlik/dnarchive-server>.

## 4 CONCLUSIONS

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In large-scale genomic projects such as T2T, efficient data management and fast data retrieval are crucial. Our study favoured NoSQL databases, particularly Cassandra and MongoDB, for better data storage and retrieval. The use of data compression using the

FASTQ format during data extraction improved data throughput for users of the DNArchive database. This approach simplifies data workflows, making genomic data analysis in the T2T project more efficient and accessible.

## 5 REFERENCES

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- [1] Y. MAO and G. ZHANG, A complete, telomere-to-telomere human genome sequence presents new opportunities for evolutionary genomics, *Nature Methods* 2022 19:6, vol. 19, no. 6, pp. 635–638, Jun. 2022, doi: 10.1038/s41592-022-01512-4.
- [2] V. BRÁZDA, N. BOHÁLOVÁ, and R. P. BOWATER, New telomere to telomere assembly of human chromosome 8 reveals a previous underestimation of G-quadruplex forming sequences and inverted repeats, *Gene*, vol. 810, Feb. 2022, doi: 10.1016/J.GENE.2021.146058.
- [3] S. CHAKRABORTY, S. PAUL, and K. M. AZHARUL HASAN, Performance Comparison for Data Retrieval from NoSQL and SQL Databases: A Case Study for COVID-19 Genome Sequence Dataset, *International Conference on Robotics, Electrical and Signal Processing Techniques*, pp. 324–328, 2021, doi: 10.1109/ICREST51555.2021.9331044.
- [4] A. A. GINART et al., Optimal compressed representation of high throughput sequence data via light assembly, *Nat Commun*, vol. 9, no. 1, Dec. 2018, doi: 10.1038/S41467-017-02480-6.

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# SUSTAINABLE CONSUMER BEHAVIOR WHEN PURCHASING FOOD

Petr Hudec<sup>1</sup>, Veronika Švecová<sup>1</sup>, Sabina Ulbrichová<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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Purchasing Food, Consumer Behavior, Theory of Planned Behavior, Sustainable Consumption

## JEL CODES

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C30, D11, Q56

## 1 INTRODUCTION

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Consumer behavior and responsibility are integral to lifestyles. Human activities impact the environment, prompting increased scrutiny and concern over their adverse effects. Urgent intervention in modern lifestyles and consumer behaviors is needed to promote responsible and balanced living, as sustainable development relies on environmentally conscious consumer actions (Lubowiecki-Vikuk et al., 2021). Sustainable consumer behavior encompasses environmental and economic aspects, emphasizing responsible choices and eco-friendly living (Binder and Blankenberg, 2017).

Sustainable consumption, defined at the 1994 Oslo symposium, involves meeting human needs while improving quality of life, minimizing environmental impact, increasing renewable energy use, and reducing waste and emissions (Šajn, 2020). The United Nations' sustainability concept prioritizes present needs without jeopardizing future generations' well-being (United Nations, 2023). To address sustainable consumer behavior, considerations encompass sustainable and healthy eating habits, such as food selection, consumption, and disposal. Food production significantly impacts water usage, land utilization,

and greenhouse gas emissions (Kawasaki et al., 2023). Promoting sustainable practices, like eco-friendly eating and responsible food handling, can reduce health and environmental burdens (Springmann et al., 2020).

When purchasing food, various factors and motivators influence consumer behavior, including emotional intelligence. Emotional intelligence relates to online shopping behavior, with emotionally intelligent consumers seeking practical shopping value and greater satisfaction (Lim et al., 2020). Enhanced technology use can positively impact the environment, particularly in online shopping (Wang et al., 2022). Governments, individuals, and businesses must responsibly promote and accelerate technology adoption while minimizing environmental consequences.

The goal of this research is to apply the Theory of Planned Behavior to create a model identifying key factors that influence consumers in their preferences and attitudes toward sustainable food consumption. Additionally, the study aims to investigate consumers' perception of the necessity of sustainable food consumption and their views on the issue of food waste.

## 2 MATERIAL AND METHODS

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The Theory of Planned Behavior by Icek Ajzen underlies this study, explaining consumer purchase intentions. It posits that intention is a function of attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991, 2015). Consumer attitudes influence their purchase

intentions, with different attitudes toward products affecting consumer decisions under varying circumstances (Udoimeh, 2015). To construct the Theory of Planned Behavior model, primary data will be collected via a questionnaire survey conducted by an agency. The survey

focuses on consumer behavior and sustainability, using a representative sample based on age and education

level quotas. The survey targets the Czech Republic's population.

### 3 RESULTS

The outcome of this article will be a theoretical model of planned behavior that addresses consumer behavior and its relationship to sustainability.

### 4 CONCLUSIONS

The results of the modeling will be compared with previous studies that have explored similar topics. For example, research by Alama et al. (2020) demonstrated that subjective (social) norms, perceived value, perceived behavioral control, and attitude significantly influence the intention to behave sustainably in food. Additionally, Soorani and Ahmadvand (2019) addressed this issue,

showing that attitude toward behavior, perceived behavioral control, and feelings of guilt were driving forces behind food consumption management and avoidance of food waste generation. Veselá et al. (2023) recommends educating consumers in food consumption planning to make their purchases a conscious rather than impulsive activity.

### 5 REFERENCES

- [1] AJZEN, I.: The theory of planned behavior: Frequently asked questions. *Human Behavior and Emerging Technologies*, 2,4, (2020), 314-324.
- [2] ALAM, S. S., AHMAD, M., HO., Y., OMAR, N. A., LIN, CH.: Applying an Extended Theory of Planned Behavior to Sustainable Food Consumption. *Sustainability*, 12(20), (2020).
- [3] BINDER, M., BLANKENBERG, A.: Green lifestyles and subjective well-being: More about self-image than actual behavior?. *Journal of Economic Behavior & Organization*, 137, (2017), 304-323.
- [4] KAWASAKI, Y., NAGAO-SATO, S., YOSHII, E., AKAMATSU, R.: Integrated consumers' sustainable and healthy dietary behavior patterns: Associations between demographics, psychological factors, and meal preparation habits among Japanese adults. *Appetite*, 180, (2023).
- [5] LIM, S. H., KIM, D. J.: Does Emotional Intelligence of Online Shoppers Affect Their Shopping Behavior? From a Cognitive-Affective-Conative Framework Perspective. *International Journal of Human-Computer Interaction*, 36, 14, (2020), 1304-1313.
- [6] LUBOWIECKI-VIKUK, A., DĄBROWSKAA A., MACHNIK, A. (2021). Responsible consumer and lifestyle: Sustainability insights. *Sustainable production and consumption*, 25, 91-101.
- [7] SPRINGMANN, M., SPAJIC, L., CLARK, M., POORE, J., HERFORTH, A., WEBB, P., RAYNER, M., SCARBOROUGH, P.: The healthiness and sustainability of national and global food based dietary guidelines: modelling study. *BMJ*, 370, (2020).
- [8] SOORANI, F., AHMADVAND, M.: Determinants of consumers' food management behavior: Applying and extending the theory of planned behavior. *Waste Management*, 98, (2019). 151-159.
- [9] ŠAJN, N.: *Sustainable consumption: Helping consumers make eco-friendly choices*. European Parliament. [https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/659295/EPRS\\_BRI\(2020\)659295\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/659295/EPRS_BRI(2020)659295_EN.pdf), (2020).
- [10] UDO I., PHILIP T.: Influence of Personality on the Buying Behaviour of Undergraduate Students in Universities in Cross River State, Nigeria. *International Journal of Marketing Studies*, 7, (2015).
- [11] United Nations: *Sustainability*. Retrieved October 23, 2023, from <https://www.un.org/en/academic-impact/sustainability>, (2023).
- [12] VESELÁ, L., KRÁLÍKOVÁ A., KUBÍČKOVÁ L.: From the shopping basket to the landfill: Drivers of consumer food waste behaviour. *Waste Management*, 2023, 169, (2023), 157-166.

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# THE IMPORTANCE OF PERFORMANCE MANAGEMENT SYSTEM IN TAX CONSULTING

Torsten Huschbeck<sup>1</sup>, Jürgen Weltermann<sup>1</sup>, Oliver Haas<sup>1</sup>

<sup>1</sup>*Comenius University of Bratislava, Slovakia*

## KEY WORDS

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Management, Tax consulting, Employee performance, Strategic goal setting

## JEL CODES

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M12, M41, H25

## 1 INTRODUCTION

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The significance of performance management in the field of tax consulting can be effectively explored. It is evident that the primary objective of a company lies in delivering value through its products or services to its customers. By maximizing efficiency and delivering tangible benefits to customers, a company generates a service that customers are willing to compensate for. To optimize customer benefits and ensure competitiveness, it is essential for companies to effectively utilize production factors. These factors traditionally include labor, land, and capital, as defined by economic theory. Efficient utilization of these production factors enables effective production and the sustained existence of the company within the market. Economists widely agree that complete

substitution of any of the aforementioned production factors is challenging to achieve. Empirical research on the Wicksell-Cob-Douglas production function, considering the limits and elasticity of production factors, supports this notion. Attempting to fully replace any of the factors—labor, land, or capital—inevitably leads to diminishing returns and the eventual depletion of profits. Given the impossibility of complete substitution, it becomes crucial for enterprises to strive for the optimal utilization of each production factor. This article focuses exclusively on the utilization of the labor factor. It addresses the importance of performance management in efficiently harnessing this production factor within an organization.

## 2 MATERIAL AND METHODS

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The purpose of this article is to answer the following research question: “What is the significance of the performance management system in tax consulting?”. In order to answer the proposed research question, an extensive literature search and a qualitative literature analysis according to Mayring were carried out. For this purpose, the following databases respectively library catalogues were used for literature research:

SpringerLink, SCOPUS, JSTOR, ABS Academic Journal Quality Guide, PROQuest, EBSCO Host, Google Scholar, Google Search. Different search terms associated with the research question were identified and used. A qualitative content analysis of existing literature, categorizing and coding the information for systematic analysis were conducted by use of MaxQDA software.

### 3 RESULTS

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This literature review explored the significance of performance management in tax consulting firms and addressed the research question of the importance of the performance management system in this context. The findings highlight the crucial role of performance management in maximizing performance, enhancing employee motivation, and gaining competitive advantages in tax consulting. The measurement and evaluation of employee performance through performance appraisal systems were identified as essential aspects of performance management. Objectively capturing and assessing employee performance allows for fair recognition and can drive improved performance. Regular feedback was also emphasized as a means to continuously enhance employee performance and address areas for development. Strategic goal setting was recognized as another relevant aspect of performance manage-

ment in tax consulting. Clear goal definition and metrics enable better monitoring of performance outcomes and facilitate progress tracking. Aligning performance management with the long-term goals of the company can motivate employees to focus their efforts on achieving those objectives. Continuous competence development emerged as a critical factor in effective performance management. Implementing training and development programs ensures that employees possess up-to-date knowledge and skills, enabling them to adapt to the ever-changing demands of the tax industry. Overall, performance management plays a vital role in tax consulting firms. By implementing performance appraisal systems, providing regular feedback, setting strategic goals, and promoting continuous competence development, companies can enhance their performance, employee motivation, and competitive edge.

### 4 CONCLUSIONS

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This literature review provides substantial evidence supporting the significance of performance management in tax consulting. Understanding and effectively implementing performance management practices can contribute to the success and growth of tax consulting firms, ensuring their continued

competitiveness in the market. Further research in this area can explore specific strategies and best practices to optimize performance management in the context of tax consulting. Only the newest references were listed in this extended abstract.

### 5 REFERENCES

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- [1] FINK, S. et al.: How to Measure the Success of Tax Compliance Management Systems: A Framework for Assessment. *Schmalenbach Business Review*, 71(4), (2019), 605-638.
- [2] HILL, T. et al.: The influence of strategic alignment on performance measurement in professional service firms. *International Journal of Operations & Production Management*, 38(11), (2018), 2252-2274.
- [3] KATARIA, A. et al.: Do high-performance HR practices augment OCBs? The role of psychological climate and work engagement. *International Journal of Productivity and Performance Management*, 68(6), (2019), 1057-1077.
- [4] LEE, E. et al.: Developing a competency framework for tax professionals: the case of South Korea. *Journal of Asian Finance, Economics and Business*, 7(8), (2020), 525-536.
- [5] MOSER, M. et al.: Audit Process Automation: The Role of Artificial Intelligence in External Auditing. *Journal of Accounting, Auditing & Finance*, 35(4), (2020), 615-644.
- [6] SCHLEICHER, D. et al.: Putting the System Into Performance Management Systems: A Review and Agenda for Performance Management Research. *Journal of Management* 44(6), (2018), 2209-2245.

# THE ROLE OF TRUST IN BUILDING COMPANY REPUTATION THROUGH CSR INITIATIVES – PRELIMINARY RESULTS AND RESEARCH DESIGN

Julie Hüvel<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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Banking Sector, ESG, Stakeholder, Sustainability

## JEL CODES

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A13, E59, M14

## 1 INTRODUCTION

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The Global financial crisis of 2007–2009 was the most significant financial crisis to have occurred since the Great Depression of 1929 [1]. The banks have abused the trust of their customers because they acted without business ethics and specifically without the morals of the honourable merchant [2]. In the recent years Corporate social responsibility (CSR) has been gaining interest from the financial sector. The study aims to understand which CSR initiatives are crucial for German bank customers with a focus on the Millennials, which specific CSR measures build trust in the bank and how this affects the marketing output corporate reputation. The President of KIT (Karlsruhe Institute of Technology) said on the

occasion of the upcoming KIT Science Week from 10 to 15 October 2023 that the concern for a liveable, stable, secure and peaceful future is burning under people's nails [3]. But investments must be made for climate protection, sustainability and CSR. Are people willing to pay for it? For a long time, the issue of sustainability passed the financial market by. But now the financial market has a key role to play, as banks have been identified as a crucial lever of transformation. Therefore, it is necessary to break down from sustainability in general to sustainability in the financial sector. The transition to a low-carbon or free economy requires high investments.

## 2 MATERIAL AND METHODS

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Relevant literature was searched and only sources that met the generally applicable scientific requirements for the level of detail and quality of the elaboration were classified as relevant, preferably not older than 10 years as well as from professional non-journal sources. Non-peer-reviewed articles were excluded and only papers written in English and German were considered. Publicly accessible databases

such as Google Scholar were searched and then the Scopus and Web of Science databases, which are available to students of the Mendel University of Brno and furthermore the library of the KIT Library (Karlsruhe Institute of Technology). This literature has been coded with the MaxQDA software. For this purpose main codes and subcodes were defined inductively and deductively. The gained information

through the detailed revision of current literature by means of a qualitative content analysis according

to Mayring and Frenzl will allow to establish an overview of the status quo in research.

### 3 RESULTS

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The available research concerning the field of CSR in the banking industry is plentiful for a lot of different countries that shows the immense importance of this issue for academics as well as for business managers. Relevant studies were found from Bahrein, Greek, India, Italy, Peru, Romania, Spain, Zambia, Southern Europe, a global study in 18 countries and a study among the Islamic banking industry.

The studies have different focuses, such as showing differences in CSR between different types of banks, or differences in demographics, while others examine the impact of long-term relationships with clients, some of them are concerned with the developing countries others are comparing different countries. Only four studies were found dealing with this topic in Germany and its banking sector.

### 4 CONCLUSIONS

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It is clear from the research that creating a business strategy based on the concept of CSR presents a significant opportunity for differentiation and achieving positive customer outcomes. As customer and behaviour varies from country to country further research should be done on this specifics. There

is a need of investigating if there is a difference between the bank types in Germany where the cradle of the cooperative bank is. The impact of banking companies' CSR activities on consumer behaviour is a worthwhile topic for study [4].

### 5 REFERENCES

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- [1] AKINBAMI, FOLARIN (2011). Financial services and consumer protection after the crisis. *International Journal of Bank Marketing* 29 (2), 134–147. <https://doi.org/10.1108/02652321111107620>.
- [2] HONEGGER, CLAUDIA/NECKEL, SIGHARD/MAGNIN, CHANTAL (Eds.) (2010). *Strukturierte Verantwortungslosigkeit. Berichte aus der Bankenwelt*. Berlin, Suhrkamp Verlag.
- [3] OBERDORF, IRIS (2023). *KIT - STS - Medien/Public Relations - Magazine - lookKIT*. Verantwortung. Available online at [https://www.sts.kit.edu/lookkit\\_magazin.php](https://www.sts.kit.edu/lookkit_magazin.php) (accessed 7/12/2023)
- [4] FATMA, MOBIN/RAHMAN, ZILLUR (2016). The CSR's influence on customer responses in Indian banking sector. *Journal of Retailing and Consumer Services* 29, 49–57. <https://doi.org/10.1016/j.jretconser.2015.11.008>.

# THE ROLE OF TRUST IN REGIONAL INNOVATION SYSTEM

Adam Janošec<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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development, region, trust, innovation ecosystem

## JEL CODES

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O18, P48

## 1 INTRODUCTION

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In the context of regional development, regional innovation systems (RIS) represent an important element that brings together different actors, including businesses, scientific institutions, governmental bodies and other stakeholders in a region, to promote economic growth and the diffusion of innovation [1]. In today's globalised world, RIS are increasingly important as they play a key role in creating competitive regions and sustainable economies. A fundamental prerequisite for the successful and effective functioning of regional innovation systems is mutual trust and commitment among its actors

[2]. Trust forms the core of collaboration between research, innovation and business actors and creates an environment in which opportunities can be better identified, problems solved and innovative solutions can be co-created that contribute to the development of the region. According to Idris et al. [3] mutual trust among innovation ecosystem actors is an important aspect that influences their performance and success, and thus it is essential to explore the mutual willingness to collaborate and spread knowledge that will stimulate economic growth and competitiveness of the region.

## 2 MATERIAL AND METHODS

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Trust (composed of commitment and willingness to share knowledge) is a fundamental condition for a successful innovation system in the region. The author's aim is to identify and assess the trust between the different RIS actors to share knowledge and collaborate with each other through an appropriately chosen methodology. In order to fulfill the goal, it will be necessary to correctly identify the members of the RIS and then obtain data indicating mutual trust between the members of the innovation ecosystem. For this reason, the most successful RIS in the Czech Republic – the RIS of the South Moravian Region

– has been selected and will be the focus of the study, in cooperation with JIC (South Moravian Innovation Centre), which integrates the actors of the innovation ecosystem, analyses data for the RIS of the South Moravian Region and creates development strategies for its successful development. In order to achieve the objective, a questionnaire survey will be conducted among nearly 500 subjects of the JMK RIS, which will be carried out by electronic data collection. Respondents can be divided into three groups – private sector (SMs, start-ups, companies), public sector (Regional Authority of the South

Moravian Region, Statutory City of Brno, etc.), and academic sector (Universities). The questions in the questionnaire will primarily ask:

1. How actors evaluate each other's competences in the field of Innovation.

### 3 RESULTS

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The results identify the role of trust between actors in the regional innovation system leading to mutual cooperation and sharing of knowledge and experience. The evaluation of the questionnaire survey will reveal, for example:

- Which of the RIS actors is considered to be the most competent in the field of innovation.
- Which groups can be expected to be most willing to cooperate and share information.
- Which member of the innovation ecosystem is the most trusted within the RIS.

### 4 CONCLUSIONS

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One of the modern theories of regional development is the so-called "regional innovation systems theory", which understands a successful innovation ecosystem in a region as a set of actors cooperating to create innovation and disseminate knowledge. This paper will contribute to this theory by identifying the role

2. What is the general level of willingness of actors to share experiences and informations and to cooperate?
3. To what extent do members of the innovation ecosystem trust each other?

- How do the different actors assess the current set-up of the innovation ecosystem.
- What is the current involvement of RIS members in innovation creation, collaboration and dissemination of experiences.

The results obtained in this way can contribute to complement the theory of regional development, at the same time the data obtained will serve for the purpose of the JIC company in the preparation of the Strategy for the Development of the Innovation Ecosystem of the South Moravian Region for 2024.

of trust in these ecosystems and the extent to which actors are willing to cooperate and share knowledge. Trust and cooperation between innovation ecosystem actors is the key to a competitive region and its economic growth.

### 5 REFERENCES

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- [1] TÖDTLING, F; TRIPPL, M.: Regional innovation policies for new path development – beyond neo-liberal and traditional systemic views, *European Planning Studies* 26, 9, (2018), 1779-1795.
- [2] WANG, Z.: Knowledge sharing, innovation and firm performance. *Expert Systems with Applications* 39, 10, (2012), 149-159
- [3] IDRISOVA, J. et al.: Regional Development in the Context of Digitalization and Globalization. *SHS Web of Conferences* 172, 02028, (2023), 172-173

# THE DECOMPOSITES OF ESG RETURN

Katharina Kastens<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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ESG, ESG Score, Return, Active Return Decomposition, Neutral ESG Score

## JEL CODES

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M14, Q56, G12

## 1 INTRODUCTION

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Particularly in recent years, ESG has gained importance in the private, business and political spheres. Companies are adapting their strategies accordingly, and investors are rewarding this through noticeably increased inflows into ESG oriented financial products over the past decade [1]. However, the extent to which outperformance from increased inflows into sustainable companies is leading to overvaluation and

a potential bubble in the market [1], and what impact ESG performance actually has on corporate financial performance, is currently being debated in the capital markets [2]. The objective of this paper is therefore to show the extent to which ESG valuation leads to different performance of the main components of returns, paying attention to regional differences and the influence of other company specific factors.

## 2 MATERIAL AND METHODS

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This study is based on company data from 43,061 companies listed on the stock exchange from a total of 49 countries worldwide (excluding financial companies). The data was collected monthly for a period of 10 years from 2011-2021 by Refinitiv Datastream and includes the ESG score from Refinitiv Eikon. Data cleaning and analysis was performed using STATA. To determine the impact of ESG performance on corporate return differentials, a return decomposition model from MSCI is used [2]. In the model, total stock return is decomposed into three components: 1. change in P/E ratio, 2. earnings growth, and 3. reinvestment return consisting of dividend yield. For this purpose, the total sample is divided into equally weighted terciles according to the ESG score (esg group 1 = lowest ratings to esg group 3 = highest ratings). In addition, esg group 0 represents

all companies without an ESG rating for comparison. In order to show the development of the returns, the active return (the alpha) and the change in returns are also examined. All variables were cumulated and annualized. Since it has already been demonstrated in the literature that there is a correlation between company quality and size and ESG score [2], which is also reflected in this sample, a neutralized ESG score was constructed for comparison to remove these explanatory factors. For this purpose, following the procedure of Giese et al. [2], the ESG scores were regressed against the quality indicator return on equity (roe) and the size of the companies (logarithm of market capitalization). The residuals of the regression were used as a neutral ESG score to construct the ESG terciles. The results of this comparison are shown in Table 1.

### 3 RESULTS

Tab. 1: Fundamental active return decomposition of esg groups (for total and neutral esg score)

total esg score						
esg group	growth in eps	change in pe	reinvestment return	active return	change in return	
0	6.07%	-1.95%	1.60%	-0.67%	3.76%	
1	7.69%	-3.45%	1.50%	0.29%	8.59%	
2	7.33%	-3.30%	1.91%	1.59%	10.61%	
3	6.64%	-2.30%	2.42%	0.90%	11.15%	
neutral esg score						
esg group	growth in eps	change in pe	reinvestment return	active return	change in return	
0	6.07%	-1.95%	1.60%	-0.67%	3.76%	
1	8.25%	-3.19%	1.75%	0.18%	10.01%	
2	7.50%	-3.16%	1.93%	0.43%	10.53%	
3	5.91%	-2.05%	2.47%	0.16%	10.75%	

The results of the return decomposition with the normal ESG score show that during the period under review, especially companies with a medium and high ESG rating outperformed the benchmark (1.59% and 0.90% alpha) and showed significant return growth, as generally higher earnings growth was recorded and higher reinvestment returns than the companies with low or no ESG rating, while however the P/E development was more negative. Comparing these results with those using the neutralized ESG score,

it is noticeable that the outperformance, measured in alpha, of the medium and high ESG rated companies relative to those with no rating is lower than before (0.43% and 0.16% alpha), that even low rated companies slightly outperform those in group 3 (0.18% alpha). Again, the main reason for the active return of ESG companies seems to be the disproportionate earnings growth and reinvestment return. These results are also robust for the regions Europe, USA and Australasia.

### 4 CONCLUSIONS

The analyses show that the outperformance of companies with high and medium ESG scores is not driven by rising valuation levels (P/E ratio development), but rather by above-average earnings growth and reinvestment return (dividend yield) and thus provides an economic explanation. This contradicts the assumption of an ESG bubble in the market, since then the valuation of these companies, measured in P/E ratio development, should also have tended to rise [2], however, a stronger increase in earnings than in the stock price can be seen here. The analyses further show that the outperformance of ESG rated companies is also the result of the

eliminated factors of quality and size, although a part is still explained by the ESG rating. However, this shows the dependence of the effect of ESG ratings in relation to other factors, which is why the influence of ESG ratings on returns should be considered as differentiated as possible. Overall, it has been found that companies with an ESG rating, especially in the mid-range segment, had a better active return compared to the overall market during the study period, both overall and in different regions, compared to companies without an ESG rating.

### 5 REFERENCES

- [1] BOFINGER, Y., HEYDEN, K. J., ROCK, B. (2022). Corporate social responsibility and market efficiency: Evidence from ESG and misvaluation measures. *Journal of Banking and Finance* 134 (2022), 106322.
- [2] GIESE, G., KUMAR, N., NAGY, Z., KOUZMENKO, R. (2021). *The Drivers of ESG Returns*. MSCI Research Insight, available at: <https://www.msci.com/documents/10199/f31964d0-c79b-02af-45cc-fada2887d085>, retrieved on 07.10.2023.

# DATA USAGE WITHIN COMPANIES WITH A STANDARDIZED REPORTING ENVIRONMENT: A CASE STUDY

Michael Keller-Fröhlich<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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data management, data usage, data driven decision-making, reporting

## JEL CODES

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M10, D80

## 1 INTRODUCTION

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The processes, technologies and tools provided in a company to enable an access to and a propagation of data are described as data management. [1] Regarding Wilkinson Et al. the data management should to follow the FAIR principles, categorizing the data as Findable, Accessible, Interoperable and Reuseable. [2]

Usually a data warehouse system is implementing the requirements for FAIR data and therefore is

often a key part in data management, especially in larger companies. Due to a proven lack of data driven decision-making in companies of the manufacturing sector [3], the target of this case study is to analyze the data usage of manufacturing companies compared to other divisions like logistics and sales within a corporate group.

## 2 MATERIAL AND METHODS

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The collected and analysed dataset consists of 2.3 million data lines collected between end of January 2019 and February 2023. The data represents the accesses of 1,973 users out of 80 legal entities to the corporate data warehouse of a globally operating corporation. All data has been processed according to a lifecycle of privacy data procedure following the recommendations described in the standard ITU-T X.1148. [4] The material is chosen that way, because the data is categorized to be FAIR and due to a large portion of standardized processes within the specific legal entities, it is also possible to conclude from

results of specific entities to possible usage in other entities. It is also possible to separate especially the manufacturing entities in groups regarding the main production technology to research possible links between process complexity and the extent of data usage. Due to some influencers, which falsified the data, a subset had to be defined. For example in 2019 a restructuring of the factories happened. During this process some factories have been closed down, which leads to a wrong picture of data usage per users per plant. Therefore it was decided to only use the years, which are fully covered by the statistics, 2020 to 2022.

### 3 RESULTS

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The collected and analysed data is providing insights into the validity of the assumption, that manufacturing companies are lacking of data driven decision-making processes. The base measures taken into consideration are number of users and number of sessions. Additionally the number of sessions per user and the respective shares were calculated. From overall perspective for the defined subset of the years 2020 to 2022, manufacturing companies seem to have a lower data consumption rate than non-manufacturing companies. The number of users

are comparatively to the share of legal entities, but the number of sessions and followed also the sessions per users are far below average. But when grouping the sessions by the production technology used in the plants, it is obvious, that the data usage increases correlating to the complexity of the production process. The number of sessions per user in the plants with the most complex processes is even outgoing the rate of the non-manufacturing companies.

### 4 CONCLUSIONS

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The collected and researched data shows that manufacturing companies tend to not use available data in the extent non-manufacturing companies do. This finding needs to be differentiated as there is a clear discrepancy between manufacturers with a low complexity in their processes and the ones with a higher complexity. Especially the years 2020 and following are interesting to analyse deeper to research

the effects of increasing raw material prices and the accompanied need to reduce waste and other material costs on the data usage. Additionally, in a next step the collected data is analyzed more detailed, especially regarding differences in the specific factories and correlations on how their performance develops in relation to the data usages.

### 5 REFERENCES

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- [1] I. GARTNER, *Gartner Glossary - Data Management (DM)*, Gartner, Inc, [Online]. Available: <https://www.gartner.com/en/information-technology/glossary/dmi-data-management-and-integration>. [Accessed 05 10 2023].
- [2] M. WILKINSON et al. The FAIR Guiding Principles for scientific data management and stewardship. *Scientific data*, vol. 3, no. 1, pp. 1 - 9, 2016.
- [3] Capgemini, *Data-driven decision-making in organizations worldwide as of 2020, by sector*, 11. 2020. [Online]. Available: <https://www.statista.com/statistics/1235436/worldwide-data-driven-decision-making-organizations-by-sector/>. [Accessed 14. 05. 2022].
- [4] I. T. Union, *ITU-T X.1148 - Framework of de-identification process for telecommunication service providers*, Geneva, CH: International Telecommunication Union, 2020.

# SUPPORT MEASURES FOR COMPANIES EMPLOYING WORKERS WITH DISABILITIES WITHIN STATE LABOR MARKET INTERVENTIONS AS A KEY TO LABOR MARKET STABILITY IN THE V4 COMPARISON

Amar Khairi<sup>1</sup>, Lucie Sedláková<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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Labor market, Visegrad Group, state intervention, company support

## JEL CODES

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J14, J15

## 1 INTRODUCTION

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One of the primary ways in which governments support the labor market is through the effective design of supportive tools and policies. These tools aim to reduce negative social and economic consequences, particularly for vulnerable groups in the labor market. The COVID-19 pandemic has led to renewed interest in supportive programs aimed at increasing labor market stability. Many countries, including the Visegrad Group (V4) countries, have introduced new measures and programs to support the labor market. For example, in Poland, in 2018, there were nearly 2.9 million people with disabilities over the age of 18, accounting for approximately 10.3% of the Polish working-age population. The Polish government introduced various measures and programs to support the employment of these individuals, including wage subsidies, reimbursement of workplace adjustments, training for employees with disabilities, and sup-

port for personal assistants. These programs are supported by the State Fund for the Rehabilitation of the Disabled (Państwowy Fundusz Rehabilitacji Osób Niepełnosprawnych/PFRON). Similarly, in the Czech Republic, the number of companies striving to employ individuals with disabilities is on the rise. In the Czech Republic, these individuals have the opportunity to utilize retraining, vocational rehabilitation, and other support programs. There is also financial support for employers who hire people with disabilities. The maximum amount of financial support for employing individuals with disabilities was increased in 2022. Employers are also eligible for tax incentives and other support measures. The labor market in the Visegrad Group countries, which includes Poland, the Czech Republic, Hungary, and Slovakia, is evolving dynamically.

## 2 MATERIAL AND METHODS

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For the research, 8 companies were approached. Internal company data from the Czech Republic, Slovakia, and Hungary were utilized. The data

pertained to companies with up to 15,000 employees. A custom income equation was formulated, which calculates based on company data. The equation's

output is the company's income from supportive tools of state social policy and the performance of employees with disabilities. The resulting equation

underwent development through application-related changes.

### 3 RESULTS

The results of the study demonstrate the advantages for companies in employing individuals with disabilities and the extent of state support's impact on the labor market. This support is capable of correcting and increasing the demand of companies for this group of individuals in the job market. Income equation modified for corporations with

hourly customer billing:

$$ZZ = [(PZ - NZ) \cdot DZP]$$

$$ZZ = [(F \cdot H) - (H \cdot O)] + [(CM + N) + (SP + ZPS)] \cdot DZP$$

This expression describes the difference between revenue from customers and the costs of employing a worker over a specified period (data for the same time frame).

### 4 CONCLUSIONS

Workforce diversity remains a current topic in these countries. Diversity in the labor market can have positive effects, such as increasing creativity and innovation. However, it also requires effective management to minimize communication issues and differences in workers' values. O'Reilly (1998) Some countries are introducing programs that support education and retraining to enable people to transition to new job opportunities. The Visegrád Group countries will need to continue monitoring and adapting their labor market policies to be able to respond to current and future challenges, ensuring sustainable

and inclusive development of their labor markets. (Bogataj et al., 2019) The aim of the study is to reveal the impact of supportive government measures on the labor market in practice, specifically focusing on the size of the resulting effect on corporations employing workers with disabilities in the respective countries. The outcome will consist of numerically supported results of corporate applications in three of the four Visegrád Group countries (the Czech Republic, Hungary, and Slovakia). The research also aims to extend the application results to include the remaining country, Poland.

### 5 REFERENCES

- [1] ANIONWU, E. N., MULHOLLAND, J., ATKINS, R., TAPPERN, M., & FRANKS, P. J. *Diversity, attrition and transition in to nursing: the DATING project final report*. Thames Valley University, London, 2005.
- [2] BOGATAJ, DAVID & BATTINI, DARIA & CALZAVARA, MARTINA & PERSONA, ALESSANDRO: The ageing workforce challenge: Investments in collaborative robots or contribution to pension schemes, from the multi-echelon perspective. *International Journal of Production Economics*, vol. 210 (C), (2019), 97-106.
- [3] O'REILLY, C. A., WILLIAMS, K. Y., & BARSADÉ, S. Group demography and innovation: Does diversity help? *M. A. Neale, E. A. Mannix, & D. H. Gruenfeld, Research on managing groups and teams*, 183-207. London: JAI Press, 1998.
- [4] Positive trends in the labour market, 2019. In: *Ministry of Family and Social Policy Republic of Poland* [online]. gov.pl [cit.2023-09-25]. Dostupné z: <https://www.gov.pl/web/family/positive-trends-in-the-labour-market>

# INFLUENCE OF TAX ADVISERS ON SMES NON-COMPLIANCE IN TAX MATTERS

Marko Kostic<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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tax compliance, tax adviser, influence, SME

## JEL CODES

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L84, M41, H26

## 1 INTRODUCTION

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Taxation is a complex field characterized by constantly changing regulations, high complexity and high uncertainty, which calls the advice of experts with specific knowledge and competence. Because governments impose self-assessment of tax in particular, the role of external advisers has become crucial in the complex world of taxation. This is valid especially for small- and medium-sized enterprises (SMEs) because they often find themselves struggling with complying with all regulations and requirements on the one hand and considering ways to reduce their

tax liabilities on the other hand. Nevertheless, more than 75% of fiscally audited companies in Germany had subsequent payments in 2018. In addition a recent study of the European Parliament's Policy Department for Economic, Scientific and Quality of Life Policies also finds that the identity and role of tax intermediaries in facilitating tax avoidance are still unclear [1]. These factors reflect a gap in current knowledge and a need to shed light on this apparent inconsistency, which is the key aim of this literature review study.

## 2 MATERIAL AND METHODS

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Through an examination of existing literature this study seeks to contribute to the understanding of how tax advisers influence the SMEs non-compliance in tax matters. The concrete research questions is: How plausible is the premise that the primary role of tax advisers is to prevent SMES from being non-compliant with tax regulations? The review comprises two themes that will facilitate answering the research questions: On the one hand the role of tax advisers in SMEs, SMEs motives in employing external tax adviser, and type of support provided to SMEs. And on the other hand tax adviser's influence in SMEs being non-compliant in tax matters.

The review critically appraises reliable sources, which facilitate answering the research question. Continually adopted search terms were used such as

'role of tax advisers' + 'SME', 'SME motivation' + 'tax adviser', 'influence accountant tax compliance', and 'SME' + 'tax compliance'. The inclusion criteria are as follows: only quantitative studies, all assessment methodologies, SME focus, English & German language studies, relevant empirical studies identified in reference section of original research identified. The abstract or introduction was first read to assess suitability for answering the research questions. Publications that were relevant and reliable were then scanned to identify key phrases, appropriate objectives, major findings and study limitations. The chosen sources were read line by line to identify major objectives, methods, key findings and study limitations.

### 3 RESULTS

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Due to the intricate and extensive tax rules, growing number of laws and precedents, and the partially ambiguous character of the legislation and regulation, SMEs are becoming more reliant on external assistance. The reasons for employing an external adviser are heterogeneous and include reducing compliance costs in regards to time and effort, overcoming knowledge and work capacity shortages, optimizing tax liabilities and potential financial penalties, and utilizing the adviser as intermediary and facilitator in conflicts and with government authorities.

When it comes to the question of adviser's cut in SMEs non-compliance, it can be noted that the presence of a tax adviser has a substantial impact on enhancing taxpayer compliance [2]. This holds true particularly in situations where the legality is unambiguous as it is found that tax adviser assist their clients in minimizing unintentional non-compliance [3] [4]. While taxpayers may rely on

their tax advisers to make judgments on how far to go [5], it is evident that taxpayers' preferences also influence their compliance behavior. And tax adviser tend to tailor their advice to clients based on their preferences. Even though tax advisers typically prioritize their clients' tax objectives over those of the tax authorities and are known to be loyal to their clients when navigating the ambiguous aspects of tax law, it has been observed that certified advisers tend to exhibit higher frequency, average levels, and variation of non-compliance on tax returns compared to non-certified adviser or to returns being self prepared. This is especially the case in situations where ambiguity exists. One possible explanation could be that tax practitioners operate in a highly competitive market, and their ability to fulfill taxpayers' requests, whether they are legal, unlawful, or on the fringes, may determine their existence.

### 4 CONCLUSIONS

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It can be ascertained that depending on clients basic preference and attitude tax advisers have a difference-making influence and their case-by-case assessment and the corresponding advice could enhance intentional as well as unintentional non-compliance behavior, especially if the client exhibits high risk affinity. Moreover it seems that various internal factors on advisers's side influence their

willingness to provide non-conservative advice to their clients, such as degree of expertise, amount of experience, competitive market stance and economic dependence on the respective client. This study also highlights the significant gap in empirical studies on the rationale for SMEs to employ tax advisers and of the relationship between the parties regarding tax compliance matters.

### 5 REFERENCES

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- [1] MULLIGAN, E., BASSEY, E., DE WIDT, D., GREGGI, M., KIESEWETTER, D., OATS, L.: *Regulation of intermediaries, including tax advisers, in the EU/Member States and best practices from inside and outside the EU*. European Parliament, Brussels, 2022, p.10.
- [2] DEVOS, K.: The impact of tax professionals upon the compliance behaviour of Australian individual taxpayers. *Revenue Law Journal*, 22(1) (2012).
- [3] ERARD, B.: Taxation with representation - An analysis of the role of tax practitioners in tax compliance. *Journal of Public Economics*, 52 (1993), p. 163-197.
- [4] KLEPPER, S., MAZUR, M., NAGIN, D.: (1991). Expert Intermediaries and Legal Compliance: The Case of Tax Preparers. *The Journal of Law & Economics*, 34(1) (1991), p. 205-229.
- [5] SAKURAI, Y., BRAITHWAITE, V.: *Tax-payers' Perception of The Ideal Tax Adviser: Playing Safe or Saving Dollars*. Working Paper, 2001.

# POLITICAL ECONOMY AND ITS THEORETICAL CONNECTION WITH THE NEW SILK ROAD PROJECT IN CENTRAL ASIA

Tomáš Král<sup>1</sup>

<sup>1</sup>*Jan Evangelista Purkyně University in Ústí nad Labem, Czech Republic*

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## KEY WORDS

New silk road, central Asia, project, regime, labor market, government, regime, international relations, railway, megaproject

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## JEL CODES

E20, F50, F60

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## 1 INTRODUCTION

Geopolitically, Central Asia is currently a very interesting region, as it is in the sphere of influence of two world powers. These are specifically Russia and China. China's power tool for gaining more influence in the region is the New Silk Road project. The New Silk Road is a megalomaniac project of the Chinese government that will run until 2040. This Chinese project has many levels of impact, the most significant of which are economic, political and geopolitical. From the research perspective,

all these levels can be approached through the lens of political economy. Based on the findings and concepts of political economy, this contribution will introduce the theoretical framework to study the possible impacts of the New Silk Road in the Central Asia. The selected theoretical concepts are then analyzed further in the paper like 1. international relations (realist, neoliberal and constructivist theories), 2. megaprojects, 3. high-speed railways and 4. globalization.

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## 2 MATERIAL AND METHODS

This paper presents the main results of literature review of research concepts related to political economy in the context of the New Silk Road project. The main method is a review of research literature, articles and other scientific resources of theory for the dissertation thesis. The targeted research was mainly on the economic and political level, ideally in theoretical concepts that connect

both fields. All available data sources were used, such as databases such as Web of science, Scopus, Google scholar. Research was also done through scientific libraries and bookstores. The content of the sources was searched in order for the researcher to understand the issue of the New Silk Road in Central Asia in a comprehensive way.

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## 3 RESULTS

As we found during the literature review, the most relevant theoretical field regarding to the topic under study is concept of the international relations as a

multidisciplinary field that examines mutual interactions between states, international organizations and other non-governmental actors. The behavior of individual

states in the international field is mainly influenced by international institutions. Institutions are described as regimes that create a space for the creation of international relations. Realistic ideas are the oldest and treat international relations as an anarchy where the law prevails and the strongest survives (Bell, 2017). Neoliberal states do not exist in an anarchist system any more than realist states do. The neoliberal approaches are the next field of the research, that describe the central Asian space in international relations and a way of governing. Neoliberal theory discusses a certain influence of institutions on international relations (Keohane, 1984). Neoliberal approaches do not limit individual actors in any way, but create certain paradigms within which there is an expectation from individual actors (Keohane, 1984). We can see this approach toward governance in individual Central Asian republics. However, there are exceptions, such as Turkmenistan, which is one of the most isolated countries in the world. The last group are structuralist theories that are based on pre-defined structures that do not change dramatically, but they can change slightly over time, for example US policy towards the Soviet Union.

## 4 CONCLUSIONS

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The aim was to present the main theoretical concepts related to the study of territory and political economy. Central Asian states are autocratic and therefore slightly unpredictable and variable in their behavior in international relations, but most of them follow a neoliberal approach in international relations, because the indirect role of institutions encourages them to do so (Keohane, 1984). Understanding the foreign policy of the Central Asian states is the basis for fulfilling the objectives of the dissertation. During the literature review, we observed many relevant concepts, but in the end the most discussed is the functional theory of regimes within international relations. The only state in the region that does not operate on neoliberal theories is only Turkmenistan, which leads a policy of complete isolation. The political functioning of this state is different from the rest of

Another relevant theoretical field of the thesis is the theory of high-speed railways. High-speed railway is a specific type of rail system that is characterized by high train speeds (often over 250 km/h) and rapid passenger transport between cities and regions. In the dissertation thesis will be particularly focus on the regional impact of the high-speed railway construction (Vickerman, 2013). The construction of high-speed railways can also be seen as a megaproject, specifically, it is about “The Wider Economic Impacts of Mega-Projects”. Megaprojects can include the construction of high-speed railways, large ports, power plants, large airports. This theory seeks to examine how such projects can affect economic growth, employment, trade and local business development where they are carried out (Vickerman, 2013).

The last concept introduced is globalization and its impact on the region through transport. Thanks to the construction of the railway, there is a gradual diffusion of globalization into this area (Ritzer, 2016). We can gradually observe changes mainly in the area of the labor market or changes in the distribution of the peripheral and core areas of the region. (Ritzer, 2016).

the region. However, it can be expected that thanks to the New Silk Road, Turkmenistan will have to open up at least partially for this Chinese strategy to work. Its characteristic is that the New Silk Road project is economically very important to understand as a megaproject that will influence many regions and countries, where the project will be realised (Vickerman, 2013). Hand in hand with this theory goes the theory of high-speed railways and what problems, pitfalls and obstacles it will have to overcome during its construction and modernization (Vickerman, 2013). In addition, concepts related mainly to the high-speed railway and its effects on the economic level in the region were presented. The theory of globalization is also very important for the understanding the economic and social impacts that the project will bring (Ritzer, 2016).

## 5 REFERENCES

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- BELL, D. Political realism and international relations. *Philosophy compass* 12 (2). 2017. 48-60p.
- KEOHANE, R. *After Hegemony: Cooperation and Discord in the World Political Economy*. Princeton: Princeton University Press. 312 p. 1984. ISBN 978-1-4008-2026-9
- RITZER, G. *The Blackwell companion to globalization*. Hoboken: John Wiley and Sons Ltd. 752p. 2016. ISBN 9781119250722
- VICKERMAN, R. Wider impacts of megaprojects: curse or cure? In: PRIEMUS, H.; BERT, W. ed. *International Handbook on Mega-Projects*. Oxford: Oxford University Press. 2013. 389-405p.

# VOLATILITY SPILLOVER IN CRYPTOCURRENCY MARKETS: EVIDENCE FROM HIGH-FREQUENCY ANALYSIS USING DCC-GJR-GARCH MODEL

Dominik Krampla<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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uncertainty, GARCH, cryptocurrencies, ARCH, conditional volatility, DCC, conditional correlation, volatility spillover, GMVP

## JEL CODES

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G11, G12, G14, G41

## 1 INTRODUCTION

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Ever since the inception of Bitcoin and the revolutionary technology of blockchain, it has become evident that the cryptocurrency market thrives within a dynamic and swiftly evolving landscape. The rising prominence of cryptocurrencies extends beyond retail investors, encompassing a growing appeal to institutional investors and even capturing the attention of many nations. Despite the increasing interest exhibited by academics and investors in

cryptocurrencies, there remains a significant research gap pertaining to the development of methodologies for predicting short-term and long-term price movements as well as volatilities within cryptocurrency markets (Gordon et al., 2023). This research focus on the identification of conditional volatility and the dispersion of uncertainty across multiple cryptocurrencies.

## 2 MATERIAL AND METHODS

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Previous researchers have predominantly centered on daily or hourly data. In this study, we address this gap by employing data sourced from five prominent cryptocurrencies, namely Bitcoin, Ethereum, Ripple, Cardano, and Litecoin, analyzed at 15-minute intervals from 23. April 2021 to 31. March 2022, with total number observations of 32 904 per cryptocurrency. Thus, the high-frequency analysis allows us to analyze the sentiment of the cryptocurrency market at a given time, where sentiment is a key element in the cryptocurrency.

Using GARCH family models, conditional volatility was modeled, and the DCC-GJR-GARCH(1,1) model was applied to identify the spread of conditional volatility, accounting for the impact of asymmetric shocks.

Furthermore, we implement three distinct portfolio strategies: the Markowitz Portfolio, Naïve Portfolio, and the Portfolio based on DCC GARCH family models.

### 3 RESULTS

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The results show that the conditional volatility of cryptocurrencies is best described by the EGARCH (1,1) –  $t$  model, which accounts for asymmetric effects in volatility by using an exponential function to model conditional volatility. The highest shock in the form of conditional volatility was in May 2021, which was likely a combination of regulation from China and tweets from Elon Musk announcing on Twitter that Tesla was discontinuing the ability to pay with Bitcoins, due to the negative environmental impact. The results of the EGARCH(1,1) model show strong clustering and persistence of volatility on all five cryptocurrencies. In addition, there is an asymmetric response to shocks (negative leverage parameter), as positive shocks increase volatility more than negative shocks of the same magnitude. The results are consistent with the findings from (Fakhfekh and Jeribi, 2020), where most of the cryptocurrencies exhibited negative leverage effect.

### 4 CONCLUSIONS

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We find, that when the uncertainty in the cryptocurrency markets is increasing, the interconnectedness is decreasing. The uncertainty spreads most from Bitcoin to Ethereum, which reaches steadily a value higher than 0.8 in the analyzed period, followed by Litecoin, then Cardano and the least affected by uncertainty from Bitcoin is Ripple. Overall, our results show, that Bitcoin is the main source of volatility spillover in cryptocurrency markets.

We further analyze the appropriate combination of cryptocurrency weights in different conceptualiza-

To evaluate the first hypothesis, the DCC-GJR-GARCH(1,1) model was used, which, like the EGARCH model, is able to account for the effect of asymmetric shocks. The results of this model show that uncertainty spreads most between Bitcoin and Ethereum, and that the cryptocurrency Ripple is the least affected by Bitcoin's volatility, followed by Cardano. Based on the results, portfolios were created according to different strategies.

The portfolio using the DCC-GJR-GARCH strategy (1,1) has the lowest risk. Conversely, the naive portfolio, characterized by an equal allocation of weights across all cryptocurrencies, exhibits the highest level of risk. Hence the results from portfolio weights using the DCC-GJR-GARCH approach are in accordance with Global Minimum Variance strategy.

tions of strategic portfolio construction. The portfolio achieves the lowest risk using the DCC-GJR-GARCH strategy (1,1). The highest risk is represented by the naive portfolio, which assigns equal weights to all cryptocurrencies. With respect to the level of risk, it can be argued that the DCC approach to portfolio construction provides the most efficient allocation of capital if the investor targets the strategy with the lowest portfolio risk (GMVP).

### 5 REFERENCES

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FAKHFEKH, M., JERIBI, A., 2020. Volatility dynamics of crypto-currencies' returns: Evidence from asymmetric and long memory GARCH models. *Res. Int. Bus. Finance* 51, 101075. <https://doi.org/10.1016/j.ribaf.2019.101075>

GORDON, S., LI, Z., MARTHINSEN, J., 2023. A deep analysis of the economics and finance research on cryptocurrencies. *Econ. Lett.* 228, 111136. <https://doi.org/10.1016/j.econlet.2023.111136>

# POSSIBILITIES FOR FINANCING CARE ROBOTS IN THE GERMAN HOSPITAL REMUNERATION SYSTEM

Birgit Lehner<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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health care, robotic nursery, hospital financing, autonomous systems

## JEL CODES

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G18, I18, I15

## 1 INTRODUCTION

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The current situation of nursing care in Germany as well as the foreseeable developments in the health care system are increasingly difficult for hospitals to cope with. Considering the expected demographic development in the coming decades – people are getting older and older, morbidity will continue to increase as a result – and the expected technical progress, costs in hospitals will continue to rise in the future. In hospitals, this will particularly affect the professional group of nursing, which has now become the focus of attention in health policy. The situation can only be alleviated through the use of technical aids, whereby their financing must inevitably also be regulated. This must not and cannot only be the

task of the providers, such as hospitals. It is an issue for society as a whole, which is why financing must be and is currently taken up by the responsible bodies in politics. Robot technology in nursing is still in its infancy and will continue to develop massively in the coming years and decades. Nevertheless, hospital management already has to deal with the topic because not only is financing a complex issue, but robotics also requires a reorganisation of many operational processes. The article provides an overview of hospital financing in Germany as well as specifically the financing of nursing and the possibilities for financing nursing robotics.

## 2 MATERIAL AND METHODS

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In contrast to the free economy, a hospital is subject to strict legal regulations in the area of financing. In Germany, hospitals are financed by means of dualistic financing, i.e. the investment costs are borne by the Länder and the operating costs by the health insurance funds. The budget for the operating costs must be

negotiated annually with the insurance funds and is therefore not available in a guaranteed fixed amount. An overview of hospital financing in Germany with emphasis on robotic care is given here, and the results of an empirical study in the form of expert interviews on the topic of financing are also discussed.

### 3 RESULTS

Hospital financing has changed fundamentally over the past 20 years:

1. Before the Era of Diagnosis Related Groups (DRG): Before 1993, the hospitals billed the health insurance funds for the patients' stay per day in so-called daily nursing rates, whereby the principle of cost recovery initially applied.
2. The DRG Era: From 2003 on, a consistently performance-oriented remuneration system was introduced. The financing of the inpatient sector in hospitals was changed from daily nursing rates to diagnosis-specific flat rates per case with so-called Diagnosis Related Groups (DRG), which are intended to cover all necessary treatment costs as an average value.
3. DRG Reform with Separation of Care Costs from 2020 onwards: While the financing of investment costs was not changed and remained below the required level, in 2020 the legislator changed the method of dual financing through several interventions in the G-DRG system. With the Nursing Staff Strengthening Act of 11 December 2018, it was decided to remove a large part of nursing staff costs from the DRG system and to remunerate them separately in future with up to 4% of the nursing budget now available for nursing

relief measures, which includes process optimisations, the use of assistants and investments in technical reliefs including robotics, the latter being explicitly listed. Thus, for the first time, a legal basis for the remuneration of the use of new nursing technologies has been created.

A further far-reaching restructuring of hospital financing will become necessary, this was also the result of the expert interviews in the area of financing. In the model with the nursing budget, additionally to financing human nursing staff, a certain framework remains for measures to relieve the burden of care. With robotics, which would be in the area of investment financing, the boundaries of the two financing pillars become merged. According to current budget thinking, caregivers are saved who would be paid by the health insurance funds. On the other hand, the expenditure increases, which would have to be financed by the state through investment subsidies. There is also the question of whether cross-financing would then be possible, and the current financing system in hospitals would have to be further developed to this end, as we are coming up against limits here. If one really buys in robots to counteract the nursing shortage, then there are no proven costs for nurses, and instead one has investments that the state would actually have to pay for, which would require a change in the financing issue.

### 4 CONCLUSIONS

The shortage of nursing staff in hospitals will not be solved in a conventional way in the foreseeable future; one possible solution is more or less autonomously acting nursing robots. However, there are many technical, ethical, legal and, above all, financial aspects to be considered. Management faces the problem of having to keep up with the state of the art without taking incalculable

risks. Autonomous nursing systems will be indispensable for managing work in the future and perhaps also a factor with considerable influence on the hospital's external image, but an introduction project in this area is associated with very high expenditure – both financially and in terms of the entire operational organisation – so that wrong decisions have major consequences.

### 5 REFERENCES

- [1] BRAUN, O. et al: *Pauschalpatienten, Kurzlieger und Draufzahler - Auswirkungen der DRGs auf Versorgungsqualität und Arbeitsbedingungen im Krankenhaus*. Hans Huber Publishing House, Bern, 2010
- [2] Federal Ministry of Health: *Krankenhauszukunftsgesetz*, [2021-01-11]. <https://www.bundesgesundheitsministerium.de/krankenhauszukunftsgesetz.html>
- [3] HETZEL, M., KOHLHÄUFL, M.: *Quality and cost-effectiveness, Pneumologie* 14. Springer Link, 2017
- [4] HORNING, J.: *Nachhaltiges Personalmanagement in der Pflege*. Springer-Verlag, Berlin Heidelberg, 2013
- [5] KAMPE, D. M., BÄCHSTÄDT, K-H.: *Die Zukunft der Krankenhausfinanzierung*. WIKOM-Verlag, Wegscheid, 2007

# A META-ANALYSIS ON PRIVATE EQUITY TECHNOLOGY-DRIVE VALUE CREATION

Maximilian Liepert<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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Private Equity, Technology, Value Creation, Meta-analysis

## JEL CODES

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G24, O33

## 1 INTRODUCTION

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With the advent of the 21st century, there has been a surge of interest in Private Equity (PE) firms and the various methods they use to improve valuation for sale. A PE firm is an investment entity that acquires equity interests in other organisations private equity. PE firms often rely on the use of leveraged buyouts for companies with high levels of debt.

Lahmann et al. (2017) argue that the primary aim of a PE firm is to enhance investment returns and exit the market within a few years to amplify

value levels. Moreover, PE firms typically surpass market performance by generating alpha (Schlegel, 2019). Alpha denotes the active return on an investment, measuring its performance against a market index or benchmark representing the overall market movement. Creating alpha hinges on the firm's adaptability to market conditions, achieved through a valuation model incorporating three key input factors: multiples, EBITDA, and net debt.

## 2 MATERIAL AND METHODS

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This study offers valuable insights into the ongoing discussion regarding the influence of PEs on boosting EBITDA to enhance divestment valuations. It quantitatively assesses the PE impact on operational performance and its potential for improving portfolio companies. Furthermore, it investigates the mechanism by which value is conveyed from investors to portfolio companies via information technology, leading to the formulation of the initial Hypothesis H1: IT Cost reduction is vital in creating value and increasing EBITDA for PEs during valuation for divestment. Moreover, the study enriches current research by distinguishing the value creation process concerning both short-term and long-term perspectives. It is conclusive that while optimizing sourcing can reduce IT operating expenses in the

short term, the strategic repositioning early in PE ownership should have a more significant impact over the medium to long term. Introducing value creation initiatives and additional activities such as improved governance, management support, and monitoring can further enhance performance. This leads to the formulation of the second Hypothesis H2: Tech-enabled improvement of operations are used in value creation and increasing EBITDA and reducing other costs for PEs during valuation for divestment. The study's third contribution lies in its examination of the divestment context and its relevance in PE deals and transactions. This context proves valuable in delineating portfolio company operations and elucidating how the CIO/CFO organization can contribute to enhancing valuation and

profitability. Consequently, this leads to the formulation of the third Hypothesis H3: Digital enablement initiatives are used in value creation and increasing EBITDA/Revenue for PEs during valuation for divestment. To test the research hypotheses, a meta-analysis was conducted to identify primary studies that investigate technology-driven value creation strategies employed by PE firms. In the eligible

studies, researchers were responsible for calculating the weighted average of effect sizes. The meta-analysis integrates data from multiple studies to generate a single estimate of the effect, categorizing it as either treatment or risk factors. This approach enhances the precision of the estimated effect by utilizing all available data.

### 3 RESULTS

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The analysis of the three hypotheses revealed statistically significant Cochran's Q data, confirming a notable amount of heterogeneity among the studies. The I test assessed the relative levels of heterogeneity, with summations indicating values of 72%, 50%, and 80% for the three hypotheses. H1: The sample studies indicated that PE funds often employ technology methods, such as IT cost reduction, to enhance operational value creation. The results largely support this hypothesis. The primary focus on optimization through initiatives aimed at reducing IT operating expenses leads to an increase in EBITDA rates from an As-Is to a To-Be situation. H2: Tech-enabled operational improvement is a crucial factor for subsequent EBITDA gains. The meta-analysis results show support for H2, with the coefficient indicating the proportion of value creation in the

divestment context. Additionally, the proportion of tech-enabled improvement strategies, such as IT system enhancements and process re-engineering, effectively reduces other costs and boosts EBITDA rates. The studies indicate that EBITDA spikes reached a substantial 20%, increasing the expected effect size by 70% compared to the previously recorded mean effect size. H3: The moderating role of digital enablement initiatives was also explored in the meta-analysis. Building on existing research, the study identified a positive moderate relationship between the adoption of new digital capabilities and EBITDA rates, as well as improved revenues. This confirms that PE firms employ technology-driven value creation to enhance EBITDA either before or during the valuation process.

### 4 CONCLUSIONS

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The preceding research paper underscores how firms enhance their valuation for divestment through technology-driven value creation. The analysis reveals that implementing strategies like IT cost reduction, tech-enabled operational improvement, and digital enablement contributes to the amplification of EBITDA. In particular, IT cost reduction initiatives focus on optimizing IT expenses, and the research findings suggest that reducing IT costs correlates with an EBITDA increase. Furthermore, the study

demonstrates that the adoption of ERP systems enhances operational efficiency and automation, leading to process improvement and reengineering. This reengineering process is associated with a growth-oriented mindset, resulting in significant EBITDA growth rates. Additionally, digital enablement emerges as a critical strategy employed by most PE firms in today's business landscape. This enablement triggers transformative approaches and initiatives that boost top-line growth and revenue.

### 5 REFERENCES

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LAHMANN, A.D.F., STRANZ, W. and VELAMURI, V.K.: Value Creation in SME Private Equity Buy-outs. *Qualitative Research in Financial Markets*, Vol. 9 No. 1, (2017), p. 2-33.

SCHLEGEL, D. Value Creation in the Private Equity Industry. *International Journal of Management Cases* 21, (2019), p. 5-16.

# THE RELATIONSHIP BETWEEN GOVERNMENT DEBT AND ECONOMIC SENTIMENT

Meiyu Lu<sup>1</sup>

<sup>1</sup>*VSB-Technical University of Ostrava, Czech Republic*

## KEY WORDS

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consumer sentiment, government debt, the European sovereign debt crisis

## JEL CODES

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D9, H68, H87

## 1 INTRODUCTION

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After Keynes (1936) proposed animal spirits, the application of sentiment in the economic field became more and more important. In the last few decades, researchers had explored mostly the impact of sentiment on macroeconomics. For example, the prediction of sentiment on unemployment, GDP, and private consumption. Government debt has been a hot topic in recent years due to problems related

to growing indebtedness in many countries around the world. Giavazzi and Pagano (1989) argue that a decline in confidence can lead to a potential debt crisis. Conversely, does a change in government debt have an impact on economic sentiment (as example: consumer confidence)? We will discuss the specific relationship in this paper with the case of the Czech Republic.

## 2 MATERIAL AND METHODS

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We employ quarterly data published by the Ministry of Finance of the Czech Republic over the period 2007–2023. In order to determine whether there is a stable, long-term correlation between consumer confidence and government debt, we evaluate the data for stationarity and cointegration. We utilized both ADF and Phillips–Perron (1988) tests during this process for the unit root test. Dickey and Fuller (1979) are referred to as the source for the ADF test, and the basic formula is shown below:

$$\Delta y_t = \alpha + \beta y_{t-1} + \delta t + \sum_{j=1}^k \zeta_j \Delta y_{t-j} + e_t$$

We used Johansen tests to examine the data for cointegration. The null hypothesis of the cointegration

test is that there is a cointegration relationship between the data. The cointegration test in Stata are based on the maximum likelihood (ML) methods developed by Johansen (1988):

$$\Delta y_t = \alpha \beta' y_t + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-1} + v + \delta t + \epsilon_t$$

After stationarity and cointegration tests, we found a long-run stationary relationship between the variables. The results of the Granger causality test indicate that consumer confidence is the Granger cause of government debt and that there is a significant negative relationship between them.

### 3 RESULTS

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To check for stationarity, we first perform a unit root test on the data for consumer confidence and government debt. Both sets of data pass the unit root test under the ADF test and PP test at the first-order difference and remain steady at the 1% significance level. The data are stationary at differences. Besides, the results of the cointegration test are stationary and we argue that there is a stable long-term rela-

tionship between the variables. Moreover, Granger causality test suggests that consumer confidence is the Granger cause of government debt. Changing in consumer confidence causes changes in government debt. After regression analysis we can infer that there is a negative relationship between consumer confidence and government debt. When consumer confidence decreases, government debt will increase.

### 4 CONCLUSIONS

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In this paper, we discuss the notion of economic sentiment and how it relates to government debt. Our study supports the conclusions made by Fernandes et al. (2016). We also come to the same conclusion as Sartell (2014), namely that there is a statistically significant correlation between consumer mood and government debt. Similar to the findings of De and Ji (2015), and Mumtaz and Surico (2018), our results also indicate that there is a negative relationship

between government debt and consumer confidence. Based on the results of the Granger causality test we conclude that government debt is not a Granger cause of changes in consumer confidence. In short, when consumer confidence increases, government debt will decrease. Consequently, debt stress might arise as a result of a nation's confidence crisis. In order to improve the model, future research is going to investigate additional explanatory variables.

### 5 REFERENCES

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- [1] DE GRAUWE P, JI Y. *Market sentiments and the sovereign debt crisis in the Eurozone*. FinMaP-Working Paper, 2015.
- [2] DICKEY D A, FULLER W A. Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American statistical association*, 1979, 74(366a): 427-431.
- [3] FERNANDES C, GAMA P M, VIEIRA E. Does local and Euro area sentiment matter for sovereign debt markets? Evidence from a bailout country. *Applied Economics*, 2016, 48(9): 816-834.
- [4] GIAVAZZI F, PAGANO M. *Confidence crises and public debt management*. 1989.
- [5] JOHANSEN S. Statistical analysis of cointegration vectors. *Journal of economic dynamics and control*, 1988, 12(2-3): 231-254.
- [6] KEYNES J M. *The general theory of interest, employment and money*. 1936.
- [7] MUMTAZ H, SURICO P. Policy uncertainty and aggregate fluctuations. *Journal of Applied Econometrics*, 2018, 33(3): 319-331.
- [8] PHILLIPS P C B, PERRON P. Testing for a unit root in time series regression. *Biometrika*, 1988, 75(2): 335-346.
- [9] SARTELL E A. *The impact of national debt and budget deficits on US consumer confidence*. Anderson University, 2014.
- [10] VANLAER W, BIELEN S, MARNEFFE W. Consumer confidence and household saving behaviors: A cross-country empirical analysis. *Social Indicators Research*, 2020, 147: 677-721.

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# HUMAN RESOURCE COMPETENCIES IN THE AUTOMOTIVE INDUSTRY 4.0 – PRELIMINARY RESULTS AND RESEARCH DESIGN

Gert Manning<sup>1</sup>, Hana Stojanová<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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Human Resources, Competencies, Industry 4.0, Human Machine Interaction

## JEL CODES

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L62, M53, M54

## 1 INTRODUCTION

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This work disclosures and outlines the need for a comprehensive research project to identify the human resource competencies required for the automotive Industry 4.0, integrating secondary quantitative data

from Programme for the International Assessment of Adult Competencies (PIAAC) Cycles 1 and 2, as well as qualitative research.

## 2 MATERIAL AND METHODS

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The still ongoing study is best understood as a mixed-methods approach, applying an extensive and systematic literature review (Linnenluecke, Marrone and Singh, 2020) as input to a quantitative and comparative analysis (Marengo and Seidl, 2021). The aim is to support a comparative analysis, being the analysis of PIAAC secondary data. PIAAC is a collaborative effort between participating countries, an international contractor responsible for study instruments, survey procedures, quality control and the Organization for Economic Cooperation and Development (OECD). PIAAC assesses the literacy, numeracy, and problem-solving skills of adults on

an wide-ranging international scale. The comparative analysis employed in this study is focused on elucidating the processes associated with changing human resource requirements and the consequences of digitalization in the automotive industry. It emphasizes examining differences and similarities in the requirements for human resources mainly between German and U.S. automotive companies. After the above mentioned quantitative analysis, a qualitative research – in which in total 20 German and US senior automotive experts are systematically interviewed – will be conducted and subsequently analyzed in order to illuminate remaining ambiguities.

### 3 RESULTS

Current literature review results are limited to the findings from the conducted extensive and systematic literature review. Identified studies emphasize the need for educational approaches that integrate lean manufacturing and production flow modeling skills. Competencies are mainly categorized into technical, managerial, and social domains, with a comprehensive “Human Capital 4.0” skill set proposed, including digital literacy and emotional intelligence (Flores, Xu and Lu, 2020). In blockchain technology specifically, securing data sharing across the automotive supply chain is acknowledged (Fraga-Lamas and Fernández-Caramés, 2019). Digital manufacturing

technology implementation necessitates skills such as digital literacy and problem-solving (Demeter, Losonci and Nagy, 2021). Training programs for analytical and technology adaptation skills are suggested (Frazzon, Kück and Freitag, 2018).

Moreover, big data analytics in supply chain management is deemed critical (Raut et al., 2019), with a skills gap identified in integrating real-time operational data (Colombari et al., 2023). To sum up, while various studies recognize evolving skill requirements and emerging technologies, however, many lack specific details on required skill sets, highlighting the need for further research and training programs.

### 4 CONCLUSIONS

To comprehensively grasp the human resource competencies essential for the automotive Industry 4.0, a comparative study using PIAAC Cycle 1 and Cycle 2 data, alongside qualitative research, is vital, since existing studies provide insights into skill needs but lack specificity, prompting further specific investigation. This approach aims to uncover disparities

and commonalities in human resource demands, especially between German and U.S. automotive firms, to discern whether global or region-specific prerequisites are essential in the evolving Industry 4.0 landscape. This research intends to bridge knowledge gaps and guide future effective training and development initiatives.

### 5 REFERENCES

- COLOMBARI, R. et al. (2023) ‘The interplay between data-driven decision-making and digitalization: A firm-level survey of the Italian and U.S. automotive industries’, *International Journal of Production Economics*, 255.
- DEMETER, K., LOSONCI, D. and NAGY, J. (2021) ‘Road to digital manufacturing – a longitudinal case-based analysis’, *Journal of Manufacturing Technology Management*, 32(3), pp. 820–839.
- FLORES, E., XU, X. and LU, Y. (2020) ‘Human Capital 4.0: a workforce competence typology for Industry 4.0’, *Journal of Manufacturing Technology Management*, 31(4), pp. 687–703.
- FRAGA-LAMAS, P. and FERNÁNDEZ-CARAMÉS, T.M. (2019) ‘A Review on Blockchain Technologies for an Advanced and Cyber-Resilient Automotive Industry’, *IEEE Access*, 7, pp. 17578–17598.
- FRAZZON, E.M., KÜCK, M. and FREITAG, M. (2018) ‘Data-driven production control for complex and dynamic manufacturing systems’, *CIRP Annals*, 67(1), pp. 515–518.
- LINNENLUECKE, M.K., MARRONE, M. and SINGH, A.K. (2020) ‘Conducting systematic literature reviews and bibliometric analyses’, *Australian Journal of Management*, 45(2), pp. 175–194.
- MARENCO, M. and SEIDL, T. (2021) ‘The discursive construction of digitalization: a comparative analysis of national discourses on the digital future of work’, *European Political Science Review*, 13(3), pp. 391–409.
- RAUT, R.D. et al. (2019) ‘Linking big data analytics and operational sustainability practices for sustainable business management’, *Journal of Cleaner Production*, 224, pp. 10–24.

# BEHAVIOUR OF REGIONAL E-COMMERCE CUSTOMERS DURING COVID-19

Ondřej Mikšík<sup>1</sup>, Halina Starzyczná<sup>1</sup>

<sup>1</sup>*School of Business Administration in Karviná, Czech Republic*

## KEY WORDS

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behaviour, changes, consumer, e-commerce

## JEL CODES

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M21, M31

## 1 INTRODUCTION

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In 2019, the first case of COVID-19 emerged. At that time, many people could not imagine that a local problem could become a global pandemic that would affect people's daily lives for a long time. Restrictions began to appear and shops, schools and other institutions were closed. Gradually, changes in the buying behaviour of customers also occurred [1]. Thus, the aim of this paper is to present partial results of a preliminary study conducted among

regional e-shop retailers. In an extended version of the paper, the results of the test group for the primary research, which is aimed at investigating changes in the buying behaviour of regional e-commerce customers, will be presented. Based on these results, the final primary research will then be refined for the dissertation on Covid-19 as an agent of change in regional e-commerce customers' buying behaviour.

## 2 MATERIAL AND METHODS

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A preliminary survey of regional e-commerce companies was conducted in early 2021, which took the form of qualitative research in the form of a structured interview.

A preliminary survey obtained responses from ten respondents (out of a total of 81 companies approached). Structured interviews were conducted with regional e-commerce shop owners, as they are mostly small businesses and small traders. The companies were contacted by email to request participation in the research and a telephone interview was subsequently arranged. This section of the paper briefly presents partial results regarding changes in e-commerce related to the COVID-19 pandemic. The

responses of the respondents were analysed using content analysis.

The subject of the research was business strategy and the establishment of e-shops and changes in the sales process.

Prior to the actual research design, three research questions were defined:

- RQ1: What impact has the introduction of the e-shop had on the company?
- RQ2: Why do companies with regional products set up an e-shop?
- RQ3: How do regional e-commerce businesses approach customer loyalty and customer relationships?

For the purposes of this paper, research question RQ2 appears to be the most relevant.

The object of the research were small entrepreneurs and small and medium-sized enterprises (SMEs) that produce regional products and one or more of these products is awarded with a regional brand (regional certificate) of the Association of Regional Brands

### 3 RESULTS

One of the questions in the structured interview was whether firms had implemented an e-shop because of the COVID-19 pandemic. Only 20% of respondents said that the pandemic had an impact on the implementation of an e-shop, and these firms had not considered implementing an e-shop until then. The remaining 80% of respondents have been running an e-shop for a long time and have only had to adjust some activities, mostly in the area of delivery of goods, due to the constraints associated with the pandemic [2].

The pandemic was also reflected in changes in delivery, with 30% of companies having to make changes – 10% had to suspend production, 10% started using carriers and 10% introduced ordering via e-shop and subsequent delivery of goods to a

(ARZ). ARZ manages 29 regions and a total of 30 regional brands in the Czech Republic. At the same time, these entrepreneurs run an e-shop. Prior to the qualitative research, a database of regional entrepreneurs and e-shops was compiled using the ARZ web portal. The database contained 81 regional e-shops and businesses.

drop-off point in Olomouc where customers could pick up the ordered goods [2].

The research also focused on whether the COVID-19 pandemic had an impact on the scale of purchases. A significant proportion of respondents (70%) confirmed the impact of COVID-19 on purchasing volumes. A fifth of respondents were positive but stated that the changes were slight. A further fifth confirmed an increase in online sales. The remainder (30%) confirmed an increase in customers but could not assess what was causing it. There was also a view that new demand had arisen and they had responded quickly. This situation may have been due to the closure of some brick-and-mortar stores. Customer growth was observed in both the B2C and B2B markets [2].

### 4 CONCLUSIONS

It can be said that the last few years have been somewhat challenging for consumers and businesses. Even small regional businesses have faced the constraints associated with the COVID-19 pandemic. Due to the restrictions, some of them have been forced to introduce e-commerce in order to continue to sell their products and keep their businesses

running. Some regional firms, in turn, faced transport problems. Either they had to find a new mode of transport or they had to introduce shipping. Subsequently, the primary research will focus on consumers buying regional food. It will examine how these consumers have changed their purchasing behaviour in recent years.

### 5 REFERENCES

- [1] BAUEROVÁ, R. and Š. ZAPLETALOVÁ, 2020. Customers' Shopping Behaviour in OGS: Changes Caused by COVID-19. In. *GREEN HUMAN RESOURCE MANAGEMENT AS A WAY TO SUPPORT SUSTAINABILITY: A LITERATURE REVIEW*. <https://doi.org/10.7441/dokbat.2020.01>.
- [2] ZAPLETALOVÁ, ŠÁRKA, HALINA STARZYCZNÁ, RADKA BAUEROVÁ, ONDŘEJ MIKŠÍK, DANIEL KVÍČALA and LUCIE VAVRUŠKOVÁ. *Customer Behaviour in eCommerce. Case Studies from the Online Grocery Market*. Cham: Springer, 2023. 108 p. SpringerBriefs in Business. ISBN 978-3-031-23573-3. doi:10.1007/978-3-031-23574-0.

# VALUATION OF ROAD INFRASTRUCTURE USING BIM

Tomáš Miniberger<sup>1</sup>, Vítězslav Pospíšil<sup>2</sup>

<sup>1</sup>*Institute of Forensic Engineering, Brno University of Technology, Czech Republic*

<sup>2</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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valuation, road, BIM, PMS

## JEL CODES

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R48, R58

## 1 INTRODUCTION

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Road infrastructure, primarily used by motor vehicles, degrades over time, resulting in a decrease in its value. This degradation can be a natural process due to planned traffic loads or weather conditions, or in some cases, it can be associated with unplanned loads, such as detours of temporarily closed highway sections, or heavily loaded roads, or due to the impact of exceptional natural events

(floods, landslides, etc.). Road administrators often lack adequate tools to quantify and evaluate this degradation, and thus the loss of network value. This paper focuses on filling these gaps and proposes the use of Building Information Modeling (BIM) and pavement management systems as means to determine the current or predicted value of road infrastructure.

## 2 MATERIAL AND METHODS

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Material and Methods can be divided into two major parts, i.e. BIM specifics for road infrastructure and integration of Pavement Management System (PMS) with BIM. Both use specific material (data) and own methods.

The data for BIM creating consists of: Geo-Data: Digital terrain models and survey data providing information on the shape of the land, crucial for accurate modeling, Design Data: Plans of roads, bridges, traffic junctions, and other infrastructure elements, providing information on the design and construction, Technical Specifications: Information about materials used, construction standards, and specifications and Traffic Data: Information on traffic flow, capacity, traffic jams, and vehicle speeds.

Methods for BIM creating are represented by Laser Scanning: To obtain precise 3D data about existing objects and terrain, CAD (Computer-Aided Design) Integration: Integration of plans, drawings, and project data into BIM models, Parametric Modeling: Creating parametric models enabling rapid geometry modifications in real-time and Model Composition and Hierarchical Structure: Organizing models for efficient management and visualization.

Data for the PMS and BIM integration part uses data obtained from Pavement Surveys: Data collection on the current state of pavements through measurements, inspections, and monitoring and Integration of BIM Data: Incorporating BIM data about

the infrastructure into PMS to gain a comprehensive view of the state of roads.

Methods for assessing condition and value of infrastructure: Degradation Calculation: Utilizing historical and ongoing maintenance and wear data to calculate the rate of infrastructure degradation, Pre-

diction of Future State: Modeling the future state of the infrastructure based on anticipated maintenance measures and other influences and Assessment of Investment Returns: Analytical methods to evaluate the effectiveness of investments in maintenance and renovation concerning the long-term value.

### 3 RESULTS

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The research resulted in valuation of road infrastructure over time using BIM via determination of Dynamic Infrastructure Value: Utilizing BIM allowed tracking changes in the value of road infrastructure over time. Dynamic modeling enabled accounting for maintenance, wear and tear, and network growth when assessing its value and Prediction of Future Value: BIM provided tools to predict the future value of infrastructure based on planned maintenance activities and anticipated changes in traffic load. This is crucial for investment planning and future development projects.

The second result lays in the integration of valuation with maintenance and renovation via Optimiz-

ing Investments: Integrating infrastructure valuation with maintenance and renovation planning led to better investment planning. Road administrators could allocate funds to maximize returns within the context of maintaining or enhancing the value of the infrastructure and Prioritization of Repairs and Maintenance: BIM enabled the analysis and comparison of various maintenance and renovation scenarios, resulting in better identification of repair priorities and directing investments where they are most needed to preserve or enhance the value of the road network.

### 4 CONCLUSIONS

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The integration of BIM into the assessment and management of road infrastructure represents a paradigm shift in how we perceive and interact with our transportation networks. The dynamic modeling and predictive capabilities afforded by BIM provide invaluable insights into the condition, value, and future trajectory of road assets. This, in turn, empowers infrastructure managers to make informed decisions, optimize resource allocation, and plan for sustainable development and growth. Through the

fusion of BIM with PMS, the gap bridged between traditional valuation methodologies and a forward-thinking, data-driven approach. The ability to assess and predict infrastructure value over time is a powerful tool, guiding us in prioritizing maintenance, rehabilitation, and strategic investments. It brings us closer to a future where our road networks are not only functional but also resilient, sustainable, and in harmony with the evolving needs of society.

### 5 REFERENCES

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- [1] BORRMANN, A., KONIG, M., KOCH, C., BEETZ, J.: Building Information Modeling: Why? What? How? In *Building Information Modeling*; BORRMANN, A., KONIG, M., KOCH, C., BEETZ, J., Eds.; Springer: Cham, Germany, 2018; pp. 1–24
- [2] WANG, J., ZHANG, S., FENN, P., LUO, X., LIU, Y., and ZHAO, L.: Adopting BIM to facilitate dispute management in the construction industry: A conceptual framework development. *J. Constr. Eng. Manage.*, 149, 2023

# IDENTIFICATION AND ANALYSIS OF INTERNATIONALIZATION TRENDS OF CZECH LARGEST JOINT-STOCK COMPANIES

Mark Mishcheniuk<sup>1</sup>

<sup>1</sup>Prague University of Economics and Business, Czech Republic

## KEY WORDS

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internationalization, diversification, international business, Czech business

## JEL CODES

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F21, F23

## 1 INTRODUCTION

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A large number of joint-stock companies in developed economies, especially those that were founded in relatively small markets, choose international diversification strategy as one of the most successful and profitable strategies for enterprise growth in order to further develop and prosper. This strategy may include penetrating foreign markets through direct investments or attracting partners to work abroad. The effectiveness of such a strategy is actively examined in various studies in the field of international business and strategic management [1, 2, 3]. The Czech market is characterized by many companies that regularly expand beyond the borders

of the Czech Republic and invest in production facilities and branches in other countries. This study analyzes such investments in subsidiaries abroad, determines the general trend on the example of the largest 10 Czech joint-stock companies, and describes possible areas for further research in this field. The key hypothesis of the study is that joint-stock companies expand abroad by establishing subsidiaries in the long term. A better understanding of this subject is a crucial factor in the strategic management of international businesses and has practical importance for the long-term management of such companies.

## 2 MATERIAL AND METHODS

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In order to determine the mentioned trends of internationalization of companies, a sample of the 10 largest joint-stock companies in the Czech Republic was selected. The ranking of the companies was based on the total revenue of the Czech company as of 2022. For the purpose of this study, joint-stock companies were chosen because this type of company publishes all necessary data and reports for investors and shareholders, which made it possible to

access all necessary data and study the investment structure of these companies. The period of the research is 10 years from 2013 to 2022. The data was collected from the mentioned annual reports of the enterprises. To determine the level of internationalization, the number of countries in which companies had direct investments through full or partial ownership of subsidiaries was calculated. The calculations initially excluded all parent companies

owning fully or partially the Czech studied company, as well as their subsidiaries, which may appear in the overall structure of the global holding but were not subsidiaries of the company under study.

After collecting all data and entering them into tables, the method of graphical representation and comparison of results was used. Also, the calculation

of mean values for the period under study and the calculation of relative values of changes in the number of countries was performed. Relative indicators in percentages were used because of the different number of countries in the starting year (2013) from which the counting of these changes began.

### 3 RESULTS

After calculating the revenue of the companies based on their annual reports for the year 2022, the following ranking was made (from the largest to the smallest): Energetický a průmyslový holding, a.s.; Škoda Auto a.s.; ČEZ, a. s.; AGROFERT, a.s.; ORLEN Unipetrol a.s.; ALPIQ ENERGY SE; MORAVIA STEEL a.s.; ČEPRO, a.s.; FORTUNA GAME a.s.; Metrostav a.s..

After calculating the changes in the number of countries over a period of 10 years, a general increasing trend was identified based on the mean values for all companies. The growth amounted to 34% in 2022 compared to 2013. The largest

company demonstrated an increase of 200%, with most of the companies showing a positive change between 20% and 40%. One company demonstrated no change in the number of countries, while two companies demonstrated a decrease. Nevertheless, these changes did not affect the overall growth trend. Given the high impact of the results of the largest company (200%) on the whole sample, the calculation was repeated with the exclusion of this company. According to the results of the calculation, the trend was still increasing, but the change was only 14% over 10 years compared to the previous result of 34%.

### 4 CONCLUSIONS

The results of the study supported the hypothesis that joint-stock companies expand abroad by establishing subsidiaries in the long term. The results showed a positive trend in a sample of the largest Czech companies over a period of 10 years. This data is an important indicator for international management, showing that in the long term the application

of this international diversification strategy can be an effective tool for company growth. Further research could cover other factors that influence the growth of the company, as well as add variables showing their relationship with the financial performance of companies.

### 5 REFERENCES

- [1] LU, J. W., & BEAMISH, P. W. (2004). International Diversification and Firm Performance: The S-Curve Hypothesis. *The Academy of Management Journal*, 47(4), 598–609. <https://doi.org/10.2307/20159604>.
- [2] DHIR, S. and DHIR, S. (2015), Diversification: Literature Review and Issues. *Strategic Change*, 24: 569-588. <https://doi.org/10.1002/jsc.2042>
- [3] CONTRACTOR, F. J. (2007). Is international business good for companies? The evolutionary or multi-stage theory of internationalization vs. the transaction cost perspective. *Management International Review*, 47(3), 453-475. <http://dx.doi.org/10.1007/s11575-007-0024-2>

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# COLLABORATION ON SPATIAL DATA IN VIRTUAL REALITY WITH WEBXR

Michal Mitter<sup>1</sup>, Jaromír Landa<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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virtual reality, spatial data, virtual collaboration, 3D Tiles, WebXR

## JEL CODES

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C88, L86

## 1 INTRODUCTION

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There is a growing need for data visualisation in virtual reality. There are many examples, from the use of VR in small and medium sized businesses [1] to the visualisation of data in crisis situations [2].

In our previous work we have successfully managed to visualise and interact with the 3D tiles format in VR using web technologies. Interaction with spatial

data in VR is more immersive and natural [3]. However it only offered single user experience. Collaboration with multiple users could further improve presentation of spatial data. The goal of our research is to find and integrate 3D Tiles visualization into collaborative VR platform based on WebXR.

## 2 MATERIAL AND METHODS

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The Third Room platform was chosen as the core of our visualisation and collaboration platform based on WebXR. Third Room is a virtual world platform built on the open, decentralised Matrix protocol. It allows users to interact in 3D worlds. It uses modern web browser features to improve performance. Its virtual scene is defined in a glTF standard with a few additional extensions. Third Room allows scene behavior to be scripted using its WebSG (Web Scene Graph) API [4]. The Third Room platform was

chosen for its support of the 3D Tiles streaming format. 3D Tiles is an Open Geospatial Consortium (OGC) community standard for streaming large 3D geospatial datasets [5].

The use of the 3D Tiles format allows us to visualise large amounts of 3D data, such as Google Photogrammetry datasets. In 2023, Google released its massive photogrammetry dataset in 3D Tiles format [6]. Meta Quest 2 was used to enter VR.

## 3 RESULTS

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Although Third Room has the basic ability to display 3D tiles, there are many problems associated with this. Loading options have been added to display 3D

tiles from Cesium ION and Google Photorealistic 3D Tiles. However, flying through a scene with Google's Photorealistic 3D Tiles has poor performance in Meta

Quest. We have modified the controls to allow users to fly with a VR joystick and fixed rendering issues with 3D tiles. We also extended the Third Room asset pipeline to seamlessly integrate 3D tiles into a scene and added a user interface to toggle the visibility of 3D tiles datasets.

## 4 CONCLUSIONS

We have successfully extended Third Room to enable real-time collaboration with spatial data in the 3D Tiles format in virtual reality. Users can navigate a 3D scene using VR controllers, see avatars of other connected users in real time and communicate via microphone. Scene behaviour can be customised using the WebSG API. The 3D tiles are converted

One of the challenges was to convert the geospatial data into 3D Tiles format. The aim of the application is to visualise the geospatial data stored in standard formats such as shapefiles. We used ArcGIS Pro to create the virtual 3D scene. The individual 3D layers were then saved in i3s format and converted to 3D Tiles using the loaders.gl Tile Converter [7].

from standard GIS software, such as ArcGIS Pro. However, there are conversion challenges, such as converting custom digital elevation models. Improving the performance of rendering Google's photorealistic 3D tiles in Meta Quest would make the dataset suitable for practical use.

## 5 REFERENCES

- [1] BRETTSCUH S., HOLLY M., HULLA M., HERSTÄTTER P., PIRKER J.: Virtual Reality in Small and Medium-Sized Enterprises: A Systematic Literature Review. *2022 IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops (VRW)*, 2022, 502-507, doi: 10.1109/VRW55335.2022.00112.
- [2] CONGES A., BREARD L., PATRUNO W., OURO-SAO A., SALATGE N., FERTIER A., LAURAS M., GRAHAM J., BENABEN F.: Situational awareness and decision-making in a crisis situation: A crisis management cell in virtual reality. *International Journal of Disaster Risk Reduction* 97. (2023), 104002, doi: 10.1016/j.ijdr.2023.104002.
- [3] MITTER M., PISAŘOVIC I.: Spatial Data Visualisation in Metaverse. *PEFnet 2022 – 26th European Scientific Conference of Doctoral Students*, 77–78. Mendel University in Brno. ISBN 978-80-7509-856-6.
- [4] *Third Room*. <https://thirdroom.io/docs> (accessed 19.10.2023)
- [5] The Open Geospatial Consortium: *3D Tiles*. <https://www.ogc.org/standards/3DTiles> (accessed 19.10.2023)
- [6] Google: *Create immersive 3D map experiences with Photorealistic 3D Tiles*. <https://cloud.google.com/blog/products/maps-platform/create-immersive-3d-map-experiences-photorealistic-3d-tiles> (accessed 19.10.2023)
- [7] loaders.gl: *Tile Converter*. <https://loaders.gl/docs/modules/tile-converter/cli-reference/tile-converter> (accessed 19.10.2023)

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# UNVEILING THE VARIATION IN CORPORATE TAX BASE DISTRIBUTION UNDER THE FORMULARY APPORTIONMENT

Markéta Mlčúchová<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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Formulary Apportionment, BEFIT, Corporate Tax Base

## JEL CODES

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H25, H83, F02

## 1 INTRODUCTION

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This study focuses on the Formulary Apportionment (FA) methodology to be used within the European Union (EU) as considered in the tabled Proposal for a Council Directive on Business in Europe: Framework for Income Taxation (BEFIT Proposal). The main objective of the paper is to analyse the variation

between the distribution of corporate tax base under the FA and SA methodology. Furthermore, the paper contemplates the possibility of group-wide loss consolidation as well as the alternative of consolidation without losses.

## 2 MATERIAL AND METHODS

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The analysis considers active companies operating within the EU internal market during the period 2011 to 2019. The qualifying search strategy identified 712 572 subsidiaries affiliated with 320 216 parent companies for which information on the profit before tax as a proxy for the corporate tax base was obtained. Additionally, to compute the corporate tax base under the FA, proxies for the factors of the FA, as envisaged for the BEFIT Proposal, namely labour, sales, tangible and intangible assets, were obtained from the Orbis database. The variation in SA and FA distribution is analysed at the level of the jurisdictions of the EU Member States. The corporate tax base under the SA is represented by the sum of the reported profits before tax in financial statements of companies registered in each

EU Member States' jurisdiction in each year ( $\text{pbt}_{j,t}^{\text{SA}}$ ). In the following Equation 1, ( $i$ ) qualifying subsidiary, ( $j$ ) jurisdiction, ( $t$ ) year,  $N_i$  number of qualifying subsidiaries affiliated with the parent company.

$$\text{pbt}_{j,t}^{\text{SA}} = \sum_{i=1}^N \text{pbt}_{i,j,t}^{\text{SA}} \quad (1)$$

To calculate the corporate tax base under FA in each jurisdiction, in every year, ( $\text{pbt}_{j,t}^{\text{FA}}$ ), first, the consolidated profit before tax of all qualifying subsidiaries affiliated with the parent company should be distributed throughout the jurisdictions of EU Member States according to the allocation mechanism indicated for the BEFIT Proposal. Second, corporate tax base under FA in each jurisdiction in every year ( $\text{pbt}_{j,t}^{\text{FA}}$ ) hence corresponds to the sum of

allocated profits of all subsidiaries ( $\text{pbt}_{i,t}^{\text{FA}}$ ) registered in each EU Member States' jurisdiction, see Equation 2. Finally, the variation between the SA and FA distribution was computed utilizing the subsequent

Equation 3.

$$\text{pbt}_{j,t}^{\text{FA}} = \sum_{i=1}^N \text{pbt}_{i,j,t}^{\text{FA}} \quad (2)$$

$$\Delta = \text{pbt}_{j,t}^{\text{FA}} - \text{pbt}_{j,t}^{\text{SA}} \quad (3)$$

### 3 RESULTS

In the absence of loss consolidation, the implementation of the FA methodology does not result in any shrinkage of the consolidated corporate tax base at the EU level. However, some EU Member States are benefiting from the methodological switch, and some EU member States experiences negative tax base consequence. Based on the results, Greece, Romania, Hungary, Estonia, and Latvia benefit the most, mainly at the expense of Luxembourg, Malta, Cyprus, the Netherlands, and Ireland who borne the biggest losses. According to the analysis, the Czech Republic, Germany, France, Spain, and Slovakia, experienced an increase in their share of the corporate tax base under the FA without loss consolidation, however, it is worth noting that in case of loss consolidation implementation under the FA,

those states face relative decline over the observed time, as shown further. Besides the highlighted decline in the overall corporate tax base in case of loss consolidation, the biggest losses are again accounted for Luxembourg, Cyprus, Malta, the Netherlands, and Ireland. On the contrary, Bulgaria, Slovenia, Hungary, Estonia, and Latvia gain the biggest share of the pie. Furthermore, the results confirmed that prominent profit-shifting countries within the EU, such as Luxembourg, Ireland, and the Netherlands, experience a decline in their corporate tax base under the FA distribution. Also, the considered FA indicted for the BEFIT Proposal allocates more tax base in low-income EU Member States such as Slovakia, Poland, Bulgaria, Hungary, or Romania

### 4 CONCLUSIONS

This paper endeavour to contribute to the debate on the BEFIT Proposal by updating the empirical research on the impact of the FA on tax base distribution. Drawing upon our analysis, a primary policy recommendation emerges, urging a reassessment of

the proposed consolidation of losses in order to ascertain its alignment with the fundamental objective of the discussed tax policy reform, particularly the equitable taxation of multinational companies and prevention of profit-shifting practices.

### 5 REFERENCES

- [1] NERUDOVÁ, D., SOLILOVÁ, V., LITZMAN, M. (2021). Is there a Real Chance to Adopt the CCCTB without UK Participation in the EU? *Ekonomický časopis*, 69(6), 582-603.
- [2] ROGGEMAN, A., VERLEYEN, I., VAN CAUWENBERGE, P., COPPENS, C. (2012). An empirical investigation into the design of an EU apportionment formula related to profit generating factors, *Transformations in Business & Economics*, 11(3), 36-56
- [3] SOLILOVÁ, V., NERUDOVÁ, D., LITZMAN, M. (2016). Implementation of Common Consolidated Corporate Tax Base and its Implications for Non-participating Country: A Case Study for the Czech Republic, *Ekonomický časopis*, 64(3), 282-298.

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# VALUATION OF NON-RECOURSE RISK UNDER WARRANTY LIMITATION

Lejla Münch<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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warranty risk, warranty cost, non-recourse, non-recourse risk

## 1 INTRODUCTION

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In the automotive industry, suppliers often seek for (project-specific) liability or warranty limitations (e. g. to a maximal amount, an amount of the sum insured or a percentage of the contract value) to limit their financial risk for a new upcoming project. This applies not only in the case of built-to-print suppliers, but also in the case of lead development suppliers.

Based on the literature, warranty is equal to the liability of the contractor, respectively supplier as the manufacturer of the single unit, towards the client, respectively OEM, which stands for Original Equipment Manufacturer, as the manufacturer of the vehicle (cf. Aljazea and Wu, 2019). The literature review shows that most early studies as well as current work focus on warranty cost and warranty risk (cf. Aljazea and Wu, 2019), estimation of future

warranty claims or costs, and the optimisation of maintenance policies (cf. Aljazea and Wu, 2018a, 2018b). However, the existing research is limited and has many gaps in representing non-recourse risk.

In the absence of a commonly agreed definition, in this thesis intent the non-recourse risk is defined as the risk of refusal of warranty cost sharing (towards the client by the contractor). The single main objective is to formulate a prediction model for non recourse risk assessment and the financial risk evaluation in the case of limited supplier liability. The specific research question tries to answer how to estimate the non-recourse risk when the warranty costs are limited, respectively the impact of limited liability on warranty costs and non-recourse risk.

## 2 MATERIAL AND METHODS

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To answer this research question the method empirical statistical analysis is used. At first, a literature review was performed, and existing research was evaluated.

One of the tough challenges for all researchers in this domain is the availability of data. Warranty costs are mostly publicly available data due to law regulations. Not publicly available data, but restricted available on single supplier:

- Warranty contracts,
- Warranty limitation contracts,

- Warranty costs per year,
- Recourse and non-recourse quotas,
- Resources for root cause analysis (cf. Vinta, 2009, p. 2),
- Age and mileage of the vehicles at repair date (cf. Vinta, 2009, p. 2).

Following restriction has to be taken into account: The data is available via database, but it is not allowed by German law to publish this data. Therefore, the data must be anonymised.

To answer this research question a quantitative method is used, since “[q]uantitative approaches are suitable in the event that likelihood and consequences can be quantified, for example using significant statistical database” (Borghesi and Gaudenzi, 2013, p. 54). Classification methods as: Logit model, support vector machines, and classification trees will be applied. To investigate this statistically, a descriptive statistical approach is used:

- The publicly available financial and warranty data of the suppliers is analysed and classified;

- The warranty and warranty limitation contracts, as well as the warranty costs and recourse quotas are analysed and classified.

First, a descriptive statistical approach is used. The publicly available financial and warranty data of the contractors (respectively suppliers) is analysed and classified.

Second, the warranty and warranty limitation contracts, as well as the warranty costs, and recourse and non-recourse quotas are analysed and classified.

### 3 RESULTS

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This advised paper aims to make a number of significant contributions to the field of economic research. In particular, as far as known, no study to date has examined the importance of non-recourse. The novelty of this research is the inclusion of

non recourse risk as a new parameter, under the circumstance of limited warranty costs between contractor (respectively supplier) and client (respectively OEM).

### 4 CONCLUSIONS

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This thesis aims to explore the phenomena of non-recourse risk. The literature review shows however, reveals several gaps and shortcomings. Following journals could be considered for publication:

- International Journal of Production Economics,
- International Journal of Production Research,
- Reliability Engineering and System Safety, or
- Sustainability.

### 5 REFERENCES

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ALJAZEA, AHMED; WU, SHAOMIN (2019): A Framework of Warranty Risk Management. *BUSTECH: The Ninth International Conference on Business Intelligence and Technology*.

ALJAZEA, AHMED; WU, SHAOMIN (2018a): Managing Risk for Auto Warranties. *International Journal of Quality & Reliability Management*.

ALJAZEA, AHMED; LUO, MING; WU, SHAOMIN (2018b): Mitigating Warranty Risk for Automotive Industry. *10th IMA International Conference on Modelling in Industrial Maintenance and Reliability*.

VINTA, SIVA (2009): Analysis of Data to Predict Warranty Cost for Various Regions. *IEEE, Annual Reliability and Maintainability Symposium*.

# DATA ENVOLEMENT ANALYSIS OF GERMAN GRASS SEED PRODUCTION

Kevin Nowag<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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DEA, Agriculture, Efficiency analysis, German grass seed production

## JEL CODES

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C67

## 1 INTRODUCTION

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The market in the grass seed production is very volatile, especially in economically weak phases a high efficiency of the acting companies is necessary.

This paper deals with a method for efficiency measurement in grass seed production in Lower Saxony. The aim of the chosen model is to show

the possible potential from soil and rainfall and to compare this to the resulting yield. The chosen model should first of all only allow an efficiency ranking between the potential and the achieved results. Further analyses regarding the further development and the derivation of measures are necessary.

## 2 MATERIAL AND METHODS

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For the efficiency measurement Data Envelopment Analysis is used. This is a method for measuring efficiency without the necessity to know a production function. The method was originally developed by Charnes, Cooper and Rhodes [1]. The necessary data for the analysis comes from various sources from 2022. The output parameter chosen is yields per farmer. This input factors are originated by the German seeds company “Deutsche Saatveredelung AG” and are subject to confidentiality. In addition, via a web application of the state of Lower Saxony to the respective GPS data of the fields, the soil points could be determined, which was chosen as input factor 1. The evaluation of the potentials via the soil was first demonstrated with the Reichsbodengesetz in Germany [2]. In addition, more

current models exist, such as the Muencheberger Soil Quality Rating. ”The indices of this soil estimation procedure, designed for the global scale, are intended to enable an assessment of yield potentials based on site-specific indicators” [3]. Furthermore, weather data from German Weather Service was used to evaluate the amount of rainfall in March, April, May and June. The input factor was developed through expert interviews at the farm and thus the average precipitation amount was included in the model as another input factor.

Since the relationship between inputs and outputs is assumed to be non-linear and economies of scale are suspected, the extended BCC model is used in an output-oriented view [4].

### 3 RESULTS

Figure 1 shows the evaluation from the selected model with 41 Decision Making Unit's for perennial ryegrass from 2022 in Lower Saxony. In total, five

DMUs have been evaluated as 100% efficient and nine with an efficiency score of less than 50%.

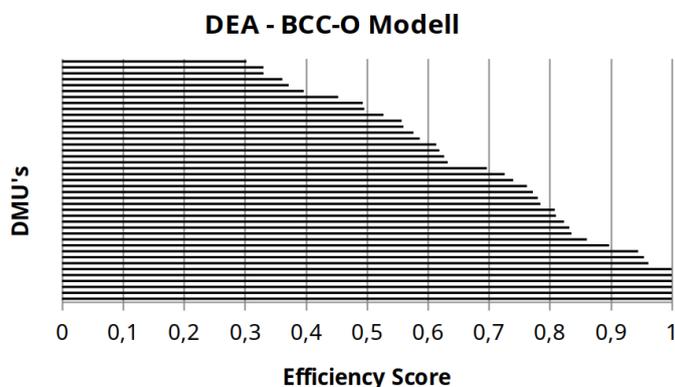


Fig. 1: DEA BCC-O Modell - Lower Saxony gras seed production 2022 – own creation

### 4 CONCLUSIONS

It could be shown that a comparison between the different farms is possible. Especially in farms with similar input factors larger differences in yield have been identified. There are also observations that are above average in terms of yield, but still fall short of their potential in view of the very positive input factors.

The multiplication of grasses is a complex process that requires a lot of knowledge and experience to define the necessary measures and find the ideal time for treatment. The results suggest that the specific field advisor per multiplier has a significant role in the efficiency of each farm. Therefore, the staff's own

training seems to be an important factor to increase the overall efficiency.

Especially due to the large spread of factors in both input and output factors, there are currently too few data points analyzed to allow a true efficiency ranking. Especially data observations with outliers in the used factors are currently too efficiently represented due to the model.

For further analysis, it is important to increase the number of data points and thus make the model more stable. The results will then be used in a second modeling step to analyze the reasons for deviations.

### 5 REFERENCES

- [1] CHARNES, A.; COOPER, W.W.; RHODES, E.: Measuring the efficiency of decision making units, North-Holland Publishing Company, *European Journal Operational Research* 2 (1978) 429-44.
- [2] *Gesetz über die Schätzung des Kulturbodens*, (Bodenschätzungsgesetz); RGBl. Teil 1 1934, S. 1050 ff.
- [3] MÜLLER, L., SCHINDLER, U., BEHRENDT, A., EULENSTEIN, F. & DANNOWSKI, R. (2007): *The Müncheberg Soil Quality Rating. Field Manual for Detecting and Assessing Properties and Limitations of Soils for Cropping and Grazing*. – Leibniz-Zentrum für Agrarlandschaftsforschung (ZALF), Müncheberg. 1. Entwurf, Nov. 2007.
- [4] BANKER, R.; CHARNES, A., COOPER, W.: Some models for estimating technical and scale inefficiencies in data envelopment analysis, *Management Science*, 30. Jahrgang Nr. 9 (1984), S. 1078-1092.

# PERFORMANCE CONTINUITY AND RESILIENCE OF DIGITAL SUPPLY CHAIN SYSTEMS BY A SYSTEMS ENGINEERING APPROACH

Jochen Nuerk<sup>1,2</sup>, František Dařena<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

<sup>2</sup>*SAP SE, Walldorf, Germany*

## KEY WORDS

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Systems Engineering, Industry 4.0, supply chain digitalisation, innovation management, enterprise architecture, enterprise engineering

## JEL CODES

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A100, A110, C51, C52, D22, L86, M15, O14, O32, O33, Q55

## 1 INTRODUCTION

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Smart digitalisation technology significantly changes business models and their innovation rate. The complexity of methodologies for balancing supply chain activities has risen. Hence, the desired integration levels across organisational levels were often not reached. In addition, supply networks face critical contrarious developments such as decreasing cross-organisational visibility caused by the increasing distribution of value-added processes to more companies, but also increasing business volatility and environmental uncertainties simultaneously. A focus on supply chain (SC) integration and interoperability and its impact on business performance and resilience are significant to various conceptions along the supply chain. For this reason, the study contributes to driving systems engineering towards a key discipline for designing supply chain systems (SCS), focusing on effectiveness, respon-

siveness, and resilience as architecture principles, which are also recognised as objectives by the INCOSE Vision 2035 (Friedenthal et al., 2021). For exploring relevant antecedent SC objectives and required focus methods, the study's research questions have been formulated as follows: (1) what are the core value potentials enabled by smart technologies of digital supply chain business models? (2) What are the focus activities of transforming digital SC business models, the main obstacles, and what are the critical value contributions of systems engineering? The findings served to develop a concise SE-driven model, for transforming and engineering digital SC business models, avoiding methodical redundancies. Such a model is estimated as a key accelerator for value exploitation in digital SC business model innovation and bridges gaps between management and engineering.

## 2 MATERIAL AND METHODS

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To address these supply chain digitalisation challenges by a systems engineering approach holistically, promising smart technologies and systems engineering methods were explored by case study research at SAP SE divisions of Industry 4.0 Innovation Development and the Business Transformation field organisation. The core value potentials enabled by smart technologies of digital supply chain

business models and the focus methods of transforming digital SC business models towards data-driven collaborative SC ecosystems, the observed obstacles, and the critical value contributions of systems engineering were explored. The case study research has been replicated at a European make-to-order automotive supplier, a German industrial manufacturer, an automotive systems supplier,

and a European sports car maker to enrich it with insights from the viewpoints of industrial organisations users and IT strategists.

The transcript case study output has been analysed using the qualitative content analysis, tool QCMap, according to Mayring (2022). Key objectives focus concepts, obstacles and important digitalisation industry trends have been identified and operationalised by applying inductive category formation. These identified concepts have

then been investigated and integrated in a harmonised way in the phases of the developed SE-driven model, as presented in session 6 of the PEFNet 2023 (Activating value potentials of digital supply chain business model using a systems engineering approach). Finally, case studies have been used again to validate the dissertation deliverable, the SE-driven SC model by a benefit and usability analysis.

### 3 RESULTS

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Systematic SE-driven methods for SC resilience and value enablers of planning and optimising supply chains have been identified such as by smart combination of Semantic Web and Machine Learning capabilities. The findings served to develop a concise SE-driven model, for transforming and engineering digital SC business models. Moreover, evaluation, simulation and design methods for data-driven- and collaborative SC business models were investigated and integrated into the model. SC resilience depends to a considerable extent on macro factors and implications from adversities are often at locations in the supply chain different from their roots. Traditional SC experts focusing typically on business functions such as sales and distribution (SD), material management (MM), production planning (PP), and more. However, a view across these SCM domains is required and across involved organisations and environmental contexts is

necessary for engineering SC resilience holistically. For SC resilience engineering, modelling meta-structures across supply chains for complementing SC domain engineering by a top-down SE approach is recommended by the study, which is not the focus of SC domain experts so far. Besides, a digital twin concept for integrated Product Lifecycle Engineering and SC optimisation is proposed, which supports circular business models and resilient data-driven collaboration across supply networks. The developed approach fosters emergence, convergence, effectiveness and resilience along supply chains, and provides methods for identifying and evaluating latent structures, macro implications and effects on the micro level of local supply chains. Moreover, the study demonstrates how to align semantics and taxonomies between collaborative business entities to link data-driven processes from sensing and design to adaptive manufacturing.

### 4 CONCLUSIONS

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A theory-driven and practice-oriented approach has been developed and validated to design and evaluate supply chain business models from a complex adaptive SC systems perspective to improve value continuity resilience and alignment to environmental changes. Using digital twins as common platforms, SC visibility and synchronization among SC ecosystem members can be increased significantly. Discrete, SCM systems-based simulations of Product Lifecycles enable detailed implications analysis of phase-in and phase-out processes on overall SC

planning and optimisation, enabling measurements for safeguarding value continuity. The simulation method System Dynamics is suggested in addition to evaluating the environmental macro implications. Moreover, high-level architectures (HLA) enable agent-based simulations of local Federations. Semantic interoperability of product- and process configurations presents a key enabler of data-driven collaboration and provides the basis for further smart use cases such as collaborative Machine Learning.

### 5 REFERENCES

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FRIEDENTHAL, S., DAVEY, C., NIELSEN, P., SCHREINEMAKERS, P., SPARKS, E., OSTER, C., MATTHEWS, S., RIETHLE, T., STOEWER, H., NICHOLS, D., ROEDLER, G., (2021), *Systems Engineering Vision 2035 Engineering Solutions for a Better World*, INCOSE

MAYRING, P., (2022), *Qualitative content analysis: theoretical foundation, basic procedures and software solution*, Social Science Open Access Repository

# AI AND PLANT DISEASES IDENTIFICATION

Petr Pernes<sup>1</sup>, Miroslav Jaroš<sup>1</sup>, Jiří Podivín<sup>1,2</sup>, Oldřich Trenz<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

<sup>2</sup>*Red Hat Czech, Brno, Czech Republic*

## KEY WORDS

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Plant diseases detection, neural networks, preprocessing, machine learning, classification

## JEL CODES

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C45

## 1 INTRODUCTION

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Early detection of plant diseases in the early stages of the disease is very important. Using an expert is expensive and laboratory analysis is time consuming. We expect to improve agricultural production, speed up and early identification of diseases with help of AI. Creating a simple application for use in the field. Furthermore, it may be possible to capture fruit defects. It can be used for recognition of other plant needs such as watering, minerals, lighting, etc.

Detection of diseases or better still negative factors will raise productivity.

For proper identification, it is necessary to train the AI of a large number of images. There are several possible sources of samples, such as conventional images, infrared and hyperspectral images. Several papers deal with this topic, some analyzing the images, some analyzing the resulting spectral curve. [2]

## 2 MATERIAL AND METHODS

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### 2.1 Plant and Sample Selection Process

This thesis will first deal with tomatoes. The used dataset is obtained from freely available sources [4]. It contains both healthy and diseased tomato leaves. This is useful in beginning the project to prove a base thesis.

### 2.2 Reprocessing of Datasets

We expect to obtain images, from the whole life cycle, different times of the day and different viewpoints of the crop. Another possibility is to collect data using drones, but the legislation of the Czech Republic is problematic in this respect. However, the drone

method would ensure collection over large areas. The used dataset contains 18345 of reprocessed healthy and unhealthy leaves.

Furthermore, the augmentation methods of the sample used to expand the dataset. Function like scaling, mirroring and rotation. This method prevents overfitting and increases the size of the training dataset.

### 2.3 Train of NN

The Keras library with Tensorflow backend version 2.2 and higher, together with the standard Python library, is used to create the NN models. The design of the models, the first tests and the final validation

were performed in the containerized environment Jupyter.

## 2.4 Export to Mobile Application

To export is used the Android Neural Networks API (NNAPI). It is an Android C API designed for running computationally intensive operations for

machine learning on Android devices. NNAPI is designed to provide a base layer of functionality for higher-level machine learning frameworks, such as TensorFlow Lite and Caffe2, that build and train neural networks. The API is available on all Android devices running Android 8.1 (API level 27) or higher. [5]

## 3 RESULTS

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Currently the method works well, but in the future we need to teach NN to find and pre-process images by itself. We found that augmentation is very important as a defense against overfitting, but

further dataset augmentation is needed for accuracy reasons. However, augmentation should be used at a maximum of about 15% to 20% in the dataset.

## 4 CONCLUSIONS

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NN can be trained to recognize crops and their diseases. Augmentation is a very important tool for increasing the training set and overcoming overtraining problems. But the dataset size is more important for proper training. So far it has been possible to identify tomato leaves and several common tomato

diseases. It would be useful to train NN to be able to recognize the stem, fruit and leaves on her own. The resulting application can be very useful for farmers and when deployed in the field can help detect crop diseases or at least specify the type of disease.

## 5 REFERENCES

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- [1] BENZAADI, S., LOUCHENE, A. 2023. Low-cost convolutional neural network for tomato plant diseases classification. *IAES International Journal of Artificial Intelligence (IJ-AI)*, Institute of Advanced Engineering and Science.
- [2] HARIHARAN, J., AMPATZIDIS, Y., ABDULRIDHA, J., BATUMAN, O. 2023. January An AI-based spectral data analysis process for recognizing unique plant biomarkers and disease features. *Computers and Electronics in Agriculture*, Elsevier BV.
- [3] SHOAB, M., SHAH, B., HUSSAIN, T., ALI, A., ULLAH, A., ALENEZI, F., GECHEV, T., ALI, F., SYED, I. 2022. December 15 A deep learning-based model for plant lesion segmentation, subtype identification, and survival probability estimation. *Frontiers in Plant Science*, Frontiers Media SA.
- [4] *Kaggle - New Plant Diseases Dataset*. Available at: <https://www.kaggle.com/datasets/vipooooool/new-plant-diseases-dataset> [accessed 31.01.2023].
- [5] *Developers - Neural Networks API* [accessed 31.01.2023].
- [6] MARJAN KLUEPFEL, JAMES H. BLAKE, ANTHONY P. KEINATH. *Tomato Diseases & Disorders*. Factsheet, HGIC 2217, Updated: May 26, 2021.

# NOVEL MEASURE OF DE JURE CENTRAL BANK INDEPENDENCE

Tomáš Pokorný<sup>1</sup>, Adam Ruschka<sup>1</sup>, Helena Chytilová<sup>1</sup>

<sup>1</sup>Prague University of Economics and Business, Czech Republic

## KEY WORDS

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Central Bank, OECD countries, Independence

## JEL CODES

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E58, E52

## 1 INTRODUCTION

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This paper provides an assessment of the independence of central banks in 21 OECD countries (excluding the Eurozone), focusing on their monetary policy autonomy as determined by legislation in 2010, 2015, and 2020. Our data collection adopts a novel approach, building upon the innovated methodology proposed by Cukierman et al. (1992), while incorporating revised components of the index that place greater emphasis on current standards of central bank independence. Additionally, we introduce new

criteria to evaluate budgetary independence, an important aspect of central bank autonomy (Swinburne and Castello-Branco, 1991). The dataset serves as a valuable resource for empirical studies seeking to analyze the impact of monetary policy independence on economic performance. Furthermore, policymakers can draw insights from this index to enhance legislative frameworks and promote stronger performance in central bank independence.

## 2 MATERIAL AND METHODS

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Currently, the empirical literature on central bank independence heavily relies on the methodology proposed by Cukierman et al. (1992), as seen in works such as Garriga (2016) and Dincer and Eichengreen (2013). The index, as suggested by Cukierman et al. (1992) (referred to as CWN), comprehensively decomposes de jure independence into four variables: the position of the chief executive officer, the position of the bank in policy formulation, the determination of objectives, and limitations on lending to the government. Each of these variables is further decomposed into concrete criteria that define the components of independence.

The components of the CWN index were selected to best capture the independence standards of the second half of the 20th century. During this

period, central banks typically made monetary policy decisions monocratically, with the chairman playing a dominant role. Moreover, a significant challenge to central bank independence was associated with (low) limitations on lending to the government. This rationale justifies the relatively high weight assigned to the variable of limitations on lending to the government in the CWN index. Critiques of the CWN approach, however, highlight its omission of crucial independence components such as budgetary independence and bank board independence (Ewiss, 2003; Crowe and Meade, 2008).

Empirical studies that evaluate central bank independence based on the CWN methodology, designed for independence standards of the previous century,

might lead to misleading implications when assessing current independence.

To address these critiques and overcome theoretical limitations, we propose a similar index that addresses these concerns and simplifies computationally intensive aspects of the CWN approach. The index components are derived from the central banks' charters of OECD countries over the last decade, maximizing

objectivity and minimizing subjective evaluations. We define four main components of central bank independence following Bini Smaghi (2008): personal, functional & institutional, financial, and budgetary independence, further decomposed into 14 criteria in total, each coded on a scale of 0 (lowest independence level) to 1 (highest independence level).

### 3 RESULTS

IMF Central Bank Legislation database crosschecking it with the disposable official legislation of the analyzed central banks. Although the dataset is designed as panel data, there is generally little variation in de jure independence between years, as the analyzed parts of legislation remained mostly unchanged. However, we observed a significant decrease in independence for the central bank of Turkey and an increase in independence for the central banks of Costa Rica and Iceland between 2015 and 2020.

Additionally, we noticed less significant changes in independence for the central banks of Hungary, Norway, and Great Britain. The complete dataset is stored in a public repository.

The newly proposed central bank independence index indicates that the examined countries whose central banks are members of the Eurosystem have relatively high independence levels. In contrast, the central banks of the examined Commonwealth countries exhibit relatively lower independence.

### 4 CONCLUSIONS

This paper introduces a novel approach to assessing the central bank independence based on an updated Cukierman et al. (1992) index. The index is designed to address critiques and theoretical limitation of the existing indices.

The results for 21 OECD countries (excluding the Eurozone) suggest that the Commonwealth countries' central banks exhibit relatively low independence compared to rest of the analyzed OECD countries.

### 5 REFERENCES

- BINI SMAGHI, L. (2008). Central bank independence in the EU: from theory to practice. *European Law Journal*, 14(4), 446-460.
- CROWE, C., & MEADE, E. E. (2008). Central bank independence and transparency: Evolution and effectiveness. *European Journal of Political Economy*, 24(4), 763-777.
- CUKIERMAN, A. (1992). Central bank strategy, credibility, and independence: Theory and evidence. *Journal des Économistes et des Études Humaines*, 3(4), 581-590.
- CUKIERMAN, A., WEB, S. B., & NEYAPTI, B. (1992). Measuring the independence of central banks and its effect on policy outcomes. *The world bank economic review*, 6(3), 353-398.
- DINCER, N. N., & EICHENGREEN, B. (2013). *Central bank transparency and independence: Updates and new measures*.
- EWISS, A. (2003). *Central Bank Independence and the Efficiency in Managing Monetary Policy: A Comparative Analysis with Focus on Egypt*. Unpublished MSc. Thesis, Faculty of Economics and Political Science, Cairo University, Egypt [in Arabic].
- GARRIGA, A. C. (2016). Central bank independence in the world: A new data set. *International Interactions*, 42(5), 849-868.
- SWINBURNE, M., & CASTELLO-BRANCO, M. (1991). *Central bank independence: issues and experience*. IMF Working Paper No. 91/58, Available at SSRN: <https://ssrn.com/abstract=884870>

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# USING EMOTIONS IN DMO MARKETING ACTIVITIES

Adéla Prášilová<sup>1</sup>, Veronika Suchárová<sup>1</sup>, Šárka Vanková<sup>1</sup>, Andrea Králiková<sup>1</sup>, Patrik Kubát<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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Emotions, marketing activities, destinations, DMOs

## JEL CODES

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Z32, M31, L83

## 1 INTRODUCTION

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Destination management and its importance for tourism are key aspects for the development and prosperity of destinations. Destination management also plays a crucial role in facilitating communication between the different tourism stakeholders. The destination's brand and image are an essential part of destination management, as a destination needs to remain competitive. Moreover, the brand establishes

an emotional connection with visitors and embodies both the emotions and the uniqueness of the destination. Emotions therefore play an important role in understanding tourists' behavior and preferences [1]. In addition, [1] have also identified loyalty towards the destination as one of the indicators of visitor acceptance by locals. Positive emotional stimuli after a visit lead to higher loyalty towards the destination, as confirmed by a previous study [2].

## 2 MATERIAL AND METHODS

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The study used secondary data [3] collected through a questionnaire survey. The target group was Destination Management Organizations (DMOs) in the Czechia at local, regional, and national level. In total, the DMOs answered 17 questions related to emotions. The questionnaire was distributed via email and was accessible from 28 February 2023 to 18 March 2023. During this period, 54 of the 176 DMOs contacted

completed the questionnaire, resulting in a response rate of almost 33%. The data were then analyzed using basic statistical characteristics and contingency tables. As part of the study, representatives from three different levels of DMOs (Karlovy Vary region, Moravian Karst and Tábor) were selected. A comparison of their websites and social media profiles was conducted, focusing on brand image and slogans and their impact on emotions.

## 3 RESULTS

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The main focus of the study is on the use of emotion in the marketing activities of DMOs at different levels. Key considerations include visual content, originality, and alignment with the target segment. The emotions that are most important for

destinations include, above all, interest, inspiration, enthusiasm, serenity, and pleasure.

Indeed, a strategy based on emotions seems to be successful, especially when it comes to increasing the awareness of a destination and the number of

visitors. Conversely, loyalty, gratitude, determination and strength seem to be of lower priority. The questionnaire survey shows that only 3 of the DMOs surveyed intend to address the loyalty of their visitors. Interestingly, the same 3 DMOs claim that their focus on emotions has led to an increase in visitor numbers. Therefore, it can be argued that DMOs should not neglect the loyalty of their visitors.

A further analysis was conducted on the websites and social media profiles of three selected destinations. The first is the Karlovy Vary region, which created the brand “Živý kraj” and the slogan “Mozaika zážitků” [7]. Despite the catchy slogan and logo, they do not provide enough information about the region itself. Nevertheless, both the website and the social media pages give an energetic and diverse impression. The second destination is the local DMO in Tábor. The advertising for this destination is relatively simple and could be made a bit more playful and entertaining. Their slogan is “Zažijte Tábor” [6], and the social media content is primarily aimed at residents. As for the regional DMO, Moravian Karst, the slogan “Musíte vidět, můžete si zamilovat” clearly captures the feelings of love and interest [4]. Even though this slogan does not

have a direct association with the destination, it is original and easily memorable. This destination also incorporates colors used in its logo and throughout its advertising, focusing on mystery and tranquility.

The destinations mentioned aim with their slogans to arouse interest, but they do not reflect the essence of the respective regions. The slogans do not evoke strong associations with the respective destination, and customers may remember the brand, but not the particular destination. However, the destinations convey consistent advertising across all platforms. The city of Tábor is the only one that targets its social media advertising primarily at the city’s residents. In this case, the city could consider creating new social media accounts targeting potential visitors to increase its reach. Destinations around the world strive to create an emotional connection with their visitors in order to create a bond between the traveler and the place in question. Examples include slogans such as “Amazing Thailand,” “I feel Slovenia” and “It is more fun in the Philippines” [2]. According to the authors, these are associations that visitors recall when the slogan is mentioned about a particular country. This idea is also supported by other studies [5].

## 4 CONCLUSIONS

Based on the results, it can be argued that focusing on emotions and choosing the right advertising approach can be one of the key factors for the success of DMOs in the Czech Republic, which translates into

an increase in the number of visitors or an increase in the awareness of the destination. Ultimately, this leads to a renewed increase in visitor numbers.

## 5 REFERENCES

- [1] HOSANY, S., HUNTER-JONES, P., MCCABE, S.: Emotions in tourist experiences: Advancing our conceptual, methodological and empirical understanding. *Journal of Destination Marketing & Management* 16 (2020), 100444.
- [2] GODOVYKH, M., TASCI, A.D.A.: The influence of post-visit emotions on destination loyalty. *Journal of Place Management and Development* 76, 1 (2021), 277–288.
- [3] LANKAŠ, F.: *Využívání emocí v marketingových aktivitách DMO* [Bachelor’s thesis]. Mendel University in Brno, 2023.
- [4] Moravský Kras. (2023). <https://www.moravskykras.eu/>
- [5] RODRIGUEZ, P., BORGES, A.P., VIEIRA, E.P.: Corporate social responsibility image and emotions for the competitiveness of tourism destinations. *Journal of Place Management and Development* 14, 2 (2021), 134–147.
- [6] Tábor. (2023). <https://www.taborcz.eu/index.asp>
- [7] Živý kraj. (2021). <https://zivykraj.cz/>

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# THE ARTIFICIAL INTELLIGENCE ALGORITHM USED FOR HARVESTED WOOD RECOGNITION

Jana Procházková<sup>1</sup>, Juraj Kriššák<sup>2</sup>

<sup>1</sup>*Brno University of Technology, Czech Republic*

<sup>2</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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artificial intelligence, algorithm, canny, sobel, RANSAC

## JEL CODES

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C63

## 1 INTRODUCTION

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Measuring tree trunk volume is a process that forestry workers encounter every day. Tree trunk has to be measured to plan future inventories, meet tree trunk transport standards, invoicing etc.. We get to the resulting numerical expression of tree trunk volume through a series of sub-processes which

take some time applied for one harvested tree. So if there are hundreds of trees, worker can either make professional guess or try to measure every tree by himself. That is where Artificial Intelligence (AI) can be useful. With it we can make measuring of tree trunk volume more accurate and faster.

## 2 MATERIAL AND METHODS

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The automatic tree trunk detection algorithm consists of four steps. First, it is identification in each frame for the training need and then using the neural network. Then, the found structures are adjusted with the help of filtering and in the last step an accurate mathematical model is created using the RANSAC iteration algorithm. [1]

From captured photo we need to identify parts of images which contains tree trunk cross section (simpler said ellipses from harvested tree). For this approach I used pre-trained neural network model called YOLO version 5. Object we are looking for – harvested tree – is not among the pre-trained classes. First we have to feed the model with labeled images of harvested trees and than train it like on Figure 1.

After we identify coordinates in image where tree trunk is, need to process image so there is big

contrast between tree trunk and surrounding. We do it by editing levels, channels, brightness and colors of image.

Now we can identify geometric objects which are closest to cross section of tree trunk. The shape can be described as circle or an ellipse. We used mathematic filters for detecting edges of objects. We chose two filters (Sobel and Canny) because of their properties. Applying them we identify edges of object represented by white pixels. [2] [3] See Figure 2.

The final part of this process is process called RANSAC which randomly generates circles and ellipses and than tries to find best solution where as much as possible white pixels lies on the geometric object.

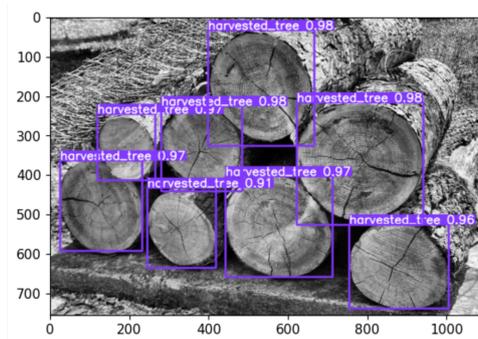


Fig. 1: YOLOv5 detection of custom objects

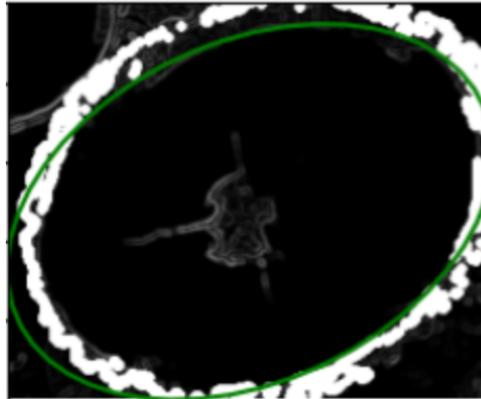


Fig. 2: RANSAC detection based on ellipse object

### 3 RESULTS

After my testing calculations on real world data we can say the accuracy between the calculations of

algorithm and values directly calculated on-site is approximately between 80%–99%.

### 4 CONCLUSIONS

Required accuracy are dependent on processing time and available computing power. The difference between calculations of this algorithm and values

directly calculated on-site is mainly based on the provided reference value.

### 5 REFERENCES

- [1] MARTIN A. FISCHLER, ROBERT C. BOLLES: a paradigm for model fitting with applications to image analysis and automated cartography., *Journal* 24, 1981, 381–395. url: <https://dl.acm.org/doi/10.1145/358669.358692>.
- [2] JOHN CANNY: A Computational Approach to Edge Detection. *Journal PAMI*-8, 1986, 679 – 698. URL: <https://ieeexplore.ieee.org/document/4767851>.
- [3] ANDERS HAST: Simple filter design for first and second order derivatives by a double filtering approach, *Journal* 42, 2014, 65 – 71. url: <https://www.sciencedirect.com/science/article/pii/S0167865514000282>.

# ADVANCING SUSTAINABILITY THROUGH DIGITALIZATION: THE INTERSECTION OF ARTIFICIAL INTELLIGENCE AND SUSTAINABILITY

Christoph Riemer<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

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## KEY WORDS

Sustainability, AI, Digitalization, IT

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## JEL CODES

O33, Q50, C61

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## 1 INTRODUCTION

The pursuit of sustainability is widespread today and requires a comprehensive economic transformation that also directly affects the public sector. In this context, the IT sector is ambivalent, as on the one hand it enables significant efficiency gains, but on the other hand it has significant resource requirements. In this paper, the possibilities of IT, in

particular Artificial Intelligence (AI), are explained in more detail in the context of sustainability. A practical example is used to illustrate how the idea of sustainability can be successfully integrated into the process of software development. It will also be shown how the public sector can actively participate in the sustainable transformation of the IT sector.

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## 2 MATERIAL AND METHODS

In order to write this present article, multiple sources, materials, and methods were used to conduct a thorough and comprehensive investigation. The main sources, materials, and methods are listed below:

Sources:

- Literature: In order to establish a solid theoretical foundation, extensive scientific articles, books and conference proceedings on AI and its role in sustainability were consulted. This included papers from recognized researchers and institutions.
- Government reports: official documents and reports from governments and international organizations, such as the UN, were analyzed to gain

insights into policy and regulatory aspects in the field of AI and sustainability.

- Case studies: research on case studies from different industries and regions was used to explore practical applications of AI to promote sustainability. This information was obtained from published company reports and academic sources.
- Databases: comprehensive datasets on environmental indicators, social parameters, and economic metrics were obtained to conduct empirical analyses. Note, however, that this data sourcing was ongoing at the time of the conference.

Methods:

- Literature Review: A comprehensive review of the relevant literature was conducted to capture the current state of research in AI and sustainability. This included identifying trends, challenges, and potential solutions.
- Expert interviews: interviews with experts from industry and research were conducted to gather insights and learnings. The opinions and experiences of these experts were included in the analysis. In addition, a best practice example of a start-up operating in the relevant market is described in a separate chapter.

### 3 RESULTS

The IT industry is currently undergoing a transformation in which sustainability aspects are gaining in importance and AI solutions are becoming more widespread. This change has a reciprocal effect: On the one hand, AI enables previously unattainable optimization and savings in terms of sustainability; on the other hand, the resource consumption of AI models can be considerable.

In the public sector, more and more customers are recognizing the potential of AI. Advances in Natural Language Processing (NLP) and Computer Vision

(CV) are enabling practical use in the processing of text documents and large amounts of data. Tasks that were previously delayed due to high manual workloads can now be completed in the shortest possible time using AI solutions. The successful implementation of these new technical possibilities in practical use is made possible by specialized software companies. These companies are able to adapt and specialize advanced AI models from research for individual use cases.

### 4 CONCLUSIONS

It is now also up to the public sector to translate modern technologies into reality and practicality, to proactively approach new players, and to recognize the potential for strengthening the sustainability of public administration and translate it into concrete action. Specialized consulting companies play a pivotal role in assisting the public sector in this pro-

cess. Through collaborative partnerships with various startups and expert engagements, they can effectively drive the transformation of the IT sector towards greater sustainability. Embracing these opportunities for innovation and sustainability is crucial for the future success of public administration in the digital age.

### 5 REFERENCES

- [1] E. Commission and D.-G. for Communication, *European green deal: delivering on our targets*. Publications Office of the European Union, 2021.
- [2] S. D. MAGESWARI, P. SUGANTHI, and M. MEENA, *Carbon footprint of info. and commu.tech.*, pp. 338–342, 2022, Institute of Electrical and Electronics Engineers Inc.
- [3] J. MORLEY, K. WIDDICKS, and M. HAZAS, Digitalisation, energy and data demand: The impact of internet traffic on overall and peak electricity consumption, *Energy Research and Social Science*, vol. 38, 2018, pp. 128–137.
- [4] L. F. W. ANTHONY, B. KANDING, and R. SELVAN, *Carbontracker: Tracking and predicting the carbon footprint of training deep learning models*, 7 2020.
- [5] S. NAUMANN, M. DICK, E. KERN, and T. JOHANN, The greensoft model: A reference model for green and sustainable software and its engineering, *Sustainable Computing: Informatics and Systems*, vol. 1, 12 2011, pp. 294–304.
- [6] R. SCHWARTZ, J. DODGE, N. A. SMITH, and O. ETZIONI, Green ai, *Communications of the ACM*, vol. 63, pp. 54–63, 11 2020.
- [7] OECD, *Öffentliche Vergabe in Deutschland: Strategische Ansatzpunkte zum Wohl der Menschen und für wirtschaftliches Wachstum*, OECD Publishing, Paris, 2019, <https://doi.org/10.1787/48df1474-de>.

# INDIRECT COST IN SHOULD COST CALCULATIONS – HOW CARMAKER’S COST ENGINEERS SEE IT

Remo Rossi<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

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## KEY WORDS

cost engineering, Should Cost, Should Costing, automotive industry, overheads

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## JEL CODES

C12, C83

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## 1 INTRODUCTION

Growing and global competition has forced carmakers to increase outsourcing activities. Externally sourced components are crucial for the total cost structure of a car, see [1], while competitive prices are crucial for carmaker’s profitability. For that reason, automakers have built up cost engineering organizations with the aim to set challenging Should Cost Calculations (SCCs) which enable fact-based negotiations. Few researchers have described the process and information requirements to generate SCCs in detail. These authors focus on the direct cost categories within Should Costing, while the consideration of indirect cost remains unclear [2]. This is surprising because the importance of indirect

activities and costs modern manufacturing environments has been intensively discussed since the 1980s of the last century, see for example [3].

This paper aims to highlight how carmaker’s cost engineers rate their cost knowledge in terms of supplier’s material- and manufacturing overheads. Additionally, it is investigating if they perceive a higher risk, that not justified supplier cost are potentially hidden in these indirect compared to direct cost categories. Lastly, the paper seeks to uncover whether cost engineers consider different levels of analytic detail and see differences within the suitability to conduct fact-based negotiations within both cost categories.

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## 2 MATERIAL AND METHODS

The data was collected through a survey, that was addressed to a global population of cost engineers. The survey was posted within the channel “Society of Product Cost Engineering and Analytics” (SPCEA) on the career platform LinkedIn. The timeframe of the investigation was May–July 2022, while 47 responses were collected. The individuals in focus of the investigation had to state to work for a car

manufacturer and indicated at least three years of work experience within the field of cost engineering. Afterwards the selected sample of cost engineers was asked to perform 20 ratings on a Likert scale. The ratings focussed on statements, that referred to three direct (raw material, labour, machine) and two indirect cost categories (material- and manufacturing overheads). Dependency of selected

answers on direct/indirect costs type were evaluated by  $\chi^2$ -independence test with the null hypothesis: Independence of assessed variables. In the case of null hypothesis rejection, the Cramer coefficient was calculated to determine the strength of the

dependency. To assess the substantive nature of the detected dependence, the so-called residuals were calculated as differences between empirical and theoretical absolute frequencies. The significance level was set at 0.05.

### 3 RESULTS

The result of  $\chi^2$ -independence test can be summarised as follows:

1. Cost engineers rate their cost knowledge within indirect cost categories different compared to direct cost categories ( $\chi^2 = 120.69$ ;  $p < 0.001$ ; Cramer  $V = 0.717$ ).
2. Cost engineers perceive a higher risk that suppliers successfully hide not acceptable cost within indirect compared to direct cost categories ( $\chi^2 = 157.63$ ;  $p < 0.001$ ; Cramer  $V = 0.908$ ).
3. Cost engineers rate the level of analytic detail in indirect cost categories of their SCC different compared to direct cost categories ( $\chi^2 = 157.63$ ;  $p < 0.001$ ; Cramer  $V = 0.987$ ).
4. Cost engineers rate the suitability to conduct fact-based negotiations in indirect cost categories

different compared to direct cost categories ( $\chi^2 = 106.34$ ;  $p < 0.001$ ; Cramer  $V = 0.621$ ).

In all cases, the null hypothesis of independence of the observed variables is rejected and the Cramer coefficient suggests rather strong dependencies. By analysing the change of the algebraic sign of residuals, the direction of the identified dependencies could be identified. It could be concluded that cost engineers have a higher cost knowledge in the direct cost categories, perceive a higher risk of not justified cost in indirect cost categories of a supplier quote, perform a higher level of analytic detail in the direct cost categories and see a higher suitability to conduct fact-based negotiations within direct compared to indirect cost categories of their SCC.

### 4 CONCLUSIONS

The results of this paper confirm significant differences within the direct compared to the indirect cost categories of SCCs. The identified correlations and their direction indicate a need to improve the determination of material- and manufacturing overheads within a SCC and to overcome potential weaknesses of currently applied cost estimation techniques. Since quantitative findings are not suited to draw conclusions on causality and root causes of an

observed phenomenon, further quantitative research is needed. A deeper understanding could be acquired through expert interviews. Finally, the consolidation of quantitative and qualitative findings, could lead to new cost model approaches, which aim to improve the level of analytic detail and the ability to conduct fact-based negotiations within the indirect cost categories. This could mitigate the risk, that not acceptable costs are hidden within supplier offers.

### 5 REFERENCES

- [1] LARGE, R.: *Strategisches Beschaffungsmanagement. Eine praxisorientierte Einführung; mit Fallstudien.* 4., vollständig überarbeitete Aufl. Wiesbaden. Gabler, 2009.
- [2] ROY, R., SOUCHOROUKOV, P., SHEHAB, E.: Detailed cost estimating in the automotive industry: Data and information requirements. *International Journal of Production Economics* 133, 2 (2011), 694–707.
- [3] COOPER, R., KAPLAN, R. S.: Measure Costs Right: Make the Right Decisions. *Harvard Business Review* 66, 5 (1988), 96–103.

# THE IMPACT OF PARENTAL INFLUENCE AND SOCIOECONOMIC STATUS ON FIRST-TIME START-UP SUCCESS IN GERMANY

Alexander Roth<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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start-up success, parental influence, socioeconomic status

## JEL CODES

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J24, J62, M13

## 1 INTRODUCTION

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Identification of the underlying reasons for successful entrepreneurship has been the motivation for significant research for decades but little agreement has been reached regarding how parents may influence their children's ambition to create their first start-up or how socioeconomic status impacts on its success.

Consequently, this research focused on German start-ups of first-time founders and sought to establish the extent to which parental influence and socioeconomic status prompt individuals to become founders of start-up companies and the impinge on subsequent success level.

## 2 MATERIAL AND METHODS

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The abundance of start-up firms in Germany is evident from Startupdetector data, which recorded 24,714 start-ups established since 2013, of which 12,937 were attributed to first-time founders [1]. However, the 90% failure start-up rate, 20% in less than one year [2], highlights the need to address the causes of survival and success of these start-ups. It is to be expected that family parental support and socioeconomic status are probable factors for first-time founders start-up success. These facts generated an extensive literature review to identify gaps in the current knowledge and to develop research questions and hypotheses to be resolved. Mixed methods were selected to gather and to analyse data in two stages: qualitative methods to collect data, the findings of which informed creation of a quantitative survey

[3] enabling four major hypotheses to be tested [4]. The qualitative study employed a purposive sample of 20 first-time founders of German start-ups, who had expert in-depth knowledge of the opportunities and risks of the venture. Semi-structured interviews selected for data collection provided a means of gathering facts and feelings from the participants by means of open questions that would facilitate facts and feeling to be expressed in an atmosphere of collaborative discussion. The interviews commenced with collection of the participants' personal data including age range, educational achievement level, and family background. The responses to the interview questions were analysed by means of systematic form of content analysis ensuring high rigour and transparency of the findings [5]. Subsequently, the

major findings from the qualitative interviews were used to develop the quantitative survey, which had the purpose of validating/invalidating each of the major findings. The quantitative survey also gathered personal data and comprised several rating and ranking questions. The sample was statistically rep-

resentative. Of the 1,500 German first-time founders who were contacted via LinkedIn or email, 401 took part in the survey. Analysis of the quantitative data was conducted using SPSS software, which enabled resolution of the hypotheses as valid or null.

### 3 RESULTS

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Most participants in the qualitative study expressed the belief that the high socioeconomic status of their parents had significantly impacted the financial success of their start-ups but also that those from lower socioeconomic backgrounds were able to be successful founders. The extent of social mobility of some successful founders was also evident and contrary to existing studies, which found social mobility in Germany to be very low. A major limitation of these findings was that some founders were unwilling to disclose the extent of financial support and/or

access to parental networks that had taken place. The quantitative survey confirmed that the socioeconomic status of parents positively influenced the academic and socialisation success of children, who founded first-time start-ups. But parents and family were not proven as the most important factor in start-up success. The socioeconomic status of the founder was also proven to have a positive influence on start-up success, even when socioeconomic status was relatively low.

### 4 CONCLUSIONS

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The employment of mixed methods research in this study enabled the initial findings from the qualitative interviews to be further investigated in a statistically representative sample of start-up founders. It demonstrated that the initial findings corresponded in relation to socioeconomic status influencing start-up success, and confirmed that higher socioeconomic

status of parents was not always the influencing factor. Whilst the parental influence was found to support academic achievement and socialisation in both studies, it was not proven as the most important factor in start-up success. Overall the degree of correspondence of the findings was high.

### 5 REFERENCES

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- [1] Startupdetector GmbH. ©2023. *Neue Startups entdecken - die Startup-Datenbank* [online]. Berlin: Startupdetector GmbH. [cit. 2023-10-10]. Available at: <https://startupdetector.de/>
- [2] AMINOVA, M. and MARCHI, E. 2021. The Role of Innovation on Start-Up Failure vs. its Success. *International Journal of Business Ethics and Governance*, 41-72. ISSN 2717-9923. Available at: <https://doi.org/10.51325/ijbeg.v4i1>
- [3] CRESWELL, J., PIANO-CLARK, V. 2007. *Designing and Conducting Mixed Methods Research*. Thousand Oaks, CA: Sage Publications. ISBN 1-4129-2791-9.
- [4] SAUNDERS, M.N.K., LEWIS, P. and THORNHILL, A. 2019. *Research Methods for Business Students*. 8th Edition. New York: Pearson. ISBN 978-1-292-20878-7.
- [5] MAYRING, P. 2015. *Qualitative Inhaltsanalyse. Grundlagen und Techniken*. Weinheim: Beltz. ISBN 978-3-407-25730-7.

# REPUTATION OF A NON-PROFIT ORGANISATION – A QUANTITATIVE-EMPIRICAL STUDY EMBEDDED IN RISK MANAGEMENT ON POLICE

Lea Saal<sup>1</sup>, Torsten Huschbeck<sup>2</sup>, Christian Horres<sup>2</sup>

<sup>1</sup>University of Police and Public Administration of North Rhine-Westphalia, Cologne, Germany

<sup>2</sup>Comenius University of Bratislava, Slovakia

## KEY WORDS

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Reputation, risk management, police force, decision-making processes

## JEL CODES

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F51, H12, H56

## 1 INTRODUCTION

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This paper examines and assesses the internal and external operations of the police and how they are perceived by the public. There are risks that specific police officers will act improperly in situations where threats are stopped or crimes are investigated and prosecuted. If the police are criticised by the public as

an authority, their reputation suffers. The resulting damage to the reputation of the police and police departments seems to have been hardly considered so far and must be covered by a risk management strategy in the future.

## 2 MATERIAL AND METHODS

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Citizens who have come into contact with the police as a service provider of internal security in order to receive help in crime-related situations are generally satisfied with the police work. The attractiveness of the police as an employer, on the other hand, is closely related to their reputation and recruitment. Despite the high level of trust in the police, attacks on the police occur in many places on New Year's

Eve. The aim of this article is to discuss the current state of knowledge on the reputation of the police as a non-profit organisation in a business sense and to answer a related scientific question. In order to create the theoretical framework for a quantitative survey in advance, a structured literature search was first conducted, the results of which were subjected to a qualitative content analysis according to Mayring [1].

## 3 RESULTS

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The qualitative content analysis shows that the reputation of the police can be divided into an affective and a cognitive component and can be

influenced on the one hand by personal experiences from a police contact and on the other hand by the news [2]. In this context, the evaluation of the

quantitative survey confirms the assumption that people who have turned to the police of a request for help or to avert danger are quite satisfied with the police work.

In order to counteract negative feelings, police officers should choose respectful as well as explanatory verbal communication, which in turn affects the quality of the service and image of the police. This behaviour, as well as a neat and tidy external appearance, creates a professional effect on the police

counterpart. On the one hand, this underlines the results of the survey that the attractiveness of the employer has a high relevance in the choice of employer and, on the other hand, shows that the reputation of the police and the recruitment of personnel are mutually influence each other. However, the flexibility of work structures does not have a significant impact on the attractiveness of the police, but shorter working hours and part-time compatibility could increase it.

## 4 CONCLUSIONS

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In addition to a study previously conducted by the lead author, it can also be stated here that the reputation of the police is made up of the components professionalism, trust, satisfaction, appreciation and respect, as well as presence in public [3]. The reputation on the police can also be influenced by personal experiences. Since it can be stated that the relevance of flexibility does not have a significant correlation with the attractiveness of the police, but

has an effect on it. The conversion of work structures to shorter working hours and part-time compatibility would be one way to increase the attractiveness of the police. This statement underlines the results of the survey, in which the participants stated that the attractiveness of the employer has a high relevance in the choice of employer and shows that the reputation of the police and the recruitment of personnel are closely linked.

## 5 REFERENCES

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- [1] MAYRING, P. et al.: *Qualitative content analysis. Handbook Methods of Empirical Social Research.* Springer, Wiesbaden, 2022, pp. 691–706.
- [2] HERMANUTZ, M. et al.: The image of the police, the quality of services and the satisfaction of the population – connections and possibilities for improvement. *Handbook of Police Management Police Policy – Police Science – Police Practice.* Springer, Wiesbaden, 2017, pp. 945–962.
- [3] SAAL, L. et al.: Brand Marketing of the Police – The Dangers of a Subculture Within the Police’s Official Guiding Culture. *Developments in Information & Knowledge Management for Business Applications* vol 5. Springer, Cham, 2022, pp. 2-3.

# THE IMPACT OF THE MACROECONOMIC ENVIRONMENT ON THE EXISTENCE OF ZOMBIE FIRMS

Pavel Sedlák<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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Zombie firm, corporate finance, institutional environment, taxation, logistic regression

## JEL CODES

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C33, G3, H25

## 1 INTRODUCTION

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The concept of zombie companies has garnered global attention, representing financially unsustainable yet persisting firms sustained by low-interest rates, lenient lending, and government interventions. (Hoshi, 2006; Banerjee & Hofmann, 2018; Tan et al., 2016) Their growth, from 1–2% to 12% in world economies from the 1980s to 2016 (Banerjee & Hofmann, 2018), is evident in research and media, emphasizing the need to comprehend their dynamics and economic impact. While existing literature comprehensively defines zombie firms, their causes, and economic effects,

a significant gap remains in assessing the influence of the institutional environment and taxation on their emergence. This study bridges that gap, using cross-country data to explore how the institutional environment and the implicit tax rate affect the likelihood of firms becoming zombies, recognizing the crucial role of the institutional environment and taxation. Understanding the influence of taxation and the state on zombie firm emergence is pivotal for effective policymaking and sustainable economic growth.

## 2 MATERIAL AND METHODS

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The empirical research is conducted on an unbalanced dataset encompassing firm-level, macroeconomic and institutional observations. The dataset covers 47 European countries over the annual period of 2011–2020. The firm-level data were sourced from Orbis, a commercial database provided by the electronic publishing firm Bureau Van Dijk. This resulted in a considerable dataset comprising 5,365,740 non-financial firms, providing a substantial foundation for our analysis. The study is conducted only on non-financial firms. For this reason, all banking firms and insurance companies were removed from the

dataset. The Orbis database provides information for both consolidated and unconsolidated units. Consolidated units were removed to avoid double counting. Institutional and macroeconomic data on yearly basis were obtained from the World Bank.

To identify the probability of a zombie firm occurrence, we use panel data analysis where the model is a logistic regression with fixed effects. The fixed effects are chosen based on the premise that each firm behaves specifically, and this assumption is approved by the Hausman test.

### 3 RESULTS

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The outcomes of the second model reaffirm the procyclicality of institutions, with a confirmed negative effect of GDP on the likelihood of zombie firm formation. This indicates the tendency for excessive lending during economic upturns and heightened caution during downturns. Regarding institutional variables, the implicit tax, denoting the tax cost-to-profitability ratio, exhibits a negative impact on zombie firm occurrence, aligning with the hypothesis that an increase of implicit tax reduces the probability of zombie emergence. Furthermore, the

influence of taxation is highlighted through the significant outcome of tax competition, rejecting the notion of tax system heterogeneity concerning firm zombification; whether a firm is located in a low-tax haven or a high-tax country, the impact on zombification remains negligible, showcasing the homogenous behaviour of different tax systems.

The outcomes of the third model provide mixed findings, revealing the dual nature of the institutional environment's influence on zombie firm emergence, with both positive and negative effects observed.

### 4 CONCLUSIONS

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This paper empirically investigates the effects of implicit tax rate and institutional environment on the formation of zombie firms. It finds that implicit tax rate has negative influence on emergence of zombie firms and this influence is further strengthened by homogeneity which occurs among taxation systems in terms of firm zombification. Further, we explore impact of certain parts of institutional environment which reveals diverse influence of institutional quality on the occurrence of zombie firms. Generally, we can conclude, that government plays huge part in zombie firm creation and there are reasons why the government is willing to support or create zombie firms, but if it is pragmatic and market-oriented enough, it will leave emotions and protectionism aside and try to prevent or get rid of them.

In response to these findings, we propose a comprehensive set of legislative changes to combat zombie firms, including implementing a minimum tax requirement for large corporations to deter excessive debt and zombification risk, enforcing a low capitalization rule to restrict tax cuts and excessive financing leverage based on an interest expense-to-capital ratio, strengthening the obligation to publish firm documentation in a public register with stricter penalties for non-compliance, establishing a ratio-based limit on debt relative to firm sales to prevent further tax burden leveraging by inefficient firms, and encouraging states to serve as mentors and supporters rather than bailout providers, promoting responsible risk management and encouraging restructuring or mergers as needed.

### 5 REFERENCES

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- BANERJEE, RYAN and HOFMANN, BORIS:  
The Rise of Zombie Firms: Causes and Consequences. *BIS Quarterly Review September*. September 2018. Accessible from: SSRN: <https://ssrn.com/abstract=3288098>
- HOSHI, TAKEO: Economics of the living dead. *Japanese Economic Review*. 2006. Vol. 57, no. 1. pp. 30-49. Accessible from: DOI 10.1111/j.1468-5876.2006.00354.x.

- TAN, YUYAN; HUANG, YIPING and WOO, WING THYE:  
Zombie Firms and the Crowding-Out of Private Investment in China. *Asian Economic Papers*. 2016. Vol. 15, no. 3. pp. 32-55. Accessible from: DOI 10.1162/ASEP\_a\_00474.

# THE LEVEL OF EFFICIENCY OF THE V4 ACCOMMODATION SECTOR ONE YEAR AFTER THE OUTBREAK OF THE COVID-19 PANDEMIC

Gabriela Soušková<sup>1</sup>, Michaela Staňková<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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Efficiency, V4 countries, data envelopment analysis, Covid-19

## JEL CODES

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C44, D24

## 1 INTRODUCTION

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Like other economic sectors, the Accommodation, food and hospitality sector was also affected by the Covid-19 pandemic. According to [1], it was the Accommodation sector that was among the hardest hit and has been suffering the consequences ever since. Before the advent of the pandemic, it was a dynamic market that had been on the rise for many years. Border closures, flight cancellations and lockdowns made travelling and overnight staying in hotels and other accommodations all but impossible. Fear and restrictions have generally resulted in frustration, which has been shown to negatively affect people's well-being [2]. Although many studies have

been done on the effects of pandemics on people, very little space has been devoted to the health of businesses. Based on results in [3], we know that in 2020 there was a drop in the efficiency of companies falling under the Accommodation sector. However, this study focused only on the year of the pandemic outbreak in the EU and not on the recovery period. For this reason, in this paper we focus on evaluating the efficiency of enterprises in the Accommodation sector in 2021. In order to achieve a homogeneous dataset, the analysis focuses only on V4 countries that have the same type of tourism.

## 2 MATERIAL AND METHODS

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In contrast to the earlier [3] and [4] studies, in this paper we rely on accounting data of individual enterprises obtained from the Orbis database. In total, it was possible to obtain information from 1 309 enterprises operating within NACE code 55 (i.e. accommodation). Specifically, there are 86 Czech companies, 114 Hungarian companies, 205 Polish companies and 904 Slovak companies. All sizes of

enterprises are represented in the dataset, i.e. from the small to the very large category.

A non-parametric data envelopment analysis (DEA) method was chosen to calculate production efficiency. Since we have enterprises of different sizes represented in the dataset, we decided to use the BCC model, which allows us to work with variable returns to scale. We chose the output orientation of the model, as the decline in the amount

of accommodation purchased during the pandemic leaves room in the market for a renewed increase in bookings and hence company turnover. The turnover of enterprises was chosen as the output variable. The labour factor is represented in the model by the cost of employees and the capital factor by the total

assets of the enterprise. In order to fully investigate the change not only in individual efficiency but also in the production possibilities frontier, we used a calculation via the Malmquist production index. All calculations were performed in DEA SolverPro.

### 3 RESULTS

The results of the changes in the Malmquist index and its two components (i.e. individual efficiency and frontier) for the V4 countries are reported in form of median in Tab. 1. We can conclude that all countries are experiencing an increase in the frontier, signalling some recovery in the sector. However, the Czech

Republic and Slovakia are lagging behind in changing individual efficiency, as the median efficiency is below the value of 1. Nevertheless, according to the overall situation (i.e. the overall index), the recovery process is generally visible, as the index values are higher than one (almost equal to one in the case of Slovakia).

Tab. 1: Median change in efficiency, frontier and Malmquist index in the form of growth coefficients for the period 2021/2020

Country	Efficiency change	Frontier change	Malmquist index change
Czech Republic	0.9796	1.0518	1.0615
Hungary	1.1437	1.0395	1.1801
Poland	1.1991	1.0143	1.1726
Slovak Republic	0.9086	1.0881	0.9973

### 4 CONCLUSIONS

This article looked at a comprehensive assessment of changes in the efficiency of enterprises in the V4 countries in 2021. The results show that the slowest

recovery is taking place in Slovakia. Other countries show growth in the overall situation, mainly due to the growth of the production possibilities frontier.

### 5 REFERENCES

- [1] GERWE, O.: The Covid-19 pandemic and the accommodation sharing sector: Effects and prospects for recovery. *Technological Forecasting and Social Change* 167 (2021), 120733.
- [2] HAGEDORN, R. L., WATTICK, R. A., OLFERT, M. D.: My Entire World Stopped: College Students' Psychosocial and Academic Frustrations during the COVID-19 Pandemic. *Applied Research in Quality of Life* 17 (2022), 1069–1090.
- [3] SOUŠKOVÁ, G., STAŇKOVÁ, M.: Change in Efficiency of EU Countries within the Accommodation, Food, and Hospitality Sector in 2020. *PEFnet 2022: Abstracts*, Mendelova univerzita v Brně, Brno, 2021, 115–116.
- [4] SOUŠKOVÁ, G., STAŇKOVÁ, M.: The position of the Czech Republic within the accommodation, food, and hospitality sector. *PEFnet 2021: Abstracts*, Mendelova univerzita v Brně, Brno, 2021, 121–122.

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# SPECULATION ON SQUEEZES

Dominik Svoboda<sup>1</sup>, Peter Albrecht<sup>1</sup>, Svatopluk Kapounek<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

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## KEY WORDS

squeeze effect, short-selling strategy, market anomalies, logistic regression

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## JEL CODES

G1

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## 1 INTRODUCTION

The squeeze effects resounded throughout the stock markets in 2021 when a massive group of retailers connected through forums opened enormous long positions for GME stock. Because of the strong demand from retail investors, hedge funds were forced to close their short-selling positions. The case of this stock became one of the best-known squeeze effects that happened on the market. Before closing their positions, institutional investors held more than 100% of the existing shares in their short-selling positions.

Through this event, the squeeze effect came to the attention of investors as well as the public as an event where the market regulators had to intervene to restrict trading in GME stock. The case of GameStop is well known, but the determinants of this

effect are unclear. It is known to be a phenomenon associated with excessive opened short positions. Increased trading volumes of retail investors put an upward pressure on the share prices [1], and this is further associated with excessive short positioning where short sellers are forced to close positions due to sharp price movements [2]. Based on these observations, we assume that changes in short-selling are related to the probability of squeeze effect occurrence. However, it is currently not known to what extent the two phenomena are related. Is this a definable phenomenon where a rapid reduction in short positions triggers a short squeeze or is it a merely random phenomenon where closing short positions affects one stock but not the other? These and similar questions motivate our research.

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## 2 MATERIAL AND METHODS

The dataset consists of a total of 70 firm stocks at a monthly frequency in the period from 03M/2018 to 03M/2021. We have chosen Mainly the companies with less than a hundred million float shares, because the companies with smaller caps are more volatile [3]. The dataset was further expanded to include “blue-chip” stocks where Morningstar database was the source of the data for the analyzed companies. The companies’ data were then augmented with

an attention index – the search intensity index downloaded from Google Trends. Then, macroeconomic indicators are obtained from Yahoo! Finance. From the selected companies, we determined whether the company experienced a squeeze effect and in what period. This was intended based on three factors. First, we observed whether the volatility of the stock prices increased exponentially in one period. At the same time, we further analyzed these

companies whether the short interest of the firm's stock increased exponentially in the same period. If these two criteria were met, we observed whether the squeeze effect of the company was also discussed on internet forums. If a firm met all three criteria, it

was assigned a value of 1 in that month. Otherwise, it would take the value of 0. Then we employ logit regression to identify the likelihood of the occurrence of the short squeeze effect.

### 3 RESULTS

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The results of the logit regression indicate a significant effect of market trading volume, stock trading volume, stock profitability, and the intensity of the

search for a particular company on increasing the likelihood of the squeeze phenomenon.

### 4 CONCLUSIONS

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The empirical results contribute to the recent stream of literature, examining which key indicators increase the likelihood of the squeeze effect occurrence. First, we confirm the occurrence of the squeeze effect through the short-selling strategy. Investors' attention should be focused on a large amount of open short positions. Second, we find that the likelihood of the squeeze effect occurrence increases with the low market capitalization of the company. A higher

likelihood was identified for companies, for which the squeeze effect was observed at least once. We argue that the risk of a squeeze becomes significant when stocks are hard to borrow. Especially when there is a lack of floating shares to trade. Third, our results suggest that although trading volume does not have the predictive power of the squeeze effect, it is a major factor that increases market volatility and large stock price movements.

### 5 REFERENCES

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- [1] GALLANT, R.A., ROSSI, P., TAUCHEN, G. 2015. Stock Prices and Volume. *The Review of Financial Studies*. vol. 5, pp. 199-242.
- [2] SCHULTZ, W.F. 2022. Short Squeezes and Their Consequences. *SSRN Electronic Journal*.
- [3] GERACE, D., CHEW, C., WHITTAKER, C., MAZZOLA, P. 2014. Stock Market Manipulation on the Hong Kong Stock Exchange. *Australasian Accounting, Business and Finance Journal*. vol. 8(4), pp. 105-140.

# COMMODITY PRODUCT CHAIN – CULTIVATION RAPESEED OIL FOR THE PRODUCTION METHYL ESTERS OF RAPESEED OIL IN THE CZECH REPUBLIC

Kristýna Tlamková<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

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## KEY WORDS

agribusiness, commodity product chain, methyl esters, oilseed rape

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## JEL CODES

Q02, Q11

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## 1 INTRODUCTION

The article is focused on the characterisation of oilseed rape's vertical commodity chain's selected relations as the main representative in the group of oilseeds in the Czech Republic. The research activity is focused on the behavior of selected groups of subjects in the vertical commodity chain. Among the investigated parts are primarily agricultural oilseed rape growers, industrial rapeseed's producers focused on oleochemical uses, traders and distributors of rapeseed's oil methyl esters and final consumers of diesel [3]. The sowing the rapeseed oil in Czech agricultural landscape for its subsequent processing into methylesters of rapeseed oil has been divided

by 4 milestones in the last quarter of a century. In September 2007, based on the Air Protection Act, 2% biocomponent was compulsorily added to diesel fuel, from September 2009 this proportion was legislatively increased to 4.5% and in April 2010 to the final 6%. On July 1, 2022, according to a legal change, the mandatory addition of biocomponent to diesel fuel was abolished, and it continues to be voluntary. Based on the determination of the relationships in the vertical commodity chain, the relevant demand functions are formally expressed, which will be the basis for creation of the dynamic econometric model of the functions [1].

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## 2 MATERIAL AND METHODS

The research database covers a twenty year horizon. Since 2003 when the Czech Republic was preparing to entrance to the European Union, until 2022 which affected the price environment on European commodity markets due to the war situation in Ukraine. Used data contains the production of rapeseed oil, the harvest area, production of FAME – fatty acid

methyl ester, production of MEŘO – methyl esters rapeseed oil, prices of agricultural producers, prices of industrial producers, consumer prices of diesel fuel, consumption of diesel fuel in In the Czech Republic, the mandatory percentage of the bio component mixed into diesel fuel based on legislative changes [3]. A linear regression model is used to investigate

dependencies in the vertical commodity chain of oilseed rape. This linear model meets the basic assumptions and is properly defined, it is linear in the parameters and has an additively connected error term, the error term of the model has zero skewness, none of the explanatory variables are correlated with

the error term, the observations of the error term are not correlated with each other, the error term has constant variance, none of the explanatory variables is a perfect linear combination of another explanatory variable, and the error term has a normal distribution [2].

### 3 RESULTS

Oilseed rape production was the highest in 2014, when 1537.3 thousand tons were grown on an area of 389.3 thousand hectares. This year, due to the climate, farmers achieved above standard yields per hectare. In the investigated period, rapeseed's cultivation was supported by agricultural support programs, unified payment per area of agricultural landscape, support for the recovery of field and special crops, support for the use of biocomponent

in transport from the chemical industry. The production of the biocomponent for ingredient in diesel fuel has been produced primarily from rapeseed oil for a long time. In 2018, a change occurs, when Czech producers partially use other sources for the production of biocomponent, the largest percentage is occupied by rapeseed oil, followed by used cooking oils, palm oil, soybean oil, animal fats and sunflower oil.

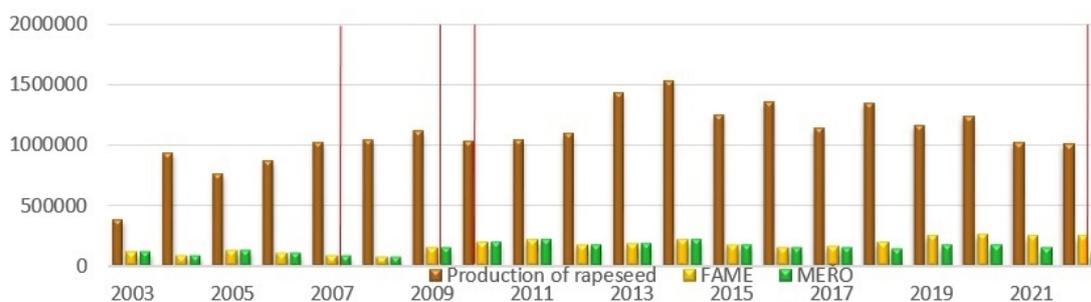


Fig. 1: Production of rapeseed, production of FAME and MEŘO in the Czech republic

### 4 CONCLUSIONS

There are visible changes in the production of biocomponent, which reflects an increasing trend in consumption until 2014 and decreasing trend in the consumption of rapeseed for the production of MEŘO from 2015. The decreasing trend is caused by the replacement of rapeseed oil with other components used in production, which also reflects the decreasing harvest area used for technical rapeseed. In 2021, the

area proportion for rapeseed used for the production of MEŘO was 35%. The Czech Republic is still the largest rapeseed producer in Europe. Rapeseed oil still represents the largest part in the production of biocomponent, but are these times coming to the end and more modern way of producing biocomponent is beginning?

### 5 REFERENCES

- [1] CLAY, P. M., FEENEY, R.: Analyzing agribusiness value chains: a literature review. *International Food and Agribusiness Management Review*, (2018), 32-34.
- [2] HAMPEL, D., BLAŠKOVÁ, V., STŘELEČEK, L.: *Econometrics 2*. Mendel University, Brno, 2011.
- [3] SYROVÁTKA, P., BLAŽKOVÁ, I.: Elasticity of demand function within commodity chain of food-corn in Czech republic. *Folia Univ. Agriculturae Et Silviculturae Mendelianae Brunensis* Vol. II, No.11, (2009), 11-17.

# FACTORS INFLUENCING THE MINIMUM WAGE IN EU COUNTRIES

Natália Várošová<sup>1</sup>, Veronika Blašková<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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employment, labor productivity, minimum wages, panel analysis

## JEL CODES

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C23, E24, J24

## 1 INTRODUCTION

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The relationship between minimum wages and employment has been examined in many studies, but the results are different [1]. Some authors argue that an increase in the minimum wage will definitely reduce employment, while others argue that the effect of an increase in the minimum wage on employment is insignificant. A less studied but very close topic is the effect of job creation on the minimum wage. The

automation process results in a decrease in demand for less skilled workers but an increase in demand for more skilled workers, causing changes in the labour market [2].

However, it does mean that there may be more effort by employers to find suitable employees, leading to higher employment of recruiters and the creation of new specific jobs [3].

## 2 MATERIAL AND METHODS

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All data used for this article were obtained from Eurostat. The time span considered was from 2008 to 2022, due to data availability and all 27 countries of European Union were followed. Due to the fact that not all countries have a minimum wage, there are also blind spots in the data, but no country has been removed from the dataset. Models are based on the calculations according to this equation:

$$\text{NMW} = \beta_0 + \text{JV}\beta_1 + \text{PGDP}\beta_2 + \text{LP}\beta_3,$$

where NMW stands for national minimum wage, JV stands for job vacancy rate, PGDP stands for percentage of gross domestic product and LP stands for labour productivity. These variables were chosen according to their relevancy to theoretical bases.

The minimum wage variable was published bi-annually at Eurostat and converted to annual terms for the purposes of this paper by applying a simple arithmetic average. Job vacancy variable cannot be obtained from Eurostat at country level but only at NACE sectoral classification level. The construction sector was therefore chosen because it has a significant share of low-wage workers and at the same time contributes significantly to GDP. The labour productivity variable was used from Eurostat in the form of a percentage change lagged by three periods in real productivity per person.

The relationship between these variables was examined with use of regression analysis of panel data. Calculations were provided by Gretl 2021a software.

### 3 RESULTS

For most of the countries job vacancy rate seems to be growing. The Hausman test did not reject the random effects model. The fixed effects model had lower information criteria. The differences between the coefficients of fixed effects model and random effects model are minimal. When visually inspecting the graph of fitted and actual values, the fixed effects model appears to be more appropriate.

All variables were statistically significant and were not correlated between each other. Residues do not meet the normality condition.

The results show that, as the job vacancy rate rises, the minimum wage will rise as well and as the sector's share on GDP and labour productivity rise, the minimum wage will fall.

Fixed effects				Random effects			
Dependent variable	Independent variable	Coefficient	p-value	Dependent variable	Independent variable	Coefficient	p-value
NMW	const	812.93	<0.001	NMW	const	827.22	<0.001
	JV	33.61	<0.001		JV	33.70	<0.001
	PGDP	-21.26	0.005		PGDP	-22.13	0.003
	LP	-1.77	<0.001		LP	-1.76	<0.001

### 4 CONCLUSIONS

As this is authentic data, the results are influenced by a wide range of external factors, causing models not to accurately fit statistical assumptions and economic theory. Since the vacancy rate is a predominantly increasing variable despite improving technology, which should lead to a reduction in the number of job vacancies, the results of the model suggest that as the vacancy rate increases, so does the minimum wage.

Another surprising twist to this model is the negative sign on the labour productivity variable and the GDP contribution variable. Negative sign would suggest a decline in the minimum wage in response to rising labour productivity or growth of the industry. Such a result may also be a consequence of significantly changing values of productivity.

### 5 REFERENCES

- [1] FANG, T.; GUNDERSON, M.; LIN C. The impact of minimum wages on wages, wage spillovers, and employment in China: Evidence from longitudinal individual-level data. *Review of development economics* 2020, 25(2), 854–877. <https://doi.org/10.1111/rode.12741>
- [2] GROSHEN, E. L.; HOLZER, H. J. Improving Employment and Earnings in Twenty-First Century Labor Markets: An Introduction. *RSF: The Russell Sage Foundation Journal of the Social Sciences* 2019, 5 (5), 1. <https://doi.org/10.7758/rsf.2019.5.5.01>.
- [3] MEER, J.; WEST, J. Effects of the Minimum Wage on Employment Dynamics. *The Journal of Human Resources* 2016, 51 (2), 500–522.

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# SURVEY OF SELECTED NATURAL LANGUAGE PROCESSING MODELS AND THEIR POTENTIAL FOR PRESERVING THE CONTEXT OF COMMUNICATION

Michaela Veselá<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

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## KEY WORDS

Communication context, autoregressive transformers, sequence-to-sequence transformers, natural language, natural language processing, autocoding transformers

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## JEL CODES

C45, L86

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## 1 INTRODUCTION

Natural language processing has been a rapidly developing field in recent years. Natural language processing is divided into Natural language understanding, natural language generating, Speech or Voice recognition, Machine translation and Spelling Correction and Grammar Checking [1]. Large language models are used in applications that can synthesize text, tell stories or fill emails. The way they are trained (dataset) influences their deployment domain along with the parameters so the ability to maintain context in dialog communication. In the near future, the learned language models could be deployed for general tasks, without the need for application-specific training. [2] The increasing size of language models is one of the biggest trends at the moment, and this is the reason why the creation of non-specialized applications is preferred. Size is

measured by the number of parameters and the size of the training data. This increase is evidenced by the emergence of models such as BERT and its variants, GPT-2, T-NLG, GPT-3 created since 2018. The proliferation of language models has shown to lead to improvements in various application tasks. [3] The accuracy of different models varies from paper to paper, even when comparing the same types of models. [4, 5]

Similarly, no comprehensive research has been found that compares multiple natural language processing models. The comparisons found compared at most six models of different types. [4, 6, 7, 9]. The aim of this report is to provide an up-to-date survey of natural language processing models with a focus on communication context processing.

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## 2 MATERIAL AND METHODS

The research focused on assessing the feasibility of models in natural language processing and the type of datasets for testing them. Natural language processing models can be divided into three subsets based on transformers. The first group includes

models with autoregressive transformers, such as Transformers-XL, XLNet and models from the GPT family. In the second subset are models based on sequence-to-sequence (S2S) transformers, here are models like T5, BART, PLBART, PALM and others.

[10] The last group are models with auto-encoding transformers, these are for example BERT and its variants and TB. [11] To test the models, benchmarks

specialized for natural language processing tasks should be used.

### 3 RESULTS

The main differences between the model types are in the development of the system. Models with autoregressive transformers are suitable for text generation because they can predict the next word based on text that has been read before. Models with autoregressive transformers are most suitable for use in text classification tasks. S2S models include a Transformer encoder and decoder, which

is why they are so suitable for machine translation tasks. The actual domain is the assessment of the ability to exploit and preserve the context of dialog communication. This is a prerequisite for dialog communication. It addresses both the form of context preservation (access) and the assessment of the quality of the access thus implemented. [12]

### 4 CONCLUSIONS

The contributions describe the current trends in language models, the rapid developments in this area, but also suggest future challenges, especially the possibilities to compare these models with each other,

including the ability to preserve the context of dialogic communication. This is a partial contribution, a survey of the state of the art, but not a solution to the partial problems defined here.

### 5 REFERENCES

- [1] SETHUNYA, R. J. et al.: Natural Language Processing: A review. *International Journal of Research in Engineering and Applied Sciences* 6, 3 (2016), 207–210.
- [2] YUAN, A., COENEN, A., REIF, E., & IPPOLITO, D. (2022). Wordcraft: Story Writing With Large Language Models. In *27th International Conference on Intelligent User Interfaces. IUI '22: 27th International Conference on Intelligent User Interfaces*. ACM.
- [3] BENDER, E. M., GEBRU, T., McMILLAN-MAJOR, A., & SHMITCHELL, S. (2021). On the Dangers of Stochastic Parrots. In *Proceedings of the 2021 ACM Conference on Fairness, Accountability, and Transparency*. FAccT '21: 2021 ACM Conference on Fairness, Accountability, and Transparency. ACM.
- [4] NUGROHO, K. S., SUKMADEWA, A. Y., & YUDISTIRA, N. (2021). Large-Scale News Classification using BERT Language Model: Spark NLP Approach. In *6th International Conference on Sustainable Information Engineering and Technology 2021*. SIET '21: 6th International Conference on Sustainable Information Engineering and Technology 2021. ACM.
- [5] DEVLIN, J. et al. (2018). *BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding* (Version 2). arXiv.
- [6] LAN, Z. et al. (2019). *ALBERT: A Lite BERT for Self-supervised Learning of Language Representations* (Version 6). arXiv.
- [7] ROBERTS, A. et al. (2020). *How Much Knowledge Can You Pack Into the Parameters of a Language Model?* (Version 4). arXiv.
- [8] CLARK, K. et al. (2020). *ELECTRA: Pre-training Text Encoders as Discriminators Rather Than Generators* (Version 1). arXiv.
- [9] TOUVRON, H. et al. (2023). *LLaMA: Open and Efficient Foundation Language Models* (Version 1). arXiv.
- [10] GONG, L. et al. (2019). Enhanced Transformer Model for Data-to-Text Generation. In *Proceedings of the 3rd Workshop on Neural Generation and Translation*. Association for Computational Linguistics.
- [11] RAHALI, A., & AKHLOUFI, M. A. (2023). End-to-End Transformer-Based Models in Textual-Based NLP. In *AI* (Vol. 4, Issue 1, pp. 54–110). MDPI AG.
- [12] KUMAR, A., & JAIN, A. (2023). *On the Convergence of Adam and Beyond*. arXiv preprint arXiv:2309.12727.

# STATE OF THE ART IN LCC ANALYSIS AND MITIGATION OF UNCERTAINTIES AND RISKS – A LITERATURE REVIEW

Stefan Wieke<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

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## KEY WORDS

Life Cycle Cost Analysis, Case Studies, Net Present Value Method, Sensitivity Analysis, Monte Carlo Simulation.

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## JEL CODES

C82, D81, G11

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## 1 INTRODUCTION

Investment decisions are often made on the basis of LCC. Although the procedure is straight forward, the authors of the studies based on LCC repeatedly encounter the same questions and difficulties, which have a considerable impact on the results of the study and thus on the selection of the best option. In this regard, reference should be made to the evaluation of OPEX (i.e. energy costs), above all, to their future development over the period under consideration. In feasibility studies, the period under consideration is generally set between ten years and sometimes more than 20 year.

These uncertainties in input data (i.e. energy costs) and the future development of input data inherent

the risk that not the best option of investment is chosen with consequences for misallocation of limited funds.

These uncertainties and risks in the evaluation have to be addressed and measures to minimize the risks and uncertainties have to be developed.

This paper covers the literature review on this topic and reflects state of the art in LCC analysis and identifies aspects for the improvement of the results and to mitigate uncertainties and risks.

Even though the literature review relates to LCC in general the focus is on the natural gas infrastructure in Germany.

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## 2 MATERIAL AND METHODS

An intensive literature survey on Elsevier, scholar google but also in relevant German databases such as Vulkan Verlag (Vulkan Verlag issues relevant journals for the natural gas infrastructure), DVGW and [www.oilgaspublisher.de](http://www.oilgaspublisher.de) (publisher of Erdöl-Erdgas-Kohle, the scientific journal of DGMK) was conducted.

The literature review shows that case studies based LCC analysis according to ISO 15663 is recognised in the energy sector. Measures to mitigate uncertainties and risks in the results are applied and categorized [1]. The effect of these measures is rarely described.

Seven feasibility studies which were performed by experts of consulting firms and were reviewed

by experts of gas suppliers have been examined. These feasibility studies are not publicly available. These seven studies apply LCC analysis with NPV method and served as the basis for decision making

on investments in the natural gas infrastructure. These feasibility studies represent state of the art and expert opinions. Also these studies do not apply sensitivity analysis or risk assessment.

### 3 RESULTS

In many companies decision making follows established procedures. Most companies apply discounted cash flow methods and LCC analysis. Reviews of academic and practitioner literature [2] revealed that most LCC cases were far from ideal and difficulties in conducting reliable LCC cases were found.

Detailed literature surveys on LCC analysis conducted by [3] and (Shafiee et al., 2019).

A large number of publications deal with LCC analysis in strategic management. On the one hand there are literature reviews and on the other hand case studies or elaborations on special topics in the context of LCC analysis. The process of LCC analysis and the application of NPV is well established and recognized. LCC analysis based on ISO 15663 is

a well established and recognised standard in the energy sector,

The results of an LCC analysis depend much on the quality of the input data that a lack of quality of these data can lead to wrong results. But not only the quality of the input data must be discussed, but also the development of the input data over time. The prediction of the cost development of the input data is one of the most difficult tasks in LCC analysis and associated with uncertainties and risks. Sensitivity analysis can mitigate uncertainties. Risk assessment with Monte Carlo Simulation allows to quantify risks by means of descriptive statistics.

The authors of the seven feasibility studies neglected sensitivity analysis and risk assessment.

### 4 CONCLUSIONS

A systematic examination of the results of feasibility studies based on LCC analysis with regard to the reliability of the results elaborated in the models is rare. Uncertainties and risks are addressed in literature and appropriate measures such as sensitivity analysis and risk assessment are proposed. Case studies based on LCC models and extensive challenging of the results (in the case the ranking of investment options)

are rare. For the infrastructure in Germany, this investigation does not exist so far.

The need of additional measures such as weighted scoring in order to implement social acceptance or environmental aspects (i.e. CO<sub>2</sub> emissions) is obvious and will add additional value to LCC analysis and have a significant impact on the result namely the ranking of the investment options.

### 5 REFERENCES

- [1] P. ILG, C. SCOPE, S. MUENCH, and E. GUENTHER, Uncertainty in LCC for long-range infrastructure. Part I leveling the playing field to address uncertainties, *International Journal Life Cycle Assess*, pp. 277–292, 2017
- [2] E. KORPI and T. ALA-RISKU, Life cycle costing: A review of published case studies, *Managerial Auditing Journal*, vol. 23, no. 3, pp. 240–261, 2008
- [3] Y. KAWAUCHI, T. E. COOPERATION, and M. RAUSAND, Life Cycle Cost (LCC) Analysis in Oil and Chemical Process Industries, *ResearchGate*, no. July 1999, 2014
- [4] M. SHAFIEE, I. ANIMAH, B. ALKALI, and D. BAGLEE, Decision support methods and applications in the upstream oil and gas sector, *J Pet Sci Eng*, vol. 173, pp. 1173–1186, 2019

# GLOBAL MOBILITY: INTERCULTURAL PREPARATION OF SHARED SERVICES CENTERS WORKFORCE

Daniela Zachová<sup>1</sup>, Zuzana Křečková Kroupová<sup>1</sup>

<sup>1</sup>Prague University of Economics and Business, Czech Republic

## KEY WORDS

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intercultural preparation, intercultural competence, global mobility, business shared services, shared services centers

## JEL CODES

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M12, M14

## 1 INTRODUCTION

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Maintaining successful and profitable global operations often means multinational companies (MNCs) must establish shared services centers (SSC), also known as business shared services (BSS) centers. Those centers are usually located in strategic hubs, while the services provided are delivered to various internal, as well as external clients globally. The SSC workforce responsibilities encompass all forms of employee international mobility, ranging from traditional business-related trips or short-term project work to long-term expatriate assignments provided to employees of all nationalities and cultures. While providing services, there are several factors influencing the quality of delivered services. While communicating, the SSC workforce has to deal in the communication with cultural differences. Therefore, the global mobility specialists competencies are wide-ranging (Valk, 2019). To this end, the management of SSC should evaluate the level of each employee's intercultural competencies not only during the onboarding phase but also evaluate the “intercultural

skills” of each employee while performing the daily work by providing intercultural preparation training. Intercultural preparation should be understood as a complex personal competence or ability to interact efficiently with others, who are culturally or linguistically different (Deardorff, 2009), it is a key competence in terms of providing global mobility services, especially with regards to consulting. SSC's global mobility workforce is one of the stakeholders, that participate in the relocation process of a client-traveler. It is important to assess how the SSC global mobility employees' level of intercultural preparation could affect the clients' overall expectations and meet all their needs. In this paper, we are going to focus on the global mobility services provided by the SSC and how the level of intercultural preparation of an SSC workforce affects the quality of services delivered to customers. It is expected to identify a connection between an inclusive working environment having a high level of intercultural competence and SSC organization success.

## 2 MATERIAL AND METHODS

In order to analyse the connection between the level of intercultural competence and successful operations of SSC and gain respective knowledge, a literature review was conducted. The aim was to analyze the current state of the art of intercultural competences in relation to services provided by MNC's SSC and secondly, to identify the method of assessing the intercultural competences used in SSC. For the literature review the relevant papers in databases

were searched via scientific search engines: Web of Science, Scopus and EBSCO host. The following key words were applied to the search: "intercultural competence" or "intercultural preparation" along with "business shared services", "shared services centers" (also using the abbreviations in the search syntax). Furthermore, the results were filtered by language (English) and a publication date (year 2018 or later).

## 3 RESULTS

Based on the search, in total 32 sources were identified which were further filtered – first, via investigation of abstracts and, subsequently, through

a full context analysis. As a result, 8 sources built the basis for this paper.

## 4 CONCLUSIONS

When delivering the global mobility services, the intercultural competence is a key ability affecting the quality of services. The fact that SSC operates digitally brings even bigger challenge to the communication. According to Deardorff's model, the intercultural competence boosts the desired outcome internally as well as externally, so the communication and behaviour are appropriate and effective (Zur, 2019). Also, the mutually shared vision on service quality positively affects the overall quality of ser-

vices and thus increase the customer satisfaction and creates a competitive advantage (Eldor, 2020). The above mentioned literature research proved that this area hasn't been thoroughly evaluated – the current research rather focuses on employees on managerial positions or travelers itself, rather than on the actual workforce performing the service in global mobility. Thus, the research will further focus on evaluation of current state of intercultural competencies of SSC workforce by using mixed methods.

## 5 REFERENCES

- [1] DEARDORFF, D. K. (2009). *The SAGE Handbook of Intercultural Competence*. SAGE.
- [2] ELBOR, L. (2020). How Collective Engagement Creates Competitive Advantage for Organizations: A Business-Level Model of Shared Vision, Competitive Intensity, and Service Performance. *Journal of Management Studies*, 57(2), 177–209. <https://doi.org/10.1111/joms.12438Z>
- [3] VALK, R. (2019). The Global Mobility function: From tightrope walker performing a balancing act towards knowledge broker and linchpin. *Journal of Global Mobility: The Home of Expatriate Management Research*, 7. <https://doi.org/10.1108/JGM-02-2019-0008>
- [4] ZUR, M. N. (2019). *The Use of Deardorff's Process Model of Intercultural Competences in Intercultural Training—An empirical investigation*. [Master Thesis]. <https://studenttheses.uu.nl/handle/20.500.12932/33979>

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# CONCEPT OF P2P ENERGY TRADING MOBILE APPLICATION

Martin Zák拉斯ník<sup>1</sup>, Oldřich Faldík<sup>1</sup>, Oldřich Trenz<sup>1</sup>, Veronika Konečná<sup>1</sup>

<sup>1</sup>*Mendel University in Brno, Czech Republic*

## KEY WORDS

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Peer-to-peer Energy Trading, Mobile application, Energy market

## JEL CODES

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L8, O3, Q41

## 1 INTRODUCTION

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In the European Union in 2022, the amount of electricity generated from renewable sources overtook the amount generated by gas for the first time [1]. That means we need to more effectively deal with the surplus from energy sources. P2P energy trading allows individuals and communities to trade surplus energy directly between producers and consumers, which supports energy efficiency and reduces dependence on traditional energy suppliers.

There are several prerequisites for P2P energy trading. The energy infrastructure must be in place to allow energy to be returned to the grid, and the grid must be sized to handle large transfers of electricity from multiple prosumers and consumers. There also needs to be a platform for trading excess electricity. There is also a need for a tool that allows people to track current electricity prices and offers from others in the community energy sector and, finally, legislation needs to be addressed.

## 2 MATERIAL AND METHODS

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The mobile app should be easy to use and provide enough information to the user. The app should provide up-to-date information about household consumption. This means that the household must already have a smart meter installed that provides an instant overview of their energy behaviour. A

user-friendly interface should be implemented within the app to easily track the current energy usage data. Graphs, tables and visualizations should be intuitive, allowing users to quickly understand how they consume and produce energy.

## 3 RESULTS

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The main goal of the mobile application for P2P trading is to connect local communities that have their own energy resources and consumers who want

to be able to take electricity from someone other than the main electricity supplier.

An important part of the app must be a connection to a home smart meter that allows a detailed

overview and trend of electricity consumption. Once we have a connection to the electricity smart meter, we can display real-time electricity consumption in the mobile app and predict future trend. Another important part is to create a platform for trading surplus electricity. The platform must be transparent and secure. This can be achieved using blockchain

technology, which allows for immutable transaction history recording and which also provides automated smart contracts [2]. Smart contracts can be triggered automatically without third party involvement, thus securing the transaction between the energy seller and buyer. The platform itself, however, is not part of the mobile app and will be handled separately.

## 4 CONCLUSIONS

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Rise of renewable energy sources is bringing about a transformational change in the energy sector. For the first time, electricity generation exceeded gas in the European Union in 2022, reflecting a shift towards sustainability. P2P trading shows increased efficiency

and reduced reliance on traditional suppliers. This paper highlights the potential of P2P energy trading in optimising the use of renewable energy and emphasises the need for continued research and policy adjustments for a more sustainable future.

## 5 REFERENCES

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- [1] *Ember: Wind and solar overtake fossil gas to produce record fifth of EU electricity* [online]. 2023. Available from: <https://ember-climate.org/press-releases/wind-and-solar-overtake-fossil-gas-to-produce-record-fifth-of-eu-electricity/>
- [2] KORKMAZ, AYŞE & ACIKGOZ, ERAY. (2020). *Blockchain Based P2P Energy Trading Platform*. 10.13140/RG.2.2.27553.02408.



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