

ИНСТИТУТ ЗА ИКОНОМИЧЕСКИ ИЗСЛЕДВАНИЯ НА БЪЛГАРСКАТА АКАДЕМИЯ НА НАУКИТЕ  
**ИКОНОМИЧЕСКИ  
ИЗСЛЕДВАНИЯ**  
*ECONOMIC STUDIES*

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## IMPORT SUBSTITUTION OR JUST “CATCHING THE WAVE”? EVIDENCE FROM THE GREEK MANUFACTURING EXPORTS<sup>3</sup>

*The purpose of the present paper is to investigate the prospects of expanding domestic manufacturing production in Greece, through the review of merchandise imports from China. This strategy does not presuppose a targeted implementation of import substitution policies, but rather a strategy for the recovery of dormant productive sectors in Greece, in light of the restructuring of the country's productive model. National economies often gain a comparative advantage in exports through imports of products belonging to the same product group, which are further processed and re-exported to other countries, thus a comparative advantage in exports can eventually be accompanied by a comparative “disadvantage” in imports. We introduce here the Revealed Comparative Disadvantage (RCD) index as an additional control of the countries' export performance by industry, in complementarity with the use of the Revealed Comparative Advantage (RCA) estimations. The results suggest that a preferable strategy to import-substitution would rather be to deploy imports, in order to effectively promote targeted domestic production and boost export performance. There is strong evidence for the favourable prospects of expanding domestic production, and consequently exports, into various sub-sectors related to the clothing and footwear industry.*

*Keywords: China; Greece; Revealed comparative advantage; Revealed comparative disadvantage*

*JEL: F13; L16; M20*

### 1. Introduction

In recent decades, the Greek manufacturing industry has suffered significant losses, which affected its former competitiveness in both domestic and international markets. The reasons are more or less well known: the strong competition from developing countries in labour-

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intensive sectors, such as China, the business relocations that have taken place to various neighbouring Balkan countries with lower labour costs – especially during the economic crisis, the insufficient institutional framework for attracting multinational companies, the significant fluctuations in the relevant legislative framework and the unstable Greek tax system. Consequently, a key challenge for the Greek economy is to find a way to restart after a long period of deindustrialization and economic crisis.

According to the Foundation for Economic and Industrial Research, expanding manufacturing production in Greece is high-priority, as it is estimated that many professional sectors (services of accountants and lawyers, banking services) could benefit from such a development, while at the same time strengthening export trade (FEIR, 2018). With regard to Greek-Chinese trade relations, previous studies have highlighted the prospects of expanding Greek export activity towards China (Karkanis and Fotopoulou, 2021), without taking into consideration imports of Chinese products nonetheless. This paper intends to fill this gap. In this context, the main questions that arise can be summarized as follows: Is it possible to substitute part of the Chinese merchandise imports in Greece with domestic production? In which product groups are there favourable prospects for expanding domestic production? With regard to sectors characterized by higher intensity in terms of Chinese imports, is it possible to identify comparative advantages for Greek exports during the post-crisis period?

It should be stressed that the purpose of this paper is not necessarily to indicate sectors in which there are favourable prospects for the substitution of Greek imports from China – as well as from other countries – with future domestic production. On the contrary, it ultimately intends to highlight sectors with favourable prospects for expanding domestic production, while achieving complementarity with imports of Chinese products. The identification of these product sectors can be an opportunity for the re-orientation of productive activities, along with the given primacy of tourism in Greece. Furthermore, the added value of the present paper is further extended by introducing the Revealed Comparative Advantage and Disadvantage indexes, as well as their corresponding symmetric forms, which are estimated for specific productive sectors in Greece.

The remainder of the paper is organized as follows. Section 2 provides a review of the relevant literature, while Section 3 describes the methodological approach as well as the data sources deployed per product category. Section 4 presents the empirical results obtained and tries to identify the sectors in which favourable prospects for expanding domestic production emerge. Section 5 refers to the different factors that are expected to determine the prospects of expanding production in specific sectors, highlighting the policy implications in each case. Finally, the last section summarizes the main results and concludes the paper.

## **2. Literature Review**

According to the relevant literature, the views expressed by the leading supporters of import substitution (Prebisch, Myrdal) were not at all uniform, each maintaining a different stance on the need or lack thereof to formulate appropriate export strategies (Irwin, 2020). However, it should be recalled that although import substitution strategies may seem outdated at least

for developed countries' economic strategies, they have been adopted by the majority of developed countries worldwide at some point in the past, as part of their economic transition. Some empirical studies suggest the adoption of import substitution industrialisation as a short-term stage towards their subsequent liberalisation, once the industrialisation process of developing countries has been completed (Adewale, 2017). Jayanthakumaran (2000) emphasises the negative impact of import substitution strategies on the incentive structure of a national economy, as well as the prospects for export expansion. Finally, Jackson and Jabbie (2020) provide recommendations for developing countries that choose to pursue import substitution policies, advocating fostering research and development activities, supporting regional integration and promotion of competitive advantages, as well as the pursuit of political stability, which in turn will contribute to FDI attraction.

The literature on the Revealed Comparative Advantage (RCA) index (Balassa, 1965) is undoubtedly extensive and with numerous applications in international trade analyses. Stellian and Danna Buitrago (2019) present standardised tools in order to compare RCA indexes estimated for a given set of countries. Oelgemöller (2013) employs the RCA index in order to shed light on the export structures of the EU countries which were severely affected by the economic crisis (Greece, Italy, Portugal, Spain), while Langhammer (2004) measures the RCAs in the trade of services of the United States, the European Union and Japan. Wosiek and Visvizi (2021) suggest a homonymous index (Visvizi-Wosiek RCA index) in order to assess the evolution of the services sector in Poland during the previous decade (2010-2019).

The introduction of the Revealed Comparative Disadvantage (RCD) estimates has already been reported for certain industries in the relevant literature (Aquino, 1999; Algieri, 2004). Maxir and Masullo (2017) provide estimations of the RCA and RCD scores in the forest product industry in Brazil during the period 2000-2014. Highlighting that national economies can be both exporters and importers of the same commodities overtime, they argue that not taking import flows into account in the analysis of countries' comparative advantages can lead to erroneous conclusions. Furthermore, the high degree of volatility which often characterizes the RCA and RCD scores has led to normalize the latter index values within the interval -1 and 1, a methodological procedure proposed by Laursen (1998) and also adopted by Algieri (2004).

### **3. Methodology and Data**

As a first step, the analysis aims to identify the top imported Chinese products in Greece during the period 2017-2019, based on data from the UNCTAD database (3-digit SITC level). For the same sectors, we examine the most recent trends in terms of revealed comparative advantage in relation to Greek exports. The RCA index is already calculated and available from the same statistical database. A national economy is said to have a revealed comparative advantage in a given product *i* when the ratio of product *i* exports to its total exports (all products included) exceeds the same ratio for the world economy as a whole ( $RCA > 1$ ). Thus, the first objective is to identify the sectors in which a revealed comparative advantage exists during the recent period 2017-2019.

In the present study, we argue that the Balassa index does not necessarily lead to safe conclusions in every case, especially when RCA calculations concern groups of traded products. National economies often gain this comparative advantage in exports through imports of products belonging to the same product group, which are processed and re-exported to other countries. In this context, the supposed comparative advantage in exports is, in certain cases, accompanied by a comparative “disadvantage” in terms of import flows. In this view, we introduce here the Revealed Comparative Disadvantage (RCD) measure, essentially as a tool extension of the RCA index, and in accordance with the methodological approach proposed by Laursen (1998) and Algieri (2004). In our study, the RCD estimations derive from the following equation:

$$RCD_{Ai} = \frac{\frac{M_{Ai}}{\sum_{k=1}^n M_{Ak}}}{\frac{M_{Wi}}{\sum_{k=1}^n M_{Wk}}} \quad (1)$$

On the above equation,  $RCD_{Ai}$  stands for the revealed comparative disadvantage of country A on imports of product  $i$ ,  $M_{Ai}$  represents country A’s imports of product  $i$ ,  $M_{Wi}$  stands for the world imports of product  $i$ ,  $\sum_{k=1}^n M_{Ak}$  is the country A’s total imports, while  $\sum_{k=1}^n M_{Wk}$  is the world’s total imports.

RCA and RCD measurements concern exclusively the thirty (30) major imported product groups from China. Based on these calculations, it is possible to further isolate the product groups which satisfy both conditions of a revealed comparative advantage in terms of Greek exports and a revealed comparative disadvantage in terms of imports by product group. Consequently, taking into account both indexes will explain whether Greece’s comparative advantages in certain sectors are ultimately related to domestic production and resources or whether they are significantly dependent on imports of products belonging to the same product group. As a next step, we further normalize the estimated RCA and RCD scores within the value interval of -1 and 1, thus providing the Revealed Symmetric Comparative Advantage and Disadvantage estimates ( $RCA_{Ai}^*$  and  $RCD_{Ai}^*$ , respectively), based on the procedure proposed by Laursen (1998) and described by the equations (2) and (3):

$$RCA_{Ai}^* = (RCA_{Ai} - 1) / (RCA_{Ai} + 1) \quad (2)$$

$$RCD_{Ai}^* = (RCD_{Ai} - 1) / (RCD_{Ai} + 1) \quad (3)$$

Finally, in order to assess favourable prospects for expansion of domestic production in specific sectors reasonably raises a new question: Is an eventual expansion of domestic production expected to mainly substitute imports from third countries (non-EU members) or rather from Greece’s European partners? The answer to this question requires an exploration of whether a possible expansion of domestic production in specific sectors in Greece would have a greater impact on the economies of EU partners or of third countries. This could imply that specific product groups where higher dependency on imports from third countries – including China – is observed, could be considered more appropriate for expanding domestic production, without underestimating the issues of availability of the relatively limited resources in the Greek case.

#### 4. Results

According to the Foundation for Economic & Industrial Research (FEIR, 2018), Greece's industrial production index in manufacturing recovered by around 10% during the period 2014-2017 amidst the economic crisis, while investments in manufacturing recovered from 2015 onwards, exceeding 12 billion in 2017. This recent general recovery of the manufacturing sector is certainly the result of diverging trends among the different product groups. As mentioned above, the analysis concerns 30 product groups marked by the highest contribution to the total value of Greek imports of Chinese products during the period 2017-2019 (Table 1). The empirical results initially highlight the presence of high or, at least, rising RCA scores in exports of i) clothing and footwear, ii) automatic data processing machines, iii) toys, games and sporting goods, iv) paper and v) plastic items. It should be noted that imports of clothing, footwear and other similar products alone accounted for 15.6% of total imports from China – a percentage similar to that of automating data processing machines (15.28%).

Based on both RCA and RCD estimates (Table 1), it is firstly possible to distinguish two groups of sectors with a positive outlook for recovery: i) those sectors with high or gradually increasing RCA scores during the years 2017-2019 and  $RCA_i < RCD_i$ , and ii) those with high or gradually increasing RCA scores and  $RCA_i > RCD_i$ . The first group concerns bilateral trade of i) footwear, ii) articles of apparel of textile fabrics, iii) men's and women's clothing of textile fabrics, as well as iv) clothing accessories of textile fabrics. The second group comprises bilateral trade of i) automatic data processing machines, ii) baby carriages, toys, games and sporting goods, iii) aluminium, iv) articles of plastics, v) women's clothing, vi) man-made woven fabrics, vii) knitted or crocheted fabrics, viii) paper and paperboard.

The findings suggest a strong positive correlation between the RCA of the aforementioned product groups and import intensity (RCD) related to the industries, implying a significant dependence of Greece's exports on intermediate product imports from other countries. This suggests that an eventual import-substitution strategy in the product sectors mentioned above could simultaneously affect Greek exports. On the other hand, imports and merchandise trade in general can contribute positively to the transfer of know-how between trading partners, which is generally one of the positive externalities of bilateral trade.

Estimates on the Revealed Symmetric Comparative Advantage and Disadvantage indexes (Table 2) provide a clearer picture, depending on the sign of the  $RCA^*$  and  $RCD^*$  values. In particular, for the aluminium products, it is the only product group where significantly higher  $RCA^*$  scores were recorded, compared to the corresponding  $RCD^*$  scores. Similar results can also be derived, although to a lesser extent, from the sector of women's clothing trade. The general trend suggests that positive  $RCA^*$  estimates are accompanied by both positive and similar values of the corresponding  $RCD^*$  estimates. Exports of household equipment products seem to lose their comparative advantage, as revealed by the negative  $RCA^*$  scores (2018 and 2019), at the same time with positive  $RCD^*$  scores. Once more, it is possible to discern the primacy of the revealed comparative advantages in exports of aluminium, of clothing and textile products, but also in exports of paper and paperboard products, which, however, come along with revealed comparative disadvantages in Greek imports related to the same product groups.

**Table 1. Major imported products from China to Greece: RCA and RCD estimations (2017-2019)**

Index	Share of Chinese imports (%)	RCA			RCD (1)		
		2017	2018	2019	2017	2018	2019
Product group	2017-2019						
Automatic data processing machines	15.28	0.74	0.98	1.05	0.73	0.83	0.84
<b>Baby carriages, toys, games &amp; sporting goods</b>	<b>5.35</b>	<b>1.22</b>	<b>1.28</b>	<b>1.30</b>	<b>1.13</b>	<b>1.15</b>	<b>1.15</b>
Footwear	4.28	0.48	0.54	0.94	1.33	1.36	1.58
Telecommunication equipment & parts	4.02	0.25	0.21	0.20	0.44	0.49	0.47
<b>Aluminium</b>	<b>3.71</b>	<b>7.25</b>	<b>6.77</b>	<b>7.03</b>	<b>2.42</b>	<b>2.48</b>	<b>2.20</b>
Heating & cooling equipment & parts	3.33	0.74	0.74	0.70	1.15	1.16	1.14
Household equipment, electrical or not	2.9	0.51	0.45	0.45	1.35	1.25	1.39
Furniture & parts	2.84	0.26	0.28	0.29	0.63	0.64	0.71
Electrical machinery & apparatus	2.72	0.55	0.31	0.44	0.49	0.50	0.55
<b>Articles, n.e.s., of plastics</b>	<b>2.49</b>	<b>1.07</b>	<b>0.98</b>	<b>1.02</b>	<b>0.90</b>	<b>0.93</b>	<b>0.95</b>
Articles of apparel, of textile fabrics	2.45	0.53	0.54	0.80	1.22	1.18	1.49
Travel goods, handbags & similar containers	2.24	0.26	0.22	0.34	0.95	0.93	1.04
Men's clothing of textile fabrics, not knitted	1.83	0.41	0.45	0.63	1.28	1.25	1.53
Ships, boats & floating structures	1.79	0.54	0.62	0.44	13.53	5.30	2.28
Lighting fixtures & fittings, n.e.s.	1.74	0.58	0.54	0.51	0.79	0.89	1.01
Women's clothing, of textile fabrics	1.74	0.67	0.69	0.81	1.43	1.42	1.57
Manufactures of base metal, n.e.s.	1.57	0.69	0.63	0.58	0.62	0.59	0.64
<b>Women's clothing, of textile, knitted or crocheted</b>	<b>1.55</b>	<b>2.34</b>	<b>2.23</b>	<b>2.82</b>	<b>1.88</b>	<b>1.82</b>	<b>2.44</b>
Miscellaneous manufactured articles	1.37	0.15	0.13	0.15	0.88	0.86	0.88
<b>Fabrics, woven, of man-made fabrics</b>	<b>1.29</b>	<b>1.19</b>	<b>1.10</b>	<b>1.26</b>	<b>0.99</b>	<b>0.99</b>	<b>1.08</b>
Made-up articles, of textile materials	1.17	0.42	0.43	0.50	0.99	0.94	1.05
<b>Household equipment of base metal</b>	<b>1.17</b>	<b>1.24</b>	<b>0.93</b>	<b>0.93</b>	<b>1.04</b>	<b>1.12</b>	<b>1.09</b>
Rotating electric plant & parts thereof	0.95	0.12	0.14	0.17	0.94	1.43	1.52
Clothing accessories, of textile fabrics	0.86	0.40	0.45	0.86	0.98	1.03	1.48
Mechanical handling equipment, parts	0.82	1.02	0.88	0.82	0.53	0.62	0.57
<b>Paper &amp; paperboard, cut to shape or size, articles</b>	<b>0.82</b>	<b>1.70</b>	<b>1.61</b>	<b>1.68</b>	<b>1.65</b>	<b>1.59</b>	<b>1.62</b>
Other non-electr. machinery, tools & mechan. appar.	0.82	0.74	0.60	0.64	1.21	1.20	1.16
Instruments & appliances, medical, etc.	0.80	0.25	0.27	0.27	0.96	0.94	0.91
<b>Knitted or crocheted fabrics, n.e.s.</b>	<b>0.77</b>	<b>1.73</b>	<b>1.52</b>	<b>1.54</b>	<b>1.33</b>	<b>1.27</b>	<b>1.47</b>
Motorcycles & cycles	0.77	0.16	0.16	0.17	0.92	0.87	1.03

Source: UNCTADStat database, and own calculations.

The greater the dependency on imports from third countries in some of the aforementioned product sectors – and therefore the higher the import share from third countries – the harder it is for domestic firms to increase their market share, at either national or international level. Based on 2019 data, this is mainly the case for aluminium (87.6%), automatic data-processing machines (64%), as well as certain categories such as fabrics and clothing accessories (Table 3). It seems that high dependency on imports from third countries pertains mostly to raw or intermediate materials (for example, aluminium, woven, knitted or crocheted fabrics). This is quite expected, given that Greece cannot acquire a comparative advantage in labour-intensive productive sectors, in which China is, in any case, in a more advantageous position.



**Table 2. Major imported products from China to Greece: RCA\* and RCD\* estimations (2017-2019)**

Index	RCA* (2)			RCD* (3)		
	2017	2018	2019	2017	2018	2019
Automatic data processing machines	-0.149	-0.010	0.024	-0.156	-0.093	-0.087
<b>Baby carriages, toys, games, sporting goods</b>	<b>0.099</b>	<b>0.123</b>	<b>0.130</b>	<b>0.061</b>	<b>0.070</b>	<b>0.070</b>
Footwear	-0.351	-0.299	-0.031	0.142	0.153	0.225
Telecommunication equipment, parts	-0.600	-0.653	-0.667	-0.389	-0.342	-0.361
<b>Aluminium</b>	<b>0.758</b>	<b>0.743</b>	<b>0.751</b>	<b>0.415</b>	<b>0.425</b>	<b>0.375</b>
Heating & cooling equipment, parts	-0.149	-0.149	-0.176	0.070	0.074	0.065
Household equipment, electric. or not	-0.325	-0.379	-0.379	0.149	0.111	0.163
Furniture & parts	-0.587	-0.563	-0.550	-0.227	-0.220	-0.170
Electrical machinery & apparatus	-0.290	-0.527	-0.389	-0.342	-0.333	-0.290
<b>Articles, n.e.s., of plastics</b>	<b>0.034</b>	<b>-0.010</b>	<b>0.010</b>	<b>-0.053</b>	<b>-0.036</b>	<b>-0.026</b>
Articles of apparel, of textile fabrics	-0.307	-0.299	-0.111	0.099	0.083	0.197
Travel goods, handbags & similar containers	-0.587	-0.639	-0.493	-0.026	-0.036	0.020
Men's clothing of textile fabrics, not knitted	-0.418	-0.379	-0.227	0.123	0.111	0.209
Ships, boats & floating structures	-0.299	-0.235	-0.389	0.862	0.683	0.390
Lighting fixtures & fittings, n.e.s.	-0.266	-0.299	-0.325	-0.117	-0.058	0.005
Women's clothing, of textile fabrics	-0.198	-0.183	-0.105	0.177	0.174	0.222
Manufactures of base metal, n.e.s.	-0.183	-0.227	-0.266	-0.235	-0.258	-0.220
<b>Women's clothing, of textile, knitted or crocheted</b>	<b>0.401</b>	<b>0.381</b>	<b>0.476</b>	<b>0.306</b>	<b>0.291</b>	<b>0.419</b>
Miscellaneous manufactured articles	-0.739	-0.770	-0.739	-0.064	-0.075	-0.064
<b>Fabrics, woven, of man-made fabrics</b>	<b>0.087</b>	<b>0.048</b>	<b>0.115</b>	<b>-0.005</b>	<b>-0.005</b>	<b>0.038</b>
Made-up articles, of textile materials	-0.408	-0.399	-0.333	-0.005	-0.031	0.024
<b>Household equipment/base metal</b>	<b>0.107</b>	<b>-0.036</b>	<b>-0.036</b>	<b>0.020</b>	<b>0.057</b>	<b>0.043</b>
Rotating electric plant & parts thereof	-0.786	-0.754	-0.709	-0.031	0.177	0.206
Clothing accessories, of textile fabrics	-0.429	-0.379	-0.075	-0.010	0.015	0.194
Mechanical handling equipment, parts	0.010	-0.064	-0.099	-0.307	-0.235	-0.274
<b>Paper &amp; paperboard, cut to shape or size, articles</b>	<b>0.259</b>	<b>0.234</b>	<b>0.254</b>	<b>0.245</b>	<b>0.228</b>	<b>0.237</b>
Other non-electric. machinery, tools & mechanical apparatus	-0.149	-0.250	-0.220	0.095	0.091	0.074
Instruments & appliances, medical, etc.	-0.600	-0.575	-0.575	-0.020	-0.031	-0.047
<b>Knitted or crocheted fabrics, n.e.s.</b>	<b>0.267</b>	<b>0.206</b>	<b>0.213</b>	<b>0.142</b>	<b>0.119</b>	<b>0.190</b>
Motorcycles & cycles	-0.724	-0.724	-0.709	-0.042	-0.070	0.015

Source: UNCTADStat database, and own calculations.

**Table 3. Major imported products from China to Greece: Import share from third countries and share of total imports (%)**

Index	Import share from third countries (3)			Share of total imports (4)		
	2017	2018	2019	2017	2018	2019
Product group						
Automatic data processing machines	62.0	64.8	64.0	1.56	1.82	1.76
Baby carriages, toys, games & sporting goods	51.6	52.6	54.0	0.80	0.79	0.78
Footwear	34.0	33.9	42.6	1.04	1.04	1.26
Telecommunication equipment & parts	32.8	33.9	34.6	1.42	1.45	1.39
Aluminium	76.4	81.3	87.6	1.69	1.81	1.46
Heating & cooling equipment & parts thereof	40.4	39.2	39.4	0.79	0.77	0.82
Household-type equipment, electrical or not	46.7	46.9	49.9	0.77	0.71	0.82
Furniture & parts	45.9	46.0	48.4	0.63	0.63	0.72
Electrical machinery & apparatus, n.e.s.	42.3	44.1	36.1	0.66	0.71	0.79
Articles, n.e.s., of plastics	36.1	36.1	37.9	0.83	0.87	0.91
Articles of apparel, of textile fabrics	23.1	26.0	39.4	1.01	0.97	1.27
Travel goods, handbags & similar containers	47.0	45.0	49.3	0.34	0.34	0.39
Men's clothing of textile fabrics, not knitted	32.0	35.7	45.4	0.52	0.50	0.63
Ships, boats & floating structures	98.7	90.8	82.5	6.34	2.42	0.86
Lighting fixtures & fittings, n.e.s.	53.6	51.4	51.9	0.22	0.24	0.26
Women's clothing, of textile fabrics	21.7	23.1	28.9	0.73	0.71	0.82
Manufactures of base metal, n.e.s.	28.3	31.2	32.0	0.55	0.54	0.61
Women's clothing, of textile, knit. or croch.	29.6	32.3	49.1	0.51	0.47	0.65
Miscellaneous manufactured articles	32.3	30.3	32.8	0.47	0.46	0.50
Fabrics, woven, of man-made fabrics	63.0	61.8	70.7	0.21	0.21	0.23
Made-up articles, of textile materials	70.6	71.8	71.6	0.30	0.28	0.33
Household equipment of base metal	52.3	54.8	57.2	0.19	0.20	0.20
Rotating electric plant & parts thereof	11.4	21.7	20.8	0.49	0.76	0.84
Clothing accessories, of textile fabrics	31.5	42.5	60.5	0.15	0.15	0.22
Mechanical handling equipment, & parts	22.5	32.7	18.8	0.27	0.32	0.30
Paper & paperboard, articles	20.1	24.7	26.6	0.56	0.53	0.56
Other non-electric. machinery, tools, etc.	22.3	22.3	26.9	0.41	0.41	0.40
Instruments & appliances, medical, etc.	18.4	19.4	21.1	0.62	0.61	0.65
Knitted or crocheted fabrics, n.e.s.	79.5	79.0	78.9	0.21	0.20	0.24
Motorecycles & cycles	44.2	45.8	44.8	0.26	0.25	0.31

Source: UNCTADStat database, and own calculations.

Significant upward trends can be mainly observed in exports regarding the women’s clothing sector (Appendix 1a), as well as footwear products. Similar trends can be observed for articles of plastics, paper and paperboard, as well as baby carriages, toys, games and sporting goods. Between 2017 and 2019, Greek exports of articles of plastics have increased by about 14% (Appendix 1b), while about one-third of Greek plastics’ imports being imported from third countries, based on 2018 data (Plastics Europe, 2019). Steady upward trends are also observed in other sectors such as paper and paperboard, baby carriages, toys and sporting goods, automatic data processing machines and aluminium. Apropos of the EU policies with regard to the latter product sector, it is worth mentioning the recent imposition of provisional anti-dumping duty rates of up to 48% on Chinese aluminium imported products in October 2021 (European Union, 2020).

As regards the footwear industry, the European Union constitutes a major provider of high-quality footwear at an international level, although the economic crisis has led to a shift in global demand to cheaper products, such as those from China that contribute to more than 50% of world production (Blery, Kakokefalos, 2014). The literature points out the lack of investment in new technologies, given the high degree of fragmentation with numerous small family businesses (Roukova et al., 2016). The footwear industry in Greece is considered as high-quality, facing at the same time strong competition from Italian brands. This is also evident during the period 2017-2019 (Appendix 1a), as it appears to be the product group marked by the sharpest increase in export value (constant prices) at least during the three years under study. Finally, the trends seem stagnant with regard to aluminium and automatic data processing machines' exports (Appendix 1c), although export performance in these product sectors is significantly better than those observed in Appendices 1b and 1c.

**Table 4. Total sales value and Number of businesses by industry**

Industry	Index	2017	2018	2019
Textile industry	Total sales value (million euros)	415.6	421.8	429.3
	Businesses (N)	172	172	167
Clothing industry	Total sales value (million euros)	390.3	420.5	414.6
	Businesses (N)	298	312	307
Leather and leather products industry	Total sales value (million euros)	70.8	84.2	76.3
	Businesses (N)	68	73	74
Rubber products and plastics industry	Total sales value (million euros)	1544.0	1586.2	1593.7
	Businesses (N)	370	365	355

Source: EL.STAT. database, and own calculations.

It seems that moving away in time from the economic crisis, but also from the starting point of imposing capital controls (2015) on the banking system in Greece – which were fully phased out in 2019 – contributes to the gradually improving performance of Greek businesses operating in the clothing and textile industry, as well as in the leather and plastics sectors. The number of businesses remains practically unchanged during the study period, although slight increases in the case of clothing and leather sectors (Table 4). In terms of sales performance, textile and clothing businesses demonstrate significant resilience, estimating a 103%, 106% and 103% increase in total sales value in the textile, clothing and rubber industries between 2017 and 2019, respectively. It, therefore, becomes evident that the strong indications of favourable prospects for expanding domestic production in these specific sectors are confirmed by the Hellenic Statistical Authority data (EL.STAT.) – even more so, at a time when the Greek economy is still recovering from the recent economic crisis.

## 5. Future Prospects and Policy Implications

The recommendations of the Hellenic Federation of Enterprises (SEV, 2013) have already emphasized the formation of a mechanism for monitoring the performance of Greek companies and the creative industries, identifying favourable prospects in the production of traditional fabrics through the use of cotton and silk threads. Utilization of technology can contribute to the production of advanced raw materials (e.g. synthetics). The integration of

innovation as well as the latest technological developments in the production process are expected to play an important role in the expansion of domestic production in the clothing sector in Greece. The current challenges include policies that will ensure lower energy costs to businesses, accelerate business licensing and provide tax incentives for investments based on sustainable development (FEIR, 2018).

The prospect of developing collaborations between the academic and research community and companies in the sectors under study is also expected to play a key role. It seems that the performance indicators related to university-industry collaboration in Greece show a recent improvement (Bertoletti and Johnes, 2021). This could mean greater involvement of the business community in the academia (visiting lectures, co-organising conferences) or/and the greater involvement of the academic community in the production of directly usable research knowledge by firms. At the same time, however, we argue that the development of the aforementioned types of cooperation should in no way lead to an asymmetric relationship between the two sides, making academic institutions dependent on private funding.

The demographic parameter is considered of great importance in all the aforementioned developments, both in production and consumption. The gradual decrease in the number of births in Greece has contributed to a shrinking domestic consumer base. Moreover, the repercussions of the recent economic crisis and depression on household income and poverty obviously affected consumer affordability. Production-wise, however, the future will show whether the impact of demographic ageing will severely affect the EU economies, including Greece. In any case, it should be borne in mind that the competitiveness of at least the older Member States is not based on labour-intensive production, but rather capital or knowledge-intensive production.

Some of the pillars of the project Greece 2.0 prescribe the digital transformation of the public sector and Greek companies, the further strengthening of the financial sector and the capital markets, along with the improvement of competitiveness through the promotion of private investments and exports (Hellenic Republic, 2021). Strengthening the country's energy interconnection with neighbouring states – as a key objective of the Greek economic diplomacy – as well as the exploitation of greener and cheaper alternative energy resources are expected to help boost the economic performance of Greek businesses. While import substitution of Chinese products could prove beneficial circumstantially, a preferable strategy for the Greek economy would be to capitalize on imports to more effectively promote Greek domestic production for exports. In this direction, the research results strongly indicate favourable prospects for the expansion of domestic production – and consequently exports – into various sub-sectors related to the clothing and footwear industry.

## **6. Conclusions and Discussion**

The results of the above analysis provided strong indications for the favourable prospects for expanding domestic production in the textile and clothing sectors, as well as the leather, rubber products and plastics industry. Import substitution policies are no longer a common practice in shaping the framework of bilateral economic relations, especially in the cases of developed and open economies, such as Greece. Besides, apart from the fact that import of

Chinese products benefits domestic consumers in Greece, an eventual import substitution strategy could also have a reverse effect on Greek exports. Consequently, import substitution policies are not proposed here – rather, the Greek economy should “catch the wave” by taking advantage of raw materials or intermediate products, but also of the know-how incorporated in the imported intermediate products, in order to further enhance export performance.

In particular, with regard to sub-sectors involved in the clothing industry, which includes the majority of the aforementioned product groups with significantly developed prospects (women’s and men’s clothing, knitted, crocheted or woven fabrics, articles of apparel, clothing accessories), we consider that favourable multiplier effects can emerge through closer cooperation between the actors in the garment industry and tourism. Boosting the domestic production of Greek clothing and footwear products can be facilitated by the organisation of relevant fashion events, thus upgrading their promotion, along with the support of fashion tourism activities.

With regard to the rest of the product groups, very promising are the export trends for aluminium, paper and plastic products during the years under study, but also for exports included in the carriages, toys, games and sporting goods group. More specifically, the revealed symmetric comparative advantage and disadvantage measurements have shown the primacy of the aluminium export sector. Sales in both the garment industry and plastics and rubber products have also proved sufficiently resilient.

The negative impact of the pandemic has been significant for the majority of export sectors, though not for all of them. Especially in Greece, a considerable improvement in the export performance of fruits and vegetables has been observed even in the midst of the pandemic crisis, thus confirming the constant and increased demand for basic necessities such as food products, especially those of high nutritional value. The present study highlighted some of the promising “dormant” productive sectors with improving export growth prospects, given the primacy of the tourism industry.

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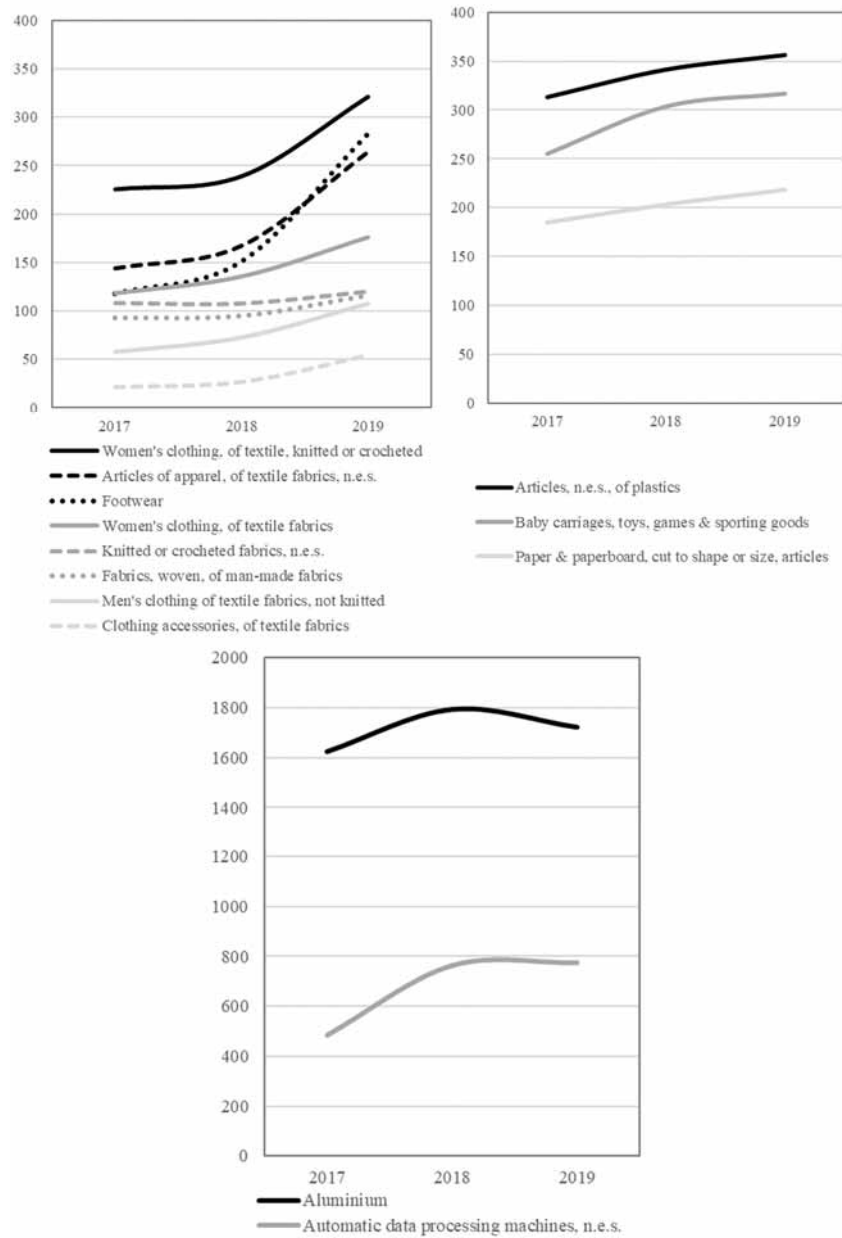
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Appendices 1a, 1b, 1c

Greek merchandise exports by 3-digit SITC product category, 2017-2019 (millions of constant 2015 US dollars, GDP deflator)



Source: UNCTADStat database, and own calculations.

## FOOD SECURITY OF THE REPUBLIC OF KAZAKHSTAN: ASSESSMENT OF PUBLIC SATISFACTION WITH LOCALLY PRODUCED FOOD<sup>3</sup>

*This study assessed the quality and safety, physical and economic availability of Kazakhstani food products in the regional market. The aim of the research is to assess the satisfaction of the local population with the availability, affordability, quality and safety of food products produced in Kazakhstan. The empirical data of 297 people who participated in the survey were analyzed using Partial Least Squares Structural Equation Modelling. The results of the study confirm the positive relationship between the presence of Kazakhstan-made food products on the market and the degree of public satisfaction with their diet, a positive relationship between the affordability of Kazakhstan-made food and the degree of public satisfaction with their diet, as well as proved the existence of a direct relationship between the quality and safety of food products made in Kazakhstan and the degree of public satisfaction with their diet. In addition, an analysis of official statistical data on the volume of production and imports of food products was carried out, which made it possible to make a more detailed analysis of the degree of provision of the country's population with basic foodstuffs.*

*Keywords: food security; food quality; food safety; availability; affordability; Kazakhstan*

*JEL: F00; Q10; Q18*

### 1. Introduction

The issue of food security is one of the main conditions for ensuring the national security of the country. Given the tense geopolitical situation in neighbouring countries, self-sufficiency in basic food is the foundation of food security in the Republic of Kazakhstan. The authors consider the level of satisfaction of the population of the region with their nutrition, focusing on the relationship between the satisfaction of the population with their nutrition and the physical and economic accessibility, quality and safety of Kazakhstani food products. The article focuses on the problem of food security in Kazakhstan in terms of food independence

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from imports and the degree of satisfaction of the population with locally produced food. Thus, in the article, the authors consider several problems: the level of self-sufficiency of the country in basic food products, the degree of satisfaction of the population with their availability in the market, affordability, quality and safety of locally produced food.

For a more in-depth analysis of the level of food independence of the country from the position of sufficiency and availability, safety and quality, the authors conducted a survey of the population (297 people). The first block included questions concerning the degree of respondents' satisfaction with their diet (DS) according to the following points: caloric content, variety of menu, quality and safety of consumed products. The second block of questions is directed to the analysis of physical availability (FAV), i.e. sufficiency in the market of foodstuff of Kazakhstani production by the volume of supply and assortment. The third block of questions reveals the level of economic affordability of food products produced in Kazakhstan (FAF), including such items as the share of expenditures on food products in total expenditures, consumer preferences in the price ratio of products of Kazakhstani production and imported origin. The fourth block is aimed at assessing the degree of respondents' satisfaction with the quality and safety of Kazakhstan-made products (FQ), and consumers' preferences for quality of Kazakhstan-made and imported goods.

In addition to the data from the survey, the authors, based on official statistical data of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan Bureau of National Statistics analyze the level of Kazakhstan's dependence on imports of basic food products, the level of self-sufficiency.

## **2. Literature Review**

Since the beginning of the study of the problem and the formation of the theory of food security, there have been many studies on the formulation of the essence of food security (Cook, 2002; Gross, 2000).

The term “food security” has been used over time to mean different things (Pinstrup-Andersen, 2009). The widely accepted definition of food security was formulated in the annual report on food security of the Food and Agriculture Organization (FAO) “The State of Food Insecurity in the World 2001”: Food security [is] a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for active and healthy life (FAO, The state of food insecurity in the world 2001, 2001). The last revision to this definition happened at the 2009 World Summit on Food Security which added a fourth dimension – stability – as the short-term time indicator of the ability of food systems to withstand shocks, whether natural or man-made (FAO, Declaration of the World Food Summit on Food Security, 2009).

Food security is achieved, if adequate food (quantity, quality, safety, socio-cultural acceptability) is available and accessible for and satisfactorily utilized by all individuals at all times to live a healthy and happy life (Gross, 2000).



Food security and food insecurity are dynamic, reciprocal and time dependent and the resultant status depends on the interaction between the stresses of food insecurity and the coping strategies to deal with them. Universal indicators for measuring food security are challenging. Different indicators may be applied to different levels of food security. Measuring food security at the household level involves five categories of indicators dietary diversity and food frequency, spending on food, consumption behaviours, experiential indicators and self-assessment measurements (Peng, 2019). Since the article focuses on the assessment of independence from food imports, let us turn to the concept of food independence.

Food independence is internal self-sufficiency in food, in the amounts necessary for the population within the country, independent of imports of finished products, raw materials, equipment and other elements of the production process chain. In other words, it is the ability of the state, at the expense of domestic production, to produce such an amount of food that is necessary to ensure the domestic market.

Food independence is often confused with food security. But food independence is a tool for achieving food security. The definition of food independence itself allows for a clearer definition of food security. Food independence is measured by the ratio of what is produced and what is consumed by the local population in a certain territorial unit (country, region, subject, state, province, etc.). If as much is produced as is consumed, or more, it can be called food independence (Tyutyunik, 2016).

According to the resolution of the Inter-parliamentary Assembly of the Eurasian Economic Community, food sovereignty is a prerequisite for ensuring the country's food security, so that a food crisis does not arise if food supplies from abroad are cut off.

According to the offer of FAO, food independence is reached through the production of vital products at the level of not less than 80% of the requirement of the population (Prosekov, 2016).

Food security comprises food independence and insurance of the availability of the food for population. The role of the national agrarian policy in providing the population with domestic food (Altukhov A. I., 2015).

In the conditions of the globalization of national economies, the current situation in macroeconomics and, as a result, the need to improve the quality of life of the population, it is necessary to clearly outline and resolve the following three strategic tasks of the country's agro-food industry: ensuring the country's foodstuff independence based on import substitution; raising the competitiveness of farm products; developing the high-level standard of living at the rural area based on the socio-economic development of the territories (Altukhov D. ..., 2016).

Transparency and understanding of the public's perception of food risks is a necessary first step in establishing the urgently required public dialogue about the complex value questions involved in food production (Jensen, 2002).

Based on the literature review, the following hypotheses were formulated:

H1 – The physical availability (availability in the market) of food products produced in Kazakhstan has a positive relationship with public satisfaction in their diet.

H2 – Economic accessibility (affordability) of Kazakhstani food products has a positive relationship with public satisfaction with their diet.

H3 – Quality and safety of Kazakhstani food products have a positive relationship with public satisfaction with their diet.

All these correlations are presented in Figure 2.

### **3. Research Methods**

#### **3.1 Data collection**

To test the hypotheses proposed by the authors, a survey of the population in Google Tables was conducted. For the selection of respondents of this research, the method of non-repeat sampling was used, the individual type of sampling was used, according to the method of selection the combined sampling was chosen, based on the combination of several sampling methods: simple random sampling and typical (stratified) sampling. The latter involves dividing a heterogeneous general population into typological groups by some essential characteristic, and then randomly selecting units from each group.

People of different ages and different places of residence took part in the survey: both urban and rural, with different levels of education and different levels of income and places of work. For the survey, a questionnaire was developed in Russian, Kazakh, and English, based on scales used by modern researchers with higher reliability (Ferris, 2008); (Zheng Qiupeng, 2016); (Felfe, 2002); (Hinkin, 2008). A five-point Likert scale was used to measure the level of agreement (satisfaction) and disagreement (dissatisfaction), where from 1 = strongly disagree (not satisfied) to 5 = strongly agree (completely satisfied).

#### **3.2 Methods**

The questionnaire consisted of two parts. The first part is focused on collecting general information about the respondents: data on age and gender, place of residence (urban, rural), income level and place of work. The second part consisted of 12 items to measure four components: satisfaction with one's diet, respondents' opinions about the physical availability of food produced in Kazakhstan, the economic availability of food produced in Kazakhstan and the quality and safety of food produced in Kazakhstan.

The authors evaluated the Cronbach's alpha, a tool that shows the internal consistency of characteristics that describe one object, but is not an indicator of the homogeneity of an object. The results show that Cronbach's alpha values for all elements are higher than the allowed value of 0.7 and are presented in Table 2 below.

#### *Common Method Variance (CMV)*

While several subjective measures have been taken, the author also analyzed Herman's univariate test to address CMV problems.

The collected data were analyzed using the Partial Least Squares Structural Equation Method (PLS-SEM) in Smart-PLS 4.0 software.

In order to study the level of food independence of the Republic of Kazakhstan on the basis of official statistics, methods of comparison and a graphical method were applied.

#### **4. Results and Data Analysis**

The sample size was 297 respondents of the population of Kazakhstan of different ages. Among the respondents, 139 (46.8%) are men and 158 (53.2%) are women. Among those interviewed, 52 people (17.5%) were between the ages of 18 and 24; 117 (39.4%) were aged 25 to 40; and 128 (43.1%) were over 40 years of age from 18 to 24 years old; 117 (39.4%) aged 25 to 40; and 128 (43.1%) were over 40 years of age.

For data analysis, the author applied the partial least squares equation (PLS-SEM) method using the Smart-PLS 4.0 software. Modern researchers (Hair, 2012) advocate the use of this method for quantitative data analysis. This study explores the properties of a measurement model with SEM-PLS by evaluating convergent validity, discriminant validity, and intrinsic robustness of constructs, as well as variable robustness.

#### *Analysis of the measurement model*

Indicator reliability: the indicator's outer loadings should be higher than 0.70. Indicators with outer loadings between 0.40 and 0.70 should be considered for removal only if the deletion leads to an increase in composite reliability and AVE above the suggested threshold value. In our model, all meanings of outer loadings are higher than 0.70 (Table 1). So we can prove the reliability of our indicators.

**Table 1. Outer loadings**

A1 <- Dietary satisfaction	0.799
A2 <- Dietary satisfaction	0.826
A3 <- Dietary satisfaction	0.852
B1 <- Food availability	0.862
B2 <- Food availability	0.896
B3 <- Food availability	0.829
C1 <- Food affordability	0.794
C2 <- Food affordability	0.866
C3 <- Food affordability	0.828
D1 <- Food quality	0.792
D2 <- Food quality	0.857
D3 <- Food quality	0.816

*Source: Authors' calculations based on survey data.*

Researchers (Hair et al, 2014) advised to consider indicators such as Cronbach's alpha, extracted mean-variance (AVE), as well as composite reliability (CR) values, which are valid for assessing convergent validity (CV). CV evaluates whether the elements are related to the construct or otherwise. Initially, we estimated loadings of indicators where values above 0.7 were retained and elements with lower values were removed, as suggested by modern researchers. (Kashif, 2017). These investigators also suggested that Cronbach's alpha should be above the 0.7 cut-off level used in the analysis of this study. Cronbach's alpha values of DS (0.767), FAF (0.775), FAV (0.828), FQ (0.759) exceeded minimum standards to demonstrate internal consistency, leading us to further measurements and evaluation. CR values should be above 0.7 and AVE should be above 0.5 as suggested by quantitative researchers (Hair et al., 2014). All these values are presented in Table 2.

**Table 2. Construct reliability and validity**

	Cronbach's alpha	rho_A	Composite reliability	Average variance extracted (AVE)
Dietary satisfaction DS	0.767	0.768	0.866	0.682
Food availability FAV	0.775	0.781	0.869	0.689
Food affordability FAF	0.828	0.830	0.897	0.745
Food quality FQ	0.759	0.759	0.862	0.676

Source: Authors' calculations based on survey data.

### Structural model

The next step in the procedure was a discriminant validity (DV) assessment to understand the extent to which the constructs differed from each other. The discriminant validity of our analysis by the Fornell-Larcker test is guaranteed because the AVE square root values are higher than the correlation values. Based on the results, it can be noted that all factor signs correlate with the level of satisfaction of the population with their diet. The results are presented in Table 3.

**Table 3. Discriminant validity – Fornell-Larcker criterion**

	Dietary satisfaction	Food affordability	Food availability	Food quality
Dietary satisfaction	0.826			
Food availability FAV	0.662	0.830		
Food affordability FAF	0.642	0.718	0.863	
Food quality	0.646	0.747	0.701	0.822

Source: Authors' calculations based on survey data.

According to Gefen and Straub (Gefen, 2005), discriminant validity occurs when each element of the dimension is weakly correlated with another construct, except for those with which it is theoretically associated."

In cross-loading, the researcher examines different elements to identify those that have a high load on the same structure and those that heavily load multiple structures. Thus, establishing discriminant validity at the element level means that there is a high correlation between elements of the same construct and a very weak correlation between elements of another

construct. Due to the simplicity of this method, it has no theoretical justification or empirical evidence. (Henseler, 2016). In the table below, elements shaded in green represent factor loads for each structure, and cross loads (not highlighted) for the same structure. You can see in Table 4 that the factor-loading values are significantly larger than the cross-loading values, indicating good discriminant validity.

**Table 4. Discriminant validity – Cross loadings**

Indicators	Dietary satisfaction	Food availability	Food affordability	Food quality
A1	0.799	0.582	0.491	0.536
A2	0.826	0.523	0.506	0.532
A3	0.852	0.535	0.590	0.533
B1	0.579	0.579	0.862	0.594
B2	0.551	0.636	0.896	0.630
B3	0.529	0.646	0.829	0.589
C1	0.486	0.794	0.597	0.547
C2	0.560	0.866	0.615	0.599
C3	0.594	0.828	0.579	0.701
D1	0.534	0.613	0.504	0.792
D2	0.515	0.623	0.592	0.857
D3	0.543	0.605	0.629	0.816

*Source: Authors' calculations based on survey data.*

The next step is to analyze the conformity of the constructed model.

R Square explains the variance in Dietary satisfaction explained by the exogenous variable(s): food availability (FAV), food affordability (FAF) and food quality (FQ). R-Square value of 0.519. This would mean that a 51,9% change in Dietary satisfaction can be explained by FAV, FAF and FQ.

The results of the analysis for the fit of the model are presented in Table 5. The saturated model assesses the correlation between all constructs. The estimated model is a model which is based on a total effect scheme and takes the model structure into account. It is hence a more restricted version of the fit measure.

The SRMR is defined as the difference between the observed correlation and the model-implied correlation matrix. Thus, it allows assessing the average magnitude of the discrepancies between observed and expected correlations as an absolute measure of the (model) fit criterion.

A value less than 0.10 or 0.08 (in a more conservative version; (Hu, 1999)) is considered a good fit. Henseler et al. (2014) introduce the SRMR as a goodness-of-fit measure for PLS-SEM that can be used to avoid model misspecification. In our analysis, SRMR (see Table 4) is equal to 0.072, that less than 0.08

As defined by Dijkstra and Henseler (Dijkstra, 2015),  $d_{ULS}$  (i.e., the squared Euclidean distance) and  $d_G$  (i.e., the geodesic distance) represent two different ways to compute this discrepancy. The bootstrap routine provides the confidence intervals of these discrepancy values. The  $d_G$  criterion builds on PLS-SEM eigenvalue computations. However, the question remains about how these eigenvalues differ from CB-SEM.

For the exact fit criteria (i.e.,  $d_{ULS}$  and  $d_G$ ), you compare their original value against the confidence interval created from the sampling distribution. The confidence interval should include the original value. Hence, the upper bound of the confidence interval should be larger than the original value of the exact  $d_{ULS}$  and  $d_G$  fit criteria to indicate that the model has a “good fit”. Choose the confidence interval in a way that the upper bound is at the 95% or 99% point.

In other words, a model fits well if the difference between the correlation matrix implied by your model and the empirical correlation matrix is so small that it can be purely attributed to sampling error. Hence, the difference between the correlation matrix implied by your model and the empirical correlation matrix should be non-significant ( $p > 0.05$ ). Otherwise, if the discrepancy is significant ( $p < 0.05$ ), the model fit has not been established.

Assuming a multinormal distribution, the  $\chi^2$  value of a PLS path model with degrees of freedom approximately is  $(N-1)*L$ , whereby  $N$  is the number of observations and  $L$  is the maximum likelihood function as defined by Lohmöller (Lohmöller, 1989). The degrees of freedom (df) are defined as  $(K^2 + K) / 2 - t$ , whereby  $K$  is the number of manifest variables in the PLS path model and  $t$  is the number of independent variables to estimate the model implied covariance matrix.

One of the first fit measures proposed in the SEM literature is the normed fit index by Bentler and Bonett (1980). It computes the  $\chi^2$  value of the proposed model and compares it against a meaningful benchmark. Since the  $\chi^2$  value of the proposed model in itself does not provide sufficient information to judge model fit, the NFI uses the  $\chi^2$  value from the null model, as a yardstick.

The NFI is then defined as 1 minus the  $\chi^2$  value of the proposed model divided by the  $\chi^2$  values of the null model. Consequently, the NFI results in values between 0 and 1. The closer the NFI is to 1, the better the fit. NFI values above 0.9 usually represent an acceptable fit. In our case, NFI is equal to 0.785.

**Table 5. Model fit**

	Saturated model	Estimated model
SRMR	0.072	0.072
$d_{ULS}$	0.405	0.405
$d_G$	0.235	0.235
Chi-square	403.980	403.980
NFI	0.785	0.785

*Source: Authors' calculations based on survey data.*

The next step is to analyze the data to test the three hypotheses proposed for this study, presented in Table 6 below. We investigated the direct impact of the main constructs: physical and economic accessibility, quality and safety of food products produced in Kazakhstan on the degree of satisfaction of the population with their diet.

The results of the analysis in Table 6 show that the physical availability of food products produced in Kazakhstan ( $\beta = 0.29$ ,  $p = 0.001$ ), the economic availability of food products produced in Kazakhstan ( $\beta = 0.263$ ,  $p = 0.001$ ) and the quality and safety of food products



produced in Kazakhstan ( $\beta = 0.245$ ,  $p = 0.001$ ) are positively related to the degree of satisfaction of the population with their diet. Therefore, the hypotheses H1, H2, H3 formulated at the beginning of the study are accepted.

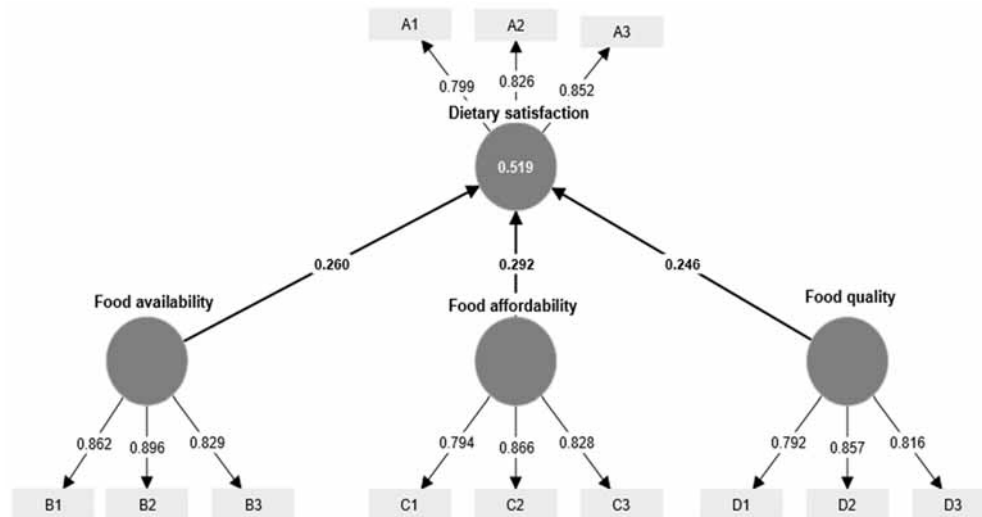
**Table 6. Testing the Path Model**

	Beta value	Standard deviation	T statistics	P values
Food availability -> Dietary satisfaction	0.290	0.086	3.385	0.001
Food affordability -> Dietary satisfaction	0.263	0.081	3.221	0.001
Food quality -> Dietary satisfaction	0.245	0.072	3.403	0.001

Source: Authors' calculations based on survey data.

Thus, we can conclude that the constructed model is adequate and reliable (Figure 2).

**Figure 2. Path model**



Source: Authors' calculations based on survey data.

## 5. Discussion

The results obtained as a result of modelling the presence of a positive relationship between the satisfaction of the population with local food products are comparable with official statistical data characterizing the physical and economic accessibility of food products in the country. Data provided by the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan.

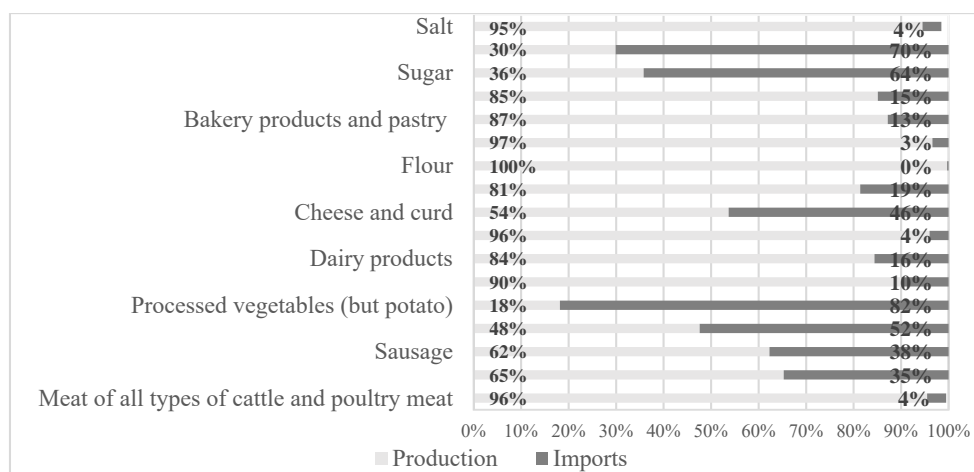
*Food availability*

According to the results of January 2022, Kazakhstani companies managed to provide the flour market with local products at a fairly high level (99.7% of demand is covered by domestic production), fresh eggs (97.2%), cereals and rice (96.6%), red meat and poultry (95.5%), vegetable oils (88.8%), as well as pasta, noodles and other similar flour products (85.1%).

As for the segment of dairy products (except for fresh milk), here, in general, the level of self-sufficiency for the entire product line is 84.4%. However, for certain product groups, the dependence is higher. Thus, local companies cover the demand for butter by only 67.9%, and for cheese and cottage cheese – by 53.7%.

As can be seen from the data in Figure 3, the Republic of Kazakhstan has a high level of dependence on imports of the following goods: tea, coffee (70% is imported), sugar (64%), cheese and cottage cheese (46%), processed vegetables (except potatoes) (82%), fish (52%), sausages (38%), canned meat (35%).

**Figure 3. Share of domestically produced and imported food products in Kazakhstan in 2022**



Source: Authors' calculations based on data from Bureau of National statistics of Agency for Strategic planning and reforms of the Republic of Kazakhstan.

As can be seen from the above data, Kazakhstan's dependence is observed mainly in processed food, which indicates a weak position in the country's food industry, the need to open new and increase existing capacities of the manufacturing industry in such areas as sugar, meat, fish, dairy, industry processing fruits and vegetables. The speedy implementation of this issue will largely solve the threat to Kazakhstan's food security from the position of dependence on imports for basic food products.

### *Food affordability*

A complex geopolitical situation has hit the Kazakhstanis in the pocket. In March 2022, Kazakhstan faced a staple food price surge. Amid the unrest in the middle of the month, people were panic buying sugar, cereals and flour. Supplies to stores from warehouses were on schedule, but they were bought so quickly that shelves with such goods were empty most of the time.

According to express information from the Bureau of National Statistics of Kazakhstan, socially significant food products in the republic went up by 11.4 per cent from January and by 9.1 per cent from early March. In the early spring of 2020 and 2019, there were no such surges, which proves the presence of exceptional growth factors.

Statisticians use three time spans to analyse prices: short-term (for one month), mid-term (from the beginning of the year) and long-term (in the last 12 months). The first two options not only prove the rise in commodity prices, but also show the results of panic buying and deficit. The annual rate, as the 'total' in pricing math, shows the real objective changes.

Thus, in the short run, prices of all 19 socially significant products (the list of commodities is approved by the government of Kazakhstan – author's note) went up in March. The minimum price rise was for sunflower oil (3 per cent), meat (2.6 per cent), flour (3.4 per cent) and bread (3.4 per cent). Cereal prices went up by 5-7 per cent on average, milk and chicken – by 6-7 per cent, potato and carrot – by 15 per cent. The biggest price jump was for sugar (35 per cent), onion (32 per cent) and cabbage (50 per cent).

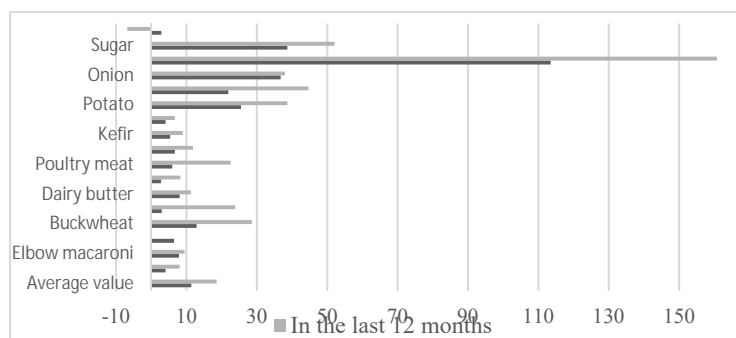
Looking at the annual figures, the mean growth value will be 18.6 per cent. From March 2021, flour, bread, macaroni, dairy butter and kefir prices went up 10 per cent in Kazakhstan. Such commodities as buckwheat, potato, onion and poultry meat went up by 30-40 per cent. The products with skyrocketed prices are sugar (52 per cent) and cabbage (187 per cent).

While the modelling results generally showed a positive relationship between the degree of satisfaction of the population with their diet and food availability, affordability, quality and safety of local food products, the presented statistical data indicate that for a number of commodity items, there is a deficit of domestic production.

In addition, in 2022 there is a significant increase in prices for almost all commodity items, which exacerbates the problem of affordability of food in the market of the country.

Thus, empirical data indicate the presence of the main threats to the country's food security as a significant lack (less than 65%) of domestic production of such products as sugar, tea, coffee, cheese, cottage cheese, processed vegetables, fish, sausages and canned meat. In addition, in 2022 there is an acute problem of economic affordability of food, which is associated with rising prices caused by shortages and disruptions in the supply chain of goods due to the tense geopolitical situation.

**Figure 4. Increase in food prices in Kazakhstan**



Source: Authors' calculations based on data from the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan.

#### *Government measures, taken to ensure food security*

According to the Decree of the Government of the Republic of Kazakhstan dated March 31, 2022 No. 178 on the approval of the Food Security Plan of the Republic of Kazakhstan for 2022-2024, a number of comprehensive measures have been taken.

"The plan consists of three main sections with 31 measures, including 18 measures to ensure physical accessibility, 6 measures to ensure economic security and 7 measures to ensure the safety and quality of products.

The first section is aimed at implementing measures to increase agricultural production and includes 18 measures, of which 1 operational and 17 medium-term.

In three years, crop production will be diversified by increasing oilseeds area from 3m to 3.5m ha, potatoes from 200,000 to 215,000 ha, and fodder crops from 3.6m to 4.2m ha. Also within three years, the number of cattle will be increased to 9 million heads, cattle to 20.1 million heads, horses to 4 million heads and so on.

Realization of investment projects on storage of potatoes, vegetables and fruits will allow increasing in storage capacities in 2022 by 98,3 thousand tons, in 2023 – 104,5 thousand tons and in 2024 – 19,6 thousand tons.

In addition, this section provides for measures on the import substitution of food products and monitoring of the actual and forecast balance of production and consumption of agricultural products.

The second section is aimed at the implementation of 5 operational and 1 medium-term measure to reduce the share of consumer spending of the population on food products and price stabilization.

These are measures such as forecasting food prices, reduction of rent by trading markets for sellers of socially important food products, development of measures for the transition from administrative regulation of prices to targeted support of socially vulnerable population

groups, evaluation of the effectiveness of stabilization funds, increasing employment in rural areas by creating at least 25 thousand farms through new forms of involving into a turnover of agricultural land, as well as the development of newly irrigated land.

The third section of the Plan provides for the implementation of four operational and three medium-term measures to provide consumers with safe products. Such as ensuring control over the quality and safety of food products to increase the share of investigated imported products to 80%, modernization of existing and creation of new domestic enterprises for the production of veterinary and biological products to increase the share of domestic veterinary and biological products to 80% in 2024 and others.

The implementation of the Plan will ensure food security is a critical component of national security, increase the level of food security, reduce the costs of the population for food products and provide consumers with safe products.

## 6. Conclusion

The survey data were analyzed from the standpoint of identifying the relationship between the degree of satisfaction of the population with the diet and the level of physical availability, affordability of nationally produced food products and the quality of domestic products. The study revealed a statistically significant positive relationship between the level of satisfaction with the physical, economic accessibility, quality and safety of locally produced food. However, the analysis of official statistical data characterizing the physical availability of food in the Republic of Kazakhstan indicated insufficient self-sufficiency in such food products as tea, coffee, sugar, vegetables, cheese, cottage cheese, butter, processed vegetables, sausage products and canned meat. Economic affordability of food also has threats due to the dynamics of rising prices of basic food products in Kazakhstan. The rise in food prices in 2022 in the country is significant and sharply exacerbated the problem of reducing the purchasing power of the population. All these factors pose significant threats to food security in Kazakhstan and require further research from a more detailed analysis of the main commodity items. The results of the study, summarized for all commodity items as a whole, gave a picture of public satisfaction with locally produced food products. Therefore, the authors plan to conduct an analysis with a differentiated approach to the level of satisfaction of the population of Kazakhstan with basic food products. This will provide a more realistic picture of the current situation with the level of food independence.

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## SECTORAL GROWTH IMPACTS OF BANK CREDIT ALLOCATION: THE ROLE OF COVID-19 PANDEMIC AS MODERATING VARIABLE<sup>3</sup>

*Our study aims to investigate the effect of bank credit on sectoral output growth in Indonesia. The sectoral output comprises the agricultural, manufacturing, construction, wholesale & retail trades, and transport & storage sectors. We position the Covid-19 pandemic as a moderating variable between sectoral economic growth and bank credit. Using monthly time series data from 2015.M1 to 2020.M12, we employ hierarchical linear regression to estimate the functional relationship between variables. The study points out that bank credit positively affects sectoral output. In contrast, the covid-19 pandemic has had a negative effect. Nevertheless, the pandemic moderates the influence of bank credit on the manufacturing, construction, transport & storage sectors but not on the agriculture, wholesales & retail trades sectors.*

*Keywords: Bank credit; Sectoral output; Covid-19 pandemic; Hierarchical linear regression*

*JEL: G01; G21; E51; O41*

### 1. Introduction

The financial sector plays a driver's role in economic growth around countries (Ahmed, Ansari, 1998; Kenza, Salah Eddine, 2016). This role is realized by carrying out financial intermediation functions, especially in lending to increase business activities (Vaithilingam et al., 2003; Sahul Hamid, 2019; Ikhsan et al., 2020). Using bank credit as the source of financing is expected to encourage community economic and business activity (Lang, Nakamura, 1995; Cepni et al., 2020) and increase output in various economic sectors (Duican, Pop, 2015).

Since 2010, the distribution of commercial bank credit in Indonesia has increased significantly (Mara et al., 2020; Wasiaturrahma et al., 2020). Till December 2019, the total disbursement of bank loans in Indonesia reached IDR 8,280,812.25 billion, a more significant

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increase than the 2016 period of IDR 6,570,902.90 billion. The credits are distributed in several economic sectors comprising agriculture & forestry, mining & quarrying, manufacturing, electricity & gas supply, wholesale & retail trades, transport & storage, information & communication, financial & insurance services, real estate activities, and business services, and other sectors. In line with this regard, there was also an increase in sectoral output marked by the raises in the gross domestic product of the respective sectors (Resosudarmo & Abdurrohman, 2018; Burke & Siyaranamual, 2019). In this study, the sectoral growth focus on the agricultural sector, manufacturing, construction, wholesale and retail, and transport and storage. These five sectors have contributed the most to Indonesia's economic growth.

However, the emergence of the Covid-19 pandemic at the end of 2019 affected the national economy. The faster spread causes not only a health crisis (Rizwan et al., 2020). But also harmed various economic sectors, including the banking sector (Cecchetti, Schoenholtz, 2020; Wojcik, Ioannou, 2020). Banks face credit risk because of the disruption of business activities (Elnahass et al., 2021). Outside the banking sector, during the pandemic, economic activity was disrupted, and this condition led to a decline in business activity (Hu, Zhang, 2021). The pandemic poses a disruption to business development, not only for large-scale businesses but also for small and medium-sized businesses (Strain, 2020; Nwokocha et al., 2021). At the same time, the government's efforts to mitigate the spread of Covid-19, such as travel restrictions, and large-scale restrictions, have caused a drastic decline in economic activity in several sectors (Buszko et al., 2021).

Studies on the linkages between bank credit and output growth have been carried out by researchers. Banking credit leads to output growth in the economy (Tinoco-Zermeño et al., 2014; Benczur et al., 2018; Awad, Al Karaki, 2019). The credit encourages the output growth of the industrial sector (Topcu, Coban, 2017; Svilokos et al., 2019; Taiwo, 2020), the agricultural (Osabohien et al., 2020; Kumari, Garg, 2021); the export and trade (Abor et al., 2014), the construction services (Grown, Bates, 1992) and the transportation sector (Li et al., 2018; Asante, Helbrecht, 2019). Even for national scope, the development of the financial sectors marked by an increase in bank credit has become the main driver of economic growth in most countries (Tang, 2005; Akinci et al., 2014; Petkovski, Kjosevski, 2014; Daly, Frikha, 2016).

Several research results, as mentioned above, reveal that bank credit boosts sectoral output growth. Banking credit for the agricultural sector, for example, has an impact on increasing output in that sector. Likewise, bank credit in the manufacturing industry also impacts the production performance of this business sector. The critical question is whether the Covid-19 pandemic affects the effect of bank credit on sectoral output. As previously explained, the Covid-19 pandemic, accompanied by government policies to mitigate its spread, hurt several economic sectors. In addition, this pandemic has also affected the intermediation function of bank financial institutions, particularly related to lending to the business world. However, the researchers mentioned above have not explicitly disclosed empirical studies regarding the extent of the moderating role of the pandemic in influencing the sectoral output impact of banking credit. Even though this information is needed to evaluate the effectiveness of bank credit in encouraging output growth during the pandemic, it is also useful for policymaking in the post-pandemic period. Therefore, this study seeks to fill the empirical gap in the

Indonesian context. This study also practically contributes input for economic policymakers in creating policies to save the national economy for the post-pandemic period.

Systematically, this paper is organized into four parts. The second section describes the data and the statistical approach used as the analysis model. The third part is the results of the research and discussion. Lastly, the fourth part is the conclusions and recommendations.

## **2. Literature Review**

### *2.1 The link between Bank credit and economic growth*

The banking institution crucially plays an essential role in the economic growth of a country (Alam et al., 2021). Therefore, until now, studies on the relationship between financial institutions and economic growth have often been carried out by economic researchers (Levine, Zervos, 1998; Jansson, 2018; Ioannou, Wojcik, 2020; Zungu, 2022). The banking-economic growth nexus has become an academic discussion among economic researchers. However, there is still no fixed consensus on the relationship between the two, including the direction and causality of the relations and whether economic growth causes banking development or vice versa (Daway-Ducanes, Gochoco-Bautista, 2019).

Several empirical studies reveal a positive relationship between bank credit and output growth (Bist, Bista, 2018; Das, Chavan, 2020; Azolibe, 2021). The distribution of bank credit does not only promote growth but is also closely and positively related to an increase in total factors of production (Gatti, Love, 2008). On the contrary, contractions in credit supply substantially reduce labour productivity and increase the chance firms will fail (Franklin et al., 2020). The positive relationship between bank credit and output growth supported by the empirical findings of Koursaros et al. (2021) suggest that other things being constant, a positive relationship between lending and output growth exists. Previously, the research of Tinoco-Zermeño et al. (2014) on the Mexican economy also points out the statistical results suggesting that the availability of private sector bank credit in the economy exerts a positive impact on real GDP. In line with these researchers, an empirical study conducted by Balasubramanian (2022) on the industrial sector in India also found that bank credit significantly increases industrial output. The same result was also discovered by Osabohien et al. (2020) for the case of the Nigerian economy pointed out that the distribution of agricultural credit by the banking sector significantly improves agricultural outputs.

In contrast to the number of researchers above, other studies provided the opposite empirical evidence. Rapid growth in bank credit can also have a detrimental impact on output growth (Gatti, Love., 2008). A shock in the credit supply is negatively associated with output growth (Chiorazzo et al., 2017), and the negative relationship between bank credit allocation and productivity growth is due to inefficient credit allocation (Ghani, Suri, 1999). An empirical study by Ikpesu (2021) using a panel data set of 35 Sub-Saharan African countries found that credit in the banking sector boosted inflation but had detrimental effects on output growth. Previously, Petkovski & Kjosevski's (2014) study using a panel dataset of 16 countries in Europe also pointed out that bank credit allocation is negatively associated with economic growth. Another research study by Alam et al. (2021) on the economic impacts of bank

lending provides empirical evidence that the distribution of bank credit for the private sector has an insignificant association with economic growth. Similar to Alam et al., the empirical findings of Pham & Nguyen's (2020) study on the case of bank credit allocation in Vietnam also pointed out that, in the long term, credit expansion does not impact economic growth.

## *2.2 Banking and economic impacts of the Covid-19 pandemic*

The COVID-19 pandemic has had a detrimental impact on the global economy (Rizwan et al., 2020). This impact occurred in various economic sectors, including the financial sectors. Bank financial institutions face a high risk due to the harmful effect of Covid-19. Banks' business models are highly vulnerable to economic shocks, so their failure during this pandemic will lead to wide-ranging economic shocks (Cecchetti, Schoenholtz, 2020). Outside of the banking sector, company performance deteriorated during the pandemic (Hu, Zhang, 2021). This pandemic has had a significant impact on decreasing the intensity of production activities in various sectors such as trade, energy and electricity, agriculture, transportation and tourism (Nayak et al., 2021), the processing industry and the food and beverage industry (Hailu, 2021) and other sectors, including hotels and restaurants (Madaï Boukar et al., 2021), infrastructure and constructions (Stiles et al., 2021), wholesale & retail trades (Sanguinet et al., 2021), and transport & storage sectors (Gray, 2020; Gray, Torshizi, 2021).

Government policies in mitigating the spread of this virus complicate people's economic activities, which in turn deteriorates the economy (Aragie et al., 2021). Territorial lockdowns, large-scale restrictions, and social distancing in certain areas have disrupted the material supply chain of industrial sectors, and the policy decreases the output growth of the economic sectors (Realff et al., 2020). The spread of the virus and government policies to reduce its negative impact on health created conditions of uncertainty in the economy. Some production activities have stopped, especially in the service and transportation sectors. Many labour-intensive industrial sectors that previously employed more employees must reduce their employees because of the social distancing policy. As a result, more of the workforce suffers from losing their jobs, resulting in increased unemployment and ultimately weakening the purchasing power of consumers, in particular, those who live in urban areas (Cho et al., 2021).

In order to save the economy from the detrimental impacts of the outbreak of Covid-19, the government is trying to implement several policies, especially in the financial sector. The decline in the interest rate policy, which is then following a decrease in lending rates, is expected to encourage banks to continue lending to the business sectors. However, the uncertainty caused by Covid-19 has made the relationship between bank lending and increased output in the economy less pronounced (Asafo-Adjei et al., 2021). The study conducted by Li et al. (2021) revealed that during the Covid-19 pandemic, financial sector policies such as bank lending did not impact economic development, and fiscal policy was more successful than monetary policy. This regard indicates that the Covid-19 pandemic and technical government policies in mitigating its spread could affect the economic impact of bank credit.

Referring to the empirical studies as explained above, it is clear that the Covid pandemic not only affected economic activities but has also potentially disrupted the effectiveness of bank lending in improving output growth in various business sectors. On the one side, bank financial institutions face uncertainty dan high credit risk. On the other side, the pandemic has adversely affected many economic sectors, including agricultural sectors, industries, constructions, wholesale & retail trades, and transport & storage sectors.

### 3. Data and Methodology

This study uses secondary data sourced from Indonesian statistics and Indonesian banking statistics. The data is monthly time series data from January 2015-December 2020 ( $n = 72$ ). The predicted variable in this study is sectoral output proxies from sectoral GDP based on 2010 constant prices expressed in IDR billion. This study also uses the Covid-19 pandemic as a moderating variable in the functional relationship between sectoral output and bank credit. This pandemic is measured by a dummy variable scoring 0 for the pre- (January 2015-February 2020) and 1 for the pandemic period (March-December 2020).

The existence of the covid-19 pandemic as a moderating variable implies that the analytical model used to analyze functional relationships between variables is hierarchical regression. However, sectoral GDP and bank credit were firstly transformed into logarithmic values, unless the Covid-19 pandemic was because of a category-scaled variable. The transformation process intends to the estimated coefficient of bank credit reflect the elasticity of the variable (Chen et al., 2019). Adopting the opinion of Helm & Mark (2012), the hierarchical linear regression applied in this study is set in three equations. The equations are then estimated by the ordinary least square (OLS) approach.

$$\text{Basic model} \quad \log SOs_t = \beta_0 + \beta_1 \log BCs_t + \varepsilon_1 \quad (1)$$

$$\text{Moderated model} \quad \log SOs_t = \beta_0 + \beta_1 \log BCs_t + \beta_2 Cvd + \varepsilon_2 \quad (2)$$

$$\text{Interaction model} \quad \log SOs_t = \beta_0 + \beta_1 \log BCs_t + \beta_2 CVD + \beta_3 \log BCs_t * Cvd + \varepsilon_3 \quad (3)$$

Where  $\log SOs_t$  represents the logarithmic value of sectoral output at the period of  $t$ ,  $\log BCs_t$  represents the logarithmic value of banking credit at the period of  $t$ ,  $Cvd$  stands for the Covid-19 pandemics, proxies by a dummy variable with the provision of 0 for before pandemic (January 2015 until February 2020), and 1 for during pandemic (March-December 2020).  $\log BCs_t * Cvd$  is an interaction variable, this is the multiplication result of the  $\log BCs_t$  and dummy variable".  $\beta_0$  is constant/intercept.  $\beta_1$ ,  $\beta_2$ , and  $\beta_3$  are the estimated coefficient of  $\log BCs_t$ , Covid-19 pandemic, and interaction variables, respectively. Last,  $\mu_1$ ,  $\mu_2$ , and  $\mu_3$  are error terms of equations 1, 2, and 3, respectively.

Equation 1 is the first basic model, only using bank credit to predict the sectoral output. The estimated coefficient ( $\beta_1$ ) represents the "main effect" of the predictors on output without

involving the Covid-19 pandemic. If  $\beta_1 \neq 0$  (p-value  $< 0.05$ ), for example, it means that bank credit has a significant effect on sectoral output. The opposite interpretation applies if  $\beta_1 = 0$  (p-value  $> 0.05$ ). Furthermore, equation 2 is the second basic model, adding the covid-19 pandemic into equation 1. The estimation coefficient  $\beta_2$  represents the main effect of the pandemic on output. If  $\beta_2 \neq 0$  (p-value  $< 0.05$ ) it means that the moderator variable has a significant effect, and vice versa if  $\beta_2 = 0$  (p-value  $> 0.05$ ) it has an insignificant effect (Amri et al., 2022).

Equation 3 is the interaction model, which adds interaction variables to the previous model. This model is a moderated regression model that explains whether the moderator variable changes the strength or/and direction of the relationship between variables (Anderson et al., 2018; Momen et al., 2019). The estimated coefficient of the interaction variable ( $\log BC_{st} * Cvd$ ) is represented by  $\beta_3$ . The moderating effect can be detected from the estimated coefficient of the interaction variables (Islam et al., 2020). If the coefficient is statistically significant, it informs that the moderating role exists (Kalmaz & Giritli, 2020). This means that if  $\beta_3 \neq 0$  (p-value  $< 0.05$ ), it means that the covid-19 pandemic moderates the sectoral output effects of bank credit. The opposite interpretation applies if  $\beta_3 = 0$  (p-value  $> 0.05$ ). The interaction effect produced by the moderator variable comprises three probabilities, namely strengthening, weakening, or changing the direction of the relationship between variables (Gardner et al., 2017; Amri et al., 2022).

Furthermore, by performing a partial derivation of model 3, the marginal effect of bank credit on sectoral output growth is formulated as follows (Huynh & Tran, 2021; Akcay, 2021):

$$\frac{\partial \log SOS_t}{\partial \log BC_{st}} = \beta_1 + \beta_3 Cvd \quad (4)$$

The marginal effects verification refers to the scored value of the pandemic, where the pre-pandemic is scored by zero and the others are one. From Equation (4), if that  $\beta_1, \beta_3 > 0$ , the pandemic covid-19 caused the rising impact of bank credit on sectoral output growth. On the other hand, if  $\beta_1$  and  $\beta_3$  have different signs, there is a threshold effect, suggesting that the impact of bank credit on the sectoral output growth differs between pre and amid the pandemic. For instance, if that  $\beta_1 > 0$  and  $\beta_3 < 0$ , the marginal impact of bank credit would be positive for the pre-pandemic period, but it could be either positive or negative during the pandemic period. Hence, it is essential to calculate the marginal effects to verify this.

## 4. Empirical Results and Discussion

### 4.1 The results of descriptive statistics

This sectoral GDP comprises the GDP of the agricultural sector, manufacturing industry, construction services, wholesale & retail trades, and transport & storage sector. Bank credit is sectoral credit allocated nationally by a commercial bank to the five economic sectors. The descriptive statistics on sectoral output and sectoral bank credit are shown in Table 1 and Table 2.

*Ikhsan, I., Amri, K. (2023). Sectoral Growth Impacts of Bank Credit Allocation: The Role of COVID-19 Pandemic as Moderating Variable.*

**Table 1. Descriptive statistics of sectoral GDP**

	Sectoral GDP (IDR Billions)				
	Agriculture	Manufacturing industry	Construction	Wholesale & retail trades	Transport & storage
Mean	421,610.6	699,983.9	329,198.6	438,820.6	133,116.6
Maximum	459,874.4	759,359.7	369,786.3	480,453.5	154,921.7
Minimum	378,565.9	622,369.3	278,265.6	394,016.8	110,132.6
Std. Dev.	25,565.97	43,002.46	29,290.38	28,203.12	13,169.58
Observations	72	72	72	72	72

*Sources: Authors' calculation by using E-Views*

**Table 2. Descriptive statistics of sectoral credit**

	Sectoral credit (IDR Billions)				
	Agriculture	Manufacturing industry	Construction	Wholesale & retail trades	Transport & storage
Mean	321,500.1	810,418.7	261,584.4	877,503.9	200,684.4
Maximum	401,627.2	961,568.7	376,473.2	1,006,069.1	266,188.9
Minimum	217,591.5	656,410.3	141,592.2	704,159.4	165,336.8
Std. Dev.	57,147.60	81,066.61	77,278.99	88,957.65	32,697.31
Observations	72	72	72	72	72

*Sources: Authors' calculation by using E-Views.*

Table 1 above shows that Indonesia's gross domestic product differs by economic sector. On average, the manufacturing industry contributed the largest GDP compared to the other five sectors. Then followed the Wholesale & retail trades sector in second place, and the Agricultural sector in third. Along with differences in GDP, the realization of bank lending for each economic sector is also different. The economic sectors with the most prominent banking credit are the wholesale & retail trade sectors. Then followed the processing industry sector in second place. On the other hand, the economic sector with the lowest credit distribution is the construction sector.

#### 4.2 The result of the estimation

As explained earlier, the functional relationship between sectoral output and bank credit, the covid-19 pandemic, and the interaction of these two predictor variables is predicted using three regression equations. The first model represents the functional relationship between sectoral output and bank lending. Thereafter, the second model adds the covid-19 pandemic as a dummy variable into the first equation. Finally, the third model was designed by adding the interaction between bank credit and Covid-19 as a predictor variable of sectoral output. The three models are then estimated using the econometrical means which is the ordinary least square approach.

The results of model 1 provide statistical evidence that banks' credit has a positive and significant effect on the output of all economic sectors. For the agricultural and manufacturing sectors, for example, the estimated coefficients of bank credit ( $\beta_1$ ) for these two sectors are 0.234 ( $p < 0.05$ ) and 0.598 ( $p < 0.05$ ), respectively. This shows that an increase in bank credit has significantly boosted the output of the two sectors. Sectoral output effects of bank credit for three other economic sectors are also positive and significant. In statistics, these statistical indications as shown by the estimated coefficient of bank credit on

the construction services sector ( $\beta_1 = 0.289$ ; p-value < 0.05), wholesale and retail trade ( $\beta_1 = 0.617$ ; p-value < 0.05) and on the transport and storage sectors ( $\beta_1 = 0.459$ ; p-value < 0.05), respectively. The rising bank credit for three business sectors significantly affects output growth. In other words, the larger the bank credit, the greater the output in the three economic sectors. This is because the distribution of bank credit to certain economic sectors can increase business activity in turn, has a direct impact on sectoral output.

**Table 3. The result of the OLS-Main effect (model 1)**

Constant & predictors	Logarithmic value of sectoral output				
	Agricultural Sectors	Manufacturing sector	Construction sector	Wholesale & retail trades	Transport & storage
Main effect (model 1)					
Constant ( $\beta_0$ )	8.849 [118.563] (0.000)	5.317 [21.813] (0.000)	9.100 [154.397] (0.000)	4.552 [24.519] (0.000)	6.198 [9.602] (0.000)
Log(BCs) ( $\beta_1$ )	0.324*** [54.938] (0.000)	0.598*** [33.389] (0.000)	0.289*** [61.108] (0.000)	0.617*** [45.445] (0.000)	0.459*** [8.670] (0.000)
R <sup>2</sup>	0.977	0.941	0.982	0.967	0.518
Adjusted R <sup>2</sup>	0.976	0.940	0.981	0.966	0.511
F-statistic	3018.236	1114.873	3733.921	2065.217	75.163
Prob(F-statistic)	0.000	0.000	0.000	0.000	0.000
D-W stat	0.228	0.702	0.258	0.619	0.032
Residual normality					
Jarque-Bera	5.534 (0.063)	1,395 (0.497)	2.199 (0.333)	1.273 (0.529)	7.118 (0.028)
Heteroskedasticity Test: White					
F-statistic	1.027 (0.902)	0.064 (0.801)	2.943 (0.069)	0.783 (0.379)	0.376 (0.423)

Note: the number in [ ] is t statistics; ( ) is p-value; and the sign of \* \*\* \*\*\* indicates significance at the confidence level of 90%, 95%, and 97.5%, respectively.

Sources: Authors' calculation by using E-Views.

The positive effects of bank credit on the agricultural sector be accordance with the result of an empirical research study conducted by Osabohien et al. (2020) pointed out that sectoral credit has a positive impact on the development of the economic sectors. These empirical findings are also consistent with the study of Ustarz & Fanta (2021) for the case of sub-Saharan countries, which also found that the development of the financial sectors had a positive effect on the service and agricultural sectors. This finding also supports the empirical study conducted by several researchers. For instance, Taiwo (2020) pointed out that bank credit increases the growth of the manufacturing sector. Previously, the research study conducted by Abor et al. (2014) concluded that an increase in bank credit has a significant impact on business development in the trade sector. Then, the results of studies by Grown & Bates (1992) and Asante & Helbrecht (2019) disclosed empirical evidence of the positive impact of bank credit on output growth in several economic sectors, especially in the manufacturing and trade sectors.

Statistical results related to the sectoral effects of Covid-19 show that the pandemic has a different impact on the respective sectors (Model 2). For the manufacturing industry sectors,

construction services, and transportation and warehousing sectors, this pandemic has a negative and significant effect, with coefficient estimates of the three sectors ( $\beta_2$ ) are -0.022 ( $p < 0.05$ ), -0.023 ( $p < 0.05$ ), and -0.164 ( $p < 0.05$ ), respectively. The pandemic has significantly impacted the decline in the output of these three economic sectors. Since the virus spread, the central and regional Indonesian government has implemented several emergency policies. The emergency policies include travel restrictions between regions, territorial lockdowns, social distancing, and the communities' duty to comply with health protocol rules. Its primary objectives are not only to limit the spread of the virus but also to protect the public from health threats. However, this policy harms economic activity in the transportation sector, disrupts the supply chain of raw materials for the manufacturing and construction industries, and reduces the intensity of trade activities. As a result, some workers in the three sectors have lost their jobs and become unemployed. These are what cause a decline in output in the three economic sectors.

This finding supports the research study by Nguyen & Vu (2021) on the case of Vietnam discovered the pandemic significantly impacted the decline in industrial sector output. Also, the empirical findings of Tan et al. (2021) in China pointed out that the pandemic has dramatically reduced the performance of manufacturing sectors. The recent evidence of the related study conducted by Xu et al. (2021) for the case of China's construction and transportation sectors pointed out that pandemics significantly decrease the output growth of the economic sectors.

The effect of the pandemic on the other two sectors is positive, with the estimated coefficients ( $\beta_2 = 0.015$ ,  $p < 0.05$ ) for the agricultural and ( $\beta_2 = 0.016$ ,  $p < 0.05$ ) for the wholesale and retail trade sectors. The pandemic had no impact on the decline in the output of the two economic sectors. This finding differs from the research result of Ahmed et al. (2021) found that the Covid-19 pandemic followed by government policies to mitigate its spread significantly reduced production in the agricultural sector. This finding also contradicts the results of research (Ion et al., 2021) for the case of the Romanian economy, which provides empirical evidence about the negative impact of Covid-19 on the wholesale and retail sectors.

The interaction between bank credit and the Covid-19 pandemic has a negative and significant effect on the output of the manufacturing sector ( $\beta_3 = -0.364$ ,  $p < 0.05$ ), construction ( $\beta_3 = -0.673$ ,  $p < 0.05$ ), and transportation & storage sector ( $\beta_3 = -2.529$ ,  $p < 0.05$ ). This regard provides statistical evidence that the Covid-19 pandemic moderated the effect of bank credit on the output of the three economic sectors. The moderating effect is negative and significant, so the pandemic has changed the significance of bank credit's influence on the sectors' business performance. With another interpretation, for the manufacturing industry sector, construction and transportation, and storage sector, there are significant differences in the sectoral output impact of bank credit between pre and amid the covid-19 pandemic. Changes in the influence of bank credit on the output of the manufacturing sector are described as shown in Figure 1. In conditions before the Covid-19 pandemic, the estimation line of the functional relationship between bank credit and manufacturing output resulted in a slope coefficient marked by a steeper estimation line (black line). In conditions during Covid-19, the estimation line is more gentle than before the pandemic (dash line). So, this figure completes the aforementioned statistical evidence that the pandemic has



significantly reduced the positive influence of bank credit on the output of the manufacturing sector.

**Table 3. The result of the OLS-Main effect (Model 2)**

Constant & predictors	Logarithmic value of sectoral output				
	Agricultural Sectors	Manufacturing sector	Construction sector	Wholesale & retail trades	Transport & storage
	Moderating effect (Model 2)				
Constant ( $\beta_0$ )	9.025 [121.885] (0.000) 0.309***	4.793 [18.719] (0.000) 0.637***	8.951 [155.491] (0.000) 0.302***	4.797 [26.931] (0.000) 0.599***	3.259 [4.740] (0.000) 0.702***
Log(BCs) ( $\beta_1$ )	[52.832] (0.000) 0.015***	[33.800] (0.000) -0.022***	[64.882] (0.000) -0.022***	[45.939] (0.000) 0.016***	[12.402] (0.000) -0.164***
Covid-19( $\beta_2$ )	[4.890] (0.000)	[-4.045] (0.000)	[-5.268] (0.000)	[4.089] (0.000)	[-6.433] (0.000)
R <sup>2</sup>	0.983	0.952	0.987	0.974	0.699
Adjusted R <sup>2</sup>	0.982	0.951	0.986	0.973	0.689
F-stat	2015.069 (0.000)	687.944 (0.000)	2594.314 (0.000)	1272.806 (0.000)	79.958 (0.000)
D-W stat	0.384	0.881	0.422	0.831	0.170
	Residual normality				
Jarque-Bera	3.945 (0.139)	5.747 (0.057)	2.597 (0.273)	0.443 (0.801)	4.218 (0.121)
	Heteroskedasticity Test: White				
F-stat	0.821 (0.491)	0.743 (0.530)	1.838 (0.191)	1.411 (0.247)	1.048 (0.323)

Note: the number in [ ] is t statistics; ( ) is p-value; and the sign of \* \*\* \*\*\* indicates a significance at the confidence level of 90%, 95%, and 97.5%, respectively.

Sources: Authors' calculation by using E-Views.

The negative moderating effect of Covid-19 on the influence of bank credits on the manufacturing sector's output statistically explains that the pandemic has had a detrimental impact on the business performance of the manufacturing industry. This finding confirms the findings of Chowdhury et al. (2020), which revealed that the short-run effect of the covid-19 pandemic was the cessation of business activities in the processing industry and disruption of trade activities. Most companies in the manufacturing industry experience logistical challenges besides demanding disruptions (Juergensen et al., 2020). The manufacturing sector experienced a worse performance decline when compared to the other sectors (Rababah et al., 2020). Research conducted by Cai & Luo (2020) also concluded that the covid pandemic impedes the supply chain of raw materials for the manufacturing industry. Supply and demand of the manufacturing industrial supply chains are severely affected by the spread of covid. The Covid-19 pandemic, which was in line with the government's efforts to mitigate the impact of its break, has caused manufacturing sectors' activity to be inactive (Asgary et al., 2020). As a result, the output of this business sector drastically decreased.

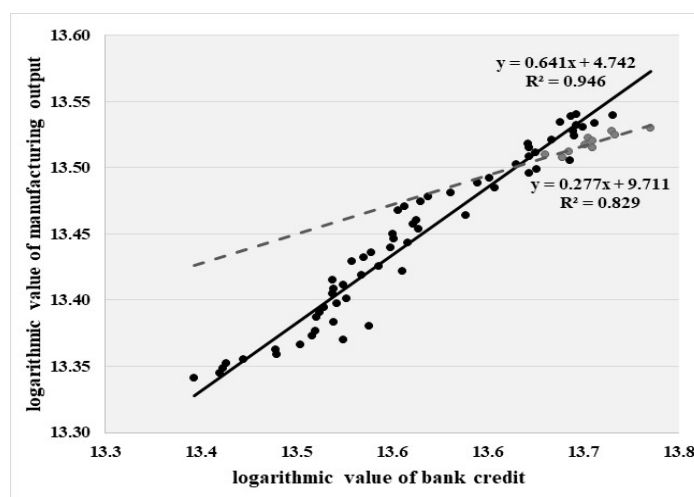
**Table 4. OLS-Interaction effect (Model 3)**

Constant & predictors	Logarithmic value of sectoral output				
	Agricultural sectors	Manufacturing sector	Construction sector	Wholesale & retail trades	Transport & storage
$c(\beta_0)$	9.024 [121.053] (0.000)	4.741 [18.817] (0.000)	8.944 [180.210] (0.000)	4.778 [26.921] (0.000)	3.127 [4.813] (0.000)
$\text{Log(BCs)} (\beta_1)$	0.309*** [52.483] (0.000)	0.641*** [34.549] (0.000)	0.303*** [75.407] (0.000)	0.600*** [46.209] (0.000)	0.712*** [13.328] (0.000)
Covid-19( $\beta_2$ )	1.076 [0.334] (0.740)	4.969* [1.989] (0.051)	8.605*** [4.979] (0.000)	3.224 [1.388] (0.169)	31.331 [3.084] (0.003)
$\text{Log(BCs)*Covid-19} (\beta_3)$	-0.082 [-0.329] (0.743)	-0.364** [-1.998] (0.049)	-0.673*** [-4.992] (0.000)	-0.233 [-1.381] (0.172)	-2.529*** [-3.100] (0.003)
$R^2$	0.983	0.955	0.990	0.974	0.736
Adjusted $R^2$	0.982	0.953	0.989	0.973	0.724
F-statistic	1326.055 (0.000)	479.849 (0.000)	2337.350 (0.000)	860.323 (0.000)	63.161 (0.000)
D-W stat	0.374	0.853	0.502	0.745	0.157
Residual normality					
Jarque-Bera	3.965 (0.138)	7.990 (0.119)	4.945 (0.414)	0.292 (0.864)	2.659 (0.265)
Heteroskedasticity Test: White					
F-statistic	1.934 (0.098)	1.316 (0.276)	1.580 (0.145)	1.633 (0.189)	1.894 (0.126)

Note: the number in [ ] is t statistics; ( ) is p-value; and the sign of \* \*\* \*\*\* indicates a significance at the confidence level of 90%, 95%, and 97.5%, respectively.

Sources: Authors' calculation by using E-Views.

**Figure 1. Scatter plot of logarithmic value for bank credit and manufacturing sector output by difference time (pre- and amid Covid-19 pandemics)**



Sources: Authors' compilation refers to mathematical calculation.

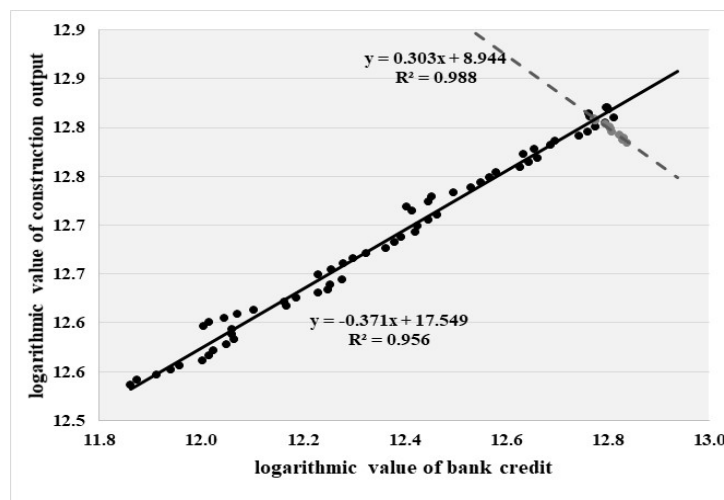
Referring to the interaction model as shown in Table 4 earlier, the marginal effect of bank credit on the output of the manufacturing sector is expressed as follows,

$$\frac{\partial \log \text{SOS}_t}{\partial \log \text{BCS}_t} = 0.641 - 0.364 \text{Cvd}$$

The methodology section explains that the Covid-19 pandemic is a dummy variable measured by a score of zero (0) for pre and 1 for the pandemic period. The marginal effect of bank credit allocation in pre-pandemic conditions is 0.641 (0.641 – 0.364\*0). Furthermore, the marginal impact for the pandemic period is 0.277 (0.641 – 0.364\*1). These statistical calculations prove that the marginal effects of bank credit on output growth in the manufacturing sector for the pandemic period are lower than in the pre-pandemic period. However, both marginal effect values show a positive sign, which means that the pandemic weakens the positive influence of bank credit on output.

The moderating effect of the Covid-19 pandemic on the nexus between the output of construction sectors and bank credit is more significant than its moderating effect on the manufacturing sectors. Even for this sector, the Covid-19 pandemic has changed the direction of the influence of bank credit on output. As shown in Figure 2, in the pre-pandemic period, the estimation line that reflects the functional relationship between bank credit rises from the bottom left to the top right (black line). In contrast, for the period of pandemics, the estimation line goes down from the top left to the bottom right (dash line). It proves that during the outbreak of the Covid-19 pandemic, the increase in bank credit was followed by decreasing in the construction sector output.

**Figure 2. Scatter plot of logarithmic value for bank credit and construction sector output at different times (pre-and amid Covid-19 pandemics)**



Sources: Authors' compilation refers to mathematical calculation.

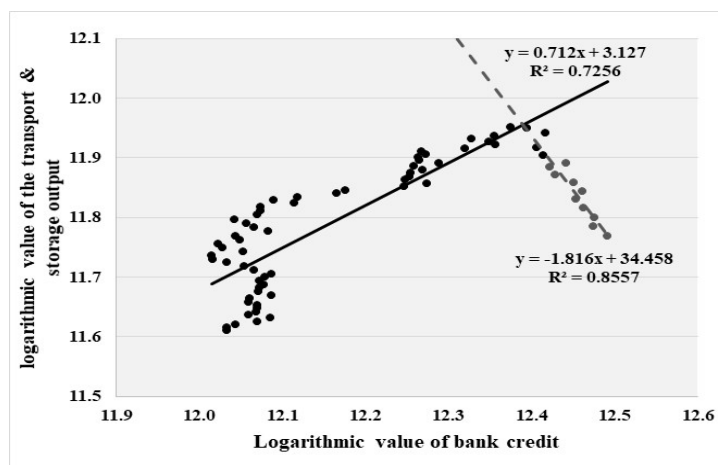
The marginal effect of bank credit allocation on the output of the construction sector is expressed as follows:

$$\frac{\partial \log \text{SOS}_t}{\partial \log \text{BCs}_t} = 0.303 - 0.673 \text{Cvd}$$

Based on the model above, the marginal effect of bank credit in pre-pandemic conditions is 0.303 (0.303 - 0.673\*0). Furthermore, the marginal impact on conditions during the pandemic is -0.371 (0.303-0.673\*1). These statistics prove that the marginal effect of bank credit on output growth in the construction sector during the pandemic contrasts with the marginal impact on conditions before the pandemic. Before the pandemic, the increase in bank credit for the construction sector significantly boosted the sector's output growth. One percent increase in bank credits leads to a rise in output by 0.303 percent. However, amid the pandemic, the effect of bank credits on the output growth of the construction sector is negative and significant. One percent increase in credit causes the construction sector's output decreases by 0.370 percent. This statistical result is consistent with the estimation line in Figure 2 above that the pandemic has changed the direction of bank credit influence on the construction sector's output.

Similarly, the Covid-19 pandemic has also changed the direction of the influence of bank credits on the output of transport and storage sectors (Figure 3). For the period of pre-pandemics, the functional relationship between the two variables is as figured in a black-coloured estimation line. This line up from the bottom left to the top right. And then, in the aftermath of the pandemic, the relationship is reflected by a dashed line that downturns from the top left side to the bottom right side.

**Figure 3. Scatter plot of logarithmic value for bank credit and transport & storage output at different times (pre-and amid Covid-19 pandemics)**



*Sources: Authors' compilation refers to mathematical calculation.*

Figure 3 above illustrates the functional relationship between the transportation sector's output and the bank credits for the pre and amid the Covid-19 pandemic. Before the pandemic, an increase in bank credit led to production growth; conversely, during a pandemic, an increase in bank credit was in line with a decrease in production. The different directions of the effects of credit such as explained in the marginal impact of bank credits, as expressed in the equation below:

$$\frac{\partial \log \text{SOS}_t}{\partial \log \text{BCs}_t} = 0.712 - 2.529 \text{Cvd}$$

In the pre-pandemic period, the marginal effect of bank credits on the output of the transportation and warehousing sector was 0.712 ( $0.712 - 2.529 \cdot 0$ ). The output production of this economic sector will increase by 0.712 percent for every 1 percent increase in bank credit. Furthermore, the marginal effect on conditions during the pandemic is -1.816 ( $0.712 - 2.529 \cdot 1$ ), which means that output will decrease by -1.817 percent for every one percentage point increase in bank credit. These statistics prove that the marginal effect of the credit on output growth in conditions during the pandemic is in contrast to the pre the pandemic. In pre-pandemic situations, the estimation line representing the functional relationship between output and credit rises from the bottom left to the top right. It informs that the larger the credits, the greater the output growth of the transportation and warehousing sector. On the other hand, in conditions during the pandemic, the estimation line descends from the top left to the bottom right, indicating an inverse relationship between bank credits and the output of the transportation and warehousing sectors. These statistical results are consistent with the estimation line as shown in Figure 2 above, that the pandemic has changed the direction of the influence of credit on the output of the transportation and warehousing sectors.

The change in direction and significance of the relationship between bank credits and output growth in the construction, transport & storage sectors shows that these two sectors are most affected by the spread of Covid-19. As explained earlier, since the beginning of the virus outbreak, the initial policy of the central government in Indonesia was to impose social distancing, large-scale restrictions, and territorial lockdowns. The emergency policies then followed by local governments implement the same approach to mitigate the spread effect of the virus. Both central and local government policy causes economic activity in the construction sector to suffer from disturbance. Regarding the chain supply, for example, the raw material supply needed by the sectors has stopped. In line with the scarcity of raw materials, most construction workers must stop working. This finding supports the result of Shibani et al. (2020) for the case of construction companies discovered that territorial lockdown and social distancing significantly and negatively affect construction companies. The territorial lockdown and large-scale restrictions caused many projects to close, and these emergency policies ultimately encouraged rising unemployment (Biswas et al., 2021). In particular, for urban areas, the policy also directly affects the transportation sector (Stalmachova, Strenitzerova., 2021). The mobility of goods and services and the movement of people between regions are constraining. This unpleasant condition causes the output of the transportation sector to be drastically declining. As a result, despite bank credit increases, the production performance of these two economic sectors has continued to decline.

In contrast to the moderating effect of the covid-19 on the relations between bank credit and the three aforementioned economic sectors, the pandemic did not significantly moderate the impact of bank credit on the output growth of the agriculture, retail, and wholesale sectors. This statistical interpretation refers to the estimated coefficients of the respective interaction variables, which are -0.082 for the agricultural and 0.233 for the wholesale and retail sectors. Both estimate coefficients are insignificant at the 5 percent level ( $p > 0.05$ ). It means that the business performance of the two economic sectors was not significantly affected by the contagion effect of the pandemic. That causes the growth impact of bank credits for agriculture and wholesale and retail trade sectors to not differ across the two opposite periods (pre-and amid covid pandemic).

## **5. Conclusion**

The Covid-19 pandemic has affected the global economy, including the Indonesian economy. The pandemic causes not only a health crisis but also affects various economic sectors and also financial sectors. This study examines the effect of bank credit on sectoral economic growth in Indonesia by placing the Covid-19 pandemic as a moderator of the relationship between the two variables. These sectoral outputs are agriculture, manufacturing, construction, wholesale & retail trades, and transport & storage sectors.

The study found that bank credit had a positive and significant effect on the output of the five economic sectors. The Covid-19 pandemic negatively and significantly affects business development in the manufacturing, construction, wholesale & retail trades, and transport & storage sectors. The impact of the pandemic on these four sectors is negative and significant. This pandemic has significantly reduced the output of the four economic sectors. In contrast, the pandemic did not affect growth in the agricultural sectors.

This pandemic also moderated the influence of bank credit on the output of the construction, transport and storage, and manufacturing sectors. The pandemic reduced the effect significance of bank credit in the manufacturing sectors and altered the influence of bank credit on the output growth in the construction sectors and transport & storage sectors. During the pandemic, changes in bank credit for these two economic sectors move inversely with changes in output growth. Conversely, the Covid-19 pandemic did not moderate the influence of bank credit on the output growth in the agriculture and wholesale & retail trades sector.

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## IMPACT OF INTELLECTUAL CAPITAL ON FINANCIAL PERFORMANCE: PANEL EVIDENCE FROM BANKING INDUSTRY IN INDONESIA<sup>3</sup>

*This research investigates the impact of intellectual capital (IC) on the financial performance of Indonesian bank enterprises. Data were collected from 42 Indonesian banks between 2017 and 2021. IC was measured using descriptive statistics, correlation coefficients, and panel data regression techniques, as well as the Value Added Intellectual Coefficient (VAIC) component through Human Capital Efficiency (HCE), Capital Employed Efficiency (CEE), and Structural Capital Efficiency (SCE), and their impact on financial performance through Return on Assets (ROA), Return on equity (ROE), and Asset Turnover (ATO). The analysis was conducted with secondary data extracted from the firms' annual reports. The results show the impact of the VAIC model and the VAIC component on financial performance. The VAIC model significantly affects financial performance, namely ROA, ROE, and ATO. The VAIC component does not significantly affect financial performance results, although SCE significantly affects financial performance as measured by ATO. This research expands the knowledge and evaluates financial performance and the creation of corporate bank value. It can be used across industries, and the findings have implications for the banking industry in the context of competitive advantage and for company managers. This study presents empirical evidence and broadens our understanding of the use of IC to enhance the financial performance of Indonesian banking firms.*

*Keywords: IC; Banking Industry; Financial Performance; Resource Based Theory; Value Added Intellectual Coefficient*

*JEL: G21; G32; J24; O34*

### 1. Introduction

The global economy is developing fast, leading to more intense competition between businesses. Increasing competition among business actors means companies must be able to change how they improve and endeavour to optimize the resources to maintain their position.

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Businesses in many industries consider value creation essential in their ability to create a competitive advantage (Poh et al., 2018a). In this case, various factors will be pursued to improve the performance of a company that is carried out continuously. This is because competition between companies is getting high and unavoidable. Therefore, adequate intellectual capital (IC) management has been recognized as the most crucial source of value creation and organizational competitive advantage (Nawaz, Haniffa, 2017).

IC was developed by Pulic (2000). The company's ability to incorporate the IC concept is a significant advancement as it heralds a new era in which personnel, expertise, and intellectual assets are prioritized. The Value Added Intellectual Coefficient (VAIC) model, which measures the amount of additional value created per unit of expenditure on each resource, is the foundation for measuring IC (Pulic, 2004).

The primary function of the VAIC model is to demonstrate, at both the microeconomic and macroeconomic levels, the stimulation of economic growth attributable to the added value provided by IC (Polcyn, 2022). In other words, the VAIC model helps to present the success of a company's IC by recognizing the latter's importance to the company's performance and competitiveness while highlighting the need to manage it effectively (Bayraktaroglu *et al.*, 2019). This is critical in terms of strategy execution for the company to gain a competitive advantage and improve its performance. However, it has been shown that higher-performing companies can also attract increased IC, including better human resources (Lu et al., 2021; Soewarno, Tjahjadi, 2020).

Business value is created through physical assets and, ideally, the successful management of IC (Poh et al., 2018b). However, this is also the main reason business value should be used carefully when assessing whether IC is being used efficiently in a company (Dzenopoljac et al., 2017). The approach raises challenges for accountants in identifying, measuring, and disclosing such value in financial statements. Therefore, to expand their businesses, enterprises should pursue more outstanding efforts to develop IC (Ni *et al.*, 2020). Investment in IC has become mandatory in this modern era of globalization due to its long-term return on investment (Ahmed et al., 2019). A company's success in the face of competition highly depends on the knowledge management strategy rather than the strategy of allocating physical and financial assets.

The majority of prior research in this area has employed the VAIC model to determine the relationship between IC (Human Capital Efficiency (HCE), Capital Employed Efficiency (CEE), and Structural Capital Efficiency (SCE)) and financial performance (Return On Assets (ROA), Return On Equity (ROE), and Asset Turnover (ATO)) (Bhattu-Babajee and Seetana (2022); Chowdhury *et al.* (2018); García Castro *et al.* (2021); Nawaz and Haniffa (2017); Soewarno and Tjahjadi (2020); Tran & Vo (2018); Weqar *et al.* (2021); Xu and Liu (2020); Xu and Zhang (2021)). However, there is some inconsistency evident between the different studies, as seen in Table 1.

This study continues the previous research, notably that of Soewarno and Tjahjadi (2020), by examining the relationship between IC and financial performance in banking studies in Indonesia. Soewarno and Tjahjadi (2020), used the 2012-2017 period; however, this study uses the 2017-2021 period. The VAIC model was adapted from the model developed by Pulic (2004), while the analysis uses the financial performance indicators ROA, ROE, and asset

turnover (ATO) in statistical models. On the other hand, this study focuses on several reasons. First, it uses panel data analysis, which has yet to be used in the estimation analyses of previous studies. Second, the results obtained from previous studies needed to be more consistent. Finally, this study contributes empirical evidence to the theory and literature of IC on banking case studies, especially in developing countries, including Indonesia.

Additionally, the banking sector has begun to implement and focus on IC. This demonstrates that the assessment of sound financial performance in the banking sector based on the content of financial statements does not indicate banks' effective and efficient management of IC (Poh *et al.*, 2018). According to Tran and Vo (2018), IC measurement in the financial system is highly accurate. First, banking operations rely heavily on consumers to generate a competitive advantage. Second, bank products are not manufactured objects but services with a monetary value based on IC. Finally, banks must invest in human resources, brand names, systems, and processes to deliver the best possible service to their customers.

The reasons for the importance of this research include the increasing awareness of the banking sector in Indonesia in managing IC and the important role that IC plays in gaining a competitive advantage. Companies must be competitive and superior relative to their rivals to survive in today's business environment. The future success and profitability of a business depends largely on its ability to harness the power of its intellectual capital. A company can gain a competitive advantage, for example. If a company has an advantage over its rivals, it shows that it has something that these companies do not have. Competitive advantage describes this situation. Companies today go beyond their material possessions and financial resources to their distinctive intellectual capital to forge a sustainable competitive advantage. This suggests that a company's ability to maximize its intangible assets is a key factor in determining its competitive advantage.

Therefore, financial institutions need to manage their IC in the most effective manner possible. It has been demonstrated that IC plays a crucial role in the achievement of financial success as well as a competitive advantage in the banking industry (Soewarno & Tjahjadi, 2020). The remainder of this paper is structured as follows. Section 2 introduces the theory relevant to IC, the VAIC as a tool for measuring IC and its extended version in the relevant literature, and the hypothesis development. In section 3, we describe the many variables as well as the research approach that was utilized. The findings from the analysis are discussed in section 4. This is followed in the final section by the conclusion and limitations of this study and the implications for the future.

## **2. Literature Review**

The Resource Based Theory (RBT) of companies is based on the relationship observed between tangible and intangible resources and financial performance (Smriti, Das, 2018; Soewarno, Tjahjadi, 2020). RBT is based on the added value of every resource owned and controlled by a business organization (Anifowose *et al.*, 2018). Resource Based Theory is characterized by the superiority of knowledge or an economy that relies on intangible assets. This theory relies on the superiority of the resources owned by the company so that it can compete with its competitors, the difference between the resources owned by the company

will provide a competitive advantage for the company. Theoretically, the concept of IC mainly depends on the RBT of enterprise and its variations – the idea of dynamic and core capabilities (Komnencic, Pokrajčić, 2012).

The business finally realized that its intangible assets, such as its capacity for innovation, information systems, organizational management, and human resources, were just as important to its survival as its physical assets in order to remain competitive in its field. According to Zéghal and Maaloul (2010), businesses acquire a competitive edge and achieve superior financial results by retaining and effectively utilizing strategic resources. This demonstrates that if a company wishes to gain a competitive advantage, it must be able to obtain, identify, and organize its resources effectively and efficiently. Company resources are the main drivers of competitiveness and company performance. A company, therefore, gains a competitive advantage and superior performance by combining and employing its assets.

**Table 1. Previous Study**

Scholar(s)	Model VAIC	Financial Performance		
		ROA	ROE	ATO
1. Soewarno & Tjahjadi	HCE	NS	NS	S
	CEE	S	S	NS
	SCE	S	S	S
2. Ozkan et al.	VAIC	NS	-	-
	HCE	S	-	-
	CEE	S	-	-
3. Tran & Vo	SCE	NS	-	-
	VAIC	S	-	-
	HCE	S	-	-
4. Xu & Liu	CEE	NS	-	-
	SCE	NS	-	-
	HCE	S	S	S
5. Nawaz & Haniffa	CEE	S	S	S
	SCE	NS	S	NS
	VAIC	S	-	-
6. Poh et al.	HCE	S	-	-
	CEE	NS	-	-
	SCE	S	-	-
7. Nadeem et al.	VAIC	S	S	-
	HCE	NS	S	-
	CEE	S	NS	-
8. Bayraktaroglu et al.	SCE	NS	S	-
	HCE	S	S	S
	CEE	S	S	S
9. Olarewaju & Msomi	HCE	S	NS	NS
	CEE	S	S	NS
	SCE	NS	NS	S
10. Weqar et al.	VACA	S	-	-
	VAHC	S	-	-
	SCVA	S	-	-
	VAIC	S	NS	NS
	HCE	S	NS	NS
	CEE	NS	NS	NS

Scholar(s)	Model VAIC	Financial Performance		
		ROA	ROE	ATO
11. Chowdhury et al. (Textile Sector)	SCE	NS	NS	NS
	HCE	S	NS	NS
	CEE	NS	NS	NS
12. Bhattu-Babajee & Seetana	SCE	NS	NS	S
	HCE	S	-	-
	CEE	NS	-	-
13. Xu & Zhang	SCE	S	-	-
	HCE	S	S	-
	CEE	S	NS	-
14. Lu et al.	SCE	NS	NS	-
	VAIC	S	-	-
	HCE	S	-	-
15. Ousama et al.	CEE	S	-	-
	SCE	S	S	-
	VAIC	S	S	-
16. Kasoga	HCE	S	S	-
	CEE	S	S	-
	SCE	NS	NS	-
17. Chowdhury et al. (Pharmaceutical Industry)	VAIC	S	-	S
	HCE	NS	-	NS
	CEE	NS	-	NS
17. Chowdhury et al. (Pharmaceutical Industry)	SCE	S	-	S
	HCE	S	NS	NS
	CEE	NS	NS	S
	SCE	NS	NS	NS

Note: NS: Not Supporte, S: Supported  
 Source: Authors' Calculations.

IC is a driver of intangible value and is increasingly essential for high business performance. The IC-based theory considers it the only strategic resource that enables firms to create added value (Joshi et al., 2013). Resources must have specific characteristics, such as being unique, non-imitable, non-substitutable, and observable; employees' skills and experience acquired over time and organizational processes (Smriti, Das, 2018). For this reason, IC and knowledge management have emerged as core competencies for corporate growth and protecting competitive advantage (Joshi et al., 2013). The existence of a good utilization role of Intellectual Capital will affect the ability to create innovation and creativity for the company to exist in industrial competition.

According to Nassar (2018), VAIC is a measure of IC used to investigate the relationship between IC, company financial performance, and market value. Bayraktaroglu et al. (2019) identified the three components of VAIC includes, namely Human Capital Efficiency (HCE), Capital Employed Efficiency (CEE), and Structural Capital Efficiency (SCE), that measure how value is created using the physical assets and IC available within the company. The VAIC value of a company is the total HCE, SCE, and CEE.

Employees are considered an asset of the company; therefore, human capital is a crucial component of the company's value creation (Smriti, Das, 2018). As a first step, HCE, the ratio of a company's value added to its expenditure on human capital, is used to determine the value contributed by human capital (Chowdhury et al., 2018). In contrast, SCE

encompasses company culture, information management, and database design (Dzenopoljac et al., 2017). Structural capital concerns the company's primary supportive structure that enables employees to achieve performance and managers to maintain profitable relationships with key external stakeholders (William et al., 2019). CEE measures the value created per unit of shareholder capital currency, which is interpreted as financial capital (Nadeem et al., 2019). Therefore, to expand their business, enterprises should make more outstanding efforts to develop IC (Ni et al., 2020).

According to RBT, company resources are the main drivers of competitiveness and performance. A company's performance is considered to equal its organizational efficiency, which in turn represents the extent to which the organization, as a social system with limited resources and means, achieves its goals without excessive effort on the part of its members (Taouab, Issor, 2019). In studies evaluating the relationship between IC efficiency and with the financial performance of financial institutions, VAIC and its components (CEE, HCE, and SCE) have been used as measures of IC efficiency. ROA, ROE, and ATO are employed as indicators of financial performance. However, numerous studies have reported contradictory findings. This has sparked a discussion regarding the magnitude of the effect of IC on a firm's bottom-line results.

Previous research has demonstrated the relationship between the VAIC model and financial performance. In a case study in the Indian finance sector, Weqar et al. (2021) showed that VAIC positively affected ROA at the 10% level of significance but had no significant impact on ROE and ATO. Nawaz and Haniffa (2017) reported that the VAIC model positively and significantly affected ROA in Islamic financial institutions. Meanwhile, Tran and Vo (2018), in a study on the Thai banking sector, found that the results of the VAIC model were not significant to ROA. According to Smriti and Das (2018), the IC significantly impacted ROA, ATO, Tobin's Q, and sales growth from Indian firms listed in COSPI. We assume that the VAIC model positively correlates with financial performance (ROA, ROE, and ATO). Therefore, we propose:

H1: The VAIC model has a positive relationship with ROA

H2: The VAIC model has a positive relationship with ROE

H3: The VAIC model has a positive relationship with ATO

The relationship between the VAIC component model and ROA. García Castro et al. (2021) found that HCE had a positive effect on ROA, and CEE and SCE had a negative effect on ROA at Colombian listed banking entities. Xu and Zhang (2021) studied Chinese agricultural listed companies and found, that while HCE and CEE had a positive and significant effect on ROA, SCE had no significant on ROA. Bhattu-Babajee and Seetanah (2022), in a study on Mauritian companies, showed that HCE, SCE, and CEE were positively related to ROA. We assume that the VAIC component model (HCE, CEE, and SCE) has a positive relationship to return on assets (ROA). Therefore, we propose:

H1a: HCE has a positive relationship with ROA

H1b: CEE has a positive relationship with ROA

H1c: SCE has a positive relationship with ROA



The relationship between the VAIC component model to ROE. In a study on the Turkish manufacturing sector, Bayraktaroglu et al. (2019) found that HCE had a significant and positive impact on ROE, but CEE and SCE were not significant. Xu and Liu (2020) studied the manufacturing industry in South Korea, as the backbone of the nation's economy, and found that HCE, SCE and CEE had a significant and positive impact on ROE. In contrast, Chowdhury et al. (2019) investigated the pharmaceutical industry in Bangladesh, that HCE, CEE, and SCE did not affect ROE. We assume that the VAIC component model (HCE, CEE and SCE) has a positive relationship with ROE. Therefore, we propose:

H2a: HCE has a positive relationship with ROE

H2b: CEE has a positive relationship with ROE

H2c: SCE has a positive relationship with ROE

Finally, the relationship between the VAIC component model and ATO. The results of a study by Chowdhury et al. (2018) in the Bangladeshi textile sector, showed that CEE had a positive and significant effect on ATO, but SCE and HCE are not significant on ATO. Soewarno and Tjahjadi (2020), in a study on banking firms in Indonesia, reported that HCE and CEE had a positive and significant effect on ATO, but SCE was not significant on ATO. We assume that the VAIC component model (HCE, CEE, and SCE) has a positive relationship with ATO. Therefore, we propose:

H3a: HCE has a positive relationship with ATO

H3b: CEE has a positive relationship with ATO

H3c: SCE has a positive relationship with ATO

### **3. Methodology**

#### *3.1. Data Collection*

This research uses quantitative data, which aligns with the approach taken by many in previous studies. In this case, the researcher points to the phenomenon of reality related to IC on financial performance in banking studies listed on the Indonesia Stock Exchange (IDX). The samples studied, which were selected through purposive sampling, comprise 42 out of the total population of 47 registered banks. The remaining five banks were not chosen because they did not publish financial statements for 2017-2021.

#### *3.2. Variable*

The independent variable in this study is IC. IC was determined based on the VAIC model, which measures the amount of new value created per monetary unit invested in each resource (Pulic, 2004). The first stage in computing the VAIC is to measure Value Added (VA). According to Pulic, VA is an objective measure of how well a business is performing and indicates its efficiency in creating value. As such, it must include investments in resources

such as salaries and interest on financial assets, dividends to investors, taxes paid to the state, and investments in the future. VA is thus formulated as follows:

$$VA = OP + EC + D + A$$

where: OP = operating profit; EC = employee costs; D = depreciation; A = amortization.

The second stage HCE, whereby the efficient use of human capital is estimated in terms of value creation by calculating the HCE ratio (Chowdhury et al., 2018). Based on Pulic's model, HCE is formulated as follows:

$$HCE = VA/HC$$

where: HCE = human capital efficiency coefficient for the company; VA = value added; HC = total salaries and wages for the company.

The third stage measure CEE this involves testing the amount of value created per unit of shareholder capital currency, which is interpreted as financial capital (Nadeem et al., 2019). Pulic formulated CEE as follows:

$$CEE = VA/CE$$

where: CEE = capital employed efficiency coefficient; VA = value added; CE = book value of the company's net assets.

The fourth stage of measuring VAIC consider SCE. SCE covers things areas such as corporate culture, information management, and databases (Dzenopoljac et al., 2017). The measurement of SCE comprises two components, which are formulated as follows:

$$SC = VA - HC$$

where: SC = structural capital for the company; VA = value added; HC = total salary and wage duties for the company.

$$SCE = SC/VA$$

where: SCE = structural capital efficiency for the company; SC = structural capital; VA = value added.

The VAIC model can thus be formulated as follows (Soewarno & Tjahjadi, 2020):

$$VAIC = HCE + CEE + SCE$$

where: VAIC = value added intellectual coefficient; HCE = human capital efficiency; CEE = capital employed efficiency; SCE = structural capital efficiency.

The dependent variable in this study is financial performance using the ROA, ROE, and ATO ratios. These measures were adopted by Soewarno and Tjahjadi (2020) and are which are formulated as follows:

$$ROA = \text{earnings after tax} / \text{total assets}$$

$$ROE = \text{earnings after tax} / \text{total equity}$$

$$ATO = \text{total sales} / \text{total assets}$$

The control variables of firm size and leverage were adopted from Olarewaju and Msomi (2021) and Chowdhury et al. (2019) and are formulated as follows:

Size = logarithm of total assets

Leverage = total debt/total assets

We examine the relationship between VAIC performance and financial performance (ROA, ROE, and ATO) in the banking sector in Indonesia. Thus, we propose six models, as follows:

$$\text{Model 1: } ROA_{it} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 LEV_{it} + \beta_3 SIZE_{it} + \varepsilon_{it}$$

$$\text{Model 2: } ROE_{it} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 LEV_{it} + \beta_3 SIZE_{it} + \varepsilon_{it}$$

$$\text{Model 3: } ATO_{it} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 LEV_{it} + \beta_3 SIZE_{it} + \varepsilon_{it}$$

$$\text{Model 4: } ROA_{it} = \beta_0 + \beta_1 HCE_{it} + \beta_2 CEE_{it} + \beta_3 SCE_{it} + \beta_4 LEV_{it} + \beta_5 SIZE_{it} + \varepsilon_{it}$$

$$\text{Model 5: } ROE_{it} = \beta_0 + \beta_1 HCE_{it} + \beta_2 CEE_{it} + \beta_3 SCE_{it} + \beta_4 LEV_{it} + \beta_5 SIZE_{it} + \varepsilon_{it}$$

$$\text{Model 6: } ATO_{it} = \beta_0 + \beta_1 HCE_{it} + \beta_2 CEE_{it} + \beta_3 SCE_{it} + \beta_4 LEV_{it} + \beta_5 SIZE_{it} + \varepsilon_{it}$$

where: ROA = return on assets; ROE = return on equity; ATO = asset turnover; VAIC = value added intellectual coefficient; HCE = human capital efficiency; CEE = capital employed efficiency; SCE = structural capital efficiency; LEV = leverage; SIZE = firm size;  $\varepsilon$  = error, i = bank, t = time period.

## 4. Empirical Results

### 4.1. Descriptive Statistics and Correlation Matrix

Table 2 contains the descriptive statistics, which include the size of the observation and the mean, standard deviation, and the min and max values of each variable studied. For ROA and ROE, the mean values are 0.004 and 0.019, which indicates that the average financial performance of the companies (ROA and ROE) is relatively low, while the mean ATO value is 0.405, indicating a relatively high average financial performance of the bank companies. The VAIC value has a mean of 7.445, which means that on average, bank companies are high efficiency in creating added value.

**Table 2. Descriptive Statistics**

Variables	Obs	Mean	Std. dev.	Min	Max
ROA	205	0.004	0.028	-0.181	0.102
ROE	204	0.019	0.113	-0.732	0.209
ATO	206	0.405	0.720	0.000	3.879
VAIC	207	7.445	1.967	2.324	1.345
HCE	208	6.508	1.960	1.764	1.268
CEE	208	0.126	0.108	0.056	0.886
SCE	208	0.832	0.055	0.433	0.921
LEV	210	0.853	0.787	0.050	8.604
SIZE	210	31.27	1.766	27.22	35.08

Source: Authors' Calculations.

HCE has a mean value of 6.508 and a standard deviation of 1.960 which indicates a small variation. CEE has a mean value of 0.126 and a standard deviation of 0.108, which also denotes a small variation. SCE has a mean value of 0.832 and a standard deviation of 0.055, indicating a very small variation. LEV has a mean value of 0.8, which denotes that the bank companies' average level of debt exceeds their assets. SIZE has a mean value of 31.27, which reveals that the average bank company is very large.

**Table 3. Correlation Matrix**

Variables	ROA	ROE	ATO	VAIC	HCE	CEE	SCE	DAR	SIZE
ROA	1.000								
ROE	0.782***	1.000							
ATO	-0.063	-0.114*	1.000						
VAIC	0.084	0.103	0.242***	1.000					
HCE	0.082	0.100	0.234***	0.997***	1.000				
CEE	0.058	0.082	-0.068	-0.026	-0.085	1.000			
SCE	0.122*	0.133*	0.250***	0.898***	0.889***	-0.044	1.000		
LEV	-0.008	-0.051	0.166**	0.061	0.060	-0.006	0.054	1.000	
SIZE	0.336***	0.448***	-0.320***	0.041	0.024	0.139**	0.105	-0.072	1.000

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Source: Authors' Calculations.

The correlation coefficients in Table 3 show the extent of the relationship between IC and the financial performance of banking firms. It can be seen that VAIC, HCE, and CEE are positively correlated while leverage is negatively correlated with ROA and ROE as measures of bank company performance that are considered statistically insignificant. Meanwhile, SCE and firm size were found to be positively correlated with ROA at the 10% (SCE) and 1% (firm size) levels of significance. VAIC, SCE, firm size, and leverage were found to be positively correlated with ATO at the 1% (VAIC, SCE, and firm size) of 5% (leverage) levels of significance. However, CEE was found to be negatively correlated with ATO, which was considered statistically insignificant.

#### 4.2. Regression Results and Discussions

Panel data analysis was used to estimate the unbalanced panel data in the research model, which is the same approach that was taken by Ozkan et al. (2017). All variables (except LEV and SIZE) were winsorized at the 0th and 99th percentiles (VAIC, HCE, CEE, and SCE) or the 1st and 99th percentiles (ROA, ROE, and ATO). Winsorizing moderates the effect of outliers on the mean and variance and thereby creates a more robust estimator of location and variability (Blaine, 2010). The result of the Shapiro-Wilk test for normality indicates that the distribution of the residual data was not normal. The next step was to estimate the panel data model between pooled OLS, fixed effects model, and the random effects model. The methods used to estimate the best panel data model comprised the F test (estimation between pooled OLS and fixed effects model), Hausman test (estimation between the fixed effect and random effects models), and LM test (estimation between the random effects model and pooled OLS).

Based on the estimation results of the panel data model selection, the best random effects model is on models 1, 2, 3, 4, 5 and 6. We used robust standard error in the random effects

model to prevent autocorrelation and heteroskedasticity in all models (in Table 4). Table 4 contains the results of the panel data regression using a random effects model on the formulated models (models 1, 2, 3, 4, and 5).

The results for models 1, 3 and 5 show a significant and positive relationship between VAIC and financial performance (ROA, ROE, and ATO) in bank companies during the 2017-2021 period. This finding is in line with RBT on bank companies in Indonesia and is consistent with prior research by Smriti and Das (2018) on Indian firms listed in COSPI. The R<sup>2</sup> value in the VAIC model indicates a small effect on the financial performance of the bank companies. This corresponds with the result reported by Tran and Vo (2018) in their on banks in Thailand and those of Ozkan et al. (2017) for the Turkish banking sector. As a result, hypotheses H1, H2, and H3 are accepted.

**Table 4. Regression Results**

	ROA	ROE	ATO	ROA	ROE	ATO
VAIC	0.0021**		0.0072*		0.0171*	
	(2.0107)		(1.7574)		(1.9283)	
HCE		0.0009		0.0019		0.0004
		(0.5351)		(0.4441)		(0.0093)
CEE		0.0056		0.0309		0.0225
		(0.9807)		(1.2857)		(1.3569)
SCE		0.0522		0.2075*		-0.1541
		(1.2961)		(1.7705)		(-0.5498)
LEV	0.0004	0.0004	0.0007	0.0008	0.0229***	0.0227***
	(0.6343)	(0.6094)	(0.7515)	(0.7619)	(3.1504)	(3.2156)
SIZE	0.0046***	0.0044***	0.0275***	0.0268***	-0.1705***	-0.1713***
	(3.181)	(2.9509)	(6.1514)	(5.9561)	(-4.2214)	(-4.2567)
Constant	-0.1552***	-0.1836	-0.8972***	-1.0106	5.6132***	5.7478***
	(-2.9566)	(-3.5461)	(-6.0311)	(-5.9308)	(4.2251)	(4.3106)
Observation	202	201	201	200	203	202
R-square	0.0235	0.0254	0.0302	0.0361	0.1941	0.1954
Wald Chi2	10.44	41.60	23.51	14.50	43.59	26.12
F (p)	0.0152	0.0128	0.0000	0.0000	0.0000	0.0001

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Source: Authors' Calculations.

Models 2, 4, and 6 show the results for the effect of the VAIC components (HCE, CEE, and SCE) on financial performance (ROA, ROE, and ATO). Based on these models, HCE does not significant effect on the financial performance (ROA, ROE, and ATO) of bank companies. Therefore, hypotheses H1a, H2a and H3a are rejected. This finding is consistent with research conducted in Bangladesh by Chowdhury et al. (2018, 2019) in Bangladesh, who reported that HCE was not significant to ROE and ATO. Kasoga (2020), in a study carried out in Tanzania, also found that HCE was not significant to ROA and ATO.

The relationship between CEE and financial performance (ROA, ROE, and ATO) was found to have no significant effect. This is consistent with Chowdhury et al. (2018), who also reported no significant effect of CEE on financial performance (ROA, ROE, and ATO) in Bangladesh. As such hypotheses H1b, H2b, and H3b are rejected. Additionally, no significant effect was found for the relationship between SCE and both ROA and ATO. This is consistent

with Xu and Liu (2020) in their study in South Korea, where they found that SCE was not significant to ROA and ATO.

However, SCE was found to have a positive and significant effect on ROE. This shows that Indonesian bank companies must invest heavily in the use of technology and company supporting facilities, which are the driving force of financial performance in terms of ROE. These results are also consistent with those of previous studies (Poh et al., 2018b; Xu, Liu, 2020). Hypotheses H1c and H3c are therefore rejected, but H2c is accepted. The R<sup>2</sup> value in the VAIC component was found to have only a small effect on the financial performance of bank companies. In terms of the control variables, ATO is significantly affected by leverage and firm size, although the effect of firm size is negative. Firm size has a considerable influence on ROE.

## 5. Conclusions and Limitations

In light of the intensifying competition between companies in the Indonesian banking sector, businesses can improve their performance and build competitive advantage using a strategy that involves the recognition and creation of IC. Therefore, understanding the significant contribution made by IC and its components is necessary. This study contributes to realizing the objective by providing market evidence from the developing banking sector for VAIC as a measure of IC and VAIC components. Additionally, the study fills a gap in the literature (SCE, CEE, and HCE).

**Table 5. Hypothesis Testing**

Hypotheses	Supported/Rejected
H1. The VAIC model has a positive relationship with ROA	Supported
H2. The VAIC model has a positive relationship with ROE	Supported
H3. The VAIC model has a positive relationship with ATO	Supported
H1a. HCE has a positive relationship with ROA	Rejected
H1b. CEE has a positive relationship with ROA	Rejected
H1c. SCE has a positive relationship with ROA	Rejected
H2a. HCE has a positive relationship with ROE	Rejected
H2a. CEE has a positive relationship with ROE	Rejected
H2c. SCE has a positive relationship with ROE	Supported
H3a. HCE has a positive relationship with ATO	Rejected
H3b. CEE has a positive relationship with ATO	Rejected
H3c. SCE has a positive relationship with ATO	Rejected

*Source: Authors' Calculations.*

The results of the study show that VAIC makes a strong contribution to improving the financial performance of banking companies in Indonesia. The reasonably significant average VAIC value in banking companies, 7.445, indicates that they should maximize the effective use of IC in improving financial performance and promoting stability in the banking market. Following RBT, companies with effective and efficient resources can enhance their competitive advantage and deliver superior performance. In line with the opinion of

Chowdhury et al. (2018), the industry can develop the effective use of IC to increase existing profit margins through higher productivity and greater efficiency.

However, given that the VAIC component in HCE and CEE does not contribute to improving financial performance as measured by ATO, these findings indicate that the effect of the VAIC component differs quite considerably. This is because banks in Indonesia need to be more efficient and effective in managing their capital and employees in terms of their contribution to improving financial performance. Management should therefore pay greater attention to the use of capital and the knowledge and skills of employees to improve company performance. This supports the opinion presented by Kasoga (2020) that a combination of these elements will result in more significant innovation in products or services, and processes.

Based on the research findings, SCE significantly affects ROE but does not affect ROA and ATO. While there is an effect on ROE, companies can further improve their financial performance on other measures through technology and supporting facilities, which can be a starting point for improving strategic IC performance (Chowdhury et al., 2018). While this study has many limitations beyond the scope of the current discussion, the researcher provides the following suggestions for further research. Despite the high level of emerging business competition in Indonesia, this study has considered only the banking sector.

This study uses secondary data and employs panel data analysis to examine the impact of IC on Financial Performance in bank companies listed on the IDX. In addition, this study also controls for heteroscedasticity and autocorrelation problems by using robust standard errors. However, there are some limitations that the number of samples studied is not too large. Therefore, for future research, it can include samples of bank companies that are not public to get a larger data sample. In addition, it can add some studies in neighbouring countries such as in Southeast Asia etc.

Further research is therefore required in other industries, including manufacturing, textiles, or food and beverages, to expand the actual knowledge and evaluate the IC findings from this study in different sectors in Indonesia. In addition, this study has only discussed the influence of IC on financial performance. Further research may therefore examine the relationship between corporate governance and IC, given its importance, as a critical element in the management of companies for competitive advantage in the increasingly advanced industrial revolution era.

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## ASSESSMENT OF THE IMPACT OF CUSTOMS REGULATION FACTOR ON FOREIGN TRADE OF KAZAKHSTAN<sup>4</sup>

*The development of Kazakhstan's foreign trade is a central factor in Kazakhstan's economic growth, and therefore it is important to understand which trade procedures have a negative and positive aspect on the development of trade relations between countries. Customs procedures are an integral part of the passage of international borders. It is significant that such procedures do not have a negative impact on trade. The article on the basis of the gravitational model of foreign trade assesses the influence of the factor of customs regulation, namely the implementation of customs procedures at the border for the development of exports and imports of Kazakhstan. The models are based on bilateral trade data from Kazakhstan with 53 countries for the period 1995-2021, with partner countries divided into three groups depending on the income level of the countries to obtain better results. Independent variables reflecting customs regulation were countries' participation in the Revised Kyoto Convention (RKC), time and cost of customs formalities at the border according to the World Bank Report «Doing Business» (Trading across borders). The study concluded on the impact of customs regulation on the foreign trade of Kazakhstan, with the time factor playing a more significant role than transaction costs on customs clearance. At the same time, the participation of countries in the RKC has a positive impact on the development of bilateral trade. The assessment of the impact of customs procedures on the development of foreign trade confirms the need for customs regulatory reforms.*

*Keywords: customs regulation; customs procedures; foreign trade; gravity model; trade and customs policy*

*JEL: F13; F14; F17*

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## 1. Introduction

The foreign trade of states is an important component of the development of economic integration processes, in which virtually all countries of the world are involved. Through international trade, countries are filling their own resource gaps and have the opportunity to profit by trading a surplus of domestic production. A well-designed trade policy provides the impetus for the sustainable development of a country's economy.

The Republic of Kazakhstan, like most of the countries of the former Soviet Union, is a small open economy characterized by dependence on foreign trade. This fact suggests that it is important for economic development to understand which factors have a positive impact on the change in imports and exports.

In recent decades, it has become clear that the simplification and harmonization of procedures related to international trade are significantly increasing its volume. Many international organizations, the main ones being the World Trade Organization (WTO) and the World Customs Organization (WCO), have as their main objective to make trade as smooth, predictable and free as possible.

Trade facilitation implies the modernization, standardization and harmonization of trade procedures for exports and imports (WTO, 2015a). In other words, the entire trade facilitation process, which affects both business and the State, is aimed at reducing the transaction costs of foreign trade.

An important role in the implementation of the trade in goods between countries is played by customs regulation, namely the activities of customs authorities to establish the order and conditions for the movement of goods across the customs border. The world's customs administrations are undergoing global changes to the extent that the country is developed. Such reforms are based on the « provision of digital solutions to expand on trade facilitation and improve risk management» (WCO, 2022).

The main purpose of this paper is to try to assess the impact of the customs facilitation process, as part of the above trade processes, on the development of imports and exports of the country on the example of Kazakhstan's trade with a group of countries with different income levels through the construction of a gravity model, which is a convenient tool, relevant for research.

The gravitational model proposed in this paper is based on the variables that most accurately characterize the impact of customs regulations on foreign trade: participation of countries in the RKC as well as the time and financial costs incurred by exporters and importers to pass the formalities at the border based on the World Bank Report «Doing Business», «Trading borders across», taking into account the level of economic development of the partner countries of Kazakhstan.

Previous studies have shown that the application of the rules of the RKC guarantees substantial economic and non-economic benefits. Such advantages may also include decreasing the trading costs of participants in international trade (Yasui, 2010). Despite the fact that the administration of the World Bank has refused to compile the ranking of countries

according to the terms of doing business «Doing Business», these reports are an indicative tool to assess the state of international trade.

In constructing the proposed models, we assume that variables based on World Bank data, related to importers' and exporters' costs of administrative procedures at the customs border, are factors of customs regulation. Given that the level of improvement, including digitalization of customs processes mentioned by WCO, is at different stages of application, models in this paper are based on trade flows of countries according to their level of income. In our opinion, such an approach will allow us to see more accurately the impact of customs regulation of foreign trade on the imports and exports of Kazakhstan depending on the level of development of the partner country.

The results obtained in this article can be used for research in the field of trade and customs policy, as well as serve as an evidence base for managerial decisions in customs regulation and for the formation of trade policy.

## **2. Literary Review**

The State's trade policy in the field of trade facilitation is closely related to other aspects of its economic and political life, which are often very difficult to change (Hillberry and Zhang, 2018). In particular, it is aimed at finding improvements in the trading environment aimed at reducing transaction costs between businesses and government. Thus, both business and government stakeholders benefit from the goals of trade facilitation, harmonization, standardization and modernization. It should be noted that the international trading environment is complex and the implementation of concepts and recommendations on trade facilitation is carried out with obstacles (Grainger, 2008).

One of the papers notes that the importance of customs remains and will be a priority in the development of foreign trade, regardless of whether trade facilitation will be decisive in the implementation of the country's trade policy. This situation is explained by the fact that customs will continue to be responsible for the effective management of borders in order to facilitate trade. This function of customs authorities plays a significant role in the formation of the country's international competitiveness (De Wulf, 2005). At the same time, during a certain period of growth in international trade, technology and other factors, the customs administrations of the world found themselves under institutional pressure, when it is necessary to balance supply chain security, replenishment of the state budget and trade facilitation. This conclusion was reached by a Jordanian researcher (Alsharari, 2022).

In the field of studying the effects of foreign trade, there are papers about the impact of the development of customs procedures on the change of bilateral trade, for example, the hypothesis of a rise in trade flows between Singapore and Japan, as a result of automation of customs regulation processes (Hertel, 2001), has been proved. In another paper, based on an econometric analysis of World Bank data, an interesting conclusion is made that countries with simpler customs procedures reduce the time spent on imports, while trade facilitation policies are more effective in countries with high incomes and better governance institutions (Hillberry, Zhang, 2018). In addition, there have been numerous studies of various factors

influencing the development of international trade based on the gravitational model, starting with the work of Linder (1961), Tinbergen (1962) and Linnemann (1966). The popularity of this empirical model is explained by the fact that gravity models play a leading role in explaining trade flows (Wilson, 2005).

Classical gravity models are based on the study of the development of bilateral trade of countries in direct relation to their size (GDP) and inversely to the distance between them. To understand what other factors, affect international trade, researchers include various explanatory variables, such as the language of communication in trading countries, the commonality of their borders and much more. For example, more than 70 variables for the development of trade between European countries, including the time of participation in the European Union, the Euro area, etc., have been assessed by means of a gravity model (Beck, 2020).

At the same time, there are other types of gravitational models that consider, for example, the impact of trade facilitation processes on changes in foreign direct investment flows (Onyango, Kiriti-Nganga, 2016), the impact of migratory flows (Arcangelis, 2022) or carbon emissions (Zhao, 2022) to develop the country's imports and exports.

Its own interpretation of the gravitational model is presented in the work of Zlatinov, Kosev & Shalamanov, which considered the influence of the production, internal electricity consumption, as well as regulations in the field of electricity export to change the growth of electricity exports of the countries of South-Eastern Europe (Zlatinov, 2022).

Past researches to achieve a goal similar to our work, based on the construction of a gravitational model, showed the following results.

To study the impact of trade facilitation on trade flows in Asia and the Pacific, John S. Wilson and others (Wilson, 2003) used country data on port efficiency, customs environment, e-business usage and many other factors. At the same time, the customs environment was understood as an integrated index consisting of an assessment of hidden import barriers, import fees, corruption, etc. The study found that customs facilitation enhances international trade opportunities, but to a lesser degree than improving port efficiency in partner countries.

The same group of authors later attempts to evaluate by means of the gravitational model of the theory of international trade, also using the variable «customs environment», which in this study consists of hidden barriers and bribes in the customs authorities. The results of the model showed that the country's exports are growing with improved customs procedures in the partner country, as well as the simplification of customs formalities can significantly reduce the cost of imports even if the customs tariffs are unchanged (Wilson, 2005).

The difference between Wilson and the present study on the impact of customs on imports and exports lies in the nature of partner countries of Kazakhstan, which in our study are grouped by income level, in the content of the variable «customs environment» as well as our consideration of changes in the level of customs procedures in both importing and exporting countries.

Another approach to assessing the impact of changes in trade procedures in Central Asian countries on foreign trade has been taken by researchers through the World Bank's Logistics

Performance Index (LPI) in the gravity model, including an indicator «Efficiency of customs services». The study also confirmed the finding that trade facilitation in Central Asian countries is making progress in trade (Felipe, Kumar, 2012). The models, constructed in this paper, show a picture of the impact on international trade of a set of factors, without highlighting progress in customs regulation separately, as such a goal was not set by researchers.

Another study of the impact of temporary delays in the delivery of goods from the sender's warehouses to the ship on international trade in 98 countries showed that each additional day of delay of goods reduces turnover by 1% (Djankov, 2006). The article under consideration also uses data from Doing Business regarding the time of delivery, but this indicator reveals problems of a different nature than the questions of our research.

Toševska-Trpčevska & Tevdovski (Toševska-Trpčevska, 2014) also use Doing Business data in their work on the impact of customs and administrative procedures on the trade of South-Eastern European countries. However, in assessing customs and administrative procedures, researchers have used the time and cost for documentary confirmation to export and import, associated with compliance with the requirements of all government agencies of the origin economy, the destination economy and any transit economies. The study concluded that the countries involved in the modelling needed to have more influence on the adoption of measures to reduce the time and costs required for border crossing.

The difference between the data reflected in the study of Toševska-Trpčevska & Tevdovski and our work is the key variables were information on time and costs, the exporter and importer incurred in the crossing of customs clearance and customs inspection as the main and resource-intensive types of government control at the border.

### **3. Methodology**

The paper proposed several models for analysis based on various studies related to the application of the gravity model of international trade.

The first part of this section describes gravitational models of foreign trade on the example of foreign trade operations of the Republic of Kazakhstan with 53 partner countries during the period 1995-2021. The second part contains descriptions of each of the variables and sources of information used for their generation.

#### *3.1. The Empirical Model*

The Model 1 hypothesis: The similarity of customs procedures applied in trade partner countries to simplify and harmonize them has a positive impact on the development of a country's foreign trade.

The RKC, which entered into force on 3 February 2006, is a model of modern and efficient customs procedures in this century and contributes to trade facilitation and effective State control of goods, moving across customs borders (WCO, 2008).

Therefore, the hypothesis is based on the assumption that the participation of partner countries in the RKC suggests a commonality and similarity of customs procedures in both countries.

The Model 1 is thus as follows:

$$LNTRADE_{Kj} = \beta_0 + \beta_1 LNGDP_{Kj} + \beta_2 LNDIST_{Kj} + \beta_3 RKC_{dummy} + \varepsilon \quad (1)$$

where:

$GDP_{Kj}$  is the real GDP of Kazakhstan and other countries;

$DIST_{Kj}$  is the distance between countries;

$RKC\_dummy$  is a dummy variable reflecting the fact of the country's participation in the RKC.

This model is not complicated by additional variables common in the construction of gravity models of foreign trade, in order to avoid the effects of multicollinearity and other negative effects of a large number of predictors.

For Models 2-5, Kazakhstan's partner countries are divided into three income groups (World Bank classification for Doing Business): high income (30 observations), low and middle income (10) and upper middle income (12). This grouping is due to the wide variation in the time and cost spent on customs and other formalities at the border, depending on the development of the country. The proposed method will also make it possible to see what impact transaction costs of time and finance have depending on the level of development of the country.

The hypothesis for Models 2-5: the increase in time and cost spent on customs formalities at the counterparty's country border negatively affects the development of exports and imports of goods from Kazakhstan.

In order to avoid the multicollinearity of the TIME and COST variables, their separation was carried out:

$$LNIMP_{Kj} = \beta_0 + \beta_1 LNGDP_{Kj} + \beta_2 LNDIST_{Kj} + \beta_3 LNTIME_{expj} + \varepsilon \quad (2)$$

$$LNIMP_{Kj} = \beta_0 + \beta_1 LNGDP_{Kj} + \beta_2 LNDIST_{Kj} + \beta_3 LNCOST_{expj} + \varepsilon \quad (3)$$

$$LNEXP_{Kj} = \beta_0 + \beta_1 LNGDP_{Kj} + \beta_2 LNDIST_{Kj} + \beta_3 LNTIME_{impj} + \varepsilon \quad (4)$$

$$LNEXP_{Kj} = \beta_0 + \beta_1 LNGDP_{Kj} + \beta_2 LNDIST_{Kj} + \beta_3 LNCOST_{impj} + \varepsilon \quad (5)$$

where:

$IMP_{Kj}$ ,  $EXP_{Kj}$  – import and export of Kazakhstan to the group of countries j;

$TIME_{expj}$ ,  $COST_{expj}$  – time and cost spent on compliance with customs rules in group of countries j when exporting to Kazakhstan;

$TIME_{impj}$ ,  $COST_{impj}$  – time and cost spent on compliance with customs regulations in the group of countries j when importing goods from Kazakhstan.

On the basis of the conclusions of the Models 2-5, Model 6 was constructed:

$$LNIMP_{Kj} = \beta_0 + \beta_1 LNGDP_{Kj} + \beta_2 LNDIST_{Kj} + \beta_3 LNTIME_{expj/impK} + \varepsilon \quad (6),$$

where:

$TIME_{expj/impK}$  – the ratio of time spent on customs formalities in the country of export of group of countries  $j$ , and time on customs clearance in Kazakhstan at import.

The hypothesis of this model is that the increase in the time spent on customs procedures in both countries has a negative impact on the growth of imports in Kazakhstan.

### 3.2 The Data

To construct the proposed models have been selected 53 countries which have accumulated with the Republic of Kazakhstan the largest volume of foreign trade in goods in 2021, namely more than 0.1% of total exports and imports in 2021. The study uses annual data from 1995 to 2021 to examine long-term factors affecting international trade.

At the same time, Table 1 provides information on the countries according to their income level according to the World Bank grouping for the Doing Business report, as well as the share of the country's foreign trade in the total foreign trade of Kazakhstan. Kazakhstan belongs to the third group of countries.

The International Monetary Fund database is the source of data on Kazakhstan's foreign trade with a group of selected countries. Information on the real GDP of the countries (base year 2015) is obtained from the World Bank Database. The distance between the countries is formed by the French research and expertise centre CEPII.

To construct the first model, additional information was used as of 25 June 2022 on the date of the signature without reservation or of deposit of instruments of ratification or accession to the International Convention on the Simplification and Harmonization of Customs Procedures (RKC) as amended, available on the World Customs Organization website (WCO, 2008).

Data for the key variables of the following models proposed in the study on the state of customs regulation are obtained from the historical data of the Doing Business Report of the World Bank for the period from 2015 to 2020. Although the World Bank administration has decided to abolish such a rating, it contains meaningful data on the time and transactions cost incurred by importers and exporters when crossing the customs borders of the States.

To solve the formed task to determine the role of customs regulation in the development of foreign trade, we focused on the indicator «Border compliance», because it reflects information on the implementation of requirements at the border, compliance with the customs regulations of the country (this segment includes the time and cost of customs clearance and customs clearance procedure customs inspection).



**Table 1. Income grouping of countries**

№	High-income countries	Share in trade turnover, 2021, %	Low-income and lower middle-income countries	Share in trade turnover, 2021, %	Upper middle-income countries	Share in trade turnover, 2021, %
1	Austria	0.22	Afghanistan	0.63	Algers	0.15
2	Belgium	0.56	Egypt	0.11	Azerbaijan	0.44
3	Brunei Darussalam	1.18	India	2.61	Brazil	0.23
4	Canada	0.66	Indonesia	0.24	Bulgaria	0.52
5	Croatia	0.91	Morocco	0.17	China	23.92
6	Czech Republic	0.34	Tajikistan	1.55	Georgia	0.12
7	Denmark	0.16	Pakistan	0.13	Iran	0.59
8	Finland	0.40	Ukraine	1.36	Malaysia	0.14
9	France	4.07	Uzbekistan	5.10	Mexico	0.23
10	Germany	2.92	Vietnam	0.57	Romania	2.09
11	Greece	1.79			Thailand	0.19
12	Hungary	0.18			Turkey	5.46
13	Ireland	0.19				
14	Israel	0.35				
15	Italy	12.97				
16	Japan	1.48				
17	Korea	3.52				
18	Lithuania	0.60				
19	Malta	0.39				
20	Netherlands	6.13				
21	Norway	0.11				
22	Poland	1.00				
23	Singapore	1.54				
24	Slovakia	0.11				
25	Spain	2.43				
26	Sweden	0.31				
27	Switzerland	1.71				
28	United Arab Emirates	0.93				
29	United Kingdom	1.55				
30	USA	2.95				

Source: Compiled by the author.

Next, consider approaches to the formation of variables for research.

The dependent variable for Model 1 is Kazakhstan's bilateral trade (K) with contracting countries (j), expressed by the natural logarithm of the sum of annual exports and imports between countries on average over the period 1995-2021 (53 observations) (Beck, 2020):

$$TRADE_{Kj} = \ln \left[ \frac{1}{T} \sum_{t=1}^T (IMPORT_{Kjt} + EXPORT_{Kjt}) \right] \quad (7)$$

The explanatory variable applied to each model is the real GDP resulting from (Beck, 2020):

$$GDP_{kj} = \frac{1}{T} \sum_{t=1}^T |GDP_j - GDP_K| \quad (8)$$

The  $DIST_{jk}$  variable is an indicator of the distance between the capitals of Kazakhstan and the contracting country, as these cities are often the centres of trade of the state.

The following variable is a dummy variable and one of the keys in this study, which defines the role of simplification and harmonization of customs procedures in the development of international trade ( $RKC\_dummy$ ). Its formation for «1» took a year, both countries were parties to the RKC, otherwise, this variable was assigned a value equal to «0». For the final construction of the dummy variable, the average for each country is taken.

Natural logarithms of average values for time and cost of customs procedures for the period 2015-2020 were taken in the formation of variables related to determining the impact of customs procedures on the development of foreign trade ( $TIME_{exp}$ ,  $TIME_{imp}$ ,  $COST_{exp}$ ,  $COST_{imp}$ ). The selected period is due to the revision and improvement of the methodology of rating formation on the indicator «Border compliance» since 2015.

For Model 5, an additional  $TIME_{exp/impK}$  variable was used, which is a natural logarithm of the ratio of the average index of the group of countries  $j$  for 2015-2020 «Time for export» to the average for the same period for the indicator «Time for import» of Kazakhstan.

At the same time, it should be noted that to obtain a logarithm of zero values according to the data of customs procedures assigned to 0.001 hours, which are translated in minutes. Similar to the value of customs procedures: value 0 was converted to 0.001 United States dollars, which has been transferred to American cents.

Calculations were made using EViews 12 Student Lite method of least squares.

#### 4. Results and Discussion

The modelling generated in the results is presented in Tables 2-4.

Table 2 shows the results of Model 1, aimed at understanding the role of country participation in the RKC. This model not only showed the expected results regarding the direct relationship of bilateral trade to the GDP of both countries and the inverse relationship of the explained variable to the distance between countries, but also confirmed the hypothesis that both countries' participation in the RKC implies an increase in States' imports and exports. At the same time, Model 1 reveals a significant direct relationship between the dummy variable and the dependent at the significance level of 5%.

**Table 2. Empirical Results of the Gravity Model 1**

Independent variables	LNTRADE <sub>Kj</sub> dependent variable for 53 observations		
	Coefficient	t-Statistic	p-value
$LNGDP_{Kj}$	1.006	5.317	0.000
$LNDIST_{Kj}$	-1.914	2.788	0.007
$RKC\_dummy$	3.461	1.927	0.059
Constant	11.674	2.146	0.036
R <sup>2</sup>	0.41		
F-statistic	11.34		

Although the determination factor is less than 50%, we assume the model is fairly stable, as it contains few variables for the reasons given above. All variables are significant, as confirmed by F-statistic.

The equation derived from model construction:

$$LNTRADE_{Kj} = 11,674 + 1,006LNGDP_{Kj} - 1,914\beta_2LNDIST_{Kj} + 3,461RKC_{dummy} \quad (9)$$

Table 3 presents the results of Models 2-6 for imports and exports of Kazakhstan with a group of high-income countries.

**Table 3. Results of Gravitational Models 2-6 with a high-income group of countries**

Independent variable	Dependent variable $LNIMP_{Kj}$		Dependent variable $LNEXP_{Kj}$		Dependent variable $LNIMP_{Kj}$
	Model 2	Model 3	Model 4	Model 5	Model 6
$LNGDP_{Kj}$	1,11 (0,000)*	1,13 (0,000)*	0,71 (0,000)*	0,70 (0,000)*	1,10 (0,000)*
$LNDIST_{Kj}$	- 3,84 (0,000)*	-3,71 (0,010)*	-1,21 (0,278)*	-0,82 (0,487)*	-3,84 (0,005)*
$LNTIME_{expj}$	-0,28 (0,046)*				
$LNCOST_{impj}$				-0,08 (0,216)*	
$LNTIME_{impj}$			-0,11 (0,358)*		
$LNCOST_{expj}$		-0,11 (0,190)*			
$LNTIME_{expj/impK}$					-1,36 (0,046)
Constant	24,23 (0,016)*	22,17 (0,035)*	7,15 (0,377)*	4,00 (0,645)*	24,24 (0,016)*
R <sup>2</sup>	0,54	0,49	0,42	0,44	0,53
F-statistic	10,01	8,44	6,27	6,68	10,01
No of Obs.	30	30	30	30	30

\* p-value data are in brackets, 5% level value

Based on Table 3, Models 2-5 show the inverse relationship of cost and time costs incurred in the group of j high-income countries, but only Model 2 has a significant variable ( $LNTIME_{expj}$ ). This model supports the assumption that the time spent by the exporter on the export of goods affects the import volumes of Kazakhstan, namely, by reducing export processing time in countries j by 10% will lead to more than 20% increase in Kazakhstan's imports.

Currently, the largest volume of goods imported into Kazakhstan is imports from the European Union countries (in 2021 – 24.8%). It can be assumed that the ease of customs procedures when sending goods from EU countries is an important factor in the development of trade with such countries.

The cost of the exporter in Model 3 showed a weak relationship. This can be explained by the fact that in the European Union countries, which are mainly high-income countries, there are no export processing costs.

A partial explanation for the fact that the importer's time and financial costs do not affect Kazakhstan's exports may be the policy in place to prioritize exports of manufactured products

Obtained equations for Models 2-5:

$$LNIMP_{Kj} = 24,23 + 1,11LNGDP_{Kj} - 3,84\beta_2LNDIST_{Kj} - 0,28\beta_3LNTIME_{expj} + \varepsilon \quad (10)$$

$$LNIMP_{Kj} = 22,17 + 1,13LNGDP_{Kj} - 3,71\beta_2LNDIST_{Kj} - 0,11\beta_3LNCOST_{expj} + \varepsilon \quad (11)$$

$$LNEXP_{Kj} = 7,15 + 0,71LNGDP_{Kj} - 1,21LNDIST_{Kj} - 0,11\beta_3LNTIME_{impj} + \varepsilon \quad (12)$$

$$LNEXP_{Kj} = 4,00 + 0,70LNGDP_{Kj} - 0,82LNDIST_{Kj} - 0,08LNCOST_{impj} + \varepsilon \quad (13)$$

The most significant according to the p-value for the key variable ( $LNTIME_{expj}$ ) and the determination ratio was Model 2. Based on this specification, a new variable is introduced, which describes the change in the time spent on the customs procedure, both high-income and high-income exports are spent in Kazakhstan – the country of imports and export groups.

The model also confirmed the hypothesis that the time costs incurred by the high-income exporter of the group j countries, as well as similar costs in Kazakhstan, were inversely related.

Consider Model 2-5 for low-income and lower-middle-income countries, the results are presented in Table 4.

**Table 4. Results of low-income and lower-middle-income gravity Models 2-5**

Independent variable	Dependent variable $LNIMP_{Kj}$		Dependent variable $LNEXP_{Kj}$	
	Model 2	Model 3	Model 4	Model 5
$LNGDP_{Kj}$	0,56 (0,378)*	-0,15 (0,243)*	0,62 (0,261)*	0,43 (0,419)*
$LNDIST_{Kj}$	-0,71 (0,471)*	0,19 (0,434)*	-2,30 (0,032)*	-2,07 (0,052)*
$LNTIME_{expj}$	-2,39 (0,084)*			
$LNCOST_{impj}$				-1,77 (0,184)*
$LNTIME_{impj}$			-1,30 (0,106)*	
$LNCOST_{expj}$		3,99 (0,000)*		
Constant	16,85 (0,135)*	-0,94 (0,696)*	20,68 (0,033)*	25,8 (0,042)*
R <sup>2</sup>	0,45	0,97	0,42	0,51
F-statistic	1,63	63,75	2,70	2,04
No of Obs.	10	10	10	10

\* p-value data are in brackets, 5% level value

This group of models showed the following results: the distance between countries when buying goods from low-income and lower-middle-income countries is not determinative. It should be noted that most of the countries in this group are slightly distant from Kazakhstan. Key variables of customs regulation were also not relevant. The composition of imports from the category of countries in question explains that the exporter's costs are not significant when importing: from low-income countries, Kazakhstan imports vegetables and fruits that are not available in the country, that is, goods with high demand (according to statistics). The export structure of Kazakhstan's goods is similar: animal and vegetable products and food.

Thus, the structure of trade may explain the low level of customs simplification in both the country of import and the country of export.

Model 3 showed not only inconsistency with the main patterns of gravity models for GDP variables and distance between countries, but also the absence of a previously identified pattern: The level of cost of customs clearance of exports does not affect the increase in the import of goods. In addition, the determination ratio of this Model 3 variant indicates that 97% of the model is driven by these variables. There may be barriers in low-income countries that are more significant than those discussed in Model 3. The multicollinearity test showed negative results, meaning the variables are not correlated. F-statistic rejects the null hypothesis of no meaningful relationship between independent and dependent variables.

The equation of this group:

$$LNIMP_{Kj} = 16,85 + 0,56LNGDP_{Kj} - 0,71\beta_2LNDIST_{Kj} - 2,39\beta_3LNTIME_{expj} + \varepsilon \quad (14)$$

$$LNIMP_{Kj} = -0,94 - 0,15LNGDP_{Kj} + 0,19\beta_2LNDIST_{Kj} + 3,99\beta_3LNCOST_{expj} + \varepsilon \quad (15)$$

$$LNEXP_{Kj} = 20,68 + 0,62LNGDP_{Kj} - 2,30LNDIST_{Kj} - 1,30\beta_3LNTIME_{impj} + \varepsilon \quad (16)$$

$$LNEXP_{Kj} = 25,8 + 0,43LNGDP_{Kj} - 2,07LNDIST_{Kj} - 1,77LNCOST_{impj} + \varepsilon \quad (17)$$

**Table 5. Results of gravity Models 2-5 with a group of countries with upper-average incomes**

Independent variable	Dependent variable $LNIMP_{Kj}$		Dependent variable $LNEXP_{Kj}$	
	Model 2	Model 3	Model 4	Model 5
$LNGDP_{Kj}$	0,59 (0,002)	0,61 (0,001)	-0,02 (0,885)	0,02 (0,890)
$LNDIST_{Kj}$	-0,31 (0,579)	-0,30 (0,583)	-1,88 (0,049)	-1,93 (0,039)
$LNTIME_{expj}$	-0,13 (0,521)			
$LNCOST_{impj}$				-1,18 (0,246)
$LNTIME_{impj}$			-0,26 (0,308)	
$LNCOST_{expj}$		-0,10 (0,469)		
Constant	0,73 (0,874)	0,46 (0,918)	22,19 (0,010)	21,75 (0,010)
R <sup>2</sup>	0,72	0,72	0,51	0,53
F-statistic	6,77	6,91	2,70	2,99
No of Obs.	12	12	12	12

\* p-value data are in brackets, 5% level value

The group models presented in Table 5 show that in upper-middle income countries, the time and cost of border formalities, most of which are customs formalities, are not significant (time and cost variables are not relevant).

It should be noted that Kazakhstan also belongs to this group of countries, which also influenced the results shown by the model: countries have an approximate level of development and almost all countries are parties to the RKC and the WTO Agreement on Trade Facilitation, which makes the facilitation of customs formalities a priority in the customs policy of these countries, that is, it can be concluded that the applicable customs regulations in the partner countries are similar. As a result of these circumstances, customs regulation is still relevant in trade with these countries, based on the findings of Model 1.

Models 2, 3 and 5 show the usual results relative to the GDP of countries and the distance between them. The exception is Model 4, which demonstrates the negative impact of the GDP of countries on export development, but the F-statistic for this model says that there is no significant link between the dependent and independent variables, However, the p-value of the GDP variable in question is not significant, so it is possible to exclude the value from the analysis by accepting the background of the key independent variable.

It should be noted that the time cost variable is most significant in the models presented. It can be assumed that time is the most sensitive factor when crossing the customs border, while transaction costs associated with border procedures are not the most important.

The equation for models presented in Table 6:

$$LNIMP_{Kj} = 0,73 + 0,59LNGDP_{Kj} - 0,31\beta_2LNDIST_{Kj} - 0,13\beta_3LNTIME_{expj} + \varepsilon \quad (18)$$

$$LNIMP_{Kj} = 0,46 + 0,61LNGDP_{Kj} - 0,30\beta_2LNDIST_{Kj} - 0,10\beta_3LNCOST_{expj} + \varepsilon \quad (19)$$

$$LNEXP_{Kj} = 22,19 - 0,021LNGDP_{Kj} - 1,88LNDIST_{Kj} - 0,26\beta_3LNTIME_{impj} + \varepsilon \quad (20)$$

$$LNEXP_{Kj} = 21,75 + 0,2LNGDP_{Kj} - 1,93LNDIST_{Kj} - 1,18LNCOST_{impj} + \varepsilon \quad (21)$$

## 5. Conclusion

Currently, large-scale work is being carried out in the Republic of Kazakhstan to simplify trade procedures, which is based primarily on the reform of customs procedures. The priority of customs regulation is an electronic declaration, an important part of that is customs risk management.

The purpose of this study is to determine, based on gravity models, the role of the customs regulation factor in the development of bilateral trade between Kazakhstan and the countries with the closest trade relations. At the same time, in order to obtain a more complete analysis, Kazakhstan's partner countries are divided into three groups depending on their income level. A model based on the simultaneous participation of countries in the RKC. Such a model is necessary to answer the question of whether similarity in customs procedures is a positive factor for the development of bilateral trade between countries.

The factor of customs regulation of foreign trade in this paper is determined by the World Bank data on the time and cost incurred by importers and exporters for crossing the customs border.

The application of the gravity model in this article was aimed at obtaining conclusions on the role of customs regulation in the development of exports and imports, which is justified by the need to apply a differentiated approach to the implementation of the foreign trade policy of the country. This paper is based on trade data from Kazakhstan with a group of selected countries, but the findings can be extrapolated to other small open economies as well as international trade studies. The conclusions of the study could serve as an evidence base for the development of an effective trade capacity-building strategy for Kazakhstan and other countries with similar indicators.

The assessment of the impact of customs regulation on the development of Kazakhstan's foreign trade showed diverse results depending on the specifications of the models, which were designed to consider the differences in the size of the economies of the countries, participating in bilateral trade with Kazakhstan. The use of the proposed approach to modelling and design gives the government and business more information on which combinations of terms of trade can provide positive changes related to the growth of exports and imports.

One model confirmed earlier research findings that participation in the RKC led to increased bilateral trade. This fact should be considered in the formulation of the trade and customs policy of States, developing instruments of customs regulation based on the fundamental principles of simplification of customs procedures laid down in this international agreement.

An analysis of Kazakhstan's exports and imports with high-income countries concluded that Kazakhstan's imports were adversely affected by export delays from partner countries. Given that most of the countries in this grouping do not have the cost of customs clearance of exports and imports, the models have shown that these variables are not significant, but still revealed the negative dependence of such variables on Kazakhstan's exports and imports. Another model in this group, however, showed that the time spent on exports in the country of departure and the same delays in clearing customs in the country of destination could negatively affect Kazakhstan's imports.

Considering the structure of Kazakhstan's imports and exports to low-income and lower-middle-income countries, the model, with the expected outcome relative to GDP and the distance between countries, showed that key variables were not relevant. Perhaps, in order to get clearer conclusions, it is necessary to take as a basis the export and import that are not essential goods. There are, however, a number of economic problems in low-income countries that are of higher priority than the factors addressed.

A third category of middle-income countries confirmed the finding that the harmonization of customs procedures aimed at simplification in partner countries had a positive impact on the development of both exports and imports of goods.

Summarizing the above observations, it can be noted that the time spent at the border in customs clearing goods plays a bigger role than the financial costs of exporters and importers.

At the same time, improved customs procedures can facilitate trade and contribute to the growth of a State's foreign trade.

Thus, the assessment of the impact of customs regulations provides for trade policy policymakers information on the nature of trade relations with countries of different income levels and also confirms the need for customs regulatory reforms, which will eventually lead to the development of trade as a fundamental factor of economic well-being for Kazakhstan's economy.

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## **BULGARIAN AND FOREIGN PATENT ACTIVITY IN BULGARIA AND BULGARIAN PATENT ACTIVITY ABROAD BY TECHNOLOGICAL AREAS AND FIELDS FOR THE PERIOD 2010- 2021<sup>2</sup>**

*As an indicator of technological changes in the economy, patents also express the inventive potential of a specific country to use knowledge and transform it into potential economic benefits. In this regard, the main goal of the study is: to determine the state and dynamics of patent activity through an analysis of Bulgarian and foreign patent activity in Bulgaria and Bulgarian patent activity abroad for the period 2010-2021. The trends of technological development are revealed – by certain technological areas and fields and by patent-holder countries. Some of the existing trends in patent research and their role as an indicator of the rate and technological change in the economy are also considered. The significance of the study is to consider the role of patents in revealing trends of technological development and to lay the foundations for future in-depth research on the issue.*

*Keywords: patent activity; patent applications; patent grants; technology areas; technology fields*

*JEL: O32; O34; O55*

### **1. Introduction**

Inventive activity has accompanied human history for thousands of years and has given impetus to the development of society. As an active factor for achieving progress, the invention is a cornerstone around which the legal system in the field of industrial, and subsequently – in the field of intellectual property was born and developed. The patent system was established.

Patents grant the owner of the patentable invention exclusive rights for a period (most often 20 years from the filing date) within the territory of the country that granted the patent. A patent can be granted for an invention that meets the criteria: novelty, non-obviously, industrial applicability. It should be noted that the legislation of the individual countries also set additional requirements that an invention must meet to be patented, i.e., those inventions

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that do not qualify for patentability are determined even if they meet the criteria for patentability.

Patents are often used to measure the results of science and technology activity (OECD Oslo Manual, 1997). They are not only an indicator of technological change in the economy but express the inventive potential of a particular country to use knowledge and transform it into potential economic benefits. Patenting beyond the national borders of the patentee on the other hand, indicates export, investment intentions or willingness to grant licenses for the patented invention, as well as the technological specialization and orientation of a specific country or firm towards certain technological areas and technological fields.

The research interest of the author in the study of this issue is dictated not only by its relevance and the growing importance of intellectual property rights in modern times, but also by the fact that patents provide an opportunity to reveal the trends of technological change in the economy.

**The object** of this study is the development of individual technological areas and technological fields.

**The subject** of the study is the Bulgarian and foreign patent activity in Bulgaria and the Bulgarian patent activity abroad for the period 2010-2021.

In this regard, the **purpose** of the study is to: through an analysis of the Bulgarian and foreign patent activity in Bulgaria and the Bulgarian patent activity abroad for the period 2010-2021, to investigate the state and dynamics of patent activity; reveal the trends of technological development – in certain technological areas and technological field and by patentee countries.

The analysis of patent activity in Bulgaria (national and foreign) will allow us to draw conclusions and forecasts for the technological opportunities open both to Bulgarian and foreign companies and to the country.

To achieve the formulated objective, the following tasks have been derived:

1. Analysis of the patent application activity for the period 2010-2021 of Bulgarian and foreign applicants.
2. Tracking the dynamics of the granted patents for the period 2010-2021.
3. Revealing the trends of technological development by analyzing the number of patents applied for and granted by technological areas and fields.

The questions to which this study seeks an answer are reduced to: What are the state and dynamics of patent activity in Bulgaria? What are the most dynamically developing technology areas in Bulgaria? Which are the fields with the strongest concentration of Bulgarian and foreign patents? Which countries demonstrate the highest patent activity in Bulgaria?

**The limitations** in the present study are reduced to:

- The research period is limited in time from 2010 to 2021 due to the specifics of data collection and submission by the World Intellectual Property Organization (WIPO) through the *WIPO Statistic Data Center* and the lack of data for 2022.
- The survey does not include data on patents applied for and granted that are not classified according to the International Patent Classification (IPC).
- The scope of the analysis covers only patents with assigned classes under the *IPC*, included in the *New Concept of Technology Classification of WIPO* (see Table 2).
- The analyzed patent activity includes patents applied for and granted through Bulgarian Patent Office and the Patent Cooperation Treaty (PCT). The activity of foreign applicants conducted through the European Patent Office and other regional patent organizations remains outside the scope of the study.

The presented research and the scientific results achieved will enrich the research in the field of industrial property. The significance of the study is to consider the role of patents in revealing trends of technological development and to lay the foundations for future in-depth research on the issue.

## **2. Literature Review**

Patents are a significant indicator of the innovativeness of an economy and the degree of development of research. In recent years, they have become a powerful technological competitive advantage. Patent statistics are therefore a useful tool for revealing technological development trends.

Among the first researchers to raise the question of using patent statistics as an economic indicator are Scherer (1965a, 1965b), Muller (1966), Schmookler (1966), Faust & Schedl (1983), Faust (1990), Griliches (1990, 1992), Dernis, Guellec & van Pottelsberghe (2001). They examine the possibility of using patent data as an indicator of technological change and a predictor of long-term trends of technological development.

Of significant importance for highlighting the possibilities for using patent data is the study of Oltra, Kemp & de Vries (2010), which outlines five essential innovation activities that can be assessed through patent data: The level of inventive activity; Types of innovation and technological competencies of organizations; Source of invention; Technological spillovers and knowledge relatedness; The novelty of inventions. The listed innovation activities allow researchers to study different directions of the innovation process.

The following years were marked by an increase in research interest in the use of patent-based indicators for economic research. Karvonen & Kässi (2011) use patent analysis to reveal the trends of changes in the direction of overlap of technology areas and the convergence of industries. De Rassenfosse, Dernis, Guellec, Picci, & van Pottelsberghe de la Potterie (2013) propose a methodology for building a patent-based indicator based on the priority of patent applications, regardless of the patent office with which they are filed. In this way, the “ingenuity” of countries is measured, and the origins of emerging technologies are traced. Hašič, Silva and Johnstone (2015) outline the growing interest in patent analysis

and use patent statistics to measure innovation in narrow technological fields, as well as to compare the achievements of individual countries. Kim & Bae (2017) propose a methodology for predicting promising innovative technologies by applying patent analysis, and Igami & Subrahmanyam (2019) analyzed the hard drive industry in the period 1976-1998 using patent statistics as a direct measure of innovation and found that patents are a predictor of innovation.

Increasing interest in recent years has been observed in research on patent activity in particular the role of patent data as an indicator of the creation and spreading of environmentally friendly technologies. Oltra, Kemp and de Vries (2010) apply patent data analysis to measure eco-innovation and its aspects and find that patent statistics are an adequate tool in measuring environmentally motivated innovations. Dechezleprêtre, Glachant, Haščič, Johnstone & Ménière (2011) examined patent applications filed at the EPO from thirteen technology directions with significant potential to reduce greenhouse gas emissions, and it was found that the transfer of these technologies occurs primarily between developed countries. Cecere, Corrocher, Gossart and Ozman (2014) analyze the patterns of innovative activity in green information and communication technologies through the patent applications filed with the European Patent Office (EPO) for the period 1987-2006. Haščič & Migotto (2015) use patent statistics to compile three indicators (Technology Development Indicator, International Technology Development Cooperation Indicator, and Technology Diffusion Indicator) through which they assess the innovative performance of countries and their policies. Dechezleprêtre, Haščič and Johnstone (2015) analyzed more than 50,000 patents for technologies related to water supplies and found a growth in patenting of these technologies, disproportionately concentrated on water supply technologies, rather than achieving higher consumption efficiency. Scarpellini, Portillo-Tarragona & Marin-Vinuesa (2019) examine the research and development (R&D) intensity of 2,218 firms and their green patents to analyze eco-innovation, proving a positive correlation between firms' eco-innovation activity and R&D intensity. Bretas, Morais, Hora and Filho (2019) use international patent databases to study green patents, and Urbaniec, Tomala & Martinez (2021) analyze the outcome of eco-innovation and measure the trends observed in green technologies through environmental patents. Azis, Rijal, Suhaimi and Abas (2022) outline developments in the waste management process and explore patent statistics to represent trends and technological innovations in the composting process. Nikolova-Minkova (2022a) analyzes the patent activity of EU Member States in the field of environmental technologies and identifies the countries with the highest patent activity in the period 2010-2020. In another study (Nikolova-Minkova, 2022b), the author analyzed the number of applications and the number of patents granted through the EPO in the period 2010-2021 for environmentally friendly technologies for the use of waste heat and identified the leading patentees in the respective technological fields.

There are also many studies using patent-based indicators to consider the efforts and results of moving to a circular economy and achieving sustainable development. Zheng, Aborisade, Liu, Song and Ding (2020) use patent-based indicators to predict the development of the composting process, and Khaertdinova, Maliashova & Gadelshina (2021) use patent activity data in the EU, OECD, and Russia as a tool to analyze innovative technologies in the transition to a circular economy. Marín-Vinuesa, Portillo-Tarragona & Scarpellini (2021) define and evaluate the capabilities of companies to patent waste-related technologies and

their links with the economic performance of business in support of decision-making towards a circular economy. Eppinger, Jain, Vimalnath, Gurtoo, Tietze and Chea (2021) highlight the importance of intellectual property rights as a component to unlock sustainable innovation and the emerging challenges of transformation to a circular economy. Ballardini & Pihlajarinne (2022) analyze the state of the patent system and provide guidance for its further development to stimulate the transition to circular and sustainable innovation and practice. Portillo-Tarragona, Scarpellini & Marín-Vinuesa (2022) investigate the so-called “Circular patents” and their impact on business opportunities. Juchneski & Antunes (2022) analyse the patent applications applicable to the production of electronic equipment and their compliance with the principles of the circular economy. The authors find a significant discrepancy between the prescriptions of the circular economy for recycling and reuse of materials and the actions of patentees, which are aimed at prolonging the useful life of equipment or energy saving.

The state and problems of patent activity are also of interest to Bulgarian authors, and some of the significant empirical studies in this area are those of: Arsenova (1994, 1995, 1999); Monchev (1993, 1997a, 1997b); Georgieva (2010, 2011); Stefanov, Georgieva (2006, 2011); Koleva, Molhova (2010); Ivanova (2017); Georgieva, Nikolova-Minkova (2019, 2020a, 2020b), Pavlov (2020), Molhova (2020, 2021). They analyse various aspects of patent activity, among which: are the possibilities of using patent statistics; the relationship of patents to national innovation potential; the technological orientation of the patents applied for and granted according to the IPC, the structure, and dynamics of patent activity. One of the most in-depth and multifaceted studies in this area is that of Georgieva (2011), who analyzed the links: “*R&D – Bulgarian patent activity in Bulgaria; Bulgarian – foreign patent activity in Bulgaria; foreign patent activity – Foreign direct investment (FDI) in Bulgaria; R&D – patent activity for EU countries; patent activity – competitiveness for EU countries*” Georgieva (2011, p.11) proves the importance of patent activity as an economic indicator and justifies the appropriateness of using patent statistics in conducting economic studies to establish the existence of links between patent and other types of activities.

This analysis does not claim to be exhaustive, and the cited studies present a limited part of the significant and fundamental studies in the field. They express the importance and ability of patent statistics to be used in different contexts to reveal existing links and dependencies and deduce the role of patent statistics as a significant tool for determining trends of technological development. For the purposes of the study, the author's opinions presented so far can be grouped into several main directions for the use of patent statistics (see Table 1).

The directions in the use of patent information are not limited to those mentioned in Table 1, since the complexity and multifaceted nature of patent data allow their wide application. This predetermines the inclusion of some studies in more than one of the separate directions.

In this study, we prioritize the use of patent data to track technological changes in the economy by analyzing the structure and dynamics of patent activity.

### 3. Method

In the present study patent statistics are used to reveal the trends of technological development – in certain technological fields and by country patentees. To achieve this goal, the research proceeds in the following stages:

*Table 1. Directions for the analysis of patent statistics*

Directions	Interpretations	References
Measuring the degree of innovation of an economy	Patent statistics are used to comparative the analysis of patent activity of individual countries and the degree of innovativeness of the countries compared.	Arsenova (1999); Archambault (2002); Koleva, Molhova (2010); Stefanov, Georgieva (2011); De Rassenfosse, Dernis, Guellec, Picci, & van Pottelsberghe de la Potterie (2013); Haščič, Silva, Johnstone (2015); Dechezleprêtre, Glachant, Haščič, Johnstone & Ménière (2011); Haščič & Migotto (2015); Pavlov, P. (2020); Nikolova-Minkova (2022a).
Identifying the source of inventive activity	Patent databases provide information on patented technologies, an analysis of which allows disclosure of the source of innovation and inventive activity.	Georgieva (2011); Stefanov, Georgieva (2011); Dechezleprêtre, Glachant, Haščič, Johnstone & Ménière (2011); De Rassenfosse, Dernis, Guellec, Picci, & van Pottelsberghe de la Potterie (2013); Haščič, Silva, Johnstone (2015); Haščič & Migotto (2015); Georgieva, Nikolova-Minkova (2020b).
Tracking technological changes in the economy	The use of patent data as an indicator of technological change allows to produce long-term trends for the technological development of individual areas.	Scherer (1965); Muller (1966); Faust & Schedl (1983); Schmookler (1990); Faust (1990); Griliches (1990, 1992); Monchev (1993); Dernis, Guellec & van Pottelsberghe (2001); Stefanov, Georgieva (2006); Georgieva (2011); Karvonen & Kässi (2011); Haščič, Silva, Johnstone (2015); Kim & Bae (2017); Ivanova (2017); Georgieva, Nikolova-Minkova (2019); Igami & Subrahmanyam (2019); Zheng, Aborisade, Liu, Song, Ding (2020); Molhova (2020); Georgieva, Nikolova-Minkova (2020a); Khaertdinova, Maliashova & Gadelschina (2021); Urbaniec, Tomala, Martinez (2021); Azis, Rijal, Suhaimi, Abas (2022).
Eco-innovation, circular economy, and sustainable development	Patent statistics is an indicator of innovative technologies in the field of eco-innovation and circular economy and is used as a measure of the transition to the use of environmentally friendly technologies and sustainable development.	Arsenova (1995); Oltra, Kemp & de Vries (2008); Oltra, Kemp, de Vries (2010); Dechezleprêtre, Glachant, Haščič, Johnstone & Ménière (2011); Cecere, Corrocher, Gossart, Ozman (2014); Dechezleprêtre, Haščič, Johnstone (2015); Scarpellini, Portillo-Tarragona & Marin-Vinuesa (2019); Bretas, Morais, Hora, Filho (2019); Zheng, Aborisade, Liu, Song, Ding (2020); Urbaniec, Tomala, Martinez (2021); Khaertdinova, Maliashova & Gadelschina (2021); Eppinger, Jain, Vimalnath, Gurtoo, Tietze, Chea (2021); Azis, Rijal, Suhaimi, Abas (2022); Nikolova-Minkova (2022a, 2022b); Ballardini & Pihlajarinne (2022); Portillo-Tarragona, Scarpellini & Marin-Vinuesa (2022); Juchneski & Antunes (2022).
Company performance	The patents owned by an enterprise are an expression of its innovativeness in a specific technological field.	Ilieva-Naidenova (2012); Scarpellini, Portillo-Tarragona & Marin-Vinuesa (2019); Molhova (2021); Marin-Vinuesa, Portillo-Tarragona & Scarpellini (2021); Nikolova-Minkova (2022b); Portillo-Tarragona, Scarpellini & Marin-Vinuesa (2022).

Source: elaborated by the author.

*First.* Establishing the dynamics and direction of patent application activity conducted by: Bulgarian citizens in Bulgaria and abroad; foreign citizens in Bulgaria. The indicators used here are:

- Total number of patent applications filed by Bulgarian and foreign citizens with the Bulgarian Patent Office (BPO).
- Total number of patent applications filed by Bulgarian citizens in Bulgaria and abroad.
- Total number of patent applications filed by foreign nationals in BPO (by nationality of the applicant).
- Total number of patent applications filed by Bulgarian applicants in foreign intellectual property offices.

*Second.* Disclosure of the technological fields in which the patent activity of Bulgarian and foreign applicants is directed. The selected indicators are:

- Number of applications submitted to BPO by technological fields.
- Number of applications submitted to BPO by Bulgarian and foreign citizens in technological fields.
- Number of applications submitted by Bulgarian citizens in technological fields.
- Number of applications submitted by Bulgarian citizens in foreign offices by technological fields.

*Third.* Establishing the dynamics of the granted patents to: Bulgarian citizens in Bulgaria and abroad; foreign citizens in Bulgaria. The following indicators are used:

- Total number of patents granted filed by Bulgarian and foreign citizens in BPO.
- Total number of patents granted by Bulgarian citizens in Bulgaria and abroad.
- Total number of patents granted filed by foreign citizens in BPO (by nationality of the applicant).
- Total number of patents granted by Bulgarian applicants in foreign intellectual property offices.

*Fourth.* Disclosure of the technological fields in which the activity of Bulgarian and foreign patentees is directed. The selected indicators are:

- Number of patents granted by BPO by technological fields.
- Number of patents granted by BPO to Bulgarian and foreign citizens in technological fields.
- Number of patents granted to Bulgarian citizens by technological fields.
- Number of patents granted to Bulgarian citizens in foreign offices by technological fields.



For these indicators, it is assumed that the applications are directly filed in the Bulgarian Patent Office or passed in the Patent Cooperation Treaty (PCT) national phase entries.

*Fifth.* Comparative analysis of the structure of the Bulgarian and foreign patent flow to identify the technological areas and fields with the greatest concentration of patents.

The data used for research and analysis of these indicators are obtained from the WIPO Statistic Database supported by the World Intellectual Property Organization (WIPO). The indicators are designed according to different criteria that provide a variety of analysis capabilities:

- Counting according to the office of filling.
- Counting according to the applicant/patentee's origin<sup>3</sup>.
- Counting according to the technological fields (IPC codes) specified in the patent application, etc.

The advantages of using the WIPO patent database are related to easy access to data and their processing, as well as complete information on a country's patent flow by technological area. A major drawback, as pointed out by Kharmova, Meissner and Sagieva (2013), is that the data are generalized and aggregated, which does not allow a deeper analysis of the requested and patented technologies – their future application, tracking their citation or the development of patent families.

To establish the technological areas and fields to which the filed patent applications and granted patents relate, WIPO applies an IPC-Technology Concordance Table, based on the International Patent Classification (see Table 2).

**Table 2. WIPO IPC-Technology Concordance Table**

No.	Area, field	IPC code
<b>I</b>		
<b>Electrical engineering</b>		
1.	Electrical machinery, apparatus, energy	F21#, H01B, H01C, H01F, H01G, H01H, H01J, H01K, H01M, H01R, H01T, H02#, H05B, H05C, H05F, H99Z
2.	Audio-visual technology	G09F, G09G, G11B, H04N-003, H04N-005, H04N-009, H04N013, H04N-015, H04N-017, H04R, H04S, H05K
3.	Telecommunications	G08C, H01P, H01Q, H04B, H04H, H04J, H04K, H04M, H04N001, H04N-007, H04N-011, H04Q
4.	Digital communication	H04L
5.	Basic communication processes	H03#
6.	Computer technology	(G06# not G06Q), G11C, G10L
7.	IT methods for management	G06Q
8.	Semiconductors	H01L
<b>II</b>		
<b>Instruments</b>		
9.	Optics	G02#, G03B, G03C, G03D, G03F, G03G, G03H, H01S

<sup>3</sup> It should be considered that the data concerning the applicant's origin are obtained by an “equivalent count” so there is a discrepancy in the total number of applications/patents granted depending on the selected search criterion. In the case of these data, an application or granted patent are equivalent to multiple applications/grants, one in each of the state’s member of those offices.

Nikolova-Minkova, V. (2023). *Bulgarian and Foreign Patent Activity in Bulgaria and Bulgarian Patent Activity Abroad by Technological Areas and Fields for the Period 2010-2021.*

No.	Area, field	IPC code
10.	Measurement	G01B, G01C, G01D, G01F, G01G, G01H, G01J, G01K, G01L, G01M, (G0N not G01N-033), G01P, G01R, G01S, G01V, G01W, G04#, G12B, G99Z
11.	Analysis of biological materials	G01N-033
12.	Control	G05B, G05D, G05F, G07#, G08B, G08G, G09B, G09C, G09D
13.	Medical technology	A61B, A61C, A61D, A61F, A61G, A61H, A61J, A61L, A61M, A61N, H0G
III	Chemistry	
14.	Organic fine chemistry	(C07B, C07C, C07D, C07F, C07H, C07J, C40B) not A61K, A61K008, A6Q
15.	Biotechnology	(C07G, C07K, C12M, C12N, C12P, C12Q, C12R, C12S) not A61K
16.	Pharmaceuticals	A61K not A61K-008
17.	Macromolecular chemistry, polymers	C08B, C08C, C08F, C08G, C08H, C08K, C08L
18.	Food chemistry	A01H, A21D, A23B, A23C, A23D, A23F, A23G, A23J, A23K, A23L, C12C, C12F, C12G, C12H, C12J, C13D, C13F, C13J, C13K
19.	Basic materials chemistry	A01N, A01P, C05#, C06#, C09B, C09C, C09F, C09G, C09H, C09K, C09D, C09J, C10B, C10C, C10F, C10G, C10H, C10J, C10K, C10L, C10M, C10N, C11B, C11C, C11D, C99Z
20.	Materials, metallurgy	C01#, C03C, C04#, C21#, C22#, B22#
21.	Surface technology, coating	B05C, B05D, B32#, C23#, C25#, C30#
22.	Micro-structural and nano-technology	B81#, B82#
23.	Chemical engineering	B01B, B01D-000#, B01D-01##, B01D-02##, B01D-03##, B01D041, B01D-043, B01D-057, B01D-059, B01D-06##, B01D-07##, B01F, B01J, B01L, B02C, B03#, B04#, B05B, B06B, B07#, B08#, D06B, D06C, D06L, F25J, F26#, C14C, H05H
24.	Environmental technology	A62D, B01D-045, B01D-046, B01D-047, B01D-049, B01D-050, B01D-051, B01D-052, B01D-053, B09#, B65F, C02#, F01N, F23G, F23J, G01T, E01F-008, A62C
IV	Mechanical engineering	
25.	Handling	B25J, B65B, B65C, B65D, B65G, B65H, B66#, B67#
26.	Machine tools	B21#, B23#, B24#, B26D, B26F, B27#, B30#, B25B, B25C, B25D, B25F, B25G, B25H, B26B
27.	Engines, pumps, turbines	F01B, F01C, F01D, F01K, F01L, F01M, F01P, F02#, F03#, F04#, F23R, G21#, F99Z
28.	Textile and paper machines	A41H, A43D, A46D, C14B, D01#, D02#, D03#, D04B, D04C, D04G, D04H, D05#, D06G, D06H, D06J, D06M, D06P, D06Q, D99Z, B31#, D21#, B41#
29.	Other special machines	A01B, A01C, A01D, A01F, A01G, A01J, A01K, A01L, A01M, A21B, A21C, A22#, A23N, A23P, B02B, C12L, C13C, C13G, C13H, B28#, B29#, C03B, C08J, B99Z, F41#, F42#
30.	Thermal processes and apparatus	F22#, F23B, F23C, F23D, F23H, F23K, F23L, F23M, F23N, F23Q, F24#, F25B, F25C, F27#, F28#
31.	Mechanical elements	F15#, F16#, F17#, G05G
32.	Transport	B60#, B61#, B62#, B63B, B63C, B63G, B63H, B63J, B64#
V	Other fields	
33.	Furniture, games	A47#, A63#
34.	Other consumer goods	A24#, A41B, A41C, A41D, A41F, A41G, A42#, A43B, A43C, A44#, A45#, A46B, A62B, B42#, B43#, D04D, D07#, G10B, G10C, G10D, G10F, G10G, G10H, G10K, B44#, B68#, D06F, D06N, F25D, A99Z
35.	Civil engineering	E02#, E01B, E01C, E01D, E01F-001, E01F-003, E01F-005, E01F007, E01F-009, E01F-01#, E01H, E03#, E04#, E05#, E06#, E21#, E99Z

Source: Schmoch, 2008, pp. 9-10.

The proposed system for assigning IPC patent codes to a particular technological direction and technological field (see Table 2) was prepared with the aim of providing a “*basic tool for the analysis of country structures and international comparisons, notably for the determination of specialisation profiles*” (Schmoch, 2008, p. 15). The above allows for the purposes of this paper to use the presented system and the data collected through it to analyze the Bulgarian and foreign patent activity in Bulgaria and the Bulgarian patent activity abroad.

To present the results of the analysis were used:

- *Graphical method* – allows visualization of the studied indicators and reveals the dynamics and trends in their development.
- *Comparative method* – suitable for comparing Bulgarian and foreign patent activity according to quantitative data, as well as for identifying the proportions of individual technological directions.

#### 4. Data and Result

##### 4.1. Patent activity of Bulgarian and foreign applicants

##### 4.1.1. Structure and dynamics of patent application activity

The state and dynamics of the total patent activity of Bulgarian and foreign citizens, measured by the number of patent applications filed in Bulgaria for the period 2010-2021, are presented in Table 3 and Figure 1.

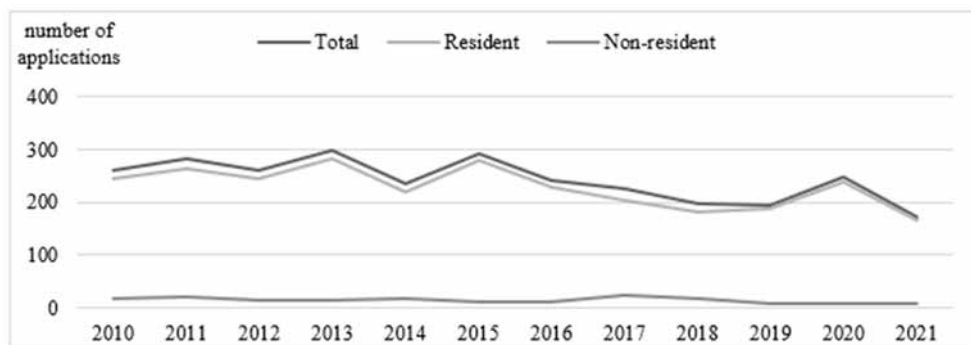
**Table 3. General (Bulgarian and foreign) patent application activity in Bulgaria (Number of applications)**

Office	Type	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Bulgaria	Total	260	283	259	297	234	291	241	225	198	193	246	171
Bulgaria	Resident	243	262	245	282	218	280	230	202	180	186	239	165
Bulgaria	Non-resident	17	21	14	15	16	11	11	23	18	7	7	6

Source: WIPO Statistic Data Center, Author's calculations.

The data in Table 3 show that the total number of applications during the survey period submitted to BPO is 2,898, with only 5.73% of them from foreign applicants. These data predetermine the total patent application activity in Bulgaria for the period 2010-2021 to be determined by the activity of Bulgarian patent applicants.

**Figure 1. Dynamics of the General (Bulgarian and Foreign) Patent Application Activity in Bulgaria (number of applications)**



Source: WIPO Statistic Data Center, Author's calculations.

The period analyzed is characterized by instability in the activity of patent applicants, which predetermines a downward trend on average annually by 2.11%.

The activity of Bulgarian patent applicants (see Table 4) can be traced through a number of patent applications filed in Bulgaria and abroad.

**Table 4. Patent application activity of Bulgarian citizens in Bulgaria and abroad (number of applications, equivalent count)**

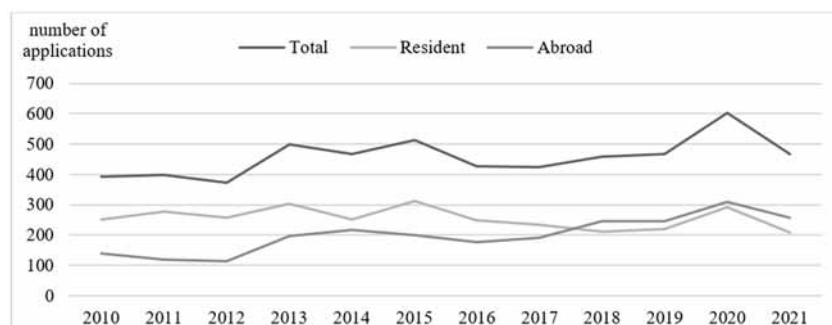
Origin	Type	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Bulgaria	Total	391	397	372	500	467	514	427	425	459	466	602	466
Bulgaria	Resident	252	278	257	304	250	313	249	233	212	220	293	208
Bulgaria	Abroad	139	119	115	196	217	201	178	192	247	246	309	258

Source: WIPO Statistic Data Center, Author's calculations.

The total number of patent applications for the period 2010-2021 increased with an average annual of 2.9%, more influenced by the reported 8.2% average annual growth in patent applications filed by Bulgarian citizens abroad. The patent application activity of Bulgarians directed to the national territory increases by an average annual of only 0.05%.

The dynamics of Bulgarian patent application activity (see Figure 2) outline the relative consistency of applications filed with Bulgaria, despite the measured average annual decrease of 1.7% for the period from 2013 to 2018. Bulgarian application activity abroad increased with some fluctuations throughout the period, with the highest growth in 2013 compared to 2012 (70.4%).

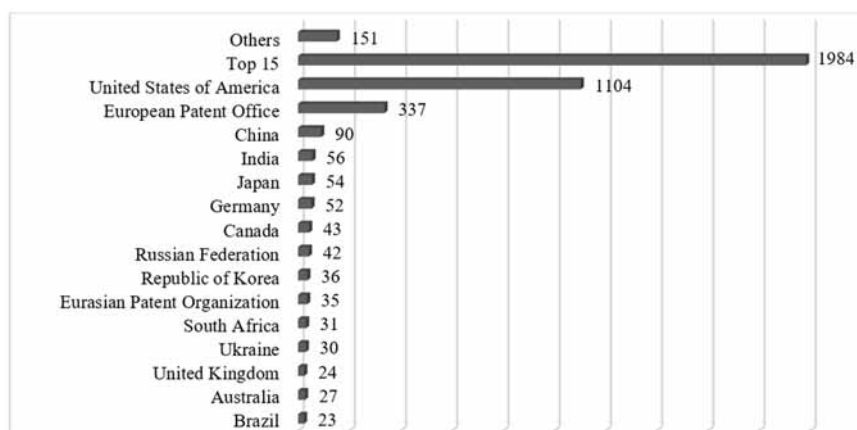
**Figure 2. Dynamics of Bulgarian Patent Application Activity in Bulgaria and Abroad (number of applications, equivalent count)**



Source: WIPO Statistic Data Center, Author's calculations.

Information about the territories where Bulgarian applicants seek legal protection is presented in Figure 3. It should be noted that the data do not cover all countries in which Bulgarian patent applicants are interested. Out of a total of 53 countries/regional organizations in which for the period 2010-2021 2,135 patent applications have been submitted, data are presented for 15 of them, which form 92.9% share.

**Figure 3. Structure of Bulgarian Patent Application Activity Abroad for the Period 2010-2021 (number of applications)**

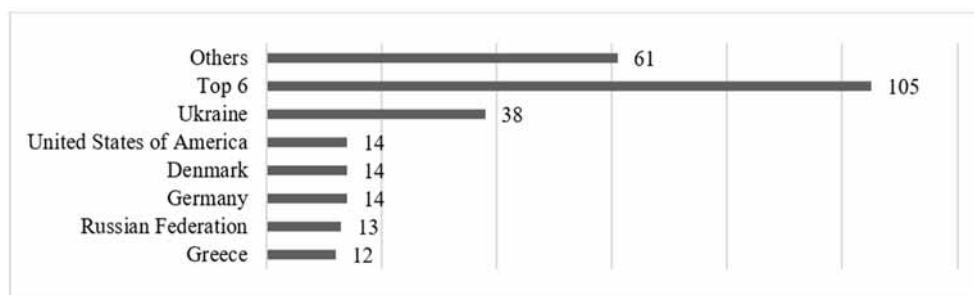


Source: WIPO Statistic Data Center, Author's calculations.

The data testify that Bulgarian patent applicants are targeting highly technologically developed territories. An example is the patent flow to the US, forming a 51.7% share of total activity. Second in terms of applicant interest is the European Patent Office (15.78%) and the third is China (4.21%). Total activity in the top three positions covered a 71.7% share.

The analysis of foreign applicant activity in Bulgaria covers 28 countries, applicants from which seek legal protection in Bulgaria through BPO and the Patent Cooperation Treaty. Information is presented for 6 of them (see Figure 4), the share of patent application activity of which forms 63.25%. The highest contributions are made by applicants from Ukraine (22.89%), followed by the United States, Denmark, and Germany (both 8.43%), the Russian Federation (7.83%) and Greece (7.22%).

**Figure 4. Structure of the foreign patent application activity in Bulgaria for the period 2010-2021 (number of applications)**



Source: WIPO Statistic Data Center, Author's calculations.

As can be seen, the activity of foreign applicants carried out through BPO, and the Patent Cooperation Treaty is weak. One of the opportunities for low activity may be because foreign patent activity in Bulgaria is conducted through other protection routes, such as those provided by the European Patent Office.

#### 4.1.2. Technological orientation of patent applicant activity

The analysis of the technological focus aims to reveal to which technological areas and fields the patent application activity is addressed.

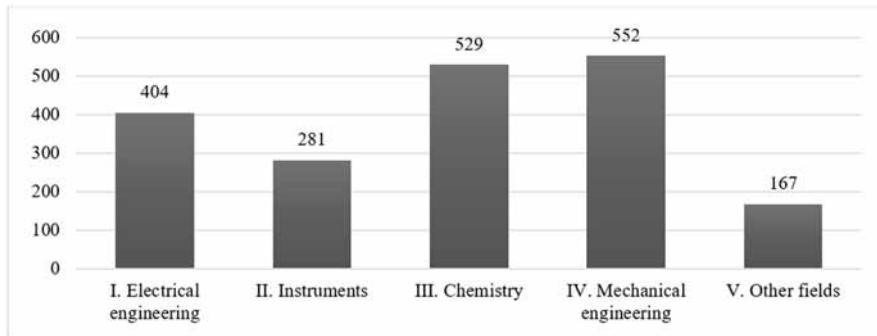
In this regard, Figure 5 presents information on the technological areas targeted by the requesting activity conducted through BPO.

The data prioritize the area of *Mechanical engineering* (28.6% of the total activity of the applicants), followed by: *Chemistry* (27.7%); *Electrical engineering* (20.9%); *Instruments* (14.5%); *Other fields* (8.6%).

Analyzing the distribution of applications filed by Bulgarian and foreign applicants (see Figure 6), there is a divergence in the ranking of technology areas – Bulgarian applicants focus the most patent applications in *Mechanical engineering* (28.64%), while the activity of foreign applicants is focused on the *Chemistry* (50%). Second, are the areas of *Chemistry* (25.2%) for Bulgarian applicants and *Mechanical engineering* (27.8%) for foreign ones. The third position is occupied by *Electrical Engineering* with 22.1% Bulgarian and 8% foreign applicant activity. The fourth most interesting among Bulgarian applicants is *Instruments* (15.3%) and among foreign applicants – *Other fields* (7.4%). The fewest applications,

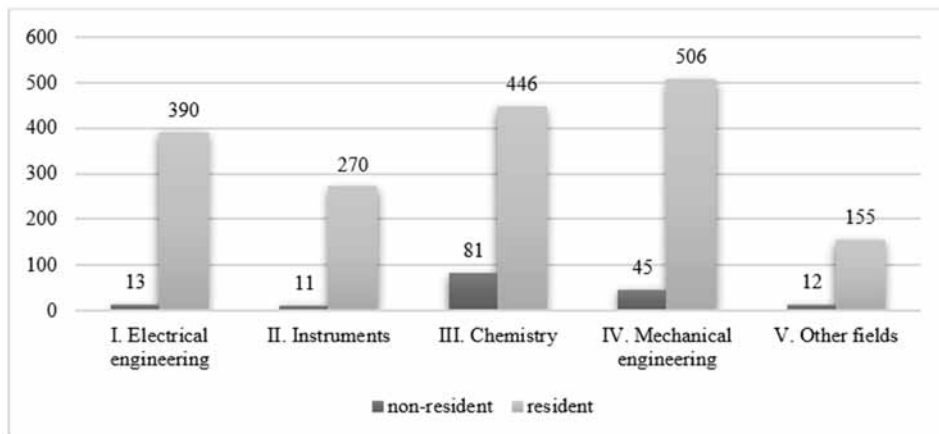
submitted by Bulgarian citizens, are in *Other fields* (8.8%), and foreign applicants show the lowest interest in the *Instruments* (6.8%).

**Figure 5. General patent application activity in Bulgaria for the period 2010-2021 by technological fields (number of applications)**



Source: WIPO Statistic Data Center, Author's calculations.

**Figure 6. Bulgarian and foreign patent application activity in Bulgaria for the period 2010-2021 by technological fields (number of applications)**

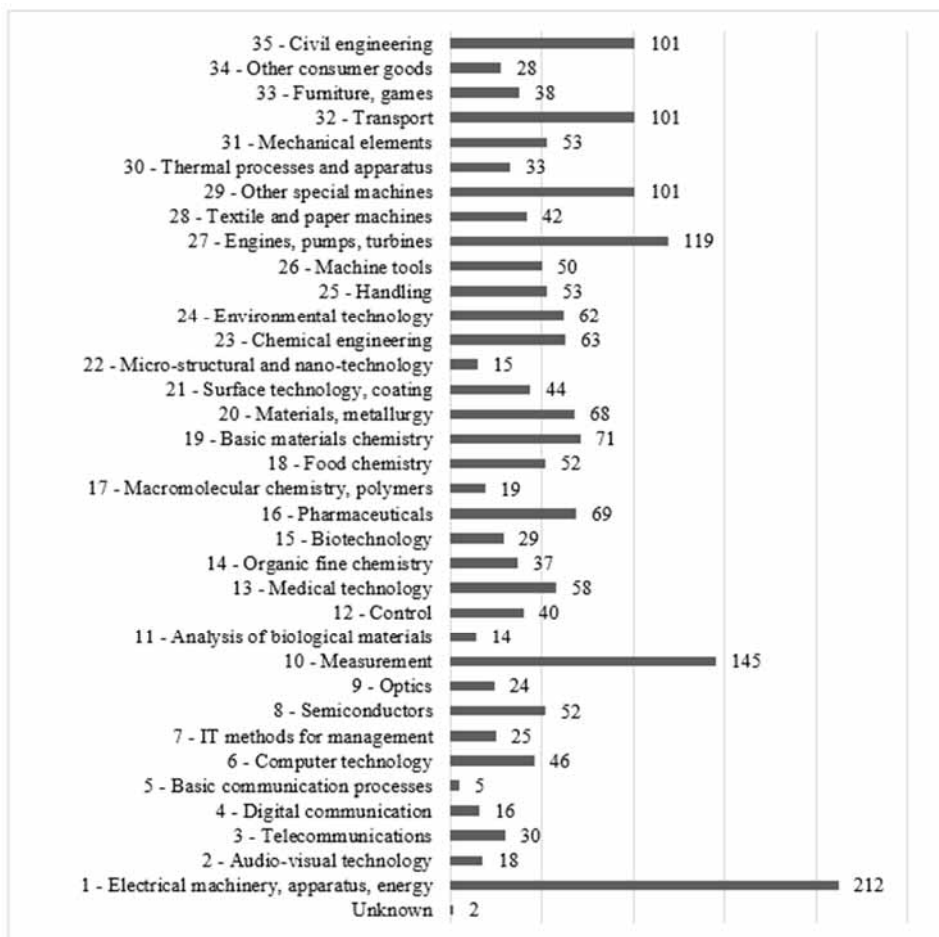


Source: WIPO Statistic Data Center, Author's calculations.

In each of these technological areas, certain fields stand out, in which there is an increased interest in acquiring monopoly positions on the territory of Bulgaria (Figure 7).

It should be noted that with the greatest applicant interest (see Figure 7) are the fields: *Electrical machinery, apparatus, energy* (212); *Measurement* (145); *Engines, pumps, turbines* (119); *Other special machines* (101); *Transport* (101); *Civil engineering* (101). They concentrate 40.3% of the application activity conducted through the Bulgarian Patent Office.

**Figure 7. Patent Application Activity in Bulgaria for the Period 2010-2021 by Technological Fields (number of applications)**



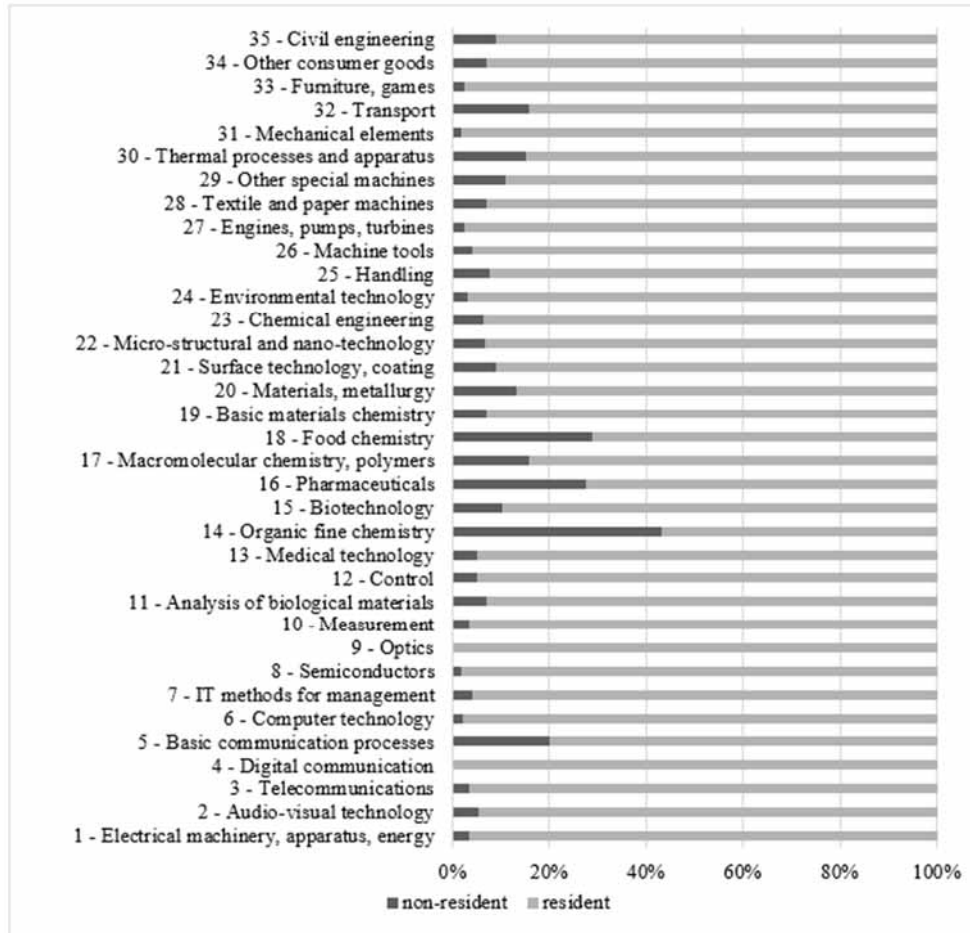
Source: WIPO Statistic Data Center, Author's calculations.

A comparison between the Bulgarian and foreign patent application activity in Bulgaria is presented in Figure 8, which clearly shows the quantitative superiority of the Bulgarian patent application activity over the foreign one.

Information about the Bulgarian patent application activity abroad can be obtained from Figure 9.



**Figure 8. Comparison of Bulgarian and foreign patent application activity in Bulgaria for the period 2010-2021 by technological fields (number of applications)**

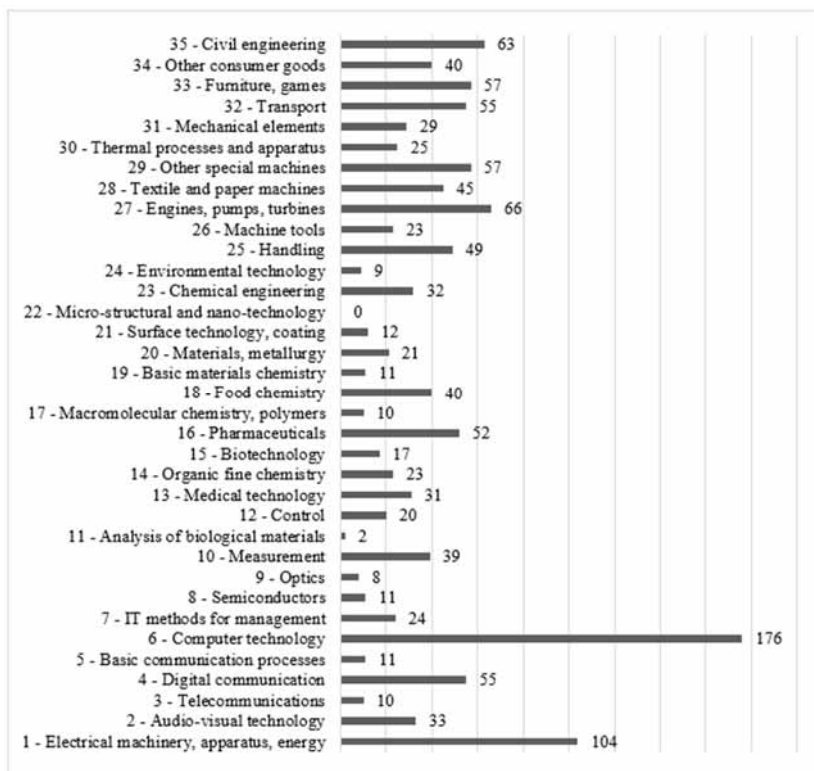


Source: WIPO Statistic Data Center, Author's calculations.

The data are indicative of the striving of Bulgarian applicants to protect their technologies on foreign territories, with the highest share of technological fields: *Computer technology* (13.9%); *Electrical machinery, apparatus, energy* (8.2%); *Engines, pumps, turbines* (5.2%). The applicant activity under the other fields is proportional. An interesting fact is that although there is Bulgarian applicant activity in Bulgaria in the field of *Micro-structural and nano-technology* (see Figure 8), there are still no applications for international protection of the rights over the same technologies.

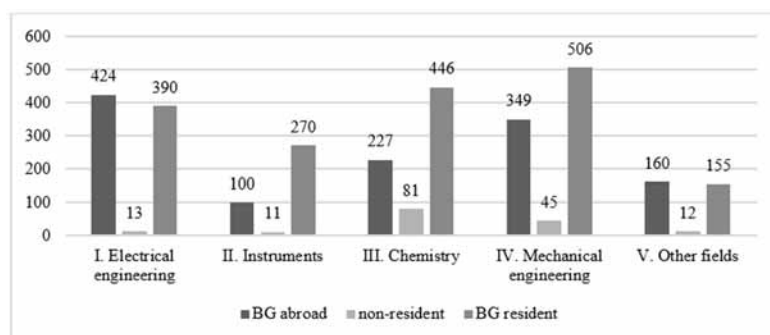
The specialization of Bulgarian applicants abroad by technological fields differs from the reported development trends on national territory (see Figure 10).

**Figure 9. Bulgarian patent application activity abroad for the period 2010-2021 by technological fields (number of applications)**



Source: WIPO Statistic Data Center, Author's calculations.

**Figure 10. Comparison of patent application activity for the period 2010-2021 by technological direction (number of applications)**



Source: WIPO Statistic Data Center, Author's calculations.

As can be seen, the highest share of Bulgarian applicant activity abroad is reported by the *Electrical Engineering field* (33.7%), which has a low presence of foreign applications. Second in interest is *Mechanical engineering* (27.7%), and in the third – *Chemistry* (18%). The increased interest of Bulgarian applicants abroad and foreign citizens in Bulgaria in the fields of *Chemistry* and *Mechanical engineering* means that foreign applicants are targeting areas and fields in which Bulgarian applicant activity is higher, therefore they can be said to have a higher local technological level. In the fourth and fifth positions are the *Other fields* (12.7%) and *Instruments* (7.9%), respectively, in which there is less interest than Bulgarian citizens in filing patent applications abroad.

To establish the extent to which the reported trends in patent application activity are also observed with respect to granted patents, the analysis continues with data on the activity of patentees.

#### 4.2. Activity of Bulgarian and foreign patentees

According to the activity data of the patentees, similar measurements and analyses were conducted.

##### 4.2.1. Structure and dynamics of patentees' activity

The state and dynamics of the total patent activity of Bulgarian and foreign citizens, measured by the number of patents granted in Bulgaria for the period 2010-2021, are presented in Table 5 and Figure 11.

The data in Table 5 show that the total number of patents granted by BPO for the period 2010-2021 is 1606, of which 24% belong to foreign patentees. The above-mentioned as well as the reflected dynamics of patent activity (see Figure 11) determine the total activity in Bulgaria for the period 2010-2021 to be determined by the activity of Bulgarian patent holders.

**Table 5. General (Bulgarian and foreign) patent activity in Bulgaria (number of grants)**

Office	Type	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Bulgaria	Total	251	128	101	125	72	37	42	77	181	195	215	182
Bulgaria	Resident	121	61	57	67	56	28	36	69	171	182	203	169
Bulgaria	Non-resident	130	67	44	58	16	9	6	8	10	13	12	13

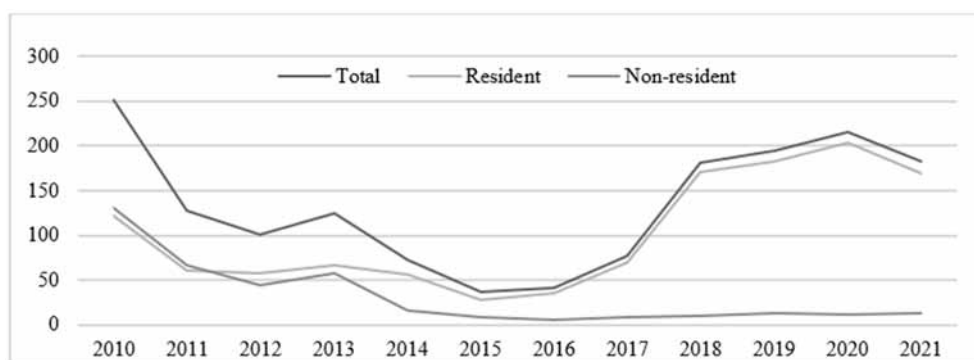
Source: WIPO Statistic Data Center, Author's calculations.

The data (see Figure 11) outline two trends in the activity of patent owners in Bulgaria for the period 2010-2021. The first is the measured decline in the activity of Bulgarian patent owners from 2010 to 2015, an average annual of 21%, the strongest this decline being expressed in 2015 compared to 2014 (50%) and in 2011 compared to 2010 (49.6%). Foreign

patent activity decreased by 33.4% on average annually for the period 2010-2016, most noticeably in 2014 compared to 2013 (72.4%) and in 2011 compared to 2010 (48.5%).

The second trend reported for the study period is an increase in activity, as for Bulgarian patent owners it continues from 2015 to 2020 (annual average of 57.2%), the most pronounced in 2018 compared to 2017 (147.8%). In 2021, there is again a slight decrease in the activity of Bulgarian patent owners (16.7%). An increase in the number of granted patents in the period 2017-2021 is also observed for foreign (an annual average of 17.8%).

**Figure 11. Dynamics of the General (Bulgarian and Foreign) Activity of Patent Owners in Bulgaria (number of grants)**



Source: WIPO Statistic Data Center, Author's calculations.

The activity of Bulgarian patent owners in Bulgaria and abroad (see Table 6) is characterized by relative comparability – 52.2% of patents have an effect on the territory of Bulgaria and 47.8% are directed abroad.

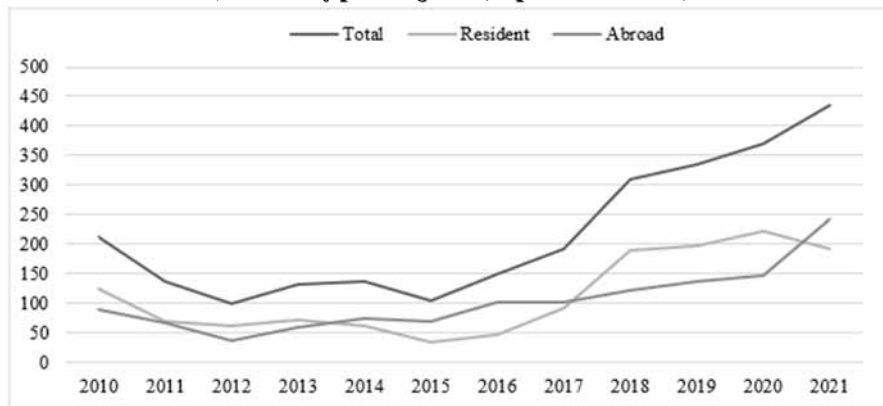
**Table 6. Activity of Bulgarian patent owners in Bulgaria and abroad (number of patent grants, equivalent count)**

Origin	Type	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Bulgaria	Total	213	136	99	131	138	104	150	192	310	334	369	435
Bulgaria	Resident	124	69	62	72	63	35	47	91	189	198	221	192
Bulgaria	Abroad	89	67	37	59	75	69	103	101	121	136	148	243

Source: WIPO Statistic Data Center, Author's calculations.

The dynamics of the patent activity of Bulgarian patent owners (Figure 12) shows a general trend of growth (annual average of 10.9%) in the granted patents in Bulgaria and abroad for the period 2010-2021, although in some years there is a certain decrease.

**Figure 12. Dynamics of the activity of Bulgarian patent owners in Bulgaria and abroad (number of patent grants, equivalent count)**

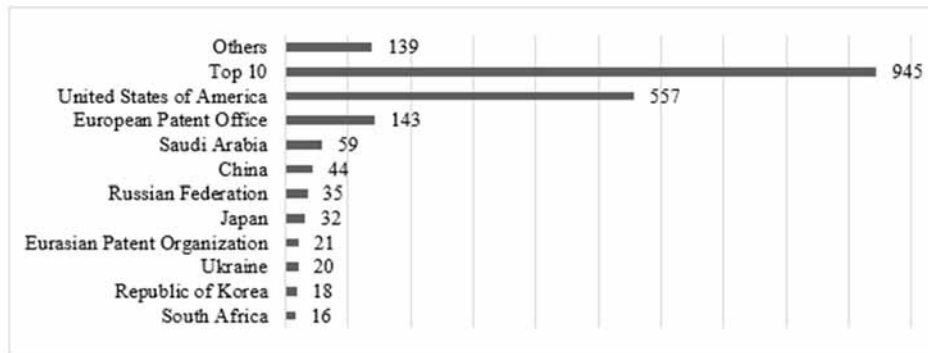


Source: WIPO Statistic Data Center, Author's calculations.

A stronger increase in acquired patent rights is reported in the patents granted abroad (an annual average of 14.7%) than in those with effect on the territory of Bulgaria (13%).

Information about the territories where Bulgarian patent holders have received legal protection for their technological innovations is presented in Figure 13. It includes data for 10 out of 43 countries/regional unions, forming an 87% share.

**Figure 13. Structure of the activity of Bulgarian and patent owners abroad for the period 2010-2021 (number of patent grants)**

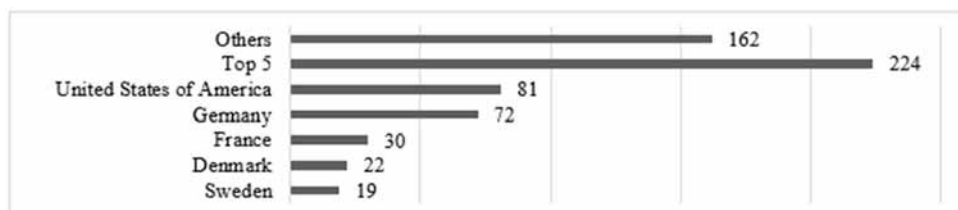


Source: WIPO Statistic Data Center, Author's calculations.

The largest patent flow is reported to the United States, where legal protection was received for 51.4% of the total patents granted to Bulgarian citizens abroad. Second in interest among Bulgarian patent owners is the European patent (13.2%), and third is Saudi Arabia (5.4%). The other territories to which Bulgarians are directed to provide legal protection for their innovative technologies have less than 5% share of the total patent flow abroad.

The analysis of foreign patent activity in Bulgaria covers 39 countries for which BPO has granted patents in the period 2010-2021. Figure 14 presents information on 5 of them, forming 58% of the total foreign patent activity.

**Figure 14. Structure of the patents granted by BPO to foreign citizens for the period 2010-2021 (number of grants)**



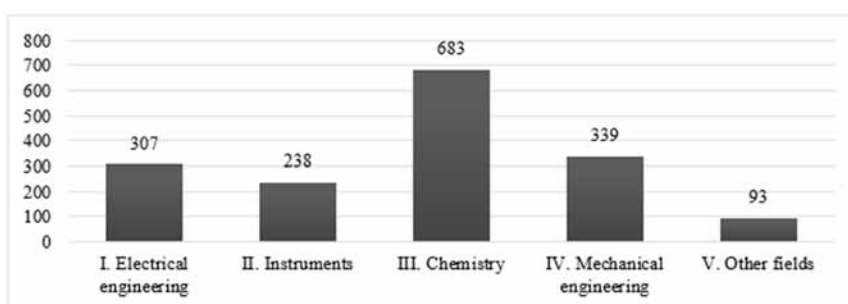
Source: WIPO Statistic Data Center, Author's calculations.

In contrast to the patent application activity in Bulgaria (see Figure 4), the patents granted in the research period (see Figure 14) have shifted the positions of the countries. US patentees rank first in the number of patents granted (21% share), followed by Germany (18.7), France (7.8), Denmark (5.7) and Sweden (4.9). The first applicant country in Bulgaria – Ukraine (38 applications) – has only 5 patents granted in the period 2010-2021. Of course, the extended period of conducting an examination of innovative technologies may delay the issuance of a patent for more than 36 months, which does not preclude obtaining a patent for the requested technologies in future periods.

#### 4.2.2. Technological orientation of granted patents

The technological areas targeted by the granted patents are presented in Figure 15.

**Figure 15. Total patents granted in Bulgaria for the period 2010-2021 by technological areas (number of grants)**

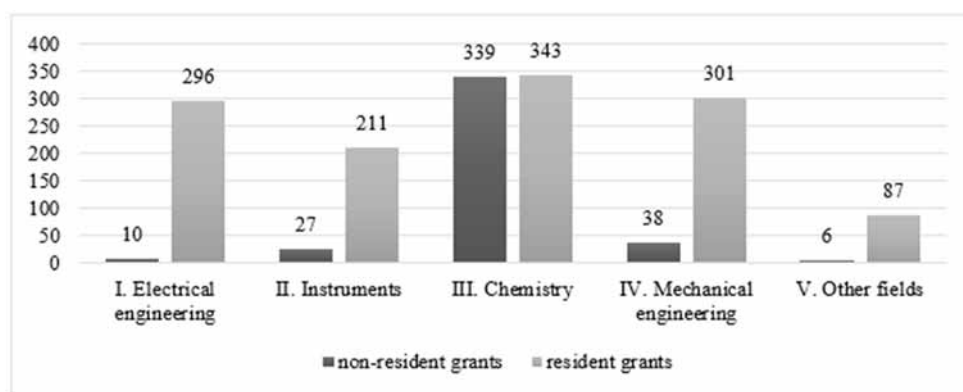


Source: WIPO Statistic Data Center, Author's calculations.

The highest concentration of patent rights is reported in *Chemistry* – 41.1% of the total patent activity. This contrasts with the applicant activity, where the most interesting was the field of *Mechanical engineering*, which in the number of patents granted by BPO falls in second position (20.4%). Third in the number of patents granted is *Electrical engineering* (18.5%), fourth is *Instruments* (14.3%), and fifth is *Other fields* (5.6%), which occupy the same positions in patent application activity.

The analysis of the number of patents granted by technological area according to the nationality of the patentee (see Figure 16) shows a strong development in *Chemistry*. There is a quantitative comparability between the patents obtained from Bulgarian and foreign holders.

**Figure 16. Patents granted in Bulgaria for the period 2010-2021 by technological fields and according to the nationality of the patent owner (number of grants)**



Source: WIPO Statistic Data Center, Author's calculations.

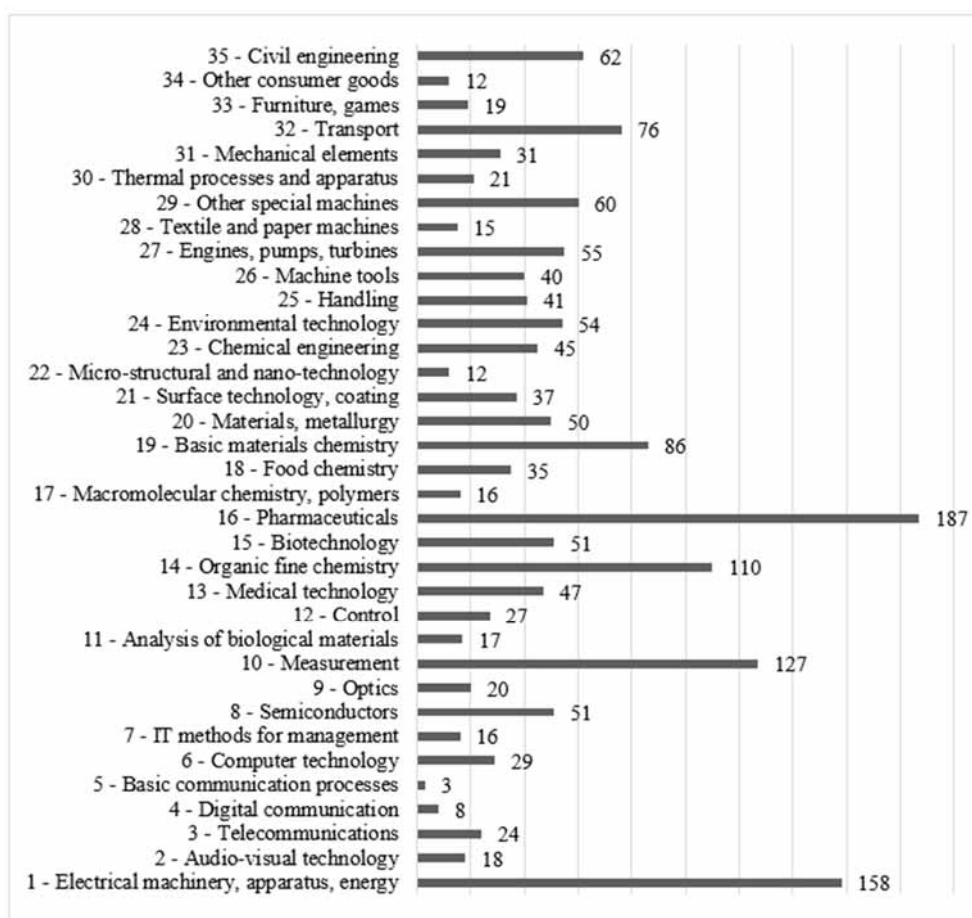
The relative share of foreign patent activity in the areas of *Chemistry* is 80.7% and the Bulgarian activity is 27.7%. Second, in the number of patents granted is *Mechanical Engineering*, with a 24.3% share for Bulgarian patent owners and 9% share for foreign ones. Next for Bulgarian patent owners is *Electrical Engineering* (23.9%), and foreign citizens have patented their technologies in *Instruments* (6.4%). The share of Bulgarian patents in *Instruments* is 17%, while for foreigners the share of patent rights obtained in the fourth most interesting area *Electrical engineering* is 2.4%. The weakest interest is the area of *Other fields* with respectively 7% share of the total patents granted for Bulgarian and a 1.4% share of the patents granted for foreign patentees.

Of interest for the present analysis are also the technological fields in the composition of the technological areas and the distribution of patent rights in them (see Figure 17).

Unlike the applicant activity, the acquired patent rights are characterized by a different ratio in technological fields. The largest number of monopoly rights are granted in the *Pharmaceuticals* (11.3% share of total patent grants), which predetermines the first position of the *Chemistry* area. Second, in the number of patents granted to Bulgarian and foreign owners is *Electrical machinery, apparatus and energy* (9.5%), and a third is *Measurement*

(7.7%). Each of these fields is leading in the respective technological areas. Next positions are occupied by *Organic fine chemistry* (6.6%) and *Basic materials chemistry* (5.2%). The other technological fields have a share of less than 5% of the monopoly rights granted by BPO for the period 2010-2021.

**Figure 17. Number of patents granted in Bulgaria for the period 2010-2021 by technological fields (number of grants)**

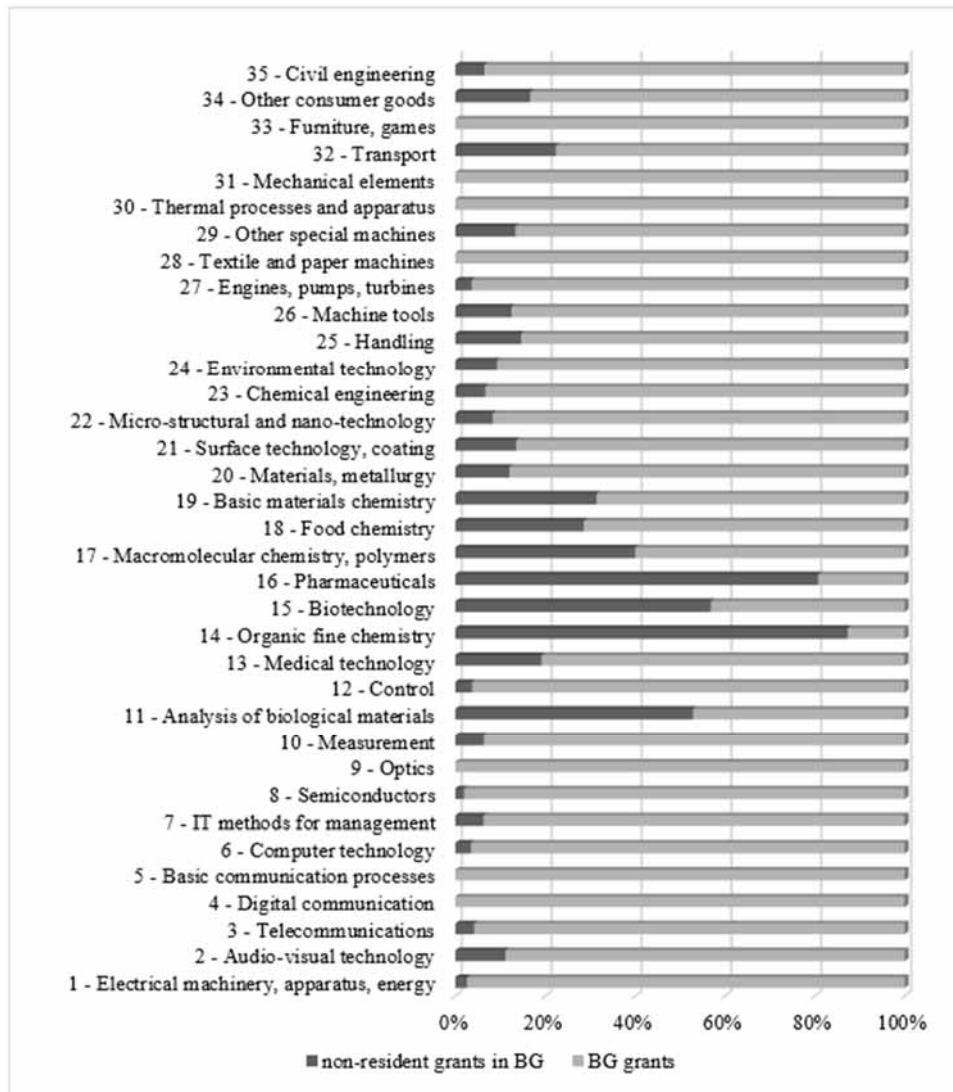


Source: WIPO Statistic Data Center, Author's calculations.

A comparison of the activity of patent owners from Bulgaria and abroad by technological fields is illustrated in Figure 18.



**Figure 18. Comparison of the number of patents granted to Bulgarian and foreign owners in Bulgaria by technological fields for the period 2010-2021 (number of grants)**

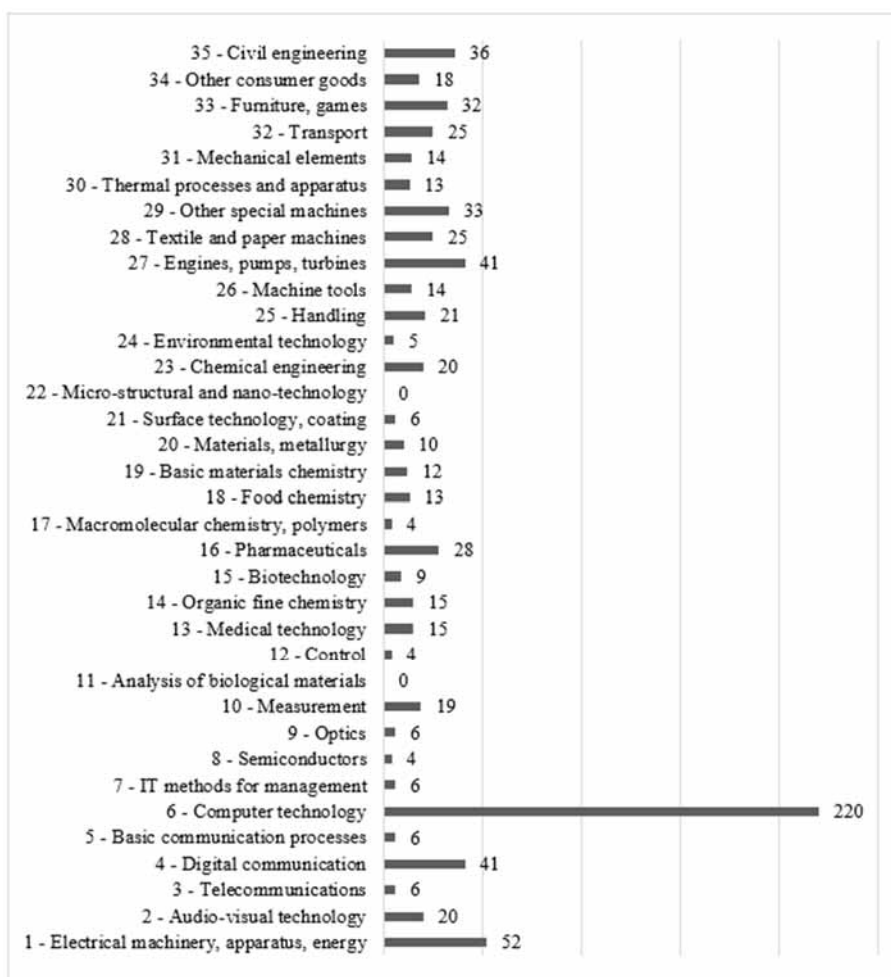


Source: WIPO Statistic Data Center, Author's calculations.

Unlike patent application activity (see Figure 8), where Bulgarian patent applicants are dominant, here (see Figure 18) there is a quantitative superiority of foreign patents rights in the technological area of *Chemistry* and, in the fields of: *Pharmaceuticals* – 34.2% share of total foreign patents granted against 2.9% of Bulgarian patents; *Organic fine chemistry* – 21.8% of foreign ones in 1.1% of Bulgarian patents; *Biotechnology* – 6.6% foreign and 1.8%

Bulgarian patent rights. Bulgarian activity in *Chemistry* is concentrated in other fields, such as: *Basic materials chemistry* (4.8%); *Environmental technology* (4%); *Materials, metallurgy* (3.6%), etc., which contributes to the quantitative comparability between the number of patent rights for Bulgarian and foreign patentees in this field (Figure 16).

**Figure 19. Number of patents granted to Bulgarian owners abroad by technological fields for the period 2010-2021 (number of grants)**



Source: WIPO Statistic Data Center, Author's calculations.

Bulgarian patent owners are focusing on *Electrical machinery, apparatus, energy* (12.4% share of total patents granted) and *Measurement* (9.6%). The rest of the patents granted to Bulgarian citizens is distributed along the different fields within 5% of the total patents granted.

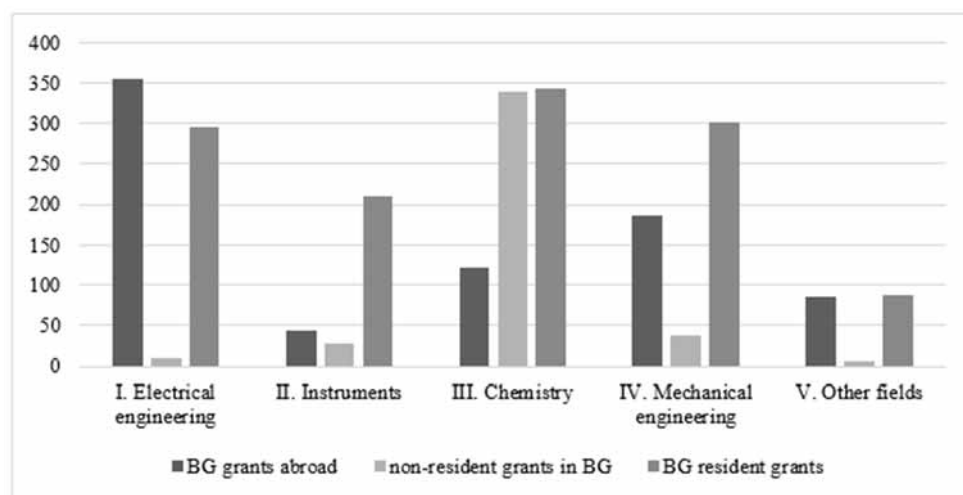
The data are also indicative of the presence of fields entirely dominated by Bulgarian monopoly rights, such as: *Digital communication*; *Basic communication processes*; *Optics*; *Textile and paper machines*; *Thermal processes and apparatus*; *Mechanical elements*; *Furniture, games*.

Looking at the activity of Bulgarian patent owners abroad (Figure 19), we can consider the similarity in the positions of the technological fields in the applied-for (Figure 9) and the obtained patent rights.

The largest share of patents was granted in *Computer technology* (27.7%); *Electrical machinery, apparatus, energy* (6.6%); *Engines, pumps, turbines* (5.2%), and *Digital communication* (5.2%). In the other fields, the obtained patent rights are less than 5% of the total share. In the fields of *Micro-structural and nano-technology* and *Analysis of biological materials* for the research period, there are no protected Bulgarian patent rights abroad.

A comparison of the granted patents of Bulgarian and foreign citizens in Bulgaria and Bulgarian citizens abroad is presented in Figure 20.

**Figure 20. Comparison of patent activity by technological areas for the period 2010-2021 (number of grants)**



Source: WIPO Statistic Data Center, Author's calculations.

Like the applicant activity, the highest patent activity Bulgarian patent owners demonstrate in *Electrical engineering* – it is concentrated at 44.8% of the total patent activity abroad. The second area in which monopoly positions of Bulgarian patentees abroad are concentrated, is *Mechanical engineering* (23.5%), and a third is *Chemistry* (15.4%). In fourth and fifth

position are respectively – *Other fields* (10.8%) and *Instruments* (5.5%), in which both the applicant activity and the number of patents granted have less interest.

In summary, the Bulgarian activity of patent owners in Bulgaria is transferred abroad – the areas where there is a concentration of patent rights on the national territory are also those where there is the largest share of Bulgarian patents abroad.

## 5. Conclusions

Although this study presents a limited view of the patent activity of Bulgarian and foreign applicants and patent owners in Bulgaria and the Bulgarian patent activity abroad, the analysis allows us to outline the following conclusions:

*First.* The analysis of the state and dynamics of Bulgarian and foreign patent activity in Bulgaria and Bulgarian activity abroad allows disclosure of the ongoing technological changes and assessment of the inventive potential in the country. The negative downward trend in the overall (Bulgarian and foreign) applicant activity in Bulgaria for the period 2010-2021 is indicative of a decrease in the interest in protecting the rights to innovative technologies in Bulgaria. At the same time, it is observed an increase in Bulgarian applicant activity abroad, aimed at advanced or technologically developing countries, including the United States, the Member States in the European Patent Office, China, India, Japan, Germany, and others.

The analysis of the state and dynamics of granted patents considers the mentioned trends, with the most noticeable decrease in the number of patents granted to foreign patentees – from 130 patents in 2010 to 13 in 2021. These data, in addition to the outflow of foreign interest in the Bulgarian market and reduced investment activity of foreign companies, may also indicate a transition to the protection of patent rights through the EPO and other regional organizations, data for which are not collected and processed by the WIPO Statistic Data Center.

The data on the number of patents granted to Bulgarian patent owners in Bulgaria and abroad shows an increase in the activity of Bulgarians for the protection of innovative technologies outside the national territory (USA, EPO, China, etc.).

*Second.* The analysis of the technological areas targeted by Bulgarian applicants in Bulgaria for the period 2010-2021 brings the area of *Mechanical engineering* as the most preferred for patenting. Second in interest for Bulgarian applicants is the area of *Chemistry*, third is *Electrical engineering*, and fourth and fifth place respectively are *Other fields* and *Instruments*. Bulgarian activity abroad for the same period is ranked in a different sequence – the first place is the area of *Electrical engineering*, followed by the areas of *Mechanical engineering*, *Chemistry*, *Other fields*, and *Instruments*.

This testifies to the technological specialization and orientation of the state and companies towards specific technological areas to which future development and inventive potential are directed. Obviously, the aspiration of Bulgarian applicants abroad is focused on *Electrical engineering*, given that in two of the fields in the same area, the highest concentration of

patent applications was measured: *Computer technology* (14% of the total applications filed) and *Electrical machinery, apparatus, energy* (8.2%). On the other hand, the development of technological fields in *Mechanical engineering* (first in the concentration of applications for protection of patent rights in Bulgaria) reflects the domestic specialization of the country.

*Third.* The structure of the patents granted in Bulgaria brings out the first in important area of *Chemistry* (41.1%). The high degree of quantitative coincidence between the granted Bulgarian (343) and foreign (339) patents in *Chemistry* shows that foreign interest is directed to areas that are characterized by higher local technological level. This is an opportunity for technological exchange and transfer of patented knowledge, granting licenses or implementing a partnership which will contribute to continued technological development and a higher level of competitiveness. Nevertheless, the distribution of patents in different areas in the field of Chemistry testifies to the lagging behind of Bulgarian patent owners compared to foreign patentees in the fields of Organic fine chemistry, Biotechnology and Pharmaceuticals, which are characterized by high added value and higher importance in the context of the concept of sustainable development.

The second area in which there is a strong concentration of Bulgarian and foreign patents is *Mechanical engineering*, reflecting the internal technological specialization of Bulgaria, and the third in the number of patents granted to Bulgarian citizens is the area of *Electrical engineering*, reflecting the external specialization of companies.

*Fourth.* Low Bulgarian and foreign patent activity in the areas of Instruments and Other fields talk about difficulties and problems related to inventive capacity, low level of R&D spending and lack of incentives and opportunities for development in these technological areas and fields.

The study and the outlined conclusions allow us to confirm the importance of patent statistics as an indicator of technological changes in the economy and an appropriate tool for analyzing the inventive potential in Bulgaria, as well as for revealing the changes and trends taking place during the study period.

The increased interest of Bulgarian citizens in acquiring monopoly positions on the territory of Bulgaria and abroad through patenting of innovative technologies reflects the scientific and technical expansion of Bulgaria to other countries. Similarly, analyzing the nationality of patented inventions by foreign patentees in Bulgaria can determine which country has economic interests in our country, and the data on the classification indices under the IPC and their analysis determines the technological areas and fields in which these interests are expected to be realized.

Analyzing the patent activity of Bulgarian patent applicants and patent owners should also consider the fact that the state of patent activity in Bulgaria is a result of the influence of several factors with a negative impact on the decision of managers to create innovative intellectual developments that will legally protect through intellectual property rights, including:

- *Low level of R&D expenditure* – according to data from the World Economic Forum for 2021 (WEF, Sep 16, 2022), the level of R&D investment in Bulgaria is lower than in

other EU-27 Member States. For this year, in terms of funds from the state budget aimed at R&D, our country occupies the penultimate position, ahead of only Romania.

- *Insufficient level of awareness and motivation of enterprise managers* – in a survey of the non-financial enterprises operating in Bulgaria in the manufacturing industry for the period 2015-2017, Panteleeva, Vamezov & Kostadinova (2018) found the extremely weak patent activity of the included enterprises. Moreover, respondents declare that “*insufficient information and knowledge in this field have prompted a significant share of managers to passive behaviour and the search for other ways to preserve the available company knowledge and assets.*” (Panteleeva, Vamezov & Kostadinova, 2018, p.140) A prerequisite for the results obtained can also be found in the scope of the survey, in which the predominant share of respondents (96%) are micro, small, and medium-sized enterprises. Their limited R&D capabilities, in addition to the necessary costs of acquiring and maintaining intellectual property rights, are a significant barrier that negatively affects patent activity in Bulgaria.
- *Stability of the legal system in the protection of patent rights* – one of the reasons discouraging the patent activity of enterprises and independent inventors is the difficulties in proving the abuse of foreign rights. Often, infringers who, instead of putting effort and money into their own developments, prefer to “copy” foreign innovative technologies, especially in cases where it is difficult to establish the unlawful use of someone else's patent rights.

These barriers to the patent activity of enterprises exacerbate their negative impact due to the impact of adverse factors on the surrounding enterprise. With the most pronounced influence can be highlighted, but not limited to, the following problem areas:

- highly dynamic and difficult to predict the functioning environment of enterprises, inability to predict market changes in the long term, difficulties in identifying market opportunities for enterprises, difficulties in entering foreign markets and competing with powerful foreign companies.
- absence of effective legislation stimulating the innovation activity of enterprises.
- lack of financial resources for the development and subsequent management of intellectual property rights.
- lack of potential for creation, acquisition, assimilation, and dissemination of technological knowledge due to the presence in enterprises of obsolete equipment and the lack of highly qualified and motivated researchers.
- ineffective interaction between scientific organizations and business.

The impact of these problems can be reduced by applying various measures and instruments, not only at the level of the enterprise, but also at a national and regional level:

- stimulating inventive activity in areas and directions where there is a lag in global trends, but also directing the efforts of researchers to meet the needs of the Bulgarian market.

- increasing R&D investment for micro, small and medium-sized enterprises, which have the most significant lag in terms of research and innovation activities.
- It is necessary to regularly conduct explanatory events on the importance of intellectual property rights for business.
- Creation of a national program to stimulate inventive activity and cooperation of Bulgarian and foreign scientific organizations.

In summary of what has been stated so far and considering the significant difficulties encountered by companies and independent inventors in providing legal protection for their developments, it should be emphasized that the use of intellectual property rights is a factor in achieving not only corporate growth and sustainability of results, but also contributes to the development of the regions and economies of individual countries. In this regard, patent statistics, as a predictor of technological development and economic change, can contribute to the development of a more flexible and scientifically based patent policy, an integral part of the general economic policy of any country, industry, or company.

The use of patent statistics as a predictor of technological development and economic change can contribute to the elaboration of a more flexible and science-based patent policy, an integral part of the general economic policy of each country, industry, or firm.

As a result of the study, we have achieved the following:

1. We presented existing patent research, showing patent statistics as a significant indicator of technological changes in the economy.
2. We studied and analysed the state and dynamics of patent application activity for the period 2010-2021 of Bulgarian and foreign applicants.
3. We studied and analysed the state and dynamics of patents granted in the period 2010-2021 to Bulgarian and foreign patent owners.
4. We revealed the trends of technological development by technological areas and fields.

Some questions remain that are not included in this paper and would be the subject of future studies: expanding the time scope of the study, establishing the trends and direction of change in the foreign patent flow in Bulgaria; analyzing the application activity and a number of patents granted through the European Patent Office, revealing the possibility of redirecting foreign applicants to the EPO patent procedures; disclosure of the links between the resource provision of enterprises in Bulgaria and their patent activity.

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Ensuring food security, in turn, is realized through the possibility of purchasing food taking into account its price, purchasing power, and its availability in appropriate quantity and quality, which will lead to social stability, food demand, Ukraine's independence from imports, development of its food production goods, the creation of reserves to stabilize food security in an emergency, unforeseen circumstances. Thus, the availability of food in sufficient quantity and quality to ensure the livelihood of society is a major challenge at the national and global levels. According to the Global Food Security Index assessment developed by Economist Impact, the level of food security decreased significantly in Ukraine (from 54<sup>th</sup> in 2020 to 71<sup>st</sup> in 2022), in the Russian Federation (from 24<sup>th</sup> in 2020 to 43<sup>rd</sup> place in 2022), in Belarus (from 23<sup>rd</sup> to 55<sup>th</sup>). There is a deterioration in the position of the Czech Republic in the rating, which moved from 5<sup>th</sup> to 16<sup>th</sup> place. The Slovak Republic, on the contrary, moved from 40<sup>th</sup> in 2020 to 36<sup>th</sup> place. Bulgaria ranked 29<sup>th</sup> place in 2022 in terms of food security out of 113 countries (Economist Impact. Global Food Security Index, 2022).

The globalization of the food problem determines the strategic goals of the world's leading agricultural countries which should guarantee a stable, affordable, sufficient, safe, and balanced level of nutrition. Ukraine is a member of the global political and economic system, in particular, the world food security system, and therefore must pursue a balanced state agricultural policy, take care of financing farmers, and timely resource provision of agricultural enterprises that provide food security.

Addressing the issue of insufficient financing of agricultural enterprises by improving the lending mechanism will ensure the effective functioning of agricultural policy and guarantee food security at all levels.

Crisis processes and modern global challenges negatively affected the interests' realization of a large number of business entities. Exchange rate and discount rate fluctuations, the introduction of quotas for the grain trade, constant changes in the taxation of entrepreneurs, low wages, and arrears of payments to the budget, unprofitable and bankrupt enterprises – all this affects the interests of employees, owners, and the state. In such conditions, the main export-oriented sector revival is extremely important.

Agriculture in Ukraine is one of the leading sectors of the economy. In addition to the stable provision of the country's population with quality, safe, affordable food, Ukraine's agriculture can make a significant contribution to solving the world problem of hunger.

The high level of development of the agricultural sector in Ukraine is largely due to favourable natural conditions. At the same time, climate change is creating new global challenges for the industry and necessitating additional investment in this sector.

At the same time, agricultural products are a resource component of production in various sectors of the national economy. The degree of saturation of the market with food products of agricultural processing, their quality, and price (availability) depends on providing the population with food, which in turn is one of the main production tasks.

Due to the growing demand for food, Ukraine has special expectations and responsibilities for increasing production. It should be noted that Ukraine is indeed gradually becoming a significant player in the global agricultural and food markets. The country occupies a leading

position in the trade of cereals and oilseeds, exports significant volumes of dairy products and sunflower oil, etc.

Now, undoubtedly, one of the reasons for the slow growth of productivity and agricultural production is the unattractive investment climate, military conflict, hostilities, and as a result insufficiently transparent, inconsistent, and burdensome government regulation for business. Now there is a lack of equipment and infrastructure in agriculture, especially since part of the agricultural machinery was damaged or destroyed as a result of warfare. The existing facilities are physically and technologically obsolete.

The need to renew fixed assets in the agro-industrial sector, where their depreciation reaches 80%, and for some agricultural enterprises even more and there is an acute shortage of agricultural machinery requires significant additional long-term financial resources, using non-traditional forms and schemes of crediting.

The level of collateral remains quite high, which in some commercial banks is three or even four, or five times higher than the loan amount. Two types of liquid assets are used for the pledge itself: young animals and future harvests. The value of mortgaged property is mostly lower than market prices. The loan amount is not limited. The problem of liquidity of mortgaged property and its use to provide movable and immovable assets remains relevant. Techniques and buildings are practically not accepted as collateral.

There is a lack of funds for the production of agricultural and food products with high-added value.

Also as a result of the pandemic and social and behavioural constraints, supply chains are disrupted, producers' access to markets is lost and demand for products falls. Some subsectors remain underdeveloped, including forestry, fishing, and aquaculture.

So the agricultural sector, which is the national economy leader in terms of goods exports, demonstrates steady growth dynamics and needs additional resources for its development. Lending to agricultural enterprises is an important source of stimulating the development of the real sector of the economy, which leads to the saturation of the domestic market with agricultural products, trade increase and food security strengthening. Problems of financing the agricultural sector and insufficient inflow of financial and credit resources continue to be the main factor hindering the agricultural production development in Ukraine.

The agricultural producers' financial support through credit resource usage is one of the most important issues in stimulating production in economic modernization. Increasing the solvency and creditworthiness of agricultural producers expands their opportunities in obtaining credit resources and increasing production capacity and solving social problems.

Along with the attractiveness of lending to agricultural enterprises, the disadvantages of such lending, as well as the peculiarities of lending in different countries, must be analyzed. For example, if in Ukraine the interest rates on loans are high, which makes it more difficult for agricultural enterprises to obtain loans, then in the Slovak Republic the interest rates are quite low, but the low-interest rates result in an increase in total loans (26,3% in 2020), and the stagnating interest costs (Ministry of Agriculture and Rural Development of the Slovak Republic. Green Report, 2020).

Some groups of countries use different approaches and features of agricultural lending mechanisms. Thus, such countries as Great Britain, the Slovak Republic, the Czech Republic, China, Austria, and the Netherlands involve a network of commercial banks in agriculture, which provide credit by providing state guarantees and subsidizing interest rates. There are countries that provide credit to agricultural production through a system of cooperative banks (France, Germany, Japan, Poland), as well as countries that operate non-bank credit organizations in agriculture (USA, Canada), credit cooperative systems for micro crediting of small family farms (countries of Central and Eastern Europe).

At the same time, each country has its own specifics in the organization of providing agricultural producers with financial resources. For example, in the USA and Germany, the financial system of agriculture includes various financial institutions. In France, Japan, the Netherlands, and Israel, most financial operations in agriculture are carried out through the involvement of one or two specialized banks. There are no specialized agricultural banks in Great Britain and the credit policy for agriculture is carried out in the same way as for other sectors of the economy. A specialized agricultural bank operates in the Netherlands, which provides about 90% of credit financing for farmers (Rudych, Zubchenko, 2016).

The article's purpose is the theoretical and methodological principles and practical recommendations development for lending to the agricultural sector.

However, there is a discrepancy between the volume of lending and the results of activities obtained by agribusiness entities. The growth of the loan portfolio of banks, aimed at this area, is accompanied by miscalculations in the implementation of prudent credit policy and assessment of customers' creditworthiness.

That is why it is necessary to find approaches, forms and methods to improve the system of lending to businesses in the agricultural sector of the economy in order to create favourable conditions for economic growth.

## **2. Literature Review**

Researchers from different countries of the world are engaged in the study of agricultural development and the problems of its financing for a long period of time, as evidenced by publications dated from different time periods. Most researchers focus on improving the regulatory framework and bringing it in line with modern needs, simplifying the provision of administrative services for agricultural producers, studying the availability of financial resources for agricultural producers, ensuring uninterrupted sales, providing producers with access to knowledge and services, ensuring the development of the subsector, etc.

The content, functions and features of credit and credit relations were reflected in the scientists' papers: Azarenkova, Belenkova (2011), Azarenkova et. al. (2013), Dekhtyar et. al. (2018), etc. The specifics of lending in the agricultural sector of the economy are described in the papers by such authors as Berezina (2013), Gerasimova (2010), Gubenko (2010), Gudz (2017), Hutorov et. al. (2018), Jankelova et. al. (2017), Kucher et. al. (2019), Krasnorutskyy (2013), Lyashenko, Kotenko (2016), Yatsiv (2013) and others.

The agricultural credit policy in developing countries is considered by (Schaefer-Kehnert, Von Piachke, 2020).

Serebrennikova et. al. (2020) identify the characteristics of subjects of lending to agricultural enterprises; expand the understanding of the essence of the Bank's social functions and determine the significance of State regulation of agricultural lending.

The innovation policy of the agricultural sector is studied by Berezina (2013). The agricultural sector financial ensuring mechanism in crisis conditions is proposed in a paper by Gerasimova (2010).

Agricultural product competitiveness is considered by Gubenko (2010), Martynchyk (2014) and Yatsiv (2013). Strategic management of the agrarian sector of the economy based on the analysis of value chains is described by Hutorov et. al. (2018). Development prospects of Ukraine's foreign trade in agricultural products in the context of European integration and global challenges are presented by Matyushenko et. al. (2018). But these studies have not attempted to determine the relationship between access to credit and various factors, for example, agricultural production.

The state and the main problems of the credit mechanism in agriculture of Ukraine are described by Dadashev, Cheremisina (2012). They summarize the characteristics and the necessity of collateral activities of agricultural producers in modern economic conditions. They identify the main causes hindering the intensification of credit facilities in the agricultural sector and the basic directions of the stabilization mechanism of agricultural lending units. The authors emphasize that for banking institutions credit relations are risky. The main types of risks include seasonality of production and demand for products (and it's related to fluctuations in cash flow and borrower solvency), high dependence of business results on weather conditions, insufficient liquidity of the collateral offered to secure the loan; the necessity for the creditor to form significant insurance reserves to cover possible losses from credit operations, which reduces the profitability of these operations, the underdevelopment of the insurance market in the country, which now provides agricultural producers with formal insurance protection. This point of view is also used by Bezrodna et. al. (2019). But in our opinion, this conclusion is one-sided, because, in addition to the risks that agricultural enterprises' lending operations carry to banks, credits are also active bank operations, on which the bank earns and without which the normal functioning of a commercial bank and the banking system as a whole is impossible.

Ascui, Cojoianu (2019) develop a natural capital credit risk assessment framework based on a bottom-up review of the material risks associated with natural capital impacts and dependencies for Australian beef production. It demonstrates that implementing natural capital credit risk assessment is feasible in agricultural lending, using a combination of quantitative and qualitative inputs. Implementation challenges include the complexity and interconnectedness of natural capital processes, data availability and cost, spatial data analytical capacity, and the need for transformational change, both within lending organisations and across the banking sector.

The agricultural sector has certain features of capital formation within the financial system of the state. This is reflected in the requirements and approaches to the development of

financial policy by the state and in the corresponding mechanism for its implementation. Being an important tool within this mechanism, lending is aimed at ensuring the economic growth of the agricultural sector. State support facilitated the system of subsidizing loans by providing funds to reduce the cost of loans for farmers in Ukraine, thus encouraging increased productivity in the agricultural sector at the initial stage. However, gradually, this caused a debt agricultural economy that became dependent on the state and started negatively affecting the elimination of structural, intersectoral, and territorial disparities in the agricultural sector (Lemishko, Schevchenko, 2021). We agree with the authors that a high level of credit dependence is negative. In addition to the factors mentioned by the authors of the debt dependence of the agrarian economy on the state, we would like to add that the use of credit funds also increases the level of expenses of agricultural enterprises for servicing the loan. High demand for credit funds also contributes to the growth of interest rates, which is also negative. Therefore, in our opinion, an optimal balanced ratio between supply and demand for credit funds should be ensured.

Toth et. al. (2019) describe the impact of integration and globalization on business risk and loans in Slovak agriculture. They say that the decrease in employment in agriculture is a result of technological progress, changes in individual family preferences and low income in agriculture in comparison to other sectors of the economy. In production commodities with low labor input dominate. Cereals, oilseeds and industrial crops dominate the agriculture production in Slovakia. Large farms benefit in the form of an economy of scale and the agricultural output of farms remains low in Slovakia. The paper compares the risk of crop and animal production based on individual farm data using Markowitz's portfolio theory. Crop production is more risky due to the higher effects of weather conditions compared to animal production. The second part of the paper evaluates the changes in the access to credit and finance gap of farms in Slovakia. Based on individual interviews with representatives of demand and supply of loans the paper concludes that large the Common agricultural policy is playing a dominant role in access to credit. Banks consider the CAP subsidies to be a stable income factor and good collateral for loans. The loan market is dominated by short-term loans and the majority of the market offers are coming from 4 commercial banks. The finance gap exists towards small farmers and farmers with animal production and special crops. Our analysis of Financial needs in the agriculture and agri-food sectors in Slovakia, 2020 largely confirms Toth et. al. (2019) research and showed that the key elements of financial demand from the Slovak agriculture sector are:

- Slovak farmers are less worried about rising production costs and declining output prices, compared to the EU-24;
- farmers mostly apply for short and medium-term loans;
- loans are used for working capital needs and investments in machinery, buildings and land;
- loans are a major source of external financing and the uptake of loans has been increasing since EU accession in 2004;



- as much as 75% of agriculture loans are directly linked to CAP support measures, according to banks interviewed. This is because RDP support catalyses investment loans and CAP direct payments are used as guarantees;
- Slovak farmer's loan applications are rejected more often than the EU-24 average;
- banks reject loans applications due to an economically unviable project or an unviable farm, a lack of sufficient collateral, a lack of credit history and the high investment risk of new entrants;
- small-sized farms and young farmers have particularly low access to loans due to poor credit history, a lack of collateral and because they are often considered economically unviable.

Stoeva, Dirimanova (2021) analyze the changes in Bulgarian agriculture which is characterized by great intensity and dynamics, as well as the dynamics in the development and specificity of land relations in Bulgaria in the context of the CAP. The results pointed out the fragmentation of the use of agricultural land and the existence of a large number of small farms. In Bulgaria in recent years, extensive farming has been given a strong impetus at the expense of intensive farming, a process that is of a sustainable nature and has a clear causal link.

Fecke et. al. (2016) investigate the influencing factors of loan demand in agriculture. The authors find that interest rate, GVA, grace periods and farmers' business expectations have significant effects on the loan demand in agriculture. According to the results, the interest rate has a significant negative effect, whereas the granted grace periods, the GVA in agriculture and farmers' business expectations have significant positive effects on the loan demand.

Osabohien et. al. (2022) examine how agricultural sector performance will be enhanced in Nigeria through access to credit. Results showed that agricultural credit proxied by the agricultural credit guarantee scheme fund (ACGSF) and commercial bank credit to agriculture significantly increased agricultural performance by 10.30% and 17.05% respectively. Also, other explanatory variables included in the model (arable land and agricultural employment) tend to increase agricultural performance by 65.51% and 12.40% respectively. Based on findings, the study recommended that farmers should be provided with sufficient access to credit which will enhance their ability to purchase agricultural inputs required to increase productivity. In our opinion, this research confirms the significant role of credit in ensuring the agricultural complex efficient functioning.

Demyanenko (2016) gives methodical recommendations on credit support for agricultural producers. According to Demyanenko (2016) regardless of the pricing of the factors in the credit market, agricultural enterprises need to set a low fee for the use of credit resources. This objective requirement is due to the low profitability of agricultural production, compared with other industries national economy and, consequently, the inability to pay to the creditor the market interest for the received credit.

Despite the existence of papers related to the agricultural enterprises' creditworthiness assessment, there are no end-to-end diagnostic models that make it possible to assess the

effectiveness of the use of credit funds at various levels of the hierarchy (macro, regional, micro), which can improve the coherence of economic policy.

Lending to the agricultural sector in Ukraine remains one of the main obstacles to the effective development of agriculture, which is manifested mainly in ignoring the specifics of agricultural production and the specifics of the agricultural sector in lending, which highlights the need to improve methodological tools for lending to the agricultural sector.

The limited capacity of agricultural enterprises to use financial instruments is explained by:

- the presence of specific risks in the activities of farms, which, accordingly, restrains the demand for credit services;
- low supply of credit services to agricultural enterprises by financial institutions;
- low level of use of existing credit instruments in the interaction of agricultural enterprises and financial institutions.
- At the same time, the limited state financial support of agricultural enterprises in Ukraine is due to:
  - change of organizational and legal forms of the subjects of the agricultural sector;
  - the destruction of the existing resource base of agricultural producers in connection with the transition to market principles of management;
  - inconsistencies, contradictions, and fragmentation of measures of state regulation of the agricultural sector;
  - the presence of numerous violations in the existing system of state financial support of agricultural enterprises, including and due to a subjective factor.

Currently, the unresolved problems of lending to agricultural enterprises remain:

- expensive banking resources and imperfect lending mechanisms for the agricultural sector;
- the limited ability of credit unions to lend to agricultural enterprises, on the one hand, and distrust of agricultural enterprises themselves to these financial institutions, on the other hand;
- insufficient collateral for agricultural producers and underdeveloped use of warehouse certificates by farmers as collateral for loans.

However, the adequate applied decision-making tools in these areas are insufficiently studied, which is proposed in this article for solving all development-related issues (finance, regulation, potential, and accessibility to certain resources and market sectors). Given the unresolved issues, this article is devoted to improving credit mechanisms, improving the borrower's creditworthiness assessment on the bases of integrated application of multidimensional analysis methods, and methodological approaches to the borrower's creditworthiness assessment of the agricultural sector.

### 3. Common Fundamentals

The research is based on the confirmation of the following empirical hypotheses:

Hypothesis 1. Effectively attracted credit funds and investment resources have a positive effect on both the agricultural sector's rate of growth and its marginality.

Hypothesis 2. There are regional, spatial, and structural imbalances in the availability of credit resources and the efficiency of their use. There is a discrepancy between the lending volume and the economic results obtained by agricultural enterprises.

Hypothesis 3. The dominant influence on the creditworthiness level of agricultural market subjects is formed by a set of different-level factors that depend on natural and climatic, economic, political, institutional, informational, legal, and technical conditions of functioning.

Hypothesis 4. The risks of lending to the agricultural sector are determined by a significant number of external and internal factors. System-providing risks, system-forming risks, mortgage risks, natural and climatic risks, and production risks are distinguished as dominant.

The development of a model basis of end-to-end analytics will make it possible to assess the level of efficiency of the use of credit resources, identify imbalances in regional development and regions with maximum returns for agricultural enterprises, and identify specific risks and factors for making more informed decisions of credit resources management.

To realize the article's purpose, a complex toolkit of modelling in the direction of their influence on agricultural enterprises indicators according to the scenarios of the development was proposed, which involves the implementation of the following stages:

1. Determination of the goals and objectives of the development of agricultural enterprises crediting.
2. Analysis of the current state of lending to agricultural enterprises.
3. Planning measures for the regional development of agricultural enterprises.
4. Assessment and forecasting of the agricultural enterprises' creditworthiness.
5. Making decisions regarding the improvement of lending to the agricultural sector of the economy.
6. Controlling the results and correction of credit activities of business entities in the agricultural sector of the economy.

The following methods of scientific research were used in the research process:

- comparative and factor analysis (for identifying specific features of the classification of lending to the agricultural sector);
- discriminant analysis (for assessment of the classification function for agricultural enterprises classes);
- univariate and multivariate variance analysis (for determination of the differences between the creditworthiness class and the size of agricultural enterprises);

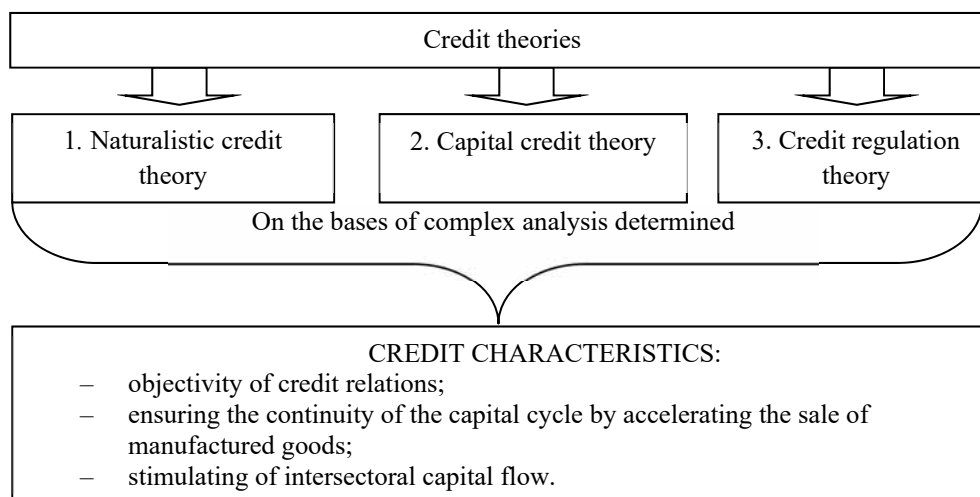
- methods of factor analysis (for confirmation of the hypothesis of grouping agricultural enterprises' credit risks by components);
- hierarchical and iterative methods of cluster analysis (for the selection of agricultural enterprises classes according to the risk level);
- models of fuzzy sets (for determination of the correspondence between the credit risk level and the change in the agricultural enterprises' creditworthiness level).

The choice of research modelling methodology is determined by the following advantages, which are implemented in the paper:

- wide possibilities of usage, especially in conditions of uncertainty and risk;
- convenience in combination with other economic and statistical methods;
- a set of statistical evaluations of the effectiveness of lending to agricultural enterprises and its impact on the regional development of the agricultural sector;
- dynamic spatial analysis of agricultural enterprises' credit risks;
- creditworthiness management scenarios for agricultural enterprises and financial institutions.

The article highlights the credit characteristics and substantiates the use of a complex approach to determine credit by different theories, which makes it possible to interpret the credit origin (see Figure 1). The systematization of factors (climatic, economic, social, legal, and institutional) in the agricultural sector was done, which allows us to take into account their impact when assessing the risks of loan non-repayment by the borrower.

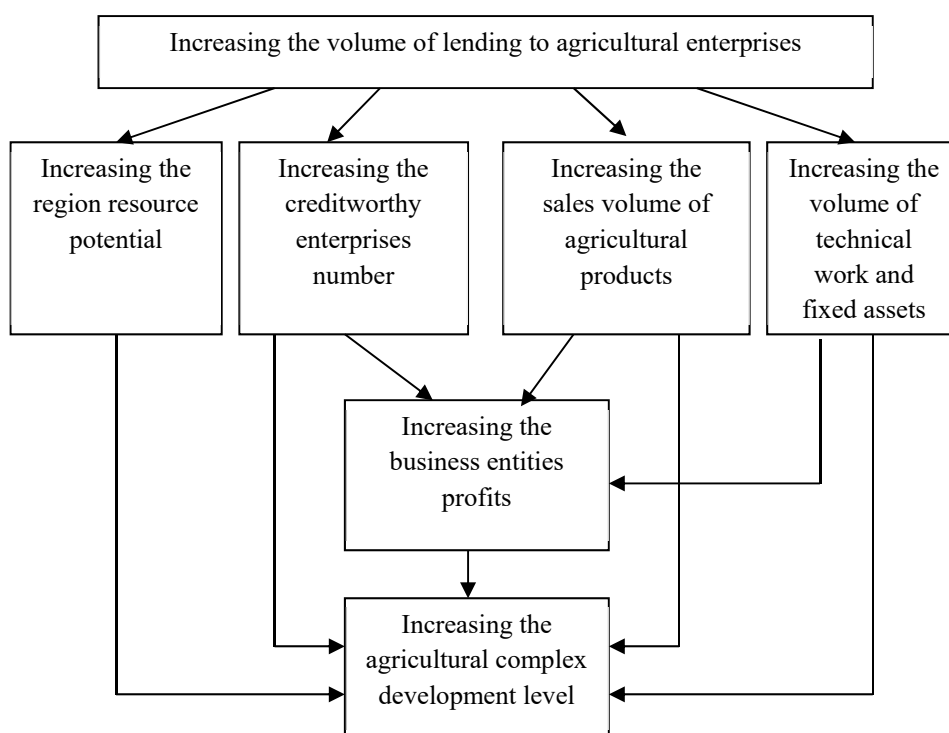
**Figure 1. Characteristic features of credit according to various theories**



*Source: developed by the authors on the bases of Bezrodna et. al. (2019), Jankelova et. al. (2017).*

It should be noted that the increase in lending will affect the agricultural complex effectiveness (see Figure 2).

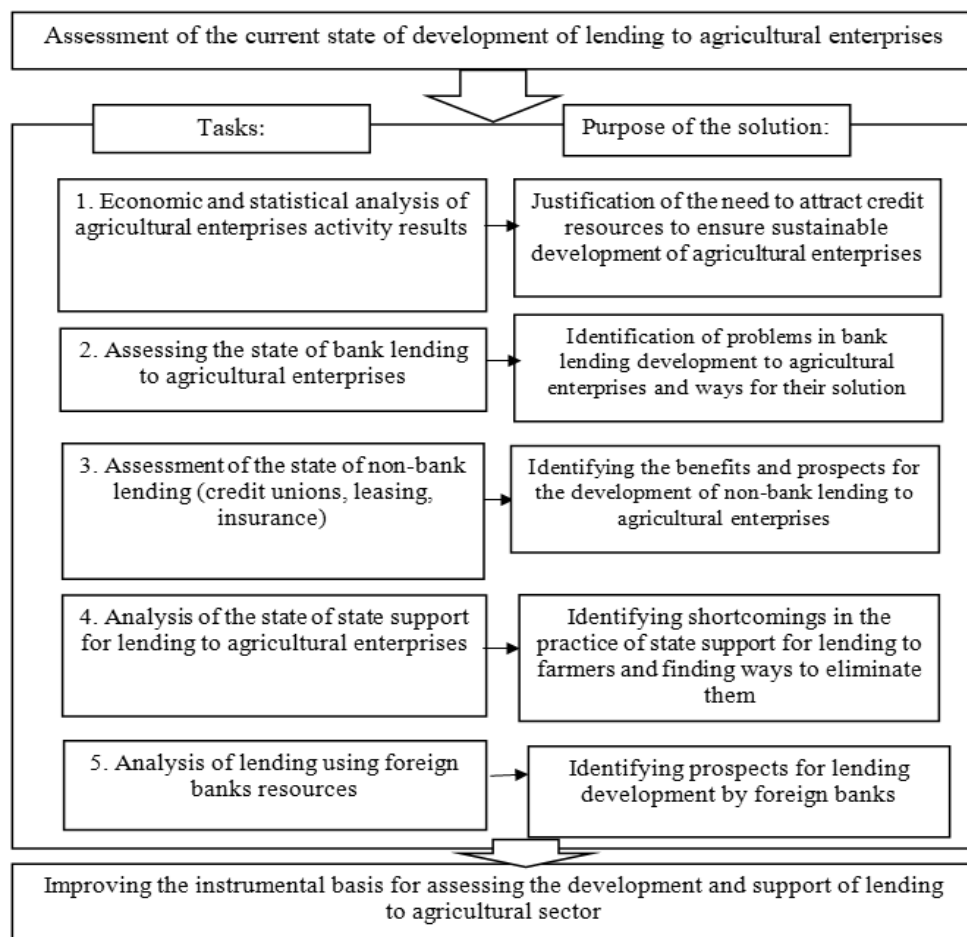
**Figure 2. Influence of lending level on the efficiency of agricultural complex activity**



Source: developed by the authors on the bases of Krasnorutsky (2013), Kucher et. al. (2019).

Assessment of the current state of lending to agricultural enterprises makes it possible to analyze the opportunities for farmers to access credit resources from various sources, the feasibility of attracting credit resources and conditions for their provision, to identify shortcomings in the agricultural credit system that exists today in Ukraine based on which it is possible to develop an effective instrumental basis for the development of financial and credit mechanism to support the agricultural sector. For this purpose, it is necessary to solve such tasks (see Figure 3).

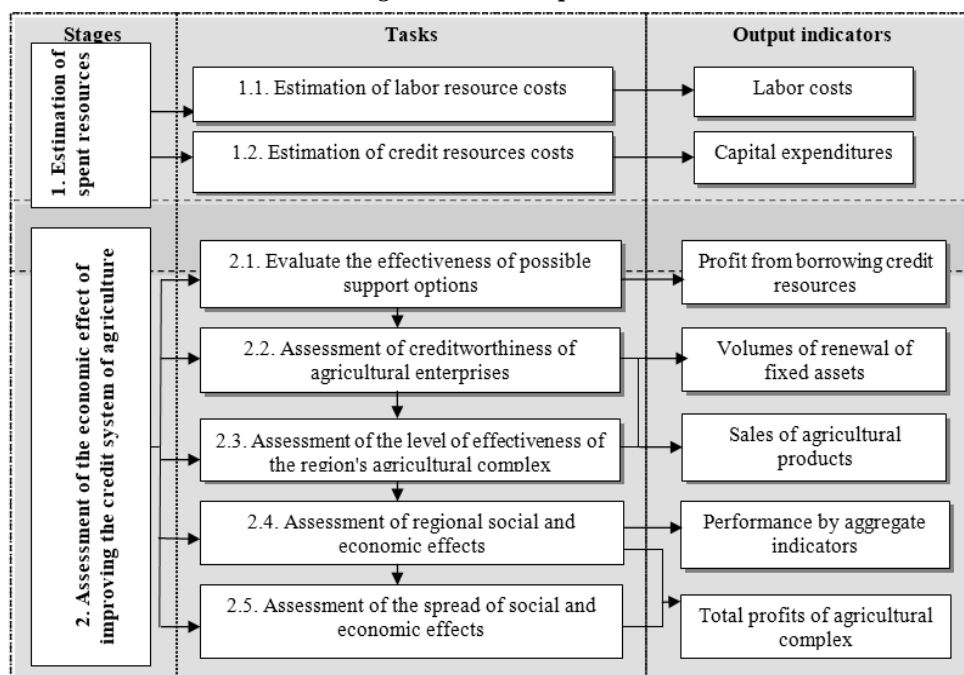
**Figure 3. The main tasks of the research of the lending development state to agricultural enterprises**



Source: developed by the authors.

To take into account the whole set of factors that affect the effectiveness of agricultural enterprises, the assessment of the effectiveness of support should be complex and solve such a set of tasks shown in Figure 4.

**Figure 4. A set of tasks to assess the effectiveness of improving the lending system of agricultural enterprises**

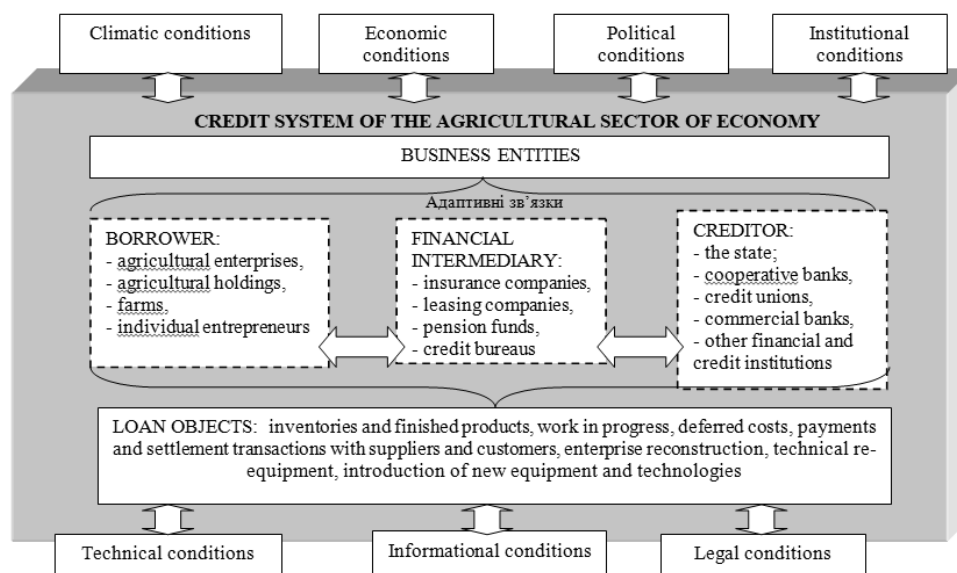


Source: developed by the authors.

The agricultural sector credit system's effectiveness depends on taking into account the climatic, economic, political, institutional, informational, legal and technical conditions. The purpose of this system is to ensure the continuity of the capital cycle by increasing production, accelerating agricultural products sale, and stimulating the process of reproduction and development of the agricultural sector of the economy (Figure 5).

It is proved that the factors of the institutional environment have a stabilizing effect on agricultural production development. The institutional factors in modern conditions can become the most important for lending to the agricultural sector of the economy. The main influence of institutional factors is manifested through formal and informal institutions. It was found that the interests of formal institutions do not always correspond to the interests of informal institutions, which leads to a mismatch between the interests of participants in the credit process.

**Figure 5. Credit system of the agricultural sector of economy**



Source: developed by the authors on the bases of Lyashenko, Kotenko (2016).

An important role is given to the analysis of the specifics of lending in the agricultural sector, which indicates a shortage of working capital and high-interest rates, the inefficiency of agricultural production, the low creditworthiness of the borrower, and the predominance of short-term lending.

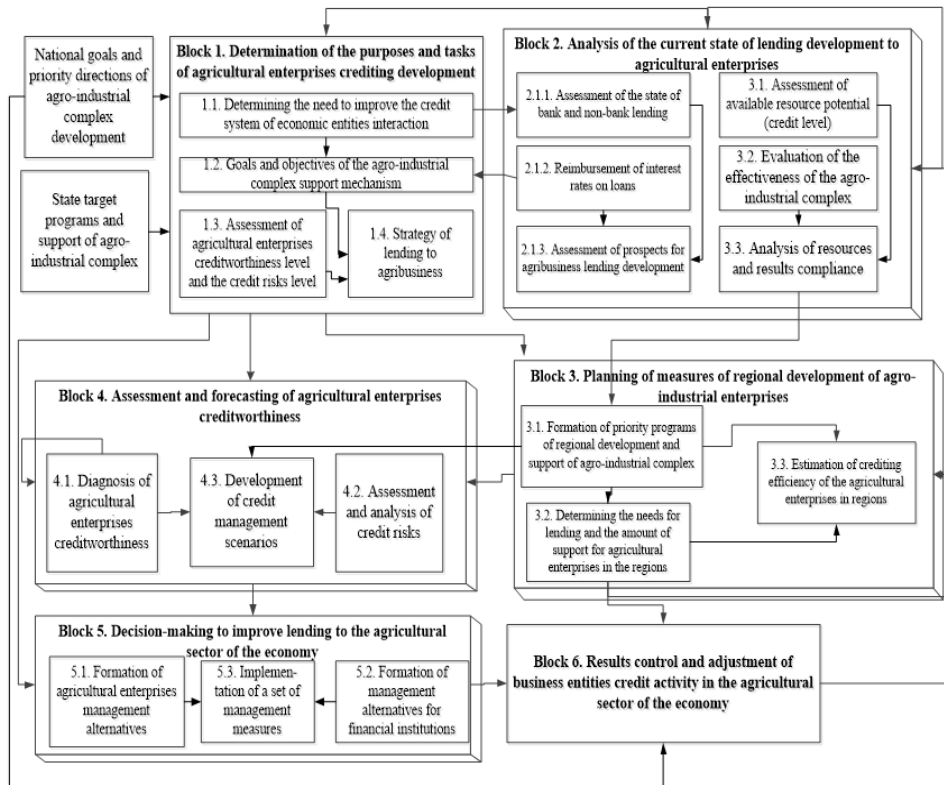
The generalization of the main approaches to determining the essence of the lending tools to agricultural entities makes it possible to clarify the economic forms and methods of relations between the state, credit institutions, and economic entities to ensure food security.

Analysis of the current state of lending to Ukraine's agricultural enterprises shows significant problems in lending development to agricultural enterprises, due to the inefficiency of the administrative and organizational structure of credit management, as well as the underdeveloped financial and credit systems to support the agricultural sector and modern credit programs.

To overcome the shortcomings and improve the management system in the paper we propose methodological tools for lending to agricultural businesses entities, which involves the interaction of three levels of the management hierarchy – macro-, meso- and micro-levels (state – region – agricultural enterprises) and aims to improve the financial and credit system to support the agricultural sector and identify management scenarios in accordance with the priority areas of agricultural sector development (Figure 6).



**Figure 6. Methodical tools for lending to agricultural businesses entities**



Source: developed by the authors on the basis of the material by Sergienko, Gula (2018).

To assess the effectiveness of agricultural sector support processes in the regions, a set of economic and mathematical models were built on the bases of econometric production functions, which make it possible not only to calculate the necessary criteria, conduct a complex analysis but also use models to predict efficiency indicators, study the impact of changes in production factors and expenditure of resources on agricultural enterprises results, develop recommendations for each situation.

Production functions models for lending effectiveness assessing agricultural enterprises in Ukraine regions are given in Table 1. Data for the construction of models are taken from the official website of the State Statistics Service of Ukraine and the official websites of agricultural enterprises, where financial statements are published.

**Table 1. Production functions models for lending effectiveness assessing to agricultural enterprises in Ukraine regions**

№	Variables of production functions models	Assessment of adequate
1 (X19)	X19 – Products of agricultural enterprises X9 – Short-term loans volumes X4 – Labor costs	$x_{19} = 25.28 \cdot x_9^{0.094} \cdot x_4^{0.786}$ R=0.966; F=417.35
2 (X7)	X7 – Net profit (loss) X9 – Short-term loans volumes X4 – Labor costs	$x_7 = 0.106 \cdot x_9^{0.284} \cdot x_4^{1.411}$ R=0.905; F=79.85
3 (X7)	X7 – Net profit (loss), X9 – Short-term loans volumes, X22 – Number of employees in agricultural enterprises	$x_7 = 6.265 \cdot x_9^{0.237} \cdot x_{22}^{1.63}$ R=0.902; F=77.46
4 (X7)	X7 – Net profit (loss) X13 – Amount of financial support for farms on a revolving basis X22 – Number of employees in agricultural enterprises	$x_7 = e^{6.57+0.0007x_{13}+0.061x_{22}}$ R=0.924; F=93.52
5 (X14)	X14 – Average volume of agricultural production by farms, X13 – Amount of financial support for farms on a revolving basis X22 – Number of employees in agricultural enterprises	$x_{14} = e^{5.52+0.685 \cdot x_{13}+0.0075 \cdot x_{22}}$ R=0.967; F=396.03

Source: developed by the authors using Statistica.

The analysis of the economic efficiency of agro enterprises of Ukraine regions makes it possible to conclude that even the presence of a high level of lending without a reasonable, clearly defined, adequate strategy of credit funds usage will not ensure high efficiency of their activities which demand agricultural enterprises lending improvement in accordance with the level of their creditworthiness, taking into account the whole set of credit risks.

The paper proposes an approach on the bases of the spatial multi-element matrix of compliance of the components and is the basis for assessing the impact of lending efficiency on the results of agricultural enterprises in accordance with their groups and allows us to determine individual features of the studied process in regions to select regulatory levers. Evaluation of the efficiency of the agro-industrial complex in the region is proposed by (Gudz, 2017). The organizational and economic measures to support lending to agricultural enterprises at different levels are presented in Table 2.

On the bases of Ukraine's region positioning, according to the level of results of agricultural enterprises' activity and their lending activity, the matrix of development directions has been developed taking into account the level of agricultural development of the regions (Tab. 3). It is proved on the bases of the obtained results, that the strategic line of agro enterprises crediting by regions according to the agricultural development level of regions is the transition from mainly basic support of agricultural enterprises crediting to crediting and financing of their specific projects that ensure the activity effectiveness for all management levels on the basis of certain directions of credit development taking into account the agro enterprises' creditworthiness level.

**Table 2. Organizational and economic measures to support lending to agricultural enterprises**

Management level	Organizational and economic measures
State	Reforming the legal, judicial and executive systems to provide support for lending to the agricultural sector
	Improving the legal framework for lending to agricultural enterprises
	Ensuring the implementation of crops with seeds of varieties and hybrids of high reproductions, compliance with modern technologies on the terms of preferential lending
	Introduction of mechanisms to reduce the cost of loans to farmers at the legislative level with the involvement of state banks
	Development of a sound concept of reforming the insurance system in agriculture
	Involvement of international banking and other financial institutions in lending (investing) the agricultural enterprises' development
Regional	Creating favourable economic and financial conditions for the cooperation of agricultural enterprises and the development of rural communities
	Establishment of regional centres for the cooperation of agricultural enterprises, credit institutions and innovation centres for small and medium business development in the agricultural complex
	Introduction of tax benefits aimed at stimulating regional development of agricultural enterprises
	Expansion of elements of agricultural lending infrastructure
	Implementation of targeted programs of the regional development of agricultural complex with the provision of targeted lending
	Organization of management consulting and measures for entrepreneurs' financial literacy improving
Entrepreneurial	Organization of monitoring of information on available agribusiness lending services, search for favourable conditions, consultations with specialists
	Search and implementation of ways to increase the enterprise's creditworthiness
	Finding ways to update production technologies, use leasing of machinery and equipment
	Participation in regional and state-targeted lending programs for agricultural enterprises
	Participation in regional events of management consulting and entrepreneurs' financial literacy improving

Source: developed by the authors.

**Table 3. Matrix of crediting development directions of agricultural enterprises by regions**

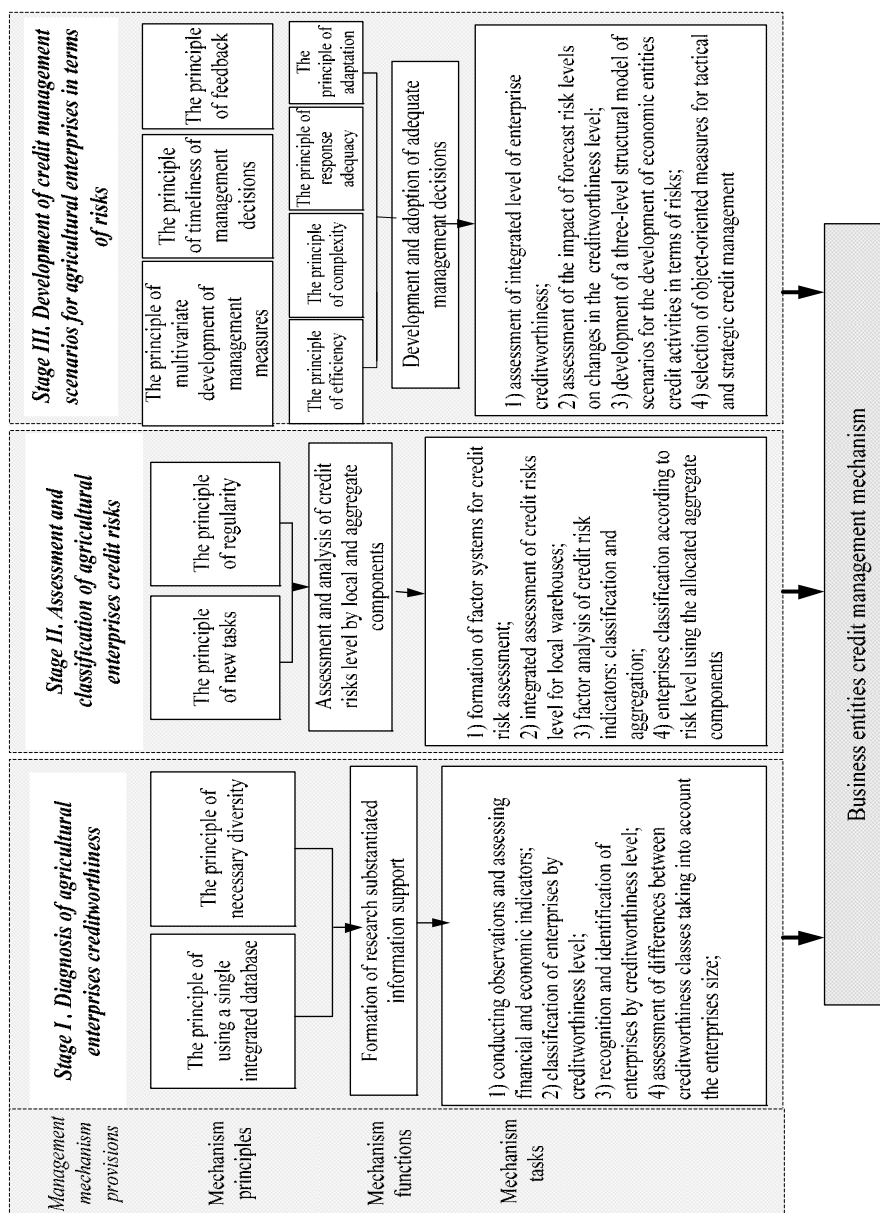
Activity results level	High	Stimulation-investment (Vinnytsia, Dnepropetrovsk, Poltava regions)		Investment stimulation (Kyiv, Kharkiv, Cherkasy regions)
	Medium	Compensation-stimulation (Zaporizhia, Sumy, Khmelnytskyi, Chernihiv regions)		Stimulation-support (Kirovohrad, Mykolaiv, Odessa, Kherson regions)
	Low	Compensation- support (Lviv and Ternopil regions)	Stimulation- compensation (Volyn, Donetsk, Zhytmyr, Zakarpattia, Ivano-Frankivsk, Luhansk, Rivne, Chernivtsi regions)	
		Low	Medium	High
Agricultural enterprises crediting level				

Source: developed by the authors on the bases of Gudz (2017), Martinchik (2014).

The paper proposes a complex credit management mechanism for agricultural enterprises on the bases of a process approach which is studied in papers by Ayvazyan et. al. (1989), Dubrov, Troshin (1998), Klebanova et. al. (2018).

The principles, functions, and tasks of the proposed mechanism are presented in Figure 7.

**Figure 7. Principles, functions and tasks of agricultural enterprises credit management mechanism**



Source: developed by the authors.

According to the method of creditworthiness diagnostics, we have obtained 3 discriminant recognition functions for the studied sample of 14 agricultural enterprises:

$$\begin{cases} Z_1 = -73,39 + 2,55 \cdot K_3 + 6,21 \cdot K_4 + 3,52 \cdot K_5 + 16,17 \cdot K_6 + 37,43 \cdot K_7 - 19,15 \cdot K_8 + 23,79 \cdot K_9 \\ Z_2 = -4,86 + 1,56 \cdot K_3 + 3,78 \cdot K_4 + 2,24 \cdot K_5 + 5,96 \cdot K_6 + 5,73 \cdot K_7 - 0,49 \cdot K_8 + 3,27 \cdot K_9 \\ Z_3 = -40,12 + 3,39 \cdot K_3 + 17,24 \cdot K_4 + 5,11 \cdot K_5 + 23,59 \cdot K_6 + 19,71 \cdot K_7 - 0,24 \cdot K_8 + 4,45 \cdot K_9 \end{cases} \quad (1)$$

where  $Z$  – integral indicator;  $K_3$  – coefficient of financial independence;  $K_4$  – a ratio of non-current assets to equity;  $K_5$  – return on equity;  $K_6$  – coefficient of profitability of sales by financial results from operating activity;  $K_7$  – coefficient of profitability of sales on financial results from ordinary activity;  $K_8$  – return on assets for net income;  $K_9$  – turnover ratio of current assets.

For the selection of the most important factors in each of the creditworthiness classes, the impact of certain indicators on the results of the discriminant analysis was assessed. The influence of indicators on the vaporization of the dependent variable (discriminant function) is stored according to the formula:

$$R_{k_j} = \frac{|a_j^*|}{\sum_{j=1}^m |a_j^*|} * 100\% \quad (2)$$

where  $R_{k_j}$  is the influence value of the  $j$ -th (in percentage) factor variable ( $K_j$ ) on the variation of the dependent variable;  $|a_j^*|$  is the modulus of the indicator value ( $K_j$ ).

For enterprises with a sufficient creditworthiness level, the largest impact of the variable  $K_7$  is observed, and for enterprises with a low and satisfactory level of creditworthiness –  $K_6$ .

The methods of variance analysis used in the study of agricultural enterprises' creditworthiness allowed us to determine the nature of the differences for their study population; test the hypothesis of the influence of factors and their interrelation at the appropriate significance level. The result is an assessment of agricultural enterprises' creditworthiness indicators variability, due to the action of each of the studied independent variables, the interaction of their totality, and random factors.

The agricultural enterprises' efficiency, as well as the level of their creditworthiness as a result indicator of the effectiveness of financial and economic activities largely depend on the risks level caused by a large number of factors of the internal and external environment that directly affect their goals, strategy, and tactics. By the proposed mechanism for agricultural enterprises' creditworthiness management, the following tasks of assessing and classifying their credit risks have been solved:

- 1) formation of a system of factors for credit risks assessment;

- 2) integral assessment of credit risks level by local components;
- 3) factor analysis of credit risk indicators, their classification, and aggregation;
- 4) classification of enterprises by risk level by selected aggregate components.

The results of factor analysis of the studied agricultural enterprises on the formed local indicators of credit risks and their components are presented in Table 4.

**Table 4. Results of factor analysis of credit risk classes for agricultural enterprises**

Components of aggregate credit risk classes	Designation of factors / (variance percentage)	Designation of local risk groups	Informativeness coefficient	Name of local credit risk components / (factor loading)
System providing risks	F2 (18.44%)	(R vr)	0.87	currency risk (0.86)
		(R dr)		government regulation risk (0.93)
System forming risks	F4 (10.53%)	(R pr)	0.79	interest rate risk (0.7)
		(R ir)		inflation risk (0.82)
		(R zr)		price risk (0.78)
Mortgage risks	F1 (37.29%)	(R zl)	0.8	liquidity decrease risk (0.75)
		(R vz)		risk of collateral loss (0.69)
Natural and climatic risks	F3 (14.69%)	(R tk)	0.78	temperature fluctuations (0.9)
		(R o)		precipitation (0.5)
		(R v)		wind (0.61)
Production risks	F5 (9.68%)	(R vtv)	0.81	risk of crop or its part loss (0.73)
		(R zpr)		risk of productivity decrease (0.95)
		(R tech)		technological risk (0.60)

Source: developed by the authors.

The aggregate classification of enterprises by the credit risk level on the bases of cluster analysis methods is presented in Tab. 5, where: L – low, M – medium, H – high-risk level.

**Table 5. Classification of agricultural enterprises by aggregate components of credit risk on the bases of cluster analysis methods**

№	Name of agricultural enterprise	R1	R2	R3	R4	R5
1	PJSC "Guniivskaya Agro Firm"	M	L	M	M	H
2	PJSC Agro Firm "Verbivske"	H	L	L	H	M
3	PJSC "Ohoche"	H	M	H	M	L
4	PJSC Agro Firm "Provesyn"	H	M	H	H	L
5	PJSC Agro Firm "Rosia"	L	H	M	H	H
6	OJSC Malovyskivska Agro Firm "Agrotechservice"	L	L	H	L	H
7	PJSC "Agro Firm named after G. S. Skovoroda"	H	M	L	H	M
8	JSC "Ukraina"	H	H	L	H	L
9	PJSC Agro Firm "Yatran"	M	M	L	L	M
10	OJSC «Agro Firm "Globyvaska"	L	M	M	M	H
11	OJSC Agro Firm "Zorya Novobuzya"	H	H	M	H	H
12	CJSC "Kolos"	M	L	L	H	L
13	CJSC Agro Firm "Sumy-Nasinna"	H	L	H	L	H
14	CJSC 14 "Tsukrove"	L	M	M	H	L

Source: developed by the authors on the bases of (Sergienko et. al., 2013).

The implementation of the results of the assessment, analysis, and classification of credit risks will increase the validity of management decisions and the efficiency of agricultural enterprises; improve the policy of credit development in the agricultural sector.

The implementation of solutions for creditworthiness management is ensured by developing, selecting, and implementing scenarios for managing the activities of agricultural enterprises by coordinating forecast estimates of trends in their development and the impact of negative factors on them.

The credit management principles are the basis for building a model of formation and selection of alternatives for improving its management, which are offered in the form of a cube of situations and allow us to solve two main tasks: positioning the real creditworthiness state on the bases of two-levels assessment due to structural elements; identification of possible and promising transitions to those cube quadrants that allow us to achieve the main goal of agricultural enterprises' creditworthiness level increasing.

The structural form of the model of formation and selection of scenarios for agricultural enterprises development in terms of risks is:

$$SK_t = \{UK_t; UR\_ZS_t; UR\_VS_t\} \quad (3)$$

where:

$SK_t$  – a set of scenarios for the agricultural enterprises lending development;

$UK_t$  – general integral enterprise's creditworthiness level on the rating scale;

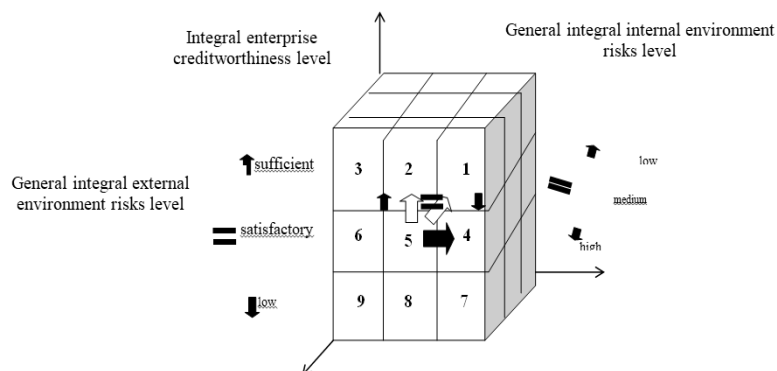
$UR\_ZS_t$  – general integral external environment risks level according to the components of the assessment;

$UR\_VS_t$  – general integral internal environment risks level according to the components of the assessment.

Methods of forming scenarios for socioeconomic systems development are described by (Kulba, 2004). Multilevel structural models of development scenarios of the international trade market subjects in the agricultural sector in the conditions of risks are proposed in the paper (Shapran et. al., 2019). The model of formation and selection of credit management alternatives for agricultural enterprises is presented in Figure 8.

The comparison of the research results is the basis for the development of a set of management measures depending on the option of credit management strategy as a systematic list of typical strategic and tactical financial decisions. Depending on changes in business conditions, the legal framework of the country, the expansion of risk factors of the external and internal environment, as well as the improvement of methods and approaches to credit management, the established set of measures may expand and change.

**Figure 8. Situations cube of formation and choice of alternatives for agricultural enterprises credit management**



Source: proposed and built by authors on the bases of Kulba (2004), Lepa (2006).

Complex analysis of agricultural enterprises lending, carried out in all possible directions, made it possible to solve the research objectives, highlight the main problems of lending to agricultural enterprises in Ukraine and shortcomings in financial and credit relations management at different levels, and identify key factors which influence on situation development and priority directions of crediting development.

#### 4. Results and Suggestions

The proposed models for assessing the economic efficiency of agricultural enterprises lending allow us to assess the impact of the use of credit resources aimed at the effectiveness of their activities, as well as the problems of their lending in the regional context. Models for assessing the impact of lending on the level of production and net profit make it possible to predict the effectiveness of borrowing and justify the development of lending to agricultural enterprises in the regions of the country.

The developed and implemented methods for diagnosing the agricultural enterprises' creditworthiness, which make it possible to solve the following tasks: conducting observations and evaluation of financial and economic indicators; classification of enterprises by creditworthiness level; recognition and identification of enterprises by creditworthiness level; assessment of differences between classes in terms of creditworthiness. On the bases of the set of methods of multidimensional analysis, differences were identified both based on a one-dimensional assessment system (by creditworthiness class and size) and a two-level assessment of the combined cross-influence of factors on creditworthiness.

The proposed hypothesis of grouping and formation of credit risk classes of agricultural enterprises based on the application of factor analysis methodology makes it possible to distinguish five main groups of external and internal risks: mortgage risks such as liquidity



decrease risk, risk of collateral loss; system providing risks: currency risk, government regulation risk; system forming risks: interest rate, inflation and price risks; natural and climatic risks: temperature fluctuations, precipitation, wind; production risks: risk of crop or it a part loss, risk of productivity decrease and technological risk.

The proposed methodology of scenario planning on the bases of fuzzy logic improves the assessment of the degree of credit risks impact on the change of indicators of agricultural enterprises' activity for the development of appropriate preventive measures and measures to counteract risks and selection measures of strategic and tactic creditworthiness management taking into account creditworthiness level, risks of external and internal environments and the enterprise size.

So, the agricultural sector credit management system of the economy is a set of financial and credit relations and should implement the main management functions arising from the creation of certain conditions for finding, attracting and efficient usage of business entities' financial resources in the agricultural sector (Table 6).

**Table 6. Problems of agricultural enterprises crediting and ways of their solution**

Problems, shortcomings, factors of influence	Ways to solve problems
	State
difficulty of state support obtaining, which is based mainly on targeted subsidies, the possibility of corruption	introduction of the mechanism of granting to agricultural producers of the state support directed on maintenance of crops of agricultural seeds of grades and hybrids of high reproductions, observance of modern technologies requirements
imperfection of the legal framework for lending to agricultural enterprises, insecurity of creditors and landowners	improvement of the legal framework for lending to agricultural enterprises, introduction of mechanisms to reduce the loan cost to farmers at the legislative level with the state banks involvement
insufficient development of legal, judicial and executive systems to resolve disputes in the lending process	development of a sound concept of reforming the legal, judicial and executive systems to resolve disputes in the process of lending to agricultural sector
imperfection of the insurance system in the field of agricultural complex	development of a sound concept of reforming the insurance system in the field of agriculture
instability of competitive positions of domestic agricultural products in foreign markets	introduction of effective mechanisms for adaptation to European requirements for food quality and safety
instability and non-transparency of state policy in agricultural complex, reforms ineffectiveness	development of a concept of reforming the country's agricultural sector and improving the legal framework for agrarian reform based on borrowing foreign experience in reforming the agricultural complex, taking into account national characteristics and interests of farmers
incomplete land reform, lack of a unified register of land plots and their legal owners	land reform on the bases of foreign experience
lack of motivation for cooperation and increase of small agricultural producers within rural communities	creation of favourable economic and financial conditions for the cooperation of agricultural enterprises and economic basis for rural communities' development
lack of appropriate mechanisms for regulating the agricultural market and the prices level for basic types of agricultural products	regulation at the state level of adequate purchase prices for agricultural products
lack of effective mechanisms to protect the domestic market and measures to create favourable conditions for export	implementation of effective mechanisms to restrict imports of agricultural products, creating favourable conditions for agricultural export

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Problems, shortcomings, factors of influence	Ways to solve problems
banks financial products for agricultural enterprises are characterized by a high level of interest rate volatility	establishment at the state level of fixed interest rates on loans for agricultural enterprises; use of non-bank lending instruments (credit unions, leasing companies, insurance companies, international financial organizations)
<b>Banking institutions</b>	
in regions with predominantly agricultural production there are no available financial products for clients-representatives of the agricultural sector	development of additional credit products for the agricultural sector taking into account the peculiarities of regional and sectoral development; improving the conditions of long-term lending by commercial banks
lending to agricultural enterprises is mostly short-term due to the complexity of risk assessment	development and implementation of effective mechanisms for assessing the risks of agricultural production and development of credit products for medium-term and long-term lending on affordable terms
complicated procedure for obtaining a bank loan	simplification of the procedure for obtaining bank loans, focused on micro agricultural enterprises
the difficulty of determining the amount and component of credit security	training of qualified specialists in assessing the volume and components of credit security or concluding agreements with relevant organizations providing such services
lack of qualified staff in the bank for assessment the financial condition and prospects of agricultural borrower	training of qualified specialists for assessment the financial condition of the agricultural borrower or concluding agreements with organizations that provide such services; usage of special means of calculation to assess the agricultural enterprises' efficiency
lack of sufficient information about appropriate credit product in a wide range of agricultural enterprises	search for additional channels for the distribution of banking credit services for agricultural enterprises
high level of calculation complexity of technical and operational indicators and estimation of the business plan in case of crediting of agricultural machinery purchase	training of qualified specialists in the calculation of technical and operational indicators and evaluation of the business plan in the case of lending for the purchase of agricultural machinery or concluding agreements with relevant organizations that provide such services
<b>Agricultural enterprises</b>	
high risk of an industry with a relatively low level of profitability compared to other economic sectors	improvement of methods of risk assessment and profits, involvement of insurance mechanisms; differentiation of agricultural production
growth of receivables for sold products	improving the system of settlements with counterparties
low efficiency of agricultural enterprises	finding ways to reduce costs, increase productivity and return on capital
outdated technologies of production and use of morally and physically worn-out equipment	search for ways to update production technologies, use of leasing of machinery and equipment
slowed turnover of funds at the production stage due to the long technological process	differentiation of agricultural production and activities to accelerate the funds turnover
financial ignorance of agricultural enterprises owners	monitoring of information on available agribusiness lending services, search for favourable conditions, consultations with specialists
gradual and uneven accumulation of costs	reimbursement of seasonal expenses at the credit in order to prevent the withdrawal of significant funds from circulation
non-compliance with the accounting requirements for agricultural enterprises economic and financial activities	improvement of the system of accounting for economic and financial activities at enterprises, control of accounting

*Source: compiled and aggregated by the authors on the bases of (Gerasimova, 2010), (Jankelova et. al., 2017), (Sergienko, Gula, 2018).*

## 5. Conclusion

As a main contribution of the article, the following elements can be singled out:

- improvement of financial instruments for increasing the efficiency of the agricultural sector and food security;
- improvement of the instrumental basis for diagnosing the effectiveness of the credit funds usage by agricultural enterprises;
- fundamental spatial and dynamic diagnostics at different levels of the hierarchy (macro, regional, micro), which makes it possible to increase economic policy consistency.

The results of lending to agricultural enterprises confirmed the objective need to improve the credit system to support the agricultural sector and lending tools for agricultural enterprises, which should include goals, objectives, problems of assessing resource development opportunities and assessing the effectiveness of agricultural business and become a central and basic prerequisite effective management at all levels.

The proposed methodological tools for lending to businesses in the agricultural sector of the economy involve the interaction of three levels of the management hierarchy: macro, meso and micro levels (state – region – agricultural enterprises) and are aimed at financial and credit system improving to support the agricultural sector and identification of management scenarios by the priority areas of agricultural sector development, which will assess the effectiveness of lending in accordance with the objectives, identify levers of regulatory influence and control the results of their implementation for business entities.

The practical significance of the obtained results lies in the use of methodological developments, recommendations, and proposals for improving lending to businesses in the agricultural sector, which can be considered as ways to increase the agricultural enterprises' financial security level. The results of complex research on lending problems of economic entities in the agricultural sector of the economy at all levels of the management hierarchy can be used to increase the management decisions level on the formation of strategic alternatives of credit relations development in unstable and even crisis environment.

The results of the research can be useful both for agricultural enterprises and for the authorities, which must pursue a balanced state agricultural policy, take care of farmers' financing, timely resource provision and ensure a stable, accessible, sufficient, safe, and balanced level of nutrition of the population. Our future research will focus on the interconnection between the financial indicators of agricultural enterprises and the food security level as well as the impact of climate change on agriculture development.

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## IMPACT OF LOCUS OF CONTROL ON FINANCIAL RISK-TAKING BEHAVIOUR: A PERCEPTION STUDY AMONG MARRIED EARNING WOMEN IN INDIA<sup>3</sup>

*The locus of control measures how much a person thinks they, rather than outside influences, are in charge of how things turn out in their lives. Financial self-efficacy is influenced by locus of control. Individuals are more likely to believe they can handle their finances when they feel more capable of doing so. In particular, this study focused on married working women in India. They are more likely to effectively manage their finances if they think they can get out of financial difficulties. A questionnaire that was distributed to a convenience sample of 278 yielded responses from married working women across PAN India. The study made use of exploratory factor analysis (EFA), which reveals the scale's factor structure. The study offers statistical evidence to support the scales' reliability and validity. The statistical findings of the investigation show that locus of control and financial literacy has a favourable impact on financial behaviour. The authors also demonstrate how the relationship between internal locus of control and financial behaviour is altered by financial literacy. As a moderator variable that affects the locus of control, financial literacy is an important factor. The research's conclusions are crucial in providing empirical support for the theoretical relationships. This study has confirmed the beneficial effects of internal locus of control and financial literacy on the financial behaviour of married working women, supporting the current literature. Additionally, it has been found that a person's financial conduct and internal locus of control have different relationships depending on their financial literacy.*

*Keywords: Locus of control; psychological factors; risk-taking; perception*

*JEL: G10; G11; G40; G41*

### 1. Introduction

Locus (meaning location) of control (LOC) is the extent to which individuals believe they tend to have control over circumstances or events taking place in their lives in contrast to factors which are external and beyond their control (Rotter, 1954). The framework of locus

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of control is based on the social learning theory of personality. An individual's locus (plural of loci) of control can be conceptualized as internal (a belief that one's life can be controlled) or external (a belief that life is controlled by outside factors which individuals cannot influence, or that chance or fate controls their lives). Individuals possessing strong internal locus of control believe they are in charge of all that happens in their lives, and they are in control of events or situations happening to or around them (for example: after results are declared, individuals, tending to take the credit or blame of doing well or otherwise on themselves and their own abilities. On the contrary, individuals with a strong external locus of control tend to praise or blame external factors or circumstances, such as the tutor or the nature of the examination itself (Carlson, 2007). The internality and externality in the locus of control must be viewed as two ends of a continuum and not as either/or typology (Rotter, 1975). People with a high internal locus of control believe they are in charge of situations and can influence outcomes through their own doings and hard work and believe that results depend on their own abilities (April et al., 2012). People with high external LOC hold external circumstances (such as fate, luck and other influential or powerful people) as responsible for what happens in their lives and that things are out of their control (Jacobs-Lawson et al, 2011). *These* tendencies have implications in terms of differences in psychological conditions and achievement motivation among these two sets of people with internal locus being often linked with higher levels of need for achievement and external locus leading to fatalistic perceptions and accentuation towards clinical depression (Benassi et al, 1988).

## **2. Financial Risk-Taking Behaviour in Women: Existing Literature**

In a study on the changing socioeconomic status of women in the UK, Yorke & Hayes (1982) found out that the proportion of married women in the workforce grew considerably and thus, making them primary targets for the marketing of commercial bank services. With the increased income, having fewer children and a higher level of education, the financial independence of women was increasing.

While studying the financial planning of women, Alcon (1999) found out that women were less confident about their earning power than men and were more inclined to take professional help in financial planning.

In a study to investigate how gender impacts retirement contributions, Borstorff et al (2007) found out that, while women have made great strides in terms of pay equity, positions, and power, a significant disparity still exists between men and women when it comes to being ready to retire. Women tend to need more descriptive information, additional counselling in option probabilities, and encouragement to become actively involved in retirement planning.

Maxfield et al (2010) aimed to explore women's risk-taking behaviour and reasons for stereotype persistence to inform human resource practice and women's career development. Based on the literature about gender and organizations to identify reasons for the persisting stereotype of women's risk aversion, the study found out evidence of gender neutrality in risk propensity and decision-making in specific managerial contexts other than portfolio allocation.



Fisher (2010) found that the gender differences in personal saving behaviours among single person households, using data from the 2007 Survey of Consumer Finances. Data showed that women were less likely than men to have saved over the previous year, while the proportion of the male and female samples reporting to save regularly was similar. The descriptive analysis also showed that women in the sample were older, had lower risk tolerance, had a shorter saving horizon, were more likely to be retired and less likely to be unemployed or self-employed, were more likely to be in fair health, had fewer years of education, were more likely to own a home, and had less wealth on average. Women reporting low-risk tolerance were significantly less likely to save over the short term as well as to be regular savers.

Malone et al (2010) conducted a survey on American women to examine their perceptions of financial well-being. The majority of the women reported they had conservative buying behaviours, desired financial independence, had a somewhat negative view of their current financial situation, had worries about retirement and their financial futures, and considered long-term care insurance a necessity. Women in non-traditional families (single mothers, cohabitators, and stepfamilies) had significantly greater worries about their financial futures than women in first marriages. Single mothers were more likely to express concern that their money would not last through retirement. Cohabiting women were significantly more likely to express fears about becoming a burden. Women who were older, were more educated, had higher incomes and who contributed more money to the household income had more positive perceptions of their financial situation.

Rowley (2012) conducted a strengths-based study to identify their motivations for positive financial behaviour change and found that they progressed through the Transtheoretical Model stages of change. Emotion, family influence, and life transitions helped participants progress to the Action and Maintenance stages. Although participants utilized a wide variety of change strategies, motivations to change were either circumstantial, underlying, or both. Most participants used educational, social, or professional support to overcome setbacks. Optimism and using financial tricks were common strategies for successful change. Implications for policy and practice include tailoring marketing messages toward women experiencing life transitions and incorporating Transtheoretical Model concepts into financial education programs.

Bucher-Koenen et al (2014) evaluated similar gender differences in financial literacy across countries. Irrespective of age, marital status or economic condition, women were found to be less likely than men to answer correctly and more likely to indicate that they do not know the answer and self-assessed themselves lower on financial literacy than men. This is important because financial literacy has been linked to economic behaviour, including retirement planning and wealth accumulation. Women live longer than men and are likely to spend time in widowhood. As a result, improving women's financial literacy is key to helping them prepare for retirement and promoting their financial security.

Vohra (2015) investigated the attributes that Indian women look for in their financial advisors and examined if the choice of attributes of a financial advisor among women investors in Punjab is the same, across demographics. The understanding of the attributes that women want in their financial advisors will help the financial advisors to be mindful of the opportunities and the challenges they have to face while working with women investors.

Studying the impact of demographics on the choice of investment advisor would enable the service providers to provide women with services relevant to their unique and individual situations. Therefore, the study contributes to the understanding of the investment behaviour of women.

Yusof (2015) examined the financial investment decision-making and risk behaviours of Malaysian men and women. It uses data obtained from a survey of employed Malaysians to test two opposing models of household decision-making, the income pooling hypothesis and the bargaining model. The results indicated that although both men and women practice autonomy in financial investment decisions, women have lower risk tolerance than men.

Paluri & Mehra (2016) have identified the factors influencing the financial attitudes of Indian women and then classifying Indian women based on these attitudes. Nine variables (anxiety, interest in financial issues, intuitive decisions, precautionary saving, free-spending, materialistic and fatalistic attitude, propensity to plan for long and short-term financial goals) were put through confirmatory factor analysis. These factors were then used as a basis for cluster analysis using convenience sampling. An analysis of the dispersion of the clusters shows that interest in financial issues has the greatest influence in the formation of clusters followed by the propensity to plan and materialistic attitude. A fatalistic attitude had the least influence in the formation of clusters. The current study uses convenience sampling which is non-probability-based sampling and hence, lack generalizability of results. This paper discusses the financial attitudes and behaviour of Indian women and further clusters these women based on their financial attitudes.

Deshmukh (2017) investigated herding behaviour in financial decision-making and found that friends/colleagues' views had an influence on financial decision-making, such as, household decision of buying a washing machine or personal decision of upgrading a mobile or investment decision like investing into a mutual fund schemes/share etc.

Ghosh (2018) examined the lending behaviour of women-owned cooperatives (WoCs) by exploiting the natural experiment of the financial crisis, employing a novel data set of Indian cooperative banks during 2004–2013. In view of the longitudinal nature of the data, the authors employ panel data techniques for the purposes of analysis. The findings indicated that WoC banks increased lending to both agriculture and small-scale industries, especially in high-income states. Further disaggregation reveals that the possible weaknesses in asset quality from lending to these sectors in low-income states could be driving the results.

### *2.1. Relationship between LOC and financial risk-taking behaviour*

In a variety of market situations, new information should induce decision-makers to act. Depending on their short and long-term investment planning, investors may want to buy or sell this asset, If the riskiness or the return expectations of an asset, change. Sometimes the wise decision is to stick to a given allocation. Odean (1999) points out that investors with discount brokerage accounts trade too much and when the stocks they buy underperform, they sell. Actually, they may be wiser if they are adopting a “buy and hold” strategy and ignoring stock market movements. Likewise, many investors who are flooded with lots of market information, tend to generally ignore such information and, in the process, may also

ignore some vital information which may give them many options to act upon, wisely. The ability to wisely respond to new information is dependent on the individual's ability to correctly interpret the same.

To ascertain the importance of locus of control under uncertain conditions, the internal locus of control has been considered as a positive trait. Andrisani (1977), Osborne Groves (2005), Semykina and Linz (2007) and Piatek and Pinger (2016) have shown that an internal locus of control is positively correlated with success in labour markets. Coleman and Deleire (2003) argued that the internal locus of control positively affects education decisions by altering teenagers' expectations regarding the returns of human capital investments. Caliendo et al. (2015) and McGee (2015) found that unemployed individuals with an internal locus of control invest more in a job search than externally controlled individuals. Cobb-Clark et al. (2014) showed that internally controlled individuals invest more in health capital, while Borghans et al. (2008) opine that such individuals produce better results in cognitive tests. Studies by Cobb-Clark and Schurer (2013) demonstrate that they also accumulate more precautionary savings, while studies by Salamanca et al. (2016) point out that internal locus of control is positively related to investments in risky assets. In recent studies by Lekfuangfu et al. (2018), it has been found that mothers with an internal locus of control invest more in their children, and consequently, cognitive and emotional development is higher among the children of such mothers.

If one considers the fact that locus of control has ambiguous effects on the quality of economic decisions, then it has importance with regard to non-cognitive skills on economic behaviours and outcomes (see, e.g., Borghans et al. 2008; Gro'nqvist et al. 2016). Studies have shown that non-cognitive skills necessarily do not increase the productive capacity of individuals. In all circumstances.<sup>3</sup> At best they may induce situation-specific behaviours and pay-offs. On the other hand, in other studies of the relationship between personal characteristics and biased probability judgment. Dohmen et al. (2009) found that cognitive ability is negatively related to biased decision-making.

Studies have shown that factors like social preferences and financial literacy have a crucial role in portfolio choice (e.g., Hong et al., 2004; Guiso et al., 2008; Van Rooij et al., 2011). Factors like optimism and overconfidence are also key drivers for investment behaviour (e.g., De Bondt, 1998; Barber, Odean, 2001; Puri, Robinson, 2007). Various aspects of personality (like non-cognitive skills) are also related to a variety of economic outcomes (e.g., Borghans et al., 2008; Almlund et al., 2011). Internal locus of control has been to affect labour market outcomes (e.g., Bowles et al., 2001a, b; Coleman, DeLeire, 2003; Caliendo et al., 2015) as also entrepreneurship (Evans, Leighton, 1989) and savings (Cobb-Clark et al., 2013). At the same time, its role in financial investment decisions has been scantily investigated.

It is found that household investors' decisions are related to factors which are yet to be fully comprehended by classical portfolio theory. Salamanca et al (2016) demonstrated that a household head's internal economic locus of control is a key determinant of investment in equity, over and beyond economic preferences (risk and time preferences) and socioeconomic characteristics. Internal economic locus of control is related to both the decision to participate in equity and the portfolio share of equity and this relation is economically, significant. Their argument is that those who have an internal economic locus of control have a lower perception of risk when investing in equity.

Pinger et al. (2018) in contrasting studies provide an alternative perspective on the role of internal locus of control for economic success. They demonstrated that in certain cases internal locus of control can induce inefficient behaviours, particularly in such cases, where doing nothing is seen to be the optimal strategy (for example: in the case of the case for most private stock investors most of the time). Hence there is a need to consider the locus of control with other with behavioural biases such as overconfidence or confirmation bias in conducting empirical studies about financial decision-making.

Some of the other finding importance in the context of locus of control are:

- subjects with an internal locus of control are more likely to make inconsistent risk choices in the experiment (Pinger et al., 2018).
- The above is true with regard to subjects with lower cognitive ability (Pinger et al., 2018).
- People or investors with an internal locus of control are more likely to bet on assets that were successful in the past.
- Internally controlled individuals invest more in human capital, are more active job seekers, exhibit higher stock market participation, and adopt a more active parenting style.

Having said this, Cobb-Clark and Schurer (2013) that it may lead to a “fallacy” to always believe that locus of control (particularly internal) leads to individual making the right choices and taking optimal decisions. There may also be circumstances where the internal locus of control may lead to suboptimal choices.

Thanki et al (2022) investigated to determine whether the determinants of financial risk tolerance varied by gender or whether the same factors influenced the risk-taking capacities of both genders using personality types (Type-A and Type-B), financial literacy, and six demographic parameters, including marital status, age, education, income, occupation, and the number of dependents, as independent variables, and gender as a dividing variable. In order to conduct this study, information was gathered from 671 investors. Four factors (personality type, financial literacy, marital status, and income) were found to have a substantial impact on the financial risk tolerance of female investors.

### **3. Objectives of the Study**

The present study perceives locus of control as a multi-dimensional concept and investigates the perception of married earning women in India about the influence of the internal and external LOC in their financial risk-taking behaviour. Based on the relevant literature, researchers developed a questionnaire, consisting of items, representing internal and external LOC in the financial risk-taking behaviour, administered the same among the married earning women in India, proposed a factor structure of the financial risk-taking behaviour, and tested whether the respondents differed in their perception in the above context. Based on the data received through the questionnaire and in-depth interview with respondents, the authors discussed the findings.

#### **4. Research Methodology**

##### *4.1. Population, sampling design, data collection*

The population for the study were Indian married earning women. The data was collected during the period from January to June 2022, using the judgmental sampling method. Women, working in entry-level and middle-level positions in organizations, across the sectors, such as, automobile, IT and ITES, banking, financial services, retail, and other sectors across the country, were approached for data collection. Based on their acceptance, the responses were collected. Data collection methods include the administration of questionnaires by e-mail and personal visits, followed by personal and telephonic interviews, for gathering an in-depth view of the perception of the respondents on their risk-taking behaviour. Data were collected in two phases. In the first phase, a Pilot study was conducted, and at a later stage, the final study was conducted.

##### *4.2. Exploratory Factor analysis*

Exploratory Factor Analysis (EFA) aims to find the latent factors, which are the resultants of observed variable grouping. The formation of factors is based on the concept of correlation. That is, observed variables that have high correlations with a factor will be listed under that factor and the process is iteratively used till all the factors are identified. Note that, the set of variables together is expected to measure the latent factors, and, also the factors are expected to contain the essence of the set of variables. Finally, EFA gives a variable-factor structure which can be used for model building. The method is exploratory in nature because the researcher does not know the variable-factor structure and the analysis gives the structure. It is to be noted that, EFA is used in the pilot study, and, in the final study. This is to ensure that the variables proposed to measure the factors satisfy the required cut-offs of the EFA and have the necessary consistency levels. Based on the results, the factor structure was proposed.

##### *4.3. Data collection and data analysis*

The data was collected in two phases.

###### First phase/ pilot study

In the first phase, a questionnaire with 30 items was sent to 239 married earning women, across PAN India, based on the population size and researchers' experience. A total of 113 responses were received. 72 respondents were 22-28 years, 15 were 29-25 years, 15 were 36-32 years and 11 were 50 years and above. 88 respondents were salaried and 25 were self-employed. 65 respondents were college degree graduates and 37 post-graduates, 2 passed 10<sup>th</sup> standard and 9 passed 12<sup>th</sup> standard. 4 earned < INR 10,000/- and 4 earned > INR 1,00,000/, 49 earned INR 10001-25000/-, 45 earned INR 25001 -50000/-, and 11 earned

50001-100000/-, per month. 82 had 0-1 child, 30 had 2-3 children and 1 had more than 3 children.

The Cronbach's alpha was .858 for the questionnaire, proving internal consistency among the variables in measuring the construct of financial risk-taking behaviour. Though for all the items, the communalities value was <.5 (% of the variance in each variable met the required levels), in five variables (items n. 5, 15, 16, 17, 25), KMO values were >.05. Those variables were re-examined and deleted from the questionnaire, as the researchers noted that the overall essence of such variables was explained in the other variables.

The questionnaire with the retained 25 variables (the item number was retained the same for each variable, as given in the original questionnaire containing 30 items), was used for Exploratory Factor Analysis, with the same sample data. The Cronbach's alpha was 0.867. The KMO values and communalities for all the variables were more than .5 (value is acceptable). A total of 6 factors have been extracted with rotated varimax (Table 1).

**Table 1. Factor analysis with varimax rotation for 25 retained variables\***

	1	2	3	4	5	6	Commun	KMO
1. I take financial decisions on my own.	-0.05979	-0.05802	-0.04062	<b>-0.88205</b>	-0.02602	0.079127	0.79354	0.6
2. I take financial decisions for my family.	-0.38663	0.131684	0.218136	<b>-0.6653</b>	0.067036	-0.3696	0.79814	0.753302
3. My financial decisions depend on my past experience.	-0.21129	-0.27133	0.153993	-0.03866	0.015882	<b>-0.76721</b>	0.73234	0.623604
4. My financial decisions depend on my competence in analysing market scenarios.	-0.0703	0.055751	0.349585	-0.21603	<b>0.74112</b>	-0.01009	0.726288	0.785768
6. I invest in financial instruments, keeping my short-term financial needs a top priority.	-0.06558	-0.04086	<b>0.709354</b>	0.15858	-0.21925	-0.24719	0.643476	0.633642
7. I invest in financial instruments, keeping my long-term financial needs a top priority.	-0.21006	-0.26234	<b>0.718784</b>	-0.0662	0.139798	-0.17785	0.685156	0.743242
8. Success in my financial investments originates from my meticulous planning.	-0.05344	0.217409	<b>0.763471</b>	-0.15654	0.283893	-0.12156	0.752887	0.822504
9. Success in my financial investments originates from my timely investment.	-0.22384	0.078533	<b>0.713526</b>	0.02025	0.203062	0.311355	0.703978	0.78051
10. Success in my financial investments depends on the amount of effort I put in, in collecting data about the market scenario.	-0.05459	0.395684	<b>0.546492</b>	0.012488	0.364431	-0.0508	0.593746	0.838155
11. I decide on the budget for my children's education.	<b>-0.68153</b>	0.197408	0.18916	0.169253	0.091009	0.045733	0.578254	0.787558
12. I decide on the budget for the month's family expenditure.	<b>-0.77777</b>	0.018829	0.074554	0.050223	-0.00244	0.060294	0.617008	0.745965
13. I decide the budget for my family's monthly savings.	<b>-0.82065</b>	0.053913	0.05569	-0.12578	-0.03485	-0.0834	0.703458	0.838176
14. I decide on purchasing long-term household assets.	<b>-0.62648</b>	-0.41716	-0.08086	-0.25168	0.115475	-0.0347	0.650922	0.796415

	1	2	3	4	5	6	Commun	KMO
18. My financial decisions are influenced by my financial consultant.	-0.06352	0.459281	0.043905	0.009503	<b>0.764302</b>	0.146483	0.822606	0.833008
19. My financial decisions are influenced by my friends.	0.044684	<b>0.771878</b>	-0.03415	-0.17805	0.377253	-0.00889	0.77306	0.764404
20. My financial decisions are influenced by my colleagues.	-0.02764	<b>0.909882</b>	-0.05141	0.049542	0.238396	0.065169	0.894827	0.722294
21. My financial decisions are a matter of chance.	-0.11216	<b>0.68068</b>	0.347026	0.120379	-0.07983	0.241766	0.675646	0.76924
22. My decisions in taking risks in financial investments are influenced by my financial consultant.	-0.15916	0.357635	0.014323	0.140805	<b>0.768956</b>	-0.10747	0.776112	0.733396
23. My decisions in taking risks in financial investments are influenced by my friends.	-0.00824	<b>0.858679</b>	-0.03582	0.007965	0.213243	0.047534	0.786477	0.783633
24. I believe that success in financial investments depends on market scenario.	-0.15302	0.082528	0.268744	0.239812	<b>0.541918</b>	-0.46195	0.667031	0.69653
26. I believe that success in financial investments is beyond my control.	-0.13985	<b>0.500</b>	0.380175	0.431279	0.129582	-0.24084	0.669536	0.763437
27. I have the liberty to decide about the budget for my children's education.	<b>-0.69482</b>	0.237539	0.054476	-0.10404	0.071973	-0.32048	0.660877	0.781859
28. I have the liberty to decide about the budget for the month's family expenditure.	<b>-0.84571</b>	-0.02354	0.113186	-0.01212	0.043564	-0.18561	0.765086	0.853246
29. I have the liberty to decide the budget for my family's monthly savings.	<b>-0.86624</b>	0.026714	0.106527	-0.00576	0.064975	-0.09861	0.776412	0.789065
30. I have the liberty to decide on purchasing long-term household assets.	<b>-0.73109</b>	-0.24367	0.145057	-0.26416	0.262654	0.112617	0.766364	0.692387

\* The original number of the items is retained, as per the original proposed questionnaire.  
Source: From data analysis.

Based on the above, the second phase of the study was conducted with a questionnaire with 25 items.

### Second phase / final study

The questionnaire with 25 items (item numbers retained as per the original questionnaire) was administered to 350 married earning women, PAN India. Total 165 responses were received, which were used for the purpose of analysis. 88 respondents were 22-28 years, 27 were 29-35 years, 36 were 36-42 years, 2 were 43-49 years, and 12 were 50 years and above. 111 respondents were salaried and 54 were self-employed. 84 respondents were college degree graduates and 63 post-graduates, 3 passed 10<sup>th</sup> standard and 15 passed 12<sup>th</sup> standard. 2 earned < INR 10,000/- and 10 earned >INR 1,00,000/, 58 earned INR 10001-25000/-, 69 earned INR 25001 -50000/-, and 26 earned 50001-100000/-, per month. 108 had 0-1 child, 51 had 2-3 children and 6 had more than 3 children.

The Cronbach's alpha was .802, for the questionnaire, which proved internal consistency among the variables in measuring the construct of financial risk-taking behaviour. The data was analyzed again with Exploratory Factor Analysis, for the present set of data. For all the items, communalities and KMO values were more than .5 (value is acceptable). Therefore, the percentage of variance in each of the variables, meets the required levels. A total of 6 factors were extracted by using rotated varimax factor structure analysis (Table 2).

**Table 2. Factor analysis with varimax rotation for 25 retained variables\***

	1	2	3	4	5	6	Commun	KMO
1. I take financial decisions on my own.	-0.2446	0.131252	-0.07066	<b>-0.83346</b>	0.162248	-0.12843	0.819526	0.594291
2. I take financial decisions of my family.	0.037879	-0.07027	0.091241	<b>-0.81619</b>	0.170515	0.038914	0.711446	0.526737
3. My financial decisions depend on my past experience.	-0.35429	-0.01261	0.25366	<b>-0.70019</b>	-0.16231	0.125266	0.722321	0.758236
4. My financial decisions depend on my competence on analysing market scenario.	-0.08918	-0.35872	0.135198	-0.30779	-0.27681	<b>0.571877</b>	0.653316	0.684558
6. I invest in financial instruments, keeping my short-term financial needs a top priority.	-0.11842	0.014788	0.411746	<b>-0.5000</b>	0.055871	0.046378	0.410658	0.632727
7. I invest in financial instruments, keeping my long-term financial needs a top priority.	0.101783	-0.23523	<b>0.500</b>	-0.01035	-0.20399	0.438918	0.52539	0.621978
8. Success in my financial investments originate from my meticulous planning.	-0.04306	-0.13453	<b>0.750751</b>	-0.06889	0.028855	0.034776	0.590367	0.656457
9. Success in my financial investments originate from my timely investment.	-0.00583	0.026977	<b>0.746705</b>	-0.14238	-0.3829	-0.04084	0.726884	0.686391
10. Success in my financial investments depends on the amount of effort I put in, in collecting data about the market scenario.	-0.10952	0.111904	<b>0.773347</b>	-0.06554	-0.00543	0.183505	0.660581	0.721601
11. I decide about the budget for my children's education.	0.045806	0.126855	0.358691	-0.06517	<b>-0.71376</b>	0.039448	0.662099	0.688212
12. I decide about the budget for the month family expenditure.	<b>-0.78046</b>	0.135294	0.085525	0.061308	-0.10997	-0.05516	0.653638	0.855037
13. I decide the budget for my family's monthly savings.	<b>-0.80554</b>	0.077066	0.161537	-0.04183	0.052866	0.00327	0.685478	0.824645
14. I decide on purchasing long-term household assets.	<b>-0.79677</b>	0.072022	0.16974	-0.183	0.079465	0.119054	0.722814	0.826052
18. My financial decisions are influenced by my financial consultant.	-0.04565	0.226488	0.09336	0.090792	0.066758	<b>0.847501</b>	0.793055	0.497953
19. My financial decisions are influenced by my friends.	0.048162	<b>0.760349</b>	0.103543	-0.04275	0.002136	-0.07632	0.598827	0.751345
20. My financial decisions are influenced by my colleagues.	0.114144	<b>0.840936</b>	-0.11847	-0.15164	-0.14094	0.132868	0.794748	0.721839
21. My financial decisions are a matter of chance.	0.00399	<b>0.809378</b>	-0.21254	0.110918	-0.20336	0.026299	0.754633	0.800041
22. My decisions in taking risk in financial investments are influenced by my financial consultant.	-0.33438	<b>0.5000</b>	0.296012	0.342709	-0.10054	0.183207	0.592351	0.803844



	1	2	3	4	5	6	Commun	KMO
23. My decisions in taking risk in financial investments are influenced by my friends.	-0.08814	<b>0.689147</b>	0.182149	0.048515	0.036886	0.050683	0.522154	0.791987
24. I believe that success in financial investments depends on market scenario.	-0.11056	<b>0.758673</b>	-0.2055	-0.03798	-0.24086	-0.14407	0.710253	0.780282
26. I believe that success in financial investments is beyond my control.	-0.18016	0.147297	-0.2727	0.283808	<b>-0.70234</b>	0.06718	0.706858	0.641675
27. I have the liberty to decide about the budget for my children's education.	-0.1551	0.285321	0.20192	0.214927	<b>-0.60855</b>	0.032471	0.56382	0.671507
28. I have the liberty to decide about the budget for the month family expenditure.	<b>-0.78977</b>	0.00531	-0.2034	-0.10433	-0.04061	-0.04914	0.680094	0.82018
29. I have liberty to decide the budget for my family's monthly savings.	<b>-0.8477</b>	-0.11579	-0.02098	-0.13003	-0.13771	0.06367	0.772361	0.782293
30. I have liberty to decide on purchasing long-term household assets.	<b>-0.83927</b>	-0.07748	0.003649	-0.08697	-0.08121	0.014717	0.724761	0.743044
	4.380417	3.679965	2.799584	2.568797	1.90722	1.422448	16.75843	

\* The original number of the items are retained, as per the original proposed questionnaire.

Source: From data analysis.

Based on the above, the following factor structure is proposed (Table 3), to investigate the perception of the earning married women about the influence of internal and external LOC, on financial risk-taking behaviour.

**Table 3. Proposed factor structure**

Variables	Items representing the variable*
Factor 1: Perceived liberty and financial decision-making	
deciding monthly family expenditure	12. I decide about the budget for the month family expenditure.
deciding family's monthly savings	13. I decide the budget for my family's monthly savings.
Deciding Long-term household assets purchase	14. I decide on purchasing long-term household assets.
Liberty to decide monthly family expenditure	28. I have the liberty to decide about the budget for the monthly family expenditure.
Liberty to decide family's monthly savings.	29. I have the liberty to decide the budget for my family's monthly savings.
liberty to decide Long-term household assets purchase	30. I have the liberty to decide on purchasing long-term household assets.
Factor 2: Influence of external factors	
Friends' influence on financial decisions	19. My financial decisions are influenced by my friends.
Colleagues' influence on financial decisions	20. My financial decisions are influenced by my colleagues.
Influence of chance	21. My financial decisions are a matter of chance.
Financial consultant influencing financial risk-taking	22. My decisions in taking risk in financial investments are influenced by my financial consultant.
Friends' influence on financial risk-taking	23. My decisions in taking risk in financial investments are influenced by my friends.
Role of market scenario	24. I believe that success in financial investments depends on market scenario.

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Variables	Items representing the variable*
Factor 3: self-planning and proactivity	
Meticulous planning	8. Success in my financial investments originate from my meticulous planning.
Timely investment	9. Success in my financial investments originate from my timely investment.
market data	10. Success in my financial investments depends on the amount of effort I put in, in collecting data about the market scenario.
Long-term financial needs	7. I invest in financial instruments, keeping my long-term financial needs a top priority.
Factor 4: Personal experience and confidence	
Taking own decision	1. I take financial decisions on my own.
Taking decision on family's behalf	2. I take financial decisions of my family.
Past experience	3. My financial decisions depend on my past experience.
Short-term financial needs	6. I invest in financial instruments, keeping my short-term financial needs a top priority.
Factor 5: Priority	
Deciding children's education budget	11. I decide about the budget for my children's education.
Control on financial success	26. I believe that success in financial investments is beyond my control.
Liberty to decide children's education budget	27. I have the liberty to decide about the budget for my children's education.
Factor 6: informed decision in investing	
Competence on market analysis	4. My financial decisions depend on my competence on analysing market scenario.
Financial consultant influencing financial decisions	18. My financial decisions are influenced by my financial consultant.

\*The original number of the items are retained, as per the original proposed questionnaire.

Descriptive statistics showed that the respondents assigned fairly high score towards almost all the variables, in the contest of financial risk-taking behaviour (lowest mean score = 3.448, highest mean score = 4.145, on a 1–5-point scale). considering this, it was hypothesized that, the average opinion of the respondents towards the role of internal and external LOCs on financial risk-taking behaviour, were more or less the same. That is, there is no significant difference between the average importance levels given to the variables, by the respondents, under each factor. This is the null hypothesis tested against the alternative that, there is a significant difference.

*H<sub>1.0</sub>: There is no significant difference between the average importance level of the variables, given by the respondents, under the factor 'perceived liberty and financial decision making'.*

*H<sub>1.A</sub>: There is a significant difference between the average importance level of the variables, given by the respondents, under the factor 'perceived liberty and financial decision making'.*

*H<sub>2.0</sub>: There is no significant difference between the average importance level of the variables, given by the respondents, under the factor 'Influence of external factors'.*

*H<sub>2.A</sub>: There is a significant difference between the average importance level of the variables, given by the respondents, under the factor 'Influence of external factors'.*

*H<sub>3,0</sub>: There is no significant difference between the average importance level of the variables, given by the respondents, under the factor ‘self-planning and proactivity’.*

*H<sub>3,A</sub>: There is a significant difference between the average importance level of the variables, given by the respondents, under the factor ‘self-planning and proactivity’.*

*H<sub>4,0</sub>: There is no significant difference between the average importance level of the variables, given by the respondents, under the factor ‘personal experience and confidence’.*

*H<sub>4,A</sub>: There is a significant difference between the average importance level of the variables, given by the respondents, under the factor ‘personal experience and confidence’.*

*H<sub>5,0</sub>: There is no significant difference between the average importance level to the variables, given by the respondents, under the factor ‘Priority’.*

*H<sub>5,A</sub>: There is a significant difference between the average importance level of the variables, given by the respondents, under the factor ‘Priority’.*

*H<sub>6,0</sub>: There is no significant difference between the average importance level of the variables, given by the respondents, under the factor ‘informed decision in investing’.*

*H<sub>6,A</sub>: There is a significant difference between the average importance level of the variables, given by the respondents, under the factor ‘informed decision in investing’.*

All the above null hypotheses can be tested, using either ANOVA or Kruskal-Wallis Test, based on whether the assumptions of the null hypothesis are satisfied by the data, or not. In order to test the assumption of normality, Shapiro-Wilk Test was used, and it was found out that the normality assumption was not satisfied by the data. Hence, Kruskal-Wallis Test (K-W Test) was used to investigate the proposed hypotheses.

Analysis revealed that there was a significant difference between the average importance level of the variables, given by the respondents, for all the factors (Table 4).

**Tale 4. Kruskal-Wallis Test (The significance level is .05 )**

Null Hypothesis	P value	Alpha	Decision
<i>H<sub>1,0</sub>: There is no significant difference between the average importance level of the variables, given by the respondents, under perceived liberty and financial decision making</i>	0.004	.05	Reject the null hypothesis <i>H<sub>1,0</sub></i>
<i>H<sub>2,0</sub>: There is no significant difference between the average importance level of the variables, given by the respondents, under the Influence of external factors.</i>	0.0000	.05	Reject the null hypothesis <i>H<sub>2,0</sub></i>
<i>H<sub>3,0</sub>: There is no significant difference between the average importance level of the variables, given by the respondents, under self-planning and proactivity.</i>	0.03	.05	Reject the null hypothesis <i>H<sub>3,0</sub></i>
<i>H<sub>4,0</sub>: There is no significant difference between the average importance level of the variables, given by the respondents, under personal experience and confidence.</i>	.0000	.05	Reject the null hypothesis <i>H<sub>4,0</sub></i>
<i>H<sub>5,0</sub>: There is no significant difference between the average importance level of the variables, given by the respondents, under Priority.</i>	0.0002	.05	Reject the null hypothesis <i>H<sub>5,0</sub></i>
<i>H<sub>6,0</sub>: There is no significant difference between the average importance level of the variables, given by the respondents, under informed decision in investing.</i>	0.002	.05	Reject the null hypothesis <i>H<sub>6,0</sub></i>

Source: From the author's analysis.

In order to identify, in which of the variables, there were significant differences, a non-parametric posthoc comparison test (Tukey's HSD / Kramer Test) was used (Table no 5). It was noted that, for the following variables (items), the p-value was less than .05. Thus, it was concluded that the following variables differed significantly, with respect to the average importance level assigned by the respondents (where P value < .05):

**Table 5. Tukey's HSD / Kramer Test**

sample 1	sample 2	p-value
Factor 1		
12. I decide about the budget for the monthly family expenditure.	14. I decide on purchasing long-term household assets.	.031
12. I decide about the budget for the month family expenditure.	30. I have liberty to decide on purchasing long-term household assets.	.037
Factor 2		
19. My financial decisions are influenced by my friends.	22. My decisions in taking risk in financial investments are influenced by my financial consultant	.00000
20. My financial decisions are influenced by my colleagues.	22. My decisions in taking risk in financial investments are influenced by my financial consultant.	.0009
21. My financial decisions are a matter of chance.	22. My decisions in taking risk in financial investments are influenced by my financial consultant.	.001
22. My decisions in taking risk in financial investments are influenced by my financial consultant.	23. My decisions in taking risk in financial investments are influenced by my friends.	.00004
22. My decisions in taking risk in financial investments are influenced by my financial consultant.	24. I believe that success in financial investments depends on the market scenario.	.025
Factor 3		
7. I invest in financial instruments, keeping my long-term financial needs a top priority.	10. Success in my financial investments depends on the amount of effort I put in, in collecting data about the market scenario.	.02
8. Success in my financial investments originate from my meticulous planning.	10. Success in my financial investments depends on the amount of effort I put in, in collecting data about the market scenario	.008
Factor 4		
1. I take financial decisions on my own.	2. I take financial decisions of my family.	.007
1. I take financial decisions on my own.	3. My financial decisions depend on my past experience.	.0000
3. My financial decisions depend on my past experience.	6. I invest in financial instruments, keeping my short-term financial needs a top priority.	.0004
Factor 5		
11. I decide about the budget for my children's education.	26. I believe that success in financial investments is beyond my control.	.0009
26. I believe that success in financial investments is beyond my control.	27. I have the liberty to decide about the budget for my children's education	.02

\* The original number of the items is retained, as per the original proposed questionnaire.

Source: From the data analysis, the significance level is 0.05.

## 5. Discussion and Conclusion

For the purpose of the present study, a questionnaire was developed in order to investigate the perception of married earning women about the role of internal and external LOC in their financial risk-taking behaviour, in India. The exploratory factor analysis indicates that LOC

plays a role in the financial risk-taking behaviour among the married earning women. This corroborates with the literature review, which advocates that various dimensions of internal and external LOC, as follows:

LOC	Dimensions mentioned in the literature review	Similar factors as per the factor structure emerged and proposed in the present study
Internal	one's fundamental appraisal of oneself, such as, self-efficacy and self-esteem, self-confidence. This means that when a person believes that he or she can act so as to maximize the possibility of good outcomes and to minimize the possibility of bad outcomes he is said to have higher internal LOC.	Perceived liberty and financial decision-making (Factor 1); self-planning and proactivity (Factor 3); Personal experience and confidence (Factor 4); Priority (Factor 5)
External	Those who are always at the mercy of luck, fate and unforeseen uncontrollable outside force and feel helpless all the time and never like to take responsibility for their bad outcomes and miserable performances in life are said to have external LOC.	Influence of external factors (Factor 2)
Internal and external (combined)	Combination of information about the external environment and taking confident and calculated risks	Informed decision in investing (Factor 6)

Results also indicated that there was a significant difference between the average importance level to the variables for all the factors, assigned by the respondents. Post-Hoc Test identified that significance existed for these factors, only in the context of the following scenario. An in-depth interview was conducted to gain complementary insight in regard to such findings.

The average perception of the respondents was significantly different for their decision about the budget for the monthly family expenditure (item 12) vis-a-vis the decision about purchasing long-term household assets (item 14) and the liberty of purchasing long-term household assets (item 30). Respondents' family situation consisting of different income structure, family size, number of children and volume of earning along with the different levels of financial and family responsibilities and needs might have led to different perceptions about their own decision-making and liberty to decide about the budget and purchase.

As discussed earlier, the internality and externality in the locus of control are two ends of a continuum (and not as either/or typology). Therefore, it is only expected that individuals' external and internal locus of control plays a significant role in their decision-making behaviour. In the context of financial risk-taking behaviour also, this holds good. The findings of the study proved the same, as descriptive statistics showed that the respondents assigned fairly high scores towards almost all the variables, in the context of financial risk-taking ((lowest mean score = 3.448, on a 1–5-point scale). This proved that the respondents perceive the influence of both internal and external locus of control in their risk-taking behaviour.

The study further revealed the following.

The respondents differed significantly in their perception about the role of financial consultants i.e.; an external investment expert (item 22) vis-à-vis the suggestions given by friends (item 19) and colleagues (item 20). Also, respondents differed significantly in

perceiving the role of chance i.e.; luck (item 21) and market scenario (item 24), vis-à-vis the role of financial consultants (item 22). This happened, since in general, respondents believed that the role of luck may be substantially minimized and the volatility of the market may be substantially hedged, with the intervention of an expert in the field (the consultant). Similarly, the role of friends and colleagues were perceived as amateurs and significantly different in this context.

Respondents differed significantly in their perception about the success of the financial investments (item 10) vis-à-vis their long-term financial needs (item 7) and planning (item 8). This indicated that the respondents perceive success as a term which gets defined and perceived by the fulfilment of their long-term financial needs and kind of planning.

Respondents differed significantly in their perception about the financial decisions they take (item 1) vis-à-vis the family (item 2). They also differed in their decision-making based on past experience (item 3) vis-à-vis financial needs (item 6). This may be the consequence of the varied age group, level of education and income level of the respondents, whose experience and exposure in investment and spending for the family may be of varied nature.

Finally, respondents differed significantly on their decision in planning the budget for their children's education (item 11) and liberty to take such a decision (item 27) vis-à-vis their belief in their power to control the success of financial investments (item 26). This may be due to limited exposure to investing and the varied nature of financial requirements (resulting from age, number of children, number of family members, education and income level), the average perception of the respondents differed.

## **6. Scope for Further Research**

The factors explained in the present study represent the role of both, internal and external, LOC, in the financial risk-taking behaviour of married earning women, in the country. This study may be extended in future to investigate whether the married earning women of other states of India have a similar perception. Also, future study can be conducted to investigate the difference among the perception of unmarried and married woman. It can also be investigated whether there is a gender-specific perception about the role of LOC in financial risk-taking behaviour.

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## CHALLENGES IN SETTING THE MUNICIPAL WASTE FEE TARIFF IN BULGARIAN MUNICIPALITIES<sup>3</sup>

*The present waste fee tariff in Bulgaria is calculated per mill on property value, which is the grounding reason why the business pays much more than the population for the generated waste amounts, thus cross-subsidizing the population costs. Legislative amendments enforced in 2017 require the waste fee to be determined based on waste amounts and a number of waste service users. Since then, the actual enforcement date for the introduction of the new waste tariff has been postponed several times due to a number of serious challenges that may undermine the future operation of the waste management systems in the municipalities. These challenges cover the need for an entire transformation of the current waste collection and transportation system, require significant additional costs in terms of capital investments, necessary massive awareness-raising campaigns, insufficient data, affordability and willingness to pay issues.*

*Keywords: municipal waste fee; waste tariffs; local budgets; municipal waste management; polluter pays principle*

*JEL: H71; H72; Q57*

### Introduction

Waste fee setting and waste fee tariff structures are not among the topics deemed attractive for scientific research. They seem to be mainly policy-driven issues, but have strong implications on household budgets and affordability, business costs, municipal budgets, cost effectiveness, environmental and health risks, etc. They also may create incentives and disincentives for behaviour changes for all players in the waste sector – local governments, contracted waste service providers, waste generators, etc.

Waste management is a public service of general economic interest dedicated to the provision of a cleaner, healthier and risk-free environment for the population and business. The presence of market failure is a structural feature of the waste sector as it frequently works under structural or legal monopolies. That is why regulation to ensure adequate service standards at affordable prices is usually in place (Marques, Simões, Pinto, 2018).

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Meanwhile, besides the political and regulatory context, waste tariff setting should pursue efficiency, equity and sustainability of the waste service. The following principles are usually observed in waste tariff structuring: efficient allocation of resources; efficient supply of waste services; cost recovery; financial viability; horizontal equity; vertical equity and poverty alleviation, administrative and technical feasibility; polluter pays and avoiding illegal dumping (Solid Waste Tariff Setting Guidelines for Local Authorities, p. 3). In the last ten years, Bulgarian municipalities face serious challenges to structure their waste fee tariffs and meanwhile, observe these principles.

The provision of household waste management services in Bulgaria is decentralized to the lowest local government tier – 265 municipalities. This is in line with the decentralization theorem (Oates, 1972, p. 256) and the “subsidiarity” principle, drawn from the European Charter of Local Self-Government. They postulate that each activity for the provision of public goods should be assigned to the lowest government tier that covers most of the benefits generated by a public good if this tier can effectively manage the service provision.

The local governments in Bulgaria hold the following waste management responsibilities:

- Organizing and managing mixed household waste collection and transportation to landfills and/or other waste recovery and treatment facilities.
- Constructing and operating all waste management facilities – waste separation and composting installations, waste treatment plants and landfills.
- Closing, recultivation and post-closure monitoring of waste landfills and other waste disposal facilities.
- Setting up sites where the local population and business may deliver free of charge separately collected waste fractions as well as bulk waste.
- Organizing the cleaning of streets, squares, alleys, parks and gardens and all public outdoor spaces.

The collection and treatment of waste fractions like packaging, end-of-life vehicles, waste electric and electronic equipment, waste tires, batteries and processed automobile oils and lubricants is under the extended responsibility of the producers and importers of these products and is performed and funded by licensed recycling organizations. These organizations are established by the producers and importers of goods generating such waste. Nevertheless, the municipalities are also responsible for organizing the separate collection for at least the following household waste fractions: bio-waste, paper and cardboard, metals, glass and plastics.

Regarding household waste management services, the Bulgarian local governments have complete powers in the three dimensions of the public services provision (CEU, 2002, Module 3, p. 5):

- *Defining* – the power to make decisions about the quantity and the quality of the provided service. This includes for example deciding on the locations of containers and waste delivery sites in the different municipal settlements and constituent residential areas; the

routes and the frequency of waste collection and cleaning of public outdoor spaces; the location and capacity of the waste management facilities, etc.

- *Financing* – the power to set fees, collect revenues and finance the provision of the service. The municipalities in Bulgaria charge the households and the businesses, living and operating respectfully on their territory with a waste fee that is part of the municipal budget revenues and finances the provided waste management activities.
- *Physical provision* – the power of the local authorities to organize the provision of the service. The Bulgarian municipalities can decide whether to provide the waste collection, transportation and treatment services by themselves (via municipal enterprises) or to contract them out to private companies. Referring to the waste fractions that fall under the extended producer responsibility schemes, the municipalities have the power to select licensed organizations to operate on their territory.

The costs for provision of the municipal waste management services are included in the annual waste costs/revenues estimate, on which basis the municipalities set the annual amount of the waste fee.

## **1. Municipal Waste Fee in Bulgaria – Current Status**

The revenues from the municipal waste fee are earmarked and cannot be used to finance costs other than those included in the annual waste costs/revenues estimate. If municipalities generate economies in waste management costs, the surplus from the waste fee revenue is transferred to the next-year municipal budget and can be used for waste management activities only.

The annual fee amount is determined by a decision of the municipal council on the basis of the approved annual waste costs/revenues estimate, including the necessary costs for each activity separately – waste collection and transportation, waste treatment (recycling, recovery, disposal, landfilling, etc.) and cleaning of public areas. The waste fees may be paid as a lump sum or in four equal instalments.

The municipal waste fee is determined as a per mill rate (‰) on the property tax value. Individual per mill rate is set for each of the three services – waste collection and transportation, waste treatment (recycling, recovery, disposal, landfilling, etc.) and cleaning of public areas. The fee is paid by the property owner and in the case of established property right of use – by the user. In the case of concession, the concessionaire pays the fee. In compliance with the Waste Management Act, no municipal waste fee is collected for churches, temples and monasteries, in which religious activity is performed by the legally registered religions in the country. However, municipalities may conduct their own fee exemption policy in order to favour different consumer groups. The waste fee rates for the different waste services are differentiated by various user categories, property types and options, as well as the exemptions for the waste fee tariff.

The municipalities set and implement their own waste management policy through the waste tariff mechanism. The application of these policy tools is illustrated with an example of four

Bulgarian municipalities. In order to present a more inclusive notion of the process, the sample covers diverse municipalities in terms of population number, administrative status, geographical location and financial capacity. The share of own source revenues in the municipal budget revenues is used as an indicator of financial capacity – the higher this share is, the greater the revenue-generating capacity of the relevant municipality. Along with this, the authors have long experience in working with these municipalities thus having data and being familiar with the local policy. The municipalities are as follows:

- *Sofia municipality* – the capital city of Bulgaria and the largest municipality in the country with a population of 1 307 438 (2021 data). It occupies 9<sup>th</sup> position among the 265 municipalities in Bulgaria in terms of share of own-source revenues in the municipal budget revenues – 46.04% (2019 data) and is thus considered a financially viable municipality.
- *Montana municipality* – a centre of Montana district in the Northwestern region of Bulgaria with a population of 45 229 (2021 data). It takes the 65<sup>th</sup> position among the 265 municipalities in Bulgaria in terms of share of own-source revenues in the municipal budget revenues – 26.36% (2019 data), which is slightly below the country average of 29.9% and thus considered as a municipality in an average financial capacity.
- *Pomorie municipality* – a Black Sea resort municipality with a population of 27 839 (2021 data), occupying 7<sup>th</sup> position among the 265 municipalities in Bulgaria in terms of share of own-source revenues in the municipal budget revenues – 49.6% (2019 data) and thus considered a financially viable municipality.
- *Rudozem municipality* – a small municipality located on Rhodope Mountain with a population of 8 614 (2021 data). It occupies 243<sup>rd</sup> position among the 265 municipalities in Bulgaria in terms of share of own-source revenues in the municipal budget revenues – 9.21% (2019 data), which is far below the country average of 29.9% and thus considered a municipality of poor financial capacity.

The structures of the waste fee tariff of the four municipalities are presented in Tables 1-4.

**Table 1. Waste fee tariff in 2022 for Sofia Municipality**

	Population (residential property)	Business (residential property)	Business (non-residential property) Option 1	Business (non-residential property) Option 2
Waste collection and transportation	0.49‰ on the property tax value	0.49‰ on the property tax value	3.10‰ on the property tax value	For 1100 litre container – BGN 1340 /1 container; For 3,5-4 m3 container – BGN 8030/1 container per year at once-a-week collection
Waste treatment	0.42‰ on the property tax value	0.42‰ on the property tax value	2.60‰ on the property tax value	
Cleaning of public areas	0.69‰ on the property tax value	0.69‰ on the property tax value	4.30‰ on the property tax value	4.30‰ on the property tax value

Source: Decision № 809, Protocol №.44 of 16 December 2021 of the Sofia Municipal Council.

**Table 2. Waste fee tariff in 2022 for Rudozem Municipality**

	Population – areas with organized waste collection	Population – areas with no organized waste collection	Business – areas with organized waste collection Option 1	Business – areas with organized waste collection Option 2	Business – areas with no organized waste collection
Waste collection and transportation	3.15‰ on the property tax value		5.10‰ on the property tax value	BGN 500 per container; BGN 100 per bin	
Waste treatment	3.6‰ on the property tax value		3.46‰ on the property tax value		
Cleaning of public areas	4.41‰ on the property tax value	8.01‰ on the property tax value	3.8‰ on the property tax value	7.26‰ on the property tax value	7.26‰ on the property tax value

Source: Decision № 296, Protocol № 32 of 30 December 2021 of the Rudozem Municipal Council.

**Table 3. Waste fee tariff in 2022 for Pomorie Municipality**

	Population – residential property	Population – non-residential property	Business – residential property	Business – non-residential property	Population and business – per container
Waste collection and transportation	1.6-22.5‰ on the property tax value depending on the settlement	2.7-35‰ on the property tax value depending on the settlement	1.6-22.5‰ on the property tax value depending on the settlement	2.7-35‰ on the property tax value depending on the settlement	BGN 134-222 for 240-litre bin BGN 613-1016 for 1100 litre container BGN 3816-6317 for 4m3 container depending on the settlement
Waste treatment	1.35-15‰ on the property tax value depending on the settlement	2.1-20‰ on the property tax value depending on the settlement	1.35-15‰ on the property tax value depending on the settlement	2.1-20‰ on the property tax value depending on the settlement	
Cleaning of public areas	0.2-5‰ on the property tax value depending on the settlement	1.9-10‰ on the property tax value depending on the settlement	0.2-5‰ on the property tax value depending on the settlement	1.9-10‰ on the property tax value depending on the settlement	

Source: Decision of 21 December 2021 of the Pomorie Municipal Council.

The waste tariff data of the four municipalities, presented in Tables 1-4, outline the following:

- The municipalities set different per-mill rates for the different payer groups. The municipalities usually distinguish between two major user groups – population and business when setting the per-mile rate. Besides, for domestic and business properties another approach is also applied – differentiation of non-residential and residential properties. Depending on this, different ways of determining the fee amount are possible. Some municipalities, like Sofia, differentiate between residential and non-residential property only for business entities, while others, like Montana, provide this opportunity also for the population. Small municipalities, like Rudozem, do not apply criteria to either residential or non-residential property at all.

**Table 4. Waste fee tariff in 2022 for Montana Municipality**

Population					
	Residential property – areas with organized waste collection Option 1	Residential property – areas with organized waste collection Option 2	Non-residential property – areas with organized waste collection Option 1	Non-residential property – areas with organized waste collection Option 2	Non-residential property – areas with no organized waste collection
Waste collection and transportation	0.59‰ on the property tax value		1.60‰ on the property tax value	BGN 50 per cubic meter of waste	
Waste treatment	1.97‰ on the property tax value		2.20‰ on the property tax value	2.20‰ on the property tax value	
Waste collection and transportation	1.30‰ on the property tax value	2.50‰ on the property tax value	3.70‰ on the property tax value	3.70‰ on the property tax value	3.7‰ on the property tax value
Business					
	Non-residential property – areas with organized waste collection	Non-residential property – areas with organized waste collection	Non-residential property – areas with no organized waste collection		
Waste collection and transportation	1.60‰ on the property tax value	BGN 50 per cubic meter of waste			
Waste treatment	2.20‰ on the property tax value	2.20‰ on the property tax value			
Waste collection and transportation	3.70‰ on the property tax value	3.70‰ on the property tax value	3.7‰ on the property tax value		

Source: Decision of 18 November 2021 № of the Montana Municipal Council.

- Waste collection and transportation in municipalities with a large number of small villages on their territories (Montana) or mountainous typology (Rudozem) is not cost-effective and especially for remote villages and such with fewer inhabitants. Thus, people in these settlements are charged only with the “cleaning of public areas” component of the waste fee, as an organized waste collection is not provided.
- The municipalities may provide options to pay based on the actual amount of generated waste or to contract directly the waste collection, transportation and treatment to licensed companies, and pay to the municipality only the public areas cleaning component of the waste fee. Some municipalities, such as Sofia, Rudozem and Montana, provide this option only to business entities, while others like Pomorie provide this option to the population as well.
- The common practice in the municipalities is to set fee rates for more aggregated user groups like population/business, residential/non-residential property and areas with organized waste collection/ areas with no organized waste collection. However, there are municipalities, like Pomorie, which develop a very detailed waste fee tariff in which

besides the differentiation in the pointed aggregate groups, there is a further differentiation by settlements, each of which having own precise waste fee rate for each waste service and user category (17 settlements, of which 1 town and 16 villages).

- Besides setting waste fee rates, the municipalities may conduct their own waste management policy by exempting certain groups from the payment of waste fees – e.g. religious institutions are exempt by law from payment of waste fees, but some municipalities decide to exempt public municipal property (schools, kindergartens, hospitals, cultural centres, etc.), which is specified in their ordinances for the administration of local fees and local service prices.

The performance of waste fee revenues average for Bulgaria and for the four municipalities and their role in the municipal budgets are presented in Table 5 and Figure 1.

**Table 5. Share of municipal waste fee revenues in the context of municipal budget revenues in the period 2017-2021 (%)**

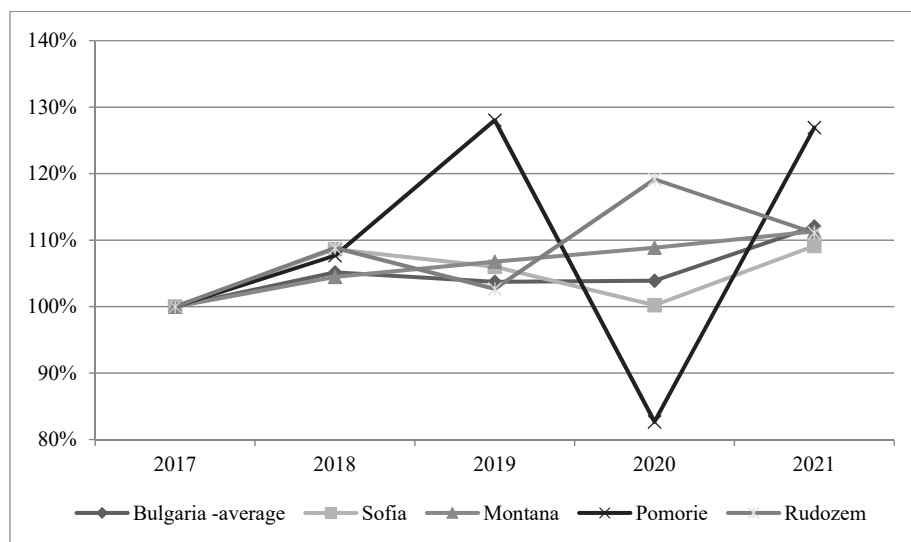
	2017	2018	2019	2020	2021
Bulgaria-average					
Waste fee/Local fee revenues	71.9	71.9	73.0	77.6	76.6
Waste fee/Local own source revenues	25.3	25.4	25.6	26.6	25.0
Sofia municipality					
Waste fee/Local fee revenues	78.8	76.9	79.2	84.5	82.0
Waste fee/Local own source revenues	30.4	29.9	32.0	32.5	30.0
Montana municipality					
Waste fee/Local fee revenues	75.8	75.8	77.1	79.7	79.0
Waste fee/Local own source revenues	32.1	30.9	32.6	36.8	39.5
Pomorie municipality					
Waste fee/Local fee revenues	71.0	73.1	76.3	77.0	77.5
Waste fee/Local own source revenues	21.9	23.9	25.5	25.6	22.1
Rudozem municipality					
Waste fee/Local fee revenues	70.1	72.9	70.7	79.2	78.9
Waste fee/Local own source revenues	29.8	21.3	23.8	26.6	25.7

Source: Ministry of Finance, National Association of Municipalities in the Republic of Bulgaria.

The presented data indicate that the waste fee revenues grow on an average of 5-7% per year in the period 2017-2019. In 2020, the waste fee revenues display a different development pattern due to the COVID-19 pandemic. In 2021, they again start to increase because some of the planned revenues for the year 2020 have actually been accounted for and collected in 2021. Nevertheless, the waste fee revenues are of key importance for the local own source revenues – the revenues which the local governments have full powers to determine.

The direct link of the waste fee rates to the two large groups of payers – population and business, makes the municipalities create and organize their databases in a way that provides detailed information about the parameters of each payer's property in terms of location, size, tax value, etc. These databases are also used for the calculation of the property tax, and the tax on transfer of real estate property, which are major local taxes and in 2021 they accounted for 68% of local tax revenues average for Bulgaria.

**Figure 1. Dynamics of municipal waste fee revenues in the period 2017-2021 (% , previous year=100)**



Source: Ministry of Finance, National Association of Municipalities in the Republic of Bulgaria.

The municipalities do not maintain databases about the amount of waste generated by the population and the business separately because the waste fee tariff presently is not linked to the amount of waste generated by a certain user (i.e. waste disposal in special waste bags or containers tagged to the specific entity). The common practice in Bulgaria is the collection of mixed waste in containers, which are then transported to waste separation facilities at the regional landfills. There, the recyclable and bio-waste is separated and recovered, while the residual waste is landfilled. Only a few municipalities, such as Sofia, have started to introduce their own separate waste collection systems beyond the ones set by licensed organizations under the extended producer responsibility schemes and have fairly precise data about the waste amounts generated by the population and the business.

**Table 6. Breakdown of municipal waste fee and waste amounts in Sofia Municipality**

	2017	2018	2019
Waste fee revenues – population (BGN)	64 779 790	65 018 886	70 921 501
Waste fee revenues – business (BGN)	129 870 426	146 263 089	153 046 464
Waste amounts – population (tons)	303 298	314 639	325 108
Waste amounts – business (tons)	67 188	69 586	71 817
Waste fees/1 ton waste – population (BGN/ton)	213.58	206.65	218.15
Waste fees/1 ton waste – business (BGN/ton)	1932.94	2101.91	2131.06

Source: Sofia Municipality.

It is evident from the data that business entities in the Sofia municipality pay about 10 times higher fees per 1 ton of generated waste than the population. This is a result of the methodology for calculating the waste fee based on the tax valuation, as the value of the

business property is higher, as well as the approach to charging business entities with higher rates (as seen from Tables 1-4 above). Although business entities make use of the options to pay per waste containers introduced by many municipalities, the “cross-subsidisation” phenomenon when the business pays for the waste generated by the population turned out to be the main problem underlying the present waste fee tariff.

## **2. Municipal Waste Fee in Bulgaria – the 2017 Legislative Changes and the Challenges They Pose**

The disadvantageous position of business entities in terms of waste fee payments for years made their representative organizations advocate for national-wide amendments in the Local Taxes and Fees Act (LTFA) regarding the method for determining the waste fee tariff.

Moreover, in 2013, the Bulgarian Parliament introduced a legal text in the LTFA that required waste collection fees to be calculated based on the generated waste (the “pay-as-you-throw” principle), instead of being based on the property value. It was due to enter into force on 1 January 2015 but was postponed a number of times. In October 2017, an amendment to the LTFA clarified the methods for calculating municipal waste costs and waste fees, but further postponed the implementation of the “polluter pays” principle for the beginning of 2020. As the municipalities in Bulgaria were not prepared for the practical implementation of these changes, the entry into force of the changes was again postponed for 01.01.2022.

According to Art. 67 of the LTFA, the amount of the municipal waste fee for each liable entity (physical person or business entity) will be determined for a calendar year in compliance with the “polluter pays” principle. The amount of the fee will be determined on a unit basis for each calendar year by a decision of the Municipal Council together with the approval of the annual waste costs/revenues estimate. The leading basis for determining the waste fee is the amount of household waste (Article 67, paragraph 4 of the LTFA). The Municipal Council may adopt a basis or bases, different from the one indicated in paragraph 4, if there are objective circumstances preventing its application.

The base for determining the amount of the municipal waste fee that the municipal council may accept is systematized as follows:

(1) for the service of collection and transportation of household waste to facilities and installations for their treatment:

- individually determined amount of household waste for the property, including through bags with a certain capacity and load
- quantity of household waste for the property, determined according to the number and capacity of the necessary containers for collection of household waste and the frequency for their transportation
- number of users of the service in the property.

(2) for the service of the treatment of household waste in facilities and installations:



- individually determined amount of household waste for the property, including through bags with a certain capacity and load
  - quantity of household waste for the property, determined according to the number and capacity of the necessary containers for collection of household waste and the frequency of their transportation
  - number of users of the service in the property.
- (3) for the service of maintaining the cleanliness on the territories for public use in the settlements and the settlement formations in the municipality:
- number of users of the service in the property
  - built-up and/or undeveloped area of the real estate.

The municipal council may adopt different bases for different settlements, for different zones in them, for settlement formations, for different categories of obligated persons and for separate services, explicitly stating the reasons for those different bases.

When accepting the base of:

- (1) "number of users of the service in the property" or "built-up and/or unbuilt-up area of the real estate" the municipal council in determining the amount of the fee for household waste may accept additional differentiation according to the settlements in the municipality and individual zones in them, the kind of property, its purpose and the type of economic activity performed in the property.
- (2) "individually determined amount of household waste for the property, including through bags with a certain capacity and load" or "amount of household waste for the property, determined according to the number and capacity of the necessary containers for collecting household waste and the frequency for their transportation" the Municipal Council may accept additional differentiation to determine the municipal waste fee according to the type of household waste.

These changes in the mechanism for determining the amount of the fee represent a serious challenge for the municipalities in the country. A working group has been set up at the National Association of Municipalities in the Republic of Bulgaria (NAMRB), which is elaborating proposals for a methodology for determining the fee base. The studies done so far do not provide an answer to the question of what should be the methodology for the determination of the municipal waste fee so as to ensure the same burden on the population or its gradual increase within reasonable limits. To date, no municipality in Bulgaria has proposed or applied a methodology for determining the amount of municipal waste fee in accordance with the changes in the LTFA. Due to this reason, new amendments to the LTFA were again promulgated in February 2021 saying that the new waste tariff bases will enter into force at the beginning of the second year after the publishing of the complete results from the Population and Housing Census in the Republic of Bulgaria held in 2021. By the beginning of February 2023, these results are not published yet, so it might be expected that the enforcement of the new waste tariff bases could be expected in 2025 at the earliest.

Therefore, for over 6 years the Bulgarian state and municipal institutions keep on pushing the date for the actual enforcement of the new waste fee tariff for the coming years. This policy decision would resolve a number of serious challenges, presented and analysed below.

### *2.1. Overall transformation of the current waste management systems*

The enforcement of the new waste tariff implies that the fee will no longer be determined based on property value but separately for each service within the tariff according to the new base. This means that the amount of waste associated with every property should be clearly distinguished (with distinctly tagged or marked bag/container or by knowing the exact number of persons using the service from the relevant property). **This means that the municipalities will have to introduce entirely new waste collection systems based on bags/individual containers, including their own systems for separate waste collection differing from the system for separate waste collection by the recovery organizations. These systems will have to entirely replace the mixed-waste container system that is presently in place in all municipalities.**

This transformation of the current waste management systems requires the allocation of significant efforts in the following directions:

**Additional costs for the introduction of the new waste collection systems include:** waste bags and individual containers as well as an increase of the annual operation costs for the collection of the individual bags and containers; new waste collection trucks that are appropriate for the collection of individual waste bags and containers instead of the present mixed-waste containers; new waste information systems – hardware, software and integration in the current municipal waste information systems as well as annual operation costs for the maintenance of the system; large-scale mass information and awareness raising campaigns to address the population and the business; a significant increase in the costs of the municipal inspectorates to monitor and control the enforcement of the new waste systems. All these costs will have to be calculated and paid by the population and the business in the form of waste fees.

**Allocation of special places for disposal of individual users' waste.** The collection of waste by bags will require the designation of special places where the users can leave these bags according to a predetermined collection schedule. While in the high-building and the not densely populated areas suitable sites may become available, this will become a serious issue in the central part of the city. The practice in countries where waste is collected in bags is to set up special rooms in the buildings where these bags are collected, or to build underground containers under the sidewalks. Special studies need to be conducted to determine what will be the most suitable option for the different residential and business areas.

**Contracts with contractors for waste collection and cleaning of public territories.** The transition to the new system will lead to tangible changes in waste collection and transportation. Currently, many municipalities have signed multi-year contracts with various contractors for the collection and transportation of mixed household waste. These contracts do not provide for the collection of waste through bags or individual containers, which are

the basis of the new charging mechanism. The core data for the financial parameters set in these contracts between the municipalities and the service providers contain estimates for routes and waste amounts that significantly differ from the proposal to collect bags and individual containers. Special legal studies should be carried out to assess the potential forfeits that the termination of these contracts would bring to the municipalities.

**Interaction of the separate waste collection systems of the municipalities with the already existing extended producer responsibility schemes.** The introduction of waste fees based on waste quantity (bags/individual containers) goes “hand in hand” with the launching of its own separate waste collection scheme by the municipalities. As described above, different extended producer responsibility schemes operate in Bulgarian municipalities. The entities licensed to implement these schemes sign contracts with the municipalities, the municipalities provide spaces for the placement of the containers and do not pay anything for the collection, transportation and treatment of this waste. If the municipality organizes a separate waste collection system parallel to the existing schemes for extended producer responsibility for packaging waste, this will inevitably lead to the reduction of the quantities disposed in the containers of the contractors implementing these schemes. In the proposed calculations of the waste fee per quantity (bag/individual container), the costs for collection, transportation and treatment of the recyclable waste are included in the fee per bag/individual container of mixed household waste. Thus the entities will have the incentive to separate the waste and pay less for their disposed mixed household waste. The calculated fee does not include any other financial incentives for the population for disposing their waste in the municipal containers for separate waste collection as, for example, discounts for their waste fee. If done so, this will have an additional negative effect on the amounts collected by the contractors for implementing these schemes.

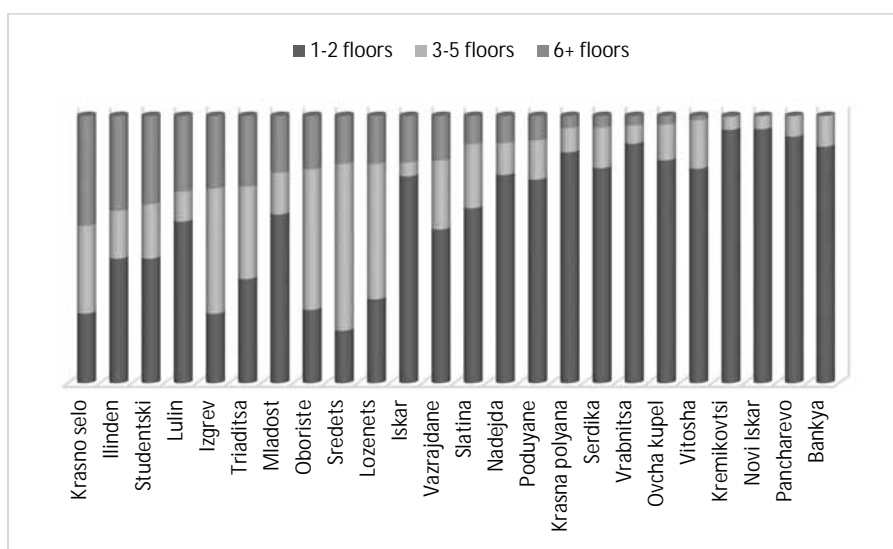
**Establishment of the necessary administrative framework** in the municipalities to manage the “transformed” waste management systems including:

- Development of municipal databases that will provide the necessary data to set the waste fee according to the new base. As pointed out above, the municipalities do not have precise information on the amount of waste generated at a given address no matter whether households live or business entities operate there. Only municipalities that have presently provided the option for certain clients to directly contract the waste collection instead of per mill payment on the property value, may have limited data about the waste amounts generated by these entities. The number of people living at a certain address is one of the potential bases for the new waste fee tariff. Two options for population registration are presently available in Bulgaria – permanent residence and current residence. The permanent residence is the official address, which Bulgarian citizens use in their communication with the state administration. The current residence is the address, at which the person presently resides – it may coincide with the permanent address, and it may differ. However, there is no governmental mechanism that obliges people to register immediately at their new current residences when moving from one address to another. Therefore, the data about the number of people by permanent or current address collected by the Civil Registration Service under the Ministry of Regional Development and Public Works is not reliable. The new amendments in the LTFA presume that each building of properties should have a person who is responsible to collect and provide this

data to the municipal administration; however, a completely new system for collection, verification and processing of this data should be established.

- Development of concepts and methodologies for calculating the fee and determining for each service the most appropriate base taking into account the specific features of each district and settlement in the relevant municipalities. For example, municipalities like Sofia and the six largest municipalities in Bulgaria have districts with different types of construction – densely populated areas with high blocks of apartments, village-like areas with houses and city centres with concentration of administrative buildings, shops and residential properties. The diversity of the buildings in the different areas of Sofia municipality is illustrated in Figure 2.

**Figure 2. Structure of residential housing by districts of Sofia Municipality**



Source: Population census, NSI, 2011.

The figure shows a vast diversity of residential structures in the different areas of the capital city Sofia varying from areas with almost 90% of 1-2 floor buildings to areas with large concentration of high buildings. This will affect seriously the local decision-making as far as the local governments have the power to choose the waste fee bases according to the specifics of the given area.

- Making the necessary structural and administrative changes in the municipal administrations in order to determine and administer the fee as well as training the employees of the municipality, who will determine and administer the fee in the new mode.
- Expanding the activity of the municipal inspectorates, including hiring and training additional staff given the fact that higher fees will possibly lead to illegal waste dumping

in unregulated places, and thus additional monitoring, control and imposing of sanctions will become necessary. No official statistics of illegal dumping sites is presently maintained in Bulgaria. However, the media periodically publish data after inspections made by the Regional Environmental and Water Inspectorates and the Prosecutor's Offices acting after signals on illegal dumping. The latest media publications say that 1426 illegal dumping sites have been determined in Bulgaria. In case of higher waste fees, this tendency will intensify inevitably<sup>4</sup>.

## 2.2. *Affordability of waste fees for the population*

Unlike the water services (water supply, sewerage and wastewater treatment) where the Bulgarian legislation sets a precise criterion of social affordability of water services costs for the population (par.1, p.4 of the Act on Regulation of Water Supply and Sewerage Services), the affordability of waste costs for the population has not been legally regulated.

In practice, this affordability of the waste fee has been evaluated in Bulgaria in relation to the overall assessment of the EU waste infrastructure projects funded under the operational programs during the 2007-2013 and 2014-2020 programming periods. The affordability assessment for the population has been done based on the so-called "Jaspers" criterion, reviewed in the publication "Application of the polluter pays principle in waste management projects" (Jaspers, 2011). According to this document, *"There is a standard policy on affordability limits defined by the national authorities. As a reference, the following table shows affordability limits currently applied for waste projects in selected Member States as well as those generally recommended by the World Bank. In general, for EU-funded projects, the common practice seems to be the use of an affordability threshold of around 1.5% of the average household income of the lowest income deciles"*.

In addition, it is necessary to make another clarification to this affordability assessment method. Currently, the Bulgarian population pays a municipal waste fee, which covers the costs of these services: 1) waste collection and transportation; (2) treatment and disposal of household waste in landfills or other facilities; and (3) cleaning of public areas. The practice in the affordability assessment is that the costs for cleaning public areas are not considered as direct waste management costs and should be excluded from the affordability estimates. This practice has also been applied by Operational Program "Environment" in the evaluation of waste infrastructure projects in the 2007-2013 and 2014-2020 programming periods.

The income statistics in Bulgaria also pose methodological issues for the affordability assessment of services at the municipal level in several aspects:

- The income statistics are managed by the National Statistical Institute (NSI). It collects the income data based on a household income survey, which involves samples of households from different districts in Bulgaria. Data for the level of incomes at the municipal level is not published officially due to representativeness problems, because an insufficient number of households living in each municipality is included in the survey

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<sup>4</sup> <https://www.investor.bg/a/332-ikonomika-i-politika/305245-proverki-sa-ustanovili-1426-nezakonni-smetishta-i-440-lokalni-zamarsyavaniya>.

sample. The NSI publishes income data at the district level (28 districts in Bulgaria), however, due to the fluctuations in the number of surveyed households in recent years, the NSI already cannot ensure the survey representativeness even at the district level, thus it ceased to publish income data for some districts, such as Montana, Lovech, Gabrovo. For other districts, the NSI points explicitly that the published data is with high stochastic error, which though officially published should be carefully considered when making evaluations and decisions. The six NUTS II regions are the lowest administrative level for which representative data for household incomes is available in Bulgaria.

- The affordability is always assessed based on the incomes of the poorest population groups. The NSI publishes representative data for population incomes by decile groups only at a national level. This structure shows the average incomes for 10 population income groups as the households of the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> decile groups are considered to be the ones with the lowest incomes, and the households in the 10<sup>th</sup> decile group are considered to be the ones with the highest incomes. So this national representative structure is usually applied to determining the income level of the poorest households although, at the district level, there may be an observed concentration of households in the low-income or high-income groups. Only Sofia municipality – the capital city and largest municipality in Bulgaria had once commissioned a special income survey in 2008 to study the structure of incomes by income groups on its territory. The results from this survey proved the conclusion that the income structure at a municipal and district level may differ significantly from the national average.

The affordability assessment of the waste fees that the population in the four sample municipalities is paying, shown in Table 7, is based on:

- Data from the local administrations of the relevant municipalities for the amount of waste fee paid by the population.
- NSI household income data for Sofia, Smolian (in which Rudozem is located) and Burgas (in which Pomorie is located) districts. As no official data for the household incomes in the Montana district is published, the NSI data for the Northwestern NUTS II region will be used (where Montana is located).
- NSI population data by municipalities and average per district number of people in a household.
- The national representative structure of incomes applied to the incomes for Burgas and Smolian districts and the Northwestern region, and the specific income structure for Sofia municipality.
- Data for the years 2018 and 2019 is used for the assessment as these are the years for which a full dataset is available.

**Table 7. Affordability of waste fee for the population in Sofia, Montana, Pomorie and Rudozem**

	Sofia		Montana		Pomorie		Rudozem	
	2018	2019	2018	2019	2018	2019	2018	2019
Waste fee paid by the population for waste (public cleaning component excluded) (BGN/per capita)	29.07	31.69	25.69	28.08	33.91	43.38	11.33	13.05
Affordability limit of the annual costs for waste management (1.5%) (BGN per capita)	82.10	85.60	37.25	40.92	37.66	43.37	41.14	45.18

*Source: NSI, Sofia Municipality, Montana Municipality, Pomorie Municipality, Rudozem Municipality, own calculations.*

As seen from the table the 2018-2019 values of waste fees paid by the population in the four municipalities are affordable even for the lowest incomes groups – they are below the affordability limit. However, in high-income municipalities, such as the capital city of Sofia, the margin between the actual population payments and the affordability threshold is greater.

The calculations in the table also illustrate the distorted and unrepresentative local statistics making the assessment of the waste fee affordability very difficult. Unexpectedly, the affordability of waste fees in Pomorie, which is a rich Black Sea resort municipality is very close to the affordability limit. This is due to two reasons: (1) the use income level average for the district, which includes municipalities with different financial status; (2) many people living in other cities but having property in the resort municipality pay the waste fees for these properties; however, no data about the number of these people is available. On the other hand, the affordability of waste fees in Rudozem municipality, which is considered a low-income municipality, is far below the affordability limit. This is because the average income level for the Smolian district is not representative because higher income households have been included in the sample.

If no “cross-subsidisation” phenomenon existed, then in 2018-2019 the municipalities had to charge the population with the full waste collection, transportation and treatment costs for the generated waste. This case is studied for Sofia municipality as long as this is the municipality that maintains a complete dataset with a breakdown of waste amounts generated by the population and the business. The results from the Sofia case study are presented in Table 8.

**Table 8. Waste fees that the population in Sofia would have to pay in case the “polluter pays” principle is enforced**

	2018	2019
Total municipal waste collection, transportation and treatment costs (BGN)	115 730 702.16	118 106 791.92
Total amount of municipal waste (tons)	384 225	396 925
Average costs per ton (BGN/ton)	301.21	297.55
Waste amounts from the population (tons)	314 639	325 108
Waste collection, transportation and treatment costs for the waste generated by the population (BGN)	94 771 012.81	96 737 325.45
Population (number)	1 328 120	1 328 790
Waste collection, transportation and treatment costs 1 person to be charged as waste fee (BGN)	71.36	72.80

*Source: NSI, Sofia Municipality, own calculations.*

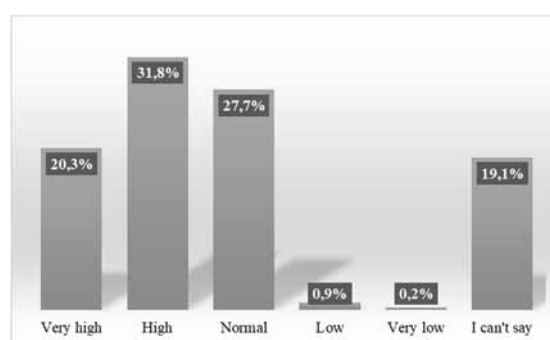
The calculations show that if Sofia municipality has implemented the “polluter pays” principle in 2018-2019 then it would have to raise the waste fee for the population by 2,5 times and almost reach the affordability limit. However, this would happen in conditions when no additional costs are made for launching a brand new waste collection and transportation system in Sofia that would raise the per capita burden far beyond the affordability limit. In the case of low-income municipalities, even a slight increase in waste fees would surpass the affordability limit.

### 2.3. Willingness of the population to pay for waste fees

The population's willingness to pay waste fees further amplifies the affordability issue. In our case, the present waste fee levels are considered as the maximum price when studying willingness to pay.

As far as the affordability of waste fees can be assessed based on statistical data and justified assumptions, there are no special studies performed to measure willingness to pay for the waste management service in Bulgaria. Value estimates for environmental goods can be obtained by using “stated” information concerning preferences for the good. In the environmental economics literature, the stated preference approach has come to be known as “contingent valuation” as the “valuation” estimated obtained from preference information given the respondent is said to be “contingent” on the details of the “constructed market” for the environmental good put forth in the survey (Carson, Hanemann, 2005). Therefore, we use the “stated” information from a representative sociological survey of the population of Sofia municipality carried out in 2018 under the project “Technical Assistance to Sofia Municipality and the Sofia Municipal Waste Treatment Enterprise to strengthen the capacity for operation and management of the waste treatment facilities”. The survey covered a various number of issues related to the quality of waste services provided to the population including questions related to the waste fee. Figures 2 and 3 are very illustrative of Sofia municipality’s population willingness to pay waste fees.

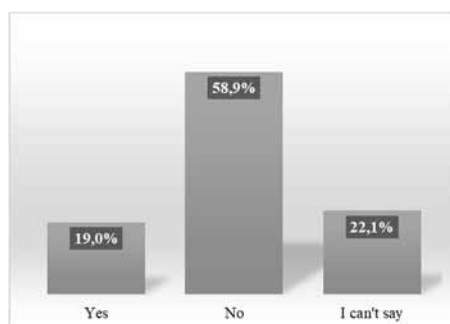
**Figure 3. How do you evaluate the waste fee you are paying compared to the waste services that you are getting?**



Source: Sofia Municipality, Project “Technical assistance to Sofia Municipality and the Sofia Municipal Waste Treatment Enterprise to strengthen the capacity for operation and management of the waste treatment facilities”, 2018.



**Figure 4. Would you pay a higher waste fee for more and better quality waste services?**



*Source: Sofia Municipality, Project "Technical assistance to Sofia Municipality and the Sofia Municipal Waste Treatment Enterprise to strengthen the capacity for operation and management of the waste treatment facilities", 2018.*

The survey results indicate that even in periods when the waste fees paid by the population were far below the estimated affordability threshold, 52.1% of the respondents considered these waste fees as high and very high. In addition to this 58.9% of the respondents were not willing to pay higher waste fees even if they are provided with more and better quality waste services. This unwillingness to pay in combination with the potential increase in the waste fees close to the affordability limit is a serious problem that may undermine the introduction of the new waste collection system in the municipalities.

It will take a long time and massive information and awareness campaigns to convince people to pay more and to dispose of their individual quantities of waste in their designated bags/containers.

## **Conclusion**

The recent developments regarding the setting of the municipal waste fee tariff unequivocally reveal that Bulgaria is at a crossroads. Obviously, there is no way back. Being a member of the EU family, Bulgaria must accept and line up with the polluter pays principle, which is widely acknowledged to be a very powerful concept to mitigate the negative impacts of pollution and particularly waste pollution.

Of course, Bulgarian authorities may make left and right turns, but finally, they have to move forward. Inarguably, the way is littered with many obstacles – among which are the vast costs, diminishing revenues at the onset, a total shift in the waste management organization, extremely poor data availability, affordability and willingness to pay concerns. It is clear that the municipalities alone have neither the knowledge, nor the skills to enforce the legal changes already postponed for almost ten years. Moreover, the unstable political situation in Bulgaria, the resonating impact of the COVID-19 pandemic and of the Russia-Ukraine war

on the household and municipal budgets further delay the linkage of the waste tariff with the polluter pays principle.

What is needed is a strong national-level political will to become the driver of the change, and to navigate the municipalities through the convoluted tariff-setting dichotomy between municipal waste management costs and revenues, between business and population, between affordability and polluter pays principle, between incentives and disincentives. Data availability tops up.

When national-level political vision and implementation tools are in place, only then the municipalities can translate them at the local level and adjust them according to their specifics: geographical territory, number of settlements, population number and density, business composition, waste amount and composition, provided waste services, etc.

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## COMPREHENSIVE BIBLIOMETRIC MAPPING OF PUBLICATION TRENDS IN EARNINGS MANAGEMENT<sup>5</sup>

*This research aims to trace the evolution of published articles, quotations, and themes on earnings management from 1988 to 2022. Therefore, the Web of Science (WOS) database is employed in the current study to identify the most-cited earnings management articles and the most-involved authors, institutions, and countries in earnings management. This research employs bibliometric exponents and tools like Microsoft Excel for frequency analysis, the VOS viewer for the visualisation of data, and Harzing's Publish or Perish for metrics of citation and earnings management analysis. According to the findings, after 2015, research in this field significantly increased. The United States has been ranked the most active nation in earnings management research. State University System of Florida from the US was the most prolific publisher of significant earnings management research publications. Accounting Review, Contemporary Accounting Research, and the Journal of Accounting and Public Policy are the leading publications in earnings management. The results of the current study are collected based on data from the Web of Science (WOS) database, and any limitations of the database impact the results. Through the integration of bibliometric information and graphical networks, this research has the potential to add to the growing body of knowledge by providing a broad overview of the trends shown in studies on earnings management that appeared in the WOS database between 1988 and the start of 2022.*

*Keywords: Earnings Management; Web of Science; Harzing's Publish or Perish; VOSviewer; Bibliometric analysis*

*JEL: M41; M42*

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## **1. Introduction**

Earnings management, often known as EM, refers to the selection of accounting policies or activities to purposefully alter earnings by managers. Some examples of earnings management include voluntary disclosure, voluntary earnings forecasting, and the estimation of accruals. EM is a significant subject for research because there is a possibility that it will harm the credibility of the financial reports, which are valuable information sources for investors in the markets (Zhong et al., 2022; Man, Wong, 2013). EM is a complex phenomenon that researchers have studied in many articles. Davidson and Stickney used the expression "earnings management" (EM) and Weil (1985) to describe the progression of achieving the desired level of earnings by various manipulations while adhering to widely accepted accounting practice constraints.

Similarly, Dechow and Schrand (2004) defined EM as a technique used by managers through the discretion of accounting methods to achieve desired goals. Healy and Wahlen (1999) defined EM as an intrusion in financial reporting to gain personal or private gain. EM is due to existing options for administrators in preparing the financial report (Kamarudin, Ismail, 2014). Earnings management exists when managers make changes to the financial statement. Additionally, managers use the methods of EM to control the results of certain accounting practices and deceive the firm's stakeholders about the firm's performance. Furthermore, managers manage earnings due to the need to meet benchmark and target earnings to affect and increase stock prices, obtain external financing, and avoid taxes (Burgstahler, Dichev, 1997; Healy, Wahlen, 1999; Dechow, Schrand, 2004). In the same way, Degeorge, Patel, and Zeckhauser (1999) exposed that a few firms were involved in EM to enhance their financial position by trying to achieve the profit forecast of the analyst and meet the expectations of investors.

Badia et al. (2008) stated that EM does not always imply fraud. Hence, fraud is a severe form of EM, according to Levitt (1998), and EM is considered somewhere between lawful accounting and pure fraud (Mansour et al., 2021; Mansour et al., 2020). According to Badertscher (2011), EM is classified into three types: (1) EM, which violates accounting principles; (2) EM, which is in the middle of acceptable accounting but violates GAAP; and (3) EM, which is within the criteria of GAAP.

Furthermore, two methods exist to manage a firm's earnings (Badertscher, 2011). The first method, known as accruals, is utilised to achieve the anticipated amount of earnings. Accrual earnings management, or AEM for short, is the name given to this approach (Healy, Wahlen, 1999; Dechow, Schrand, 2004). The second method involves adjusting actual business operations, such as lowering prices to boost sales, producing additional goods to cut down on the cost of the goods being sold, and cutting back on discretionary expenditures to increase current earnings. Managing earnings via real business transactions is known as "real earnings management" (REM) (Purwaningsih & Kusuma, 2020; Roychowdhury, 2006). According to (Cohen, Zarowin, 2010; Dechow, Schrand, 2010; Badertscher, 2011), firms can manage their profits using both accrual-based and REM methods.

Hirst debated the predictions of EM, Koonce, and Venkataraman (2008) and classified the earnings prognosis into three components (consequences, characteristics, and antecedents),

which match the timeline related to earnings forecasts. The authors found that most of the prior articles focused on how prediction or the characteristics of prediction affect predictions and did not examine any potential interactions between the three components.

Burgstahler and Dichev (1997) suggested that firms try to prevent EM from losing and falling. Simultaneously, they found that cash flow from operations and changes in working capital increased profits. According to Leuz, Nanda, and Wysocki (2003), who discoursed systematic differences in EM in 31 countries, their elucidation was grounded on the assumption that insiders use EM to boost their corporate performance to conserve their personal benefits. Consequently, EM is predictable to reduce investor protection as effective defence limits the insiders' ability to get precise benefits, reducing their incentive to disguise firm performance (Khan, Çera, Netek, 2019).

In addition, the areas that EM touches are wide. The study demonstrates the connection between EM and time detachment in the language (Kim, Kim, Zhou, 2017). The study assumes that managers are less inclined to participate in EM practices. Their insight on earnings manipulation is more immediate if they operate in countries where speakers are not linguistically required to identify future occurrences. The prior inquiry has focused on determining the existence of the phenomenon of EM. The result demonstrated that EM has a variety of incentives and motives, including altering how the stock market is perceived, improving management compensation, decreasing the likelihood that credit agreements would be violated, and preventing regulatory involvement (Bin, Chen, Hasanatunnisa, 2018). Some of these findings are similar to the results relating to management compensation such as Bilan, Mishchuk, Samoliuk, and Mishchuk (2020) and Skalicka, Zinecker, Balcerzak, and Meluzin (2018). However, the setting of Muslim culture alters the circumstances and outcomes (Qizam, 2021).

Additionally, bibliometric research has become more widespread recently; some articles have been conducted related to EM. For example, Vagner, Valaskova, Durana, and Lazaroiu (2021) investigated the keywords related to EM issues, emphasising the evolution and changes in a publication that appeared on the Web of Science. They discovered that perception and application had shifted during the reporting periods. The expression that was most frequently related to EM continued to expand. However, the prime group of words continued unchanged.

Further, Siekelova (2020) used a bibliometric analysis of earnings management. The findings provide techniques that are generally accepted in the assessment of researchers, teams, and institutions. In addition, the findings offer markers for the quality assessment of scientific publications. Citation database data is a significant source of information. Santos-Jaén et al. (2021) used a systematic bibliometric review to test the effect of Corporate Social Responsibility (CSR) on EM. The finding demonstrated that scholars are becoming increasingly interested in researching the influence of CSR. Despite the fact that the US and China produce the majority of published works, authors hail from more than 50 countries all over the world. The findings also display that being prolific does not imply being influential in this area. Based on prior studies, there are several gaps in the literature – for example, on voluntary disclosure of information, gender diversity, and the existence of audit committees, among others – that motivate the research to improve the analysis of the EM.

Despite the fact that bibliometric studies have been conducted related to EM, the current study contributes to the knowledge by further investigating many bibliometric traits that were neglected in the previous studies. In particular, the current study distinguishes itself from other bibliometric studies by analysing the types of documents and document languages in the area of EM. Furthermore, this study investigates the most active source title, the most active publisher, and the most influential institution in EM research. Moreover, the current study has an advantage over other prior studies by analysing the citation metric using Harzing's Publish and Perish software and conducting text analysis for the abstract and title papers in the EM area. Finally, the current study is the first in this area to analyse authorship and co-authorship in the research of the EM field.

A limited bibliometric study related to earnings management studies has been conducted in the past (see Table 1).

**Table 1. Previous Studies on EM Using Bibliometric Analysis**

Author	Area/Search Strategy	Scope & Source of Data	TDE*	Bibliometric Traits Examined
Vagner et al. (2021)	Earnings Management	<ul style="list-style-type: none"> <li>• Web of Science database</li> </ul>	1,547	<ul style="list-style-type: none"> <li>• Conduct a keyword analysis focusing on topics connected to earnings management</li> <li>• changes and evolution over time, from 1988 to the present</li> </ul>
Santos-Jaén et al. (2021)	Social Responsibility AND Earnings Management Social Responsibility AND Earnings Quality Social Responsibility AND Accruals Quality	<ul style="list-style-type: none"> <li>• Web of Science (WoS)</li> </ul>	329	analysis of various bibliometric indicators, including <ul style="list-style-type: none"> <li>• the number of publications,</li> <li>• total citations,</li> <li>• citations per article,</li> <li>• top journals,</li> <li>• most relevant universities and</li> <li>• most influential countries on the subject,</li> <li>• analyse co-occurrence of terms and</li> <li>• co-authorship networks and</li> <li>• map density based on researcher networks</li> </ul>
Anna Siekelova. (2020)	Earnings Management	<ul style="list-style-type: none"> <li>• Web of Science</li> <li>• Science Citation Index Expanded (SCI-E);</li> <li>• Social Science Citation Index (SSCI);</li> <li>• Arts &amp; Humanities Citation Index (AHCI);</li> <li>• Index Chemicus;</li> <li>• Current Chemical Reaction.</li> <li>• Conference Proceedings Citation Index -Science (CPCI-S);</li> <li>• Conference Proceedings Citation Index -Social Sciences &amp; Humanities (CPCI-SSH).</li> </ul>	Not Provided	<ul style="list-style-type: none"> <li>• Development of the number of publications on EM</li> <li>• Frequency of "earnings management" publications in selected countries</li> <li>• "Earnings management" in different fields of science</li> <li>• keyword publications on the topic of earnings management</li> <li>• the origin of publications dealing with "earnings management. "</li> <li>• most frequently cite publications with the term "earnings management."</li> <li>• the journals that publish research with the term "earnings management."</li> </ul>

Note: TDE = total documents examined

The purpose of this paper is to give a bibliometric analysis of the scientific literature on EM by focusing on four main research questions: (a) how EM research has evolved and been distributed; (b) which countries, institutions, and authors are the most productive and

effective in EM studies; (c) what are the most common themes in the EM field among scholars; and (d) what are the most influential articles in the field of EM studies. The rest of this paper discusses many topics and factors related to addressing the research questions mentioned earlier and provides specifics on the study methodology, results, and interpretations. In order to answer these four questions, the bibliometric analysis considered the following aspects of the literature on EM:

(a) How has EM research evolved and been distributed?

- number of studies that are published each year
- number of cited publications per year
- total citations per year
- average citations per publication for each year
- average citations per cited publication for each year
- h-index; and g-index
- The document types
- The documents Languages
- Subject area

(b) Which countries, institutions, and authors are the most productive and effective in EM studies?

- The Most Active Source Titles
- The Most Active Publisher
- The most active countries
- Most Influential Institutions
- Analysis of Citation Metrics

(c) What are the most common themes in the EM field among scholars?

- Keywords Analysis
- Text Analysis

d) What are the most influential articles in the field of EM studies?

- Authorship and Co-Authorship Analysis

This research was conducted to acquire a more in-depth understanding of the EM phenomenon, particularly regarding the phenomenon's international scope and the collaborations it involves. It was essential to look at the most recent data in order to provide researchers with the information they needed to make suggestions for further investigation into the evolution of EM.

The remaining portions of the article are organised as follows: Section 2 demonstrates the methodology, whereas Section 3 displays the article's findings. Section 4 discusses numerous issues and problems that are elaborated on in answering the study questions. Finally, the final section presents a conclusion and recommendations for further research.

## **2. Methods**

This study's method is based on how the data are gathered and organised until the whole set is ready to be analysed. Before this point, it was important to figure out the topic and the scope of the investigation based on why this study was being done. Our main focus will be on all the scientific work on EM in the WOS database. It was decided to use the Web of Science (WOS) database as it is the "largest single abstract and indexing database ever built" (Burnham, 2006) and the "largest searchable citation and abstract literature search list" (Allam et al., 2022; Mansour et al., 2020; Falagas et al., 2008; Nwagwu, 2007).

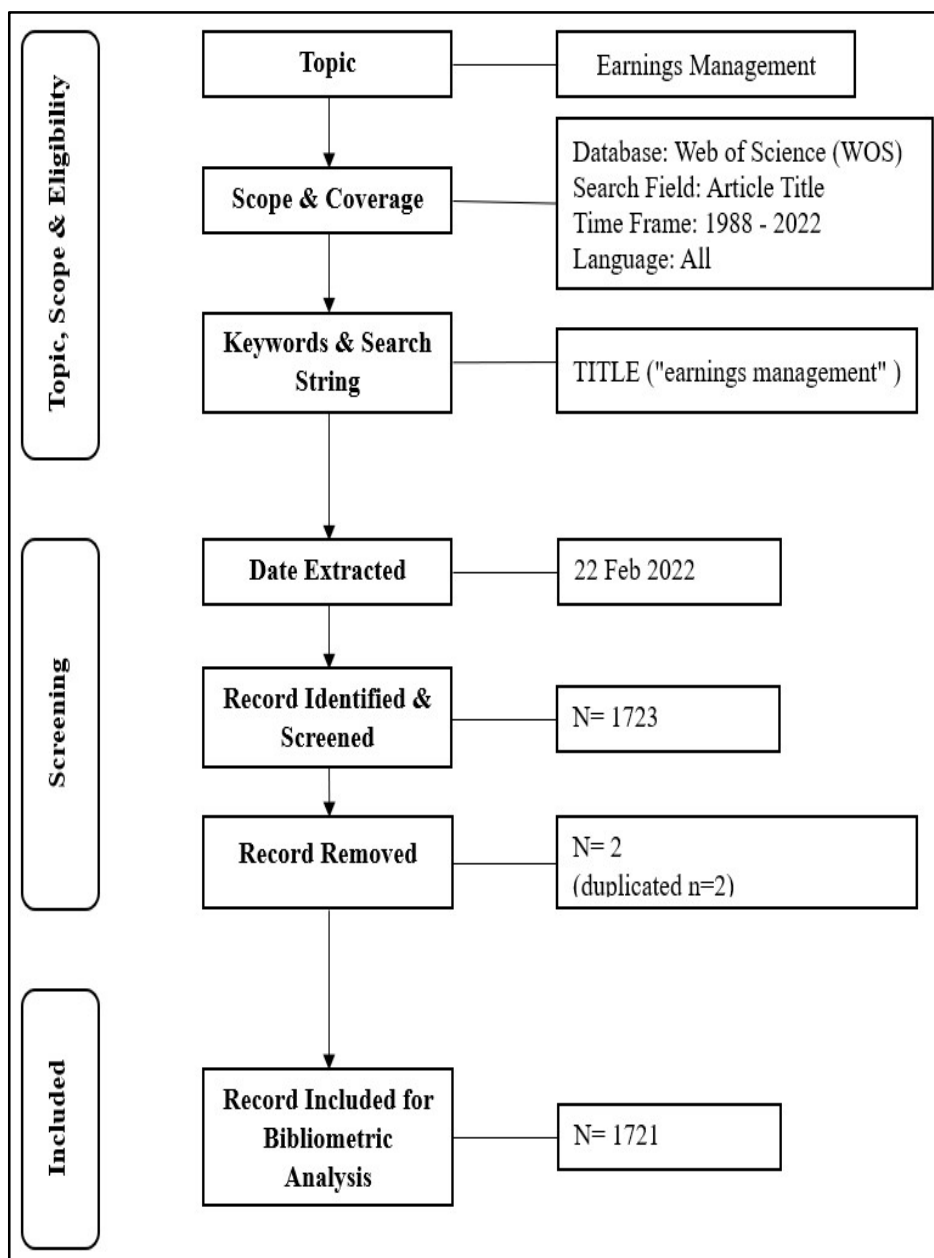
The research plan that was followed to choose the documents collected for this study can be seen in Fig. 1. This plan served as the basis for the selection process. On February 22, 2022, the data was taken directly from the WOS database. The phrase "earnings management" was used as a combination of keywords to find all targeted publications.

The bibliometric study of EM has not received much attention due to the lack of work put into it. Hence, we restricted the documents relevant to earnings management based on the title. To attain this purpose, the following enquiry was conducted: TITLE ("earnings management") AND (EXCLUDE (PUBYEAR, 2022)). This inquiry produced a total of 1723 documents. As the sequences of data cleaning operations exhibited four duplicate documents, 1721 documents were retained after this process. Since then, the data obtained from the WOS database has been exported into comma-separated values (.csv) and research information systems (.ris) formatted files.

This study examined the research trends in earnings management using the bibliometric method. Among the facts gleaned from the database are information on the documents' authors and affiliations; the publications' year of publication; language; topic matter; and title and keywords. Microsoft Excel, Harzing's Publish or Perish, and VOS-Viewer software have been used for data gathering and visualisation, respectively, intended for data analysis and visualisation. In addition, we used VOS-viewer software to execute key portions of the mapping analysis (Bastian et al., 2009; Van Eck, Waltman, 2020). The VOS-viewer employs two uniform weights to graphically describe the nodal network, such as the number and overall strength of the connections. The network size and the network-connecting interlinking lines represent the importance and power of the links.



**Figure 1. Flow Diagram**



### 3. Results and Findings

We examined bibliometric traits like publication per year and the yearly growth, types of documents and sources, the document's language, subject area, analysis of keywords, country productivity, authorship, active institution, and citation analysis using data from the WOS database. The findings are presented, for the most part, in the form of frequency and percentage. We reported the citation analysis as citation metrics and have disclosed the top 10 articles in EM that have received the most citations. Finally, the co-occurrence of the author's keywords is mapped via the VOS-viewer.

#### 3.1 Evolution of Published Studies

The current research examines the evolution of published studies by analysing the number of documents created each year. Examining the papers for their publication years provides the researcher with assistance in understanding the development of the selected topic across time (Ahmi & Mohamad, 2019). The extended statistics of annual publications on earnings management are presented in Table 2, which covers the years 1988 through 2021. The first study published on earnings management according to the WOS database in 1988 was by the Journal of Accounting Research. Then, the research in this area grew heavily until 2015, when the publications increased remarkably to 146 (8.48%) publications this year. As shown in the table, the number of publications on EM increased steadily, with most of the publications occurring in 2020, totalling 214 documents (12.43%).

According to Table 2, documents produced in 2008 got the largest number of citations (a total of 4896 citations were found, with an average of 89.02 citations within each article). Furthermore, the documents published in 1992 got the fewest citations, totalling only 72. However, since 2015, the publication of earnings management has started to increase (Figure 1).

As shown in Table 2, the highest h-index by year was for 2008, with a value of 27 (which means that 27 publications this year had at least 25 citations). In comparison, the highest g-index per year was for the year 2012, with a value of 40 (which means that the top 40 publications in this year had a sum of at least 1600 citations). Furthermore, according to Table 2, the most cited publication in this area is the study by Jones (1991), with the title Earnings Management During Import Relief Investigations, published in the Journal of Accounting Research.

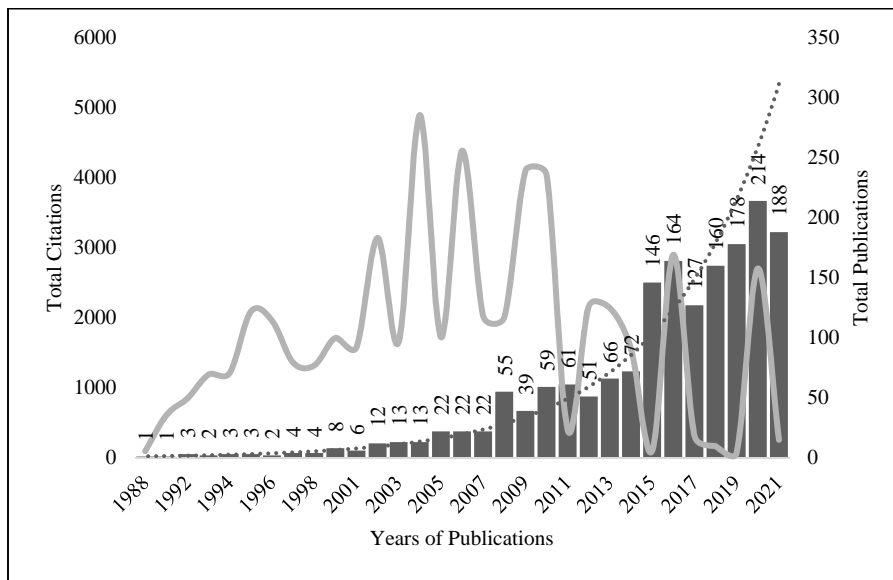
**Table 2. Year of Publications**

Year	TP	Percentage	NCP	TC	C/P	C/CP	h	g
2021	188	10.924	58	96	0.51	1.66	3	4
2020	214	12.435	143	610	2.85	4.27	11	14
2019	178	10.343	139	849	4.77	6.11	14	18
2018	160	9.297	128	1190	7.44	9.30	18	25
2017	127	7.379	84	1214	9.56	14.45	20	30
2016	164	9.529	121	2089	12.74	17.26	26	39
2015	146	8.483	110	1960	13.42	17.82	25	38
2014	72	4.184	57	1360	18.89	23.86	21	35

Year	TP	Percentage	NCP	TC	C/P	C/CP	h	g
2013	66	3.835	44	1319	19.98	29.98	19	35
2012	51	2.963	40	1712	33.57	42.80	17	40
2011	61	3.544	45	1580	25.90	35.11	21	39
2010	59	3.428	37	3140	53.22	84.86	25	37
2009	39	2.266	28	1654	42.41	59.07	19	28
2008	55	3.196	39	4896	89.02	125.54	27	39
2007	22	1.278	16	1722	78.27	107.63	16	16
2006	22	1.278	18	4386	199.36	243.67	16	18
2005	22	1.278	19	2021	91.86	106.37	12	19
2004	13	0.755	12	2010	154.62	167.50	12	12
2003	13	0.755	11	4106	315.85	373.27	10	11
2002	12	0.697	12	4040	336.67	336.67	10	12
2001	6	0.349	6	392	65.33	65.33	5	6
1999	8	0.465	8	2168	271.00	271.00	7	8
1998	4	0.232	4	2139	534.75	534.75	4	4
1997	4	0.232	4	1550	387.50	387.50	4	4
1996	2	0.116	2	101	50.50	50.50	2	2
1995	3	0.174	3	2900	966.67	966.67	3	3
1994	3	0.174	3	311	103.67	103.67	3	3
1993	2	0.116	2	166	83.00	83.00	2	2
1992	3	0.174	3	72	24.00	24.00	3	3
1991	1	0.058	1	2704	2704.00	2704.00	1	1
1988	1	0.058	1	257	257.00	257.00	1	1

Notes: TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; and g=g-index.

Figure 2. Documents by Year (1988 - 2022)



### 3.2 Document Types

First of all, the collected data was analysed based on various types of research papers. The document types are classified as follows: articles, proceedings papers, early access, editorial materials, review articles, corrections, book reviews, discussions, meeting abstracts, notes, and retracted publications. The diversity of WOS database-recognised document types was analysed in terms of distribution. The analysis revealed a total of 11 different categories of documents. As shown in Table 3, the most common document type was articles, which accounted for 79.2% (1363) of total production, followed by proceedings papers, which accounted for 19.2% (328). Early Access 4.53% (78), Editorial Materials 1.22% (21), Review Articles 0.7% (12), Corrections 0.52% (9), Book Reviews 0.17% (3), Discussions 0.06% (1), Meeting Abstracts 0.06% (1), Notes 0.06% (1) and Retracted Publications 1 (0.06%).

**Table 3. Document Type**

Document Types	Record Count	Percentage (%)
Articles	1363	79.20
Proceedings Papers	328	19.06
Early Access	78	4.53
Editorial Materials	21	1.22
Review Articles	12	0.70
Corrections	9	0.52
Book Reviews	3	0.17
Discussions	1	0.06
Meeting Abstracts	1	0.06
Notes	1	0.06
Retracted Publications	1	0.06

### 3.3 Documents Languages

Table 4 demonstrates that English is the most commonly used language in journals, contributing to 96.46% of all articles. Furthermore, several documents used multiple languages, including Portuguese, Chinese, French, Spanish, German, Turkish, and Russian, which account for the smallest percentage of all published texts. After figuring out the current trends in languages, the next way to spot current trends is to look at the topic area, which shows where earnings management has been found.

**Table 4. Language of Documents**

Language	Total Publications*	Percentage (%)
English	1660	96.456
Portuguese	25	1.453
Chinese	14	0.813
French	7	0.407
Spanish	5	0.291
German	4	0.232
Turkish	4	0.232
Russian	1	0.058
Unspecified	1	0.058

\* 97 documents have been published in dual languages

### 3.4 Subject Area

Table 5 displays the results of this analysis's subject-area sorting of published papers. The distribution shows a lot of literature on EM in different fields, such as "Business Economics and Social Sciences." other areas, i.e., Public Administration, Computer Science, Operations Research, Management Science, etc." As presented in Table 5, most of the documents analysed are in Business Economics (90.5%). After making certain that the most recent papers in earnings management studies focused on a trending subject area, we analysed the most active source in this field.

**Table 5. Subject Area**

Subject Area	Total Publications	Percentage (%)
Business Economics	1558	90.529
Social Sciences Other Topics	83	4.823
Public Administration	70	4.067
Computer Science	59	3.428
Operations Research Management Science	49	2.847
Science Technology Other Topics	45	2.615
Engineering	44	2.557
Education Educational Research	28	1.627
Environmental Sciences Ecology	28	1.627
International Relations	15	0.872
Mathematics	11	0.639
Government Law	10	0.581
Area Studies	6	0.349
Mathematical Methods in Social Sciences	6	0.349
Arts Humanities Other Topics	5	0.291
Criminology Penology	5	0.291
Development Studies	5	0.291
Telecommunications	5	0.291
Social Issues	4	0.232
Agriculture	3	0.174
Communication	3	0.174
Information Science Library Science	3	0.174
Materials Science	3	0.174
Psychology	3	0.174
Biotechnology Applied Microbiology	2	0.116
Geology	2	0.116
Religion	2	0.116
Sociology	2	0.116
Urban Studies	2	0.116
Women S Studies	2	0.116
Architecture	1	0.058
Automation Control Systems	1	0.058
Construction Building Technology	1	0.058
Mechanics	1	0.058
Mining Mineral Processing	1	0.058
Physical Geography	1	0.058
Transportation	1	0.058

### 3.5 Most Active Source Titles

Table 6 highlights the most active source title in the earnings management area. According to the table, the Accounting Review is the top journal contributing to earnings management publications, with 62 publications and 11777 total citations. Contemporary Accounting Research is in 2<sup>nd</sup> place in the list of most active source titles with 46 total publications and 2408 total citations. Also, "Journal of Accounting and Public Policy" is ranked 3<sup>rd</sup> in the most active source title list, with 41 publications and 1476 citations (Table 6). In comparison, the Journal of Business Finance and Accounting and the Journal of Accounting Economics are ranked fourth and fifth in the list of the most active source titles, which is presented in Table 6. After classifying the most active source in this section, the following section discusses the most active publisher.

**Table 6. Most Active Source Title**

Source Title	TP	TC	Publisher	Cite Score	SJR 2020	SNIP 2020
Accounting Review	62	11777	American Accounting Association	6.7	5.678	3.503
Contemporary Accounting Research	46	2408	Wiley-Blackwell Publishing Ltd	4.3	2.769	2.295
Journal of Accounting and Public Policy	41	1476	Elsevier	4.3	1.264	1.552
Journal of Business Finance and Accounting	37	1161	Wiley-Blackwell Publishing Ltd	3.3	1.282	1.738
Journal of Accounting Economics	35	8414	Elsevier	7.4	6.607	3.553
Journal of Business Ethics	29	1335	Springer Nature	9.0	2.209	2.534
Asia Pacific Journal of Accounting Economics	26	94	Taylor and Francis Ltd.	1.4	0.255	0.614
Journal of Accounting Research	26	4841	Wiley-Blackwell Publishing Ltd	7.1	6.767	3.565
Review of Accounting Studies	26	748	Springer Nature	5.3	4.418	2.807
Journal of Corporate Finance	22	2325	Elsevier	4.9	1.894	2.665
International Journal of Accounting and Information Management	19	156	Emerald Group Publishing Ltd.	3.2	0.455	1.333
Journal of Financial Reporting and Accounting	19	65	Emerald Group Publishing Ltd.	1.8	0.299	0.785
Journal of Applied Accounting Research	18	103	Emerald Group Publishing Ltd.	2.7	0.446	1.159
Journal of Banking Finance	17	737	Elsevier	4.4	1.580	2.166
Review of Quantitative Finance and Accounting	17	216	Springer Nature	2.6	0.664	1.444
Sustainability	17	75	Multidisciplinary Digital Publishing Institute (MDPI)	3.9	0.612	1.242
Advances in Accounting	16	90	Elsevier	2.3	0.445	0.768
Journal of Asian Finance Economics and Business	16	69	Korea Distribution Science Association (KODISA)	2.6	0.369	1.033
Accounting and Finance	15	268	Wiley-Blackwell Publishing Ltd	3.3	0.645	1.517
European Accounting Review	15	410	Taylor and Francis Ltd.	3.7	1.016	1.622

Notes: TP=total number of publications; TC=total citations; Cite Score= measures average citations received per document published in the serial in 2020; SJR= SCImago Journal Rank measures weighted citations received by the serial in 2020; SNIP= Source Normalized Impact per Paper that measures actual citations received relative to citations expected for the serial's subject field in 2020.

### 3.6 Most Active Publisher

Table 7 presents the most active publishers in the area of earnings management. According to Table 7, Elsevier is the most active publisher in this area, with 312 publications (18.13%), followed by Wiley, with 226 publications (13.13%). In contrast, Emerald Group Publishing is in third place on the most active publisher list, with 220 published (12.79%). Table 7 shows that Taylor & Francis is ranked 4th in the most active publisher list in the earnings management area, with 128 (7.44%). Finally, based on Table 7, Springer Nature, with 120 (6.97%), is listed as the fifth most active publisher in earnings management.

**Table 7. Most Active Publisher**

Publishers	Record Count	Percentage (%)
Elsevier	312	18.129
John Wiley & Sons, Inc	226	13.132
Emerald Group Publishing	220	12.783
Taylor & Francis	128	7.438
Springer Nature	120	6.973
American Accounting Association	105	6.101
Atlantis Press	42	2.44
IEEE	37	2.15
SAGE Publications Inc	32	1.859
MDPI	28	1.627
St Plum-Blossom Press Pty Ltd	24	1.395
World Scientific	21	1.22
Dalian University of Technology Press	17	0.988
Korea Distribution Science Association	16	0.93
International Business Information Management Association -IBIMA	13	0.755
Wuhan University of Technology Press	11	0.639
Canadian Academic Accounting Association	9	0.523
Editura ASE	9	0.523
Inderscience Enterprises Ltd	9	0.523
Information Engineering Research Institute	9	0.523

### 3.7 Publications Geographical Distribution

The current analysis sheds light on the countries that have been the most active publishers in earning management. Table 8 lists the most active countries. The USA, with 480 publications; China, with 400 publications; Taiwan, with 104 publications; and England, with 101 publications, control the list. The USA is also ranked 1st in total citations, with 40485 citations. In comparison, China is ranked 2<sup>nd</sup> with 7905 citations, England, with 1764 citations, is ranked 3<sup>rd</sup>, and Taiwan, with 1481 citations, is ranked 4th in the list of top countries contributing to EM research regarding total citation terms.

**Table 8. Top 20 Countries contributed to EM Research**

Country	TP	NCP	TC	C/P	C/CP	h	g
USA	480	422	40485	84.34	95.94	85	196
People's Republic of China	400	186	7905	19.76	42.50	36	87
Taiwan	104	85	1481	14.24	17.42	19	35
England	101	83	1764	17.47	21.25	21	40
Australia	91	79	1411	15.51	17.86	21	33
Malaysia	82	64	769	9.38	12.02	14	25
Indonesia	71	39	157	2.21	4.03	7	9
Canada	67	59	2280	34.03	38.64	20	47
Spain	62	57	1514	24.42	26.56	18	38
South Korea	60	49	945	15.75	19.29	12	30
Tunisia	47	33	793	16.87	24.03	11	28
Brazil	43	19	230	5.35	12.11	6	15
India	39	18	97	2.49	5.39	5	9
France	35	26	1725	49.29	66.35	12	26
Italy	35	29	1054	30.11	36.34	12	29
Vietnam	30	17	105	3.50	6.18	7	9
Saudi Arabia	24	19	189	7.88	9.95	9	13
New Zealand	23	22	247	10.74	11.23	8	15
Slovakia	23	13	66	2.87	5.08	4	7
Germany	21	15	585	27.86	39.00	7	15

Notes: TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; and g=g-index.

### 3.8 Most Influential Institutions

Table 9 lists the most prominent institutions in earnings management research. Based on Table 9, the State University System of Florida is the most influential institution in earnings management, with 34 total publications. In addition, Beijing Jiaotong University is ranked 2<sup>nd</sup> on this list with 32 publications. Universiti Utara Malaysia, with 30 publications, is ranked 3<sup>rd</sup> on the list of most influential institutions. Regarding the most influential institution in total citations, New York University is in first place, with 4773 total citations for its 15 publications. The University of California System is also listed second with 2955 total citations for their 21 documents. Then, Hong Kong Polytechnic University is the third-most influential institution regarding total citations, with 1362 citations for its 16 publications. According to Table 8, the University System of Georgia, with 1329 citations, and the State University System of Florida, with 1223 citations, are ranked fourth and fifth in the Most Influential Institutions.



**Table 9. Most Influential Institutions**

Affiliation	Country	TP	NCP	TC	C/P	C/CP	h	g
State University System of Florida	USA	34	29	1223	35.97	42.17	11	29
Beijing Jiaotong University	China	32	7	41	1.28	5.86	2	6
Universiti Utara Malaysia	Malaysia	30	26	261	8.70	10.04	10	15
University of Texas System	USA	30	27	1148	38.27	42.52	16	27
University De Sfax	Tunisia	29	18	655	22.59	36.39	8	18
Dalian University of Technology	China	24	3	5	0.21	1.67	1	2
University of Zilina	Slovakia	22	13	66	3.00	5.08	4	7
Pennsylvania State System of Higher Education (PASSHE)	USA	21	18	1038	49.43	57.67	12	18
University of California System	USA	21	18	2955	140.71	164.17	14	18
University of North Carolina	USA	18	6	7	0.39	1.17	1	1
University of Indonesia	Indonesia	17	6	29	1.71	4.83	3	5
Egyptian Knowledge Bank (EKB)	Egypt	16	13	151	9.44	11.62	6	12
Harbin Institute of Technology	China	16	3	4	0.25	1.33	1	1
Hong Kong Polytechnic University	Hong Kong	16	13	1362	85.13	104.77	11	13
National Taiwan University	Taiwan	16	16	148	9.25	9.25	9	11
New York University	USA	15	14	4773	318.20	340.93	10	14
Universiti Teknologi Mara	Malaysia	15	11	92	6.13	8.36	5	9
University System of Georgia	USA	15	14	1329	88.60	94.93	9	14
Wuhan University of Technology	China	15	1	1	0.07	1.00	1	1
Indian Institute of Management IIM	India	14	5	20	1.43	4.00	2	4

Notes: TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; and g=g-index.

### 3.9 Citation Analysis

The citation metric was produced by Harzing's Publish and Perish software. It was accomplished by importing two RIS-formatted files for two periods, 1988–2018 and 2018–2022, from the WOS database into the above software to display the raw citation metrics. Table 10 summarises, as of February 22, 2022, the citation metrics for the retrieved documents. As indicated, there have been 5946 citations to EM publications from 1988–2018 and 48768 from 2018–2022. Table 10 shows that 1000 papers were published from 1988 until 2018, and 721 papers were published from 2018 to 2022.

**Table 10. Citations Metric**

Metrics	Data 1	Data 2
Publication years	1988- Aug 2018	Aug 2018-2022
Citation years	5	33
Papers	1000	721
Total Citations	5946	48768
Citations per year	1477.82	1189.2
Citations per paper	5.95	67.64
Citations per author	2503.26	25820.29
Papers per author	456.71	375.67
h-index	32	99
g-index	46	211

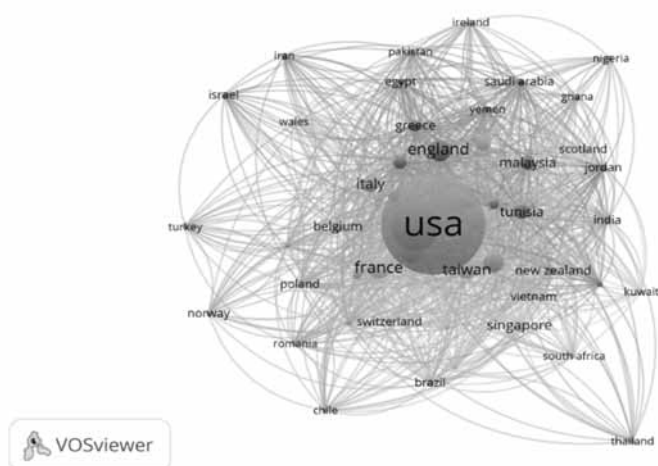
Table 11 displays the top 20 most cited articles in earnings management. Table 11 shows that the most-cited document in this field is Detecting Earnings Management, which came out in 1995 and has been cited 2,742 times. Moreover, as shown in Figure 3, the analysis exposes a visual map of the citations based on countries with at least five citations for each article. The node size signifies the citation number per country, while the nodes' lines characterise the partnership between the authors in each country. The countries that regularly work together are assembled in the same colour as in Figure 3. The USA and China are the top 2 countries cited for their work in earnings management, while England, Taiwan, and Malaysia also receive a good number of citations.

**Table 11. Highly Cited Published Articles in EM**

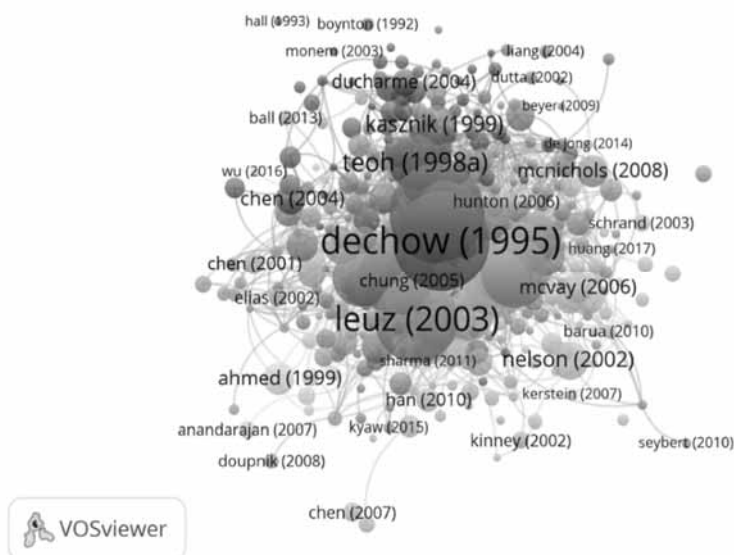
No.	Authors	Title	Cites	Cites per Year
1	Dechow et al. (1995)	Detecting Earnings Management	2742	105.46
2	Jones (1991)	Earnings Management During Import Relief Investigations	2704	90.13
3	Leuz et al. (2003)	Earnings management and investor protection: an international comparison	2040	113.33
4	Klein (2002)	Audit committee, board of director characteristics, and earnings management	1689	88.89
5	Roychowdhury (2006)	Earnings management through real activities manipulation	1415	94.33
6	Burgstahler & Dichev (1997)	Earnings management to avoid earnings decreases and losses	1340	55.83
7	Cohen et al. (2008)	Real and accrual-based earnings management in the pre- and post-Sarbanes-Oxley periods	1026	78.92
8	Xie et al. (2003)	Earnings management and corporate governance: the role of the board and the audit committee	966	53.67
9	Degeorge et al. (1999)	Earnings management to exceed thresholds	956	43.45
10	Teoh et al. (1998a)	Earnings management and the long-run market performance of initial public offerings	853	37.09
11	Bergstresser & Philippon (2006)	CEO incentives and earnings management	836	55.73
12	Teoh et al. (1998b)	Earnings management and the underperformance of seasoned equity offerings	780	33.91
13	Frankel et al. (2002)	The relation between auditors' fees for non-audit services and earnings management	733	38.58
14	Cohen & Zarowin (2010)	Accrual-based and real earnings management activities around seasoned equity offerings	700	63.64
15	Yu & Zang (2012)	Evidence on the Trade-Off between Real Activities Manipulation and Accrual-Based Earnings Management	683	75.89
16	Burgstahler et al. (2006)	The importance of reporting incentives: Earnings management in European private and public firms	603	40.2
17	Cheng & Warfield (2005)	Equity incentives and earnings management	548	34.25
18	Yu (2008)	Analyst coverage and earnings management	526	40.46
19	Be' Dard et al. (2004)	The effect of audit committee expertise, independence, and activity on aggressive earnings management	480	28.24
20	Peasnell et al. (2005)	Board monitoring and earnings management: Do outside directors influence abnormal accruals?	449	28.06

In addition, the analysis of the current study, as shown in Figure 4, exposes the visualisation map of the citation based on the document, where the minimum number of citations per document is 20. The results presented in Figure 4 reveal that Dechow (1995) and Jones (1991) are the most cited documents in this area.

**Figure 3. Network Visualization Map of The Citation by Countries**



**Figure 4. Network Visualization Map of the Citation by Documents**







### 3.11 Authorship and Co-Authorship Analysis

In this section, the emphasis is placed on the total number of authors for each publication. As is obtainable in Table 12, the highest number of authors who contributed to a single document is 7. There are 285 documents written by single authors, while other documents have multiple authors write the other documents. Three authors carried out 34.8% of the total publications, and two authors did 32.7% of the total publications.

**Table 12. Number of Authors per Document**

Author Count	Total Publications	Percentage (%)
1	285	16.56
2	563	32.71
3	599	34.81
4	233	13.54
5	35	2.03
6	4	0.23
7	2	0.12
Total	1721	100.00

**Table 13. Most Productive Authors**

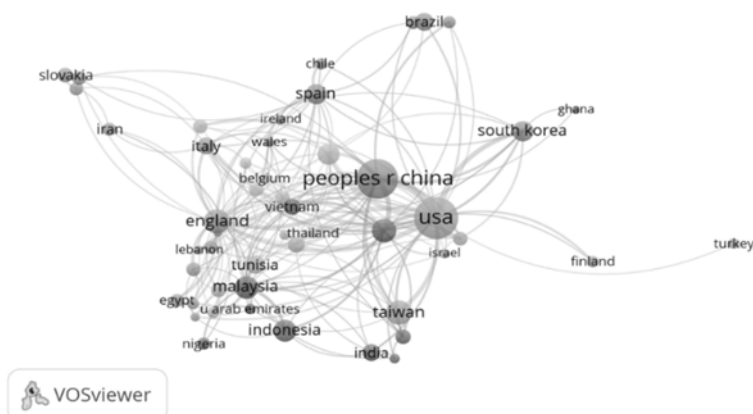
Author's Name	Affiliation	Country	TP	NCP	TC	C/P	C/CP	h	g
Li YX	Dalian University of Technology	China	10	0	0	0.00	0.00	0	0
Kim Y	University of Seoul	South Korea	9	8	308	34.22	38.50	7	8
Alhadab M	Al al-Bayt University	Jordan	8	8	108	13.50	13.50	5	8
Durana P	University of Zilina	Slovakia	8	5	20	2.50	4.00	3	4
Li L	University of Waikato	New Zealand	8	5	26	3.25	5.20	3	5
Valaskova K	University of Zilina	Slovakia	8	6	49	6.13	8.17	3	6
Jarboui A	Universite de Sfax	Tunisia	7	6	34	4.86	5.67	3	5
Kim JB	City University of Hong Kong	China	7	7	1002	143.14	143.14	7	7
Li X	Beijing Jiaotong University	China	7	4	35	5.00	8.75	4	4
Ozili PK	University of Essex	England	7	6	22	3.14	3.67	2	4
Wang X	University of Hong Kong	China	7	6	92	13.14	15.33	3	6
Campa D	International University of Monaco	Monaco	6	6	60	10.00	10.00	4	6
Gao J	Harbin Institute of Technology	China	6	3	8	1.33	2.67	2	2
Goel S	Management Development Institute (MDI)	India	6	5	22	3.67	4.40	3	4
Li Q	Wuhan Institute of Technology	China	6	1	1	0.17	1.00	1	1
Li YH	Beijing Jiaotong University	China	6	2	19	3.17	9.50	2	2
Sanusi ZM	Universiti Teknologi MARA	Malaysia	6	4	52	8.67	13.00	4	4
Seybert N	University of Maryland	USA	6	6	70	11.67	11.67	3	6
Shen CH	Shih Chien University	Taiwan	6	6	449	74.83	74.83	6	6
Yao H	Dalian University of Technology	China	6	1	1	0.17	1.00	1	1

Furthermore, Table 13 displays the list of the most productive authors in earnings management. The results indicate that Li YX from China is the author who published the most documents in this area, with ten publications. In comparison, Kim Y from South Korea is the second most productive author who published documents with the maximum number

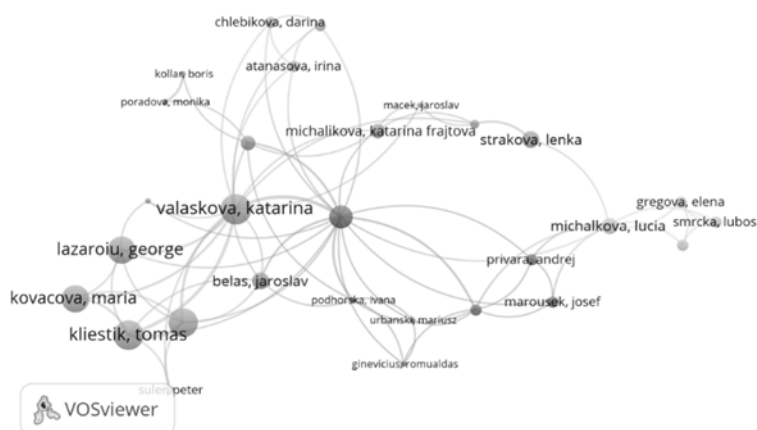
of citations, with seven publications totalling 1002 citations. Moreover, Alhadab M. from Jordan is ranked 3rd with eight publications and 108 citations.

In addition, Figure 8 depicts the author's country or region as a network visualisation. Only those countries that have cited more than five publications and more than five citations combined are included in the analysis. The results of the method used to count scores indicate that the United States has a very significant role in collaboration with other countries. The US works closely with Australia, South Korea, and England, whereas China works closely with Australia, Taiwan, and England. Furthermore, Figure 9 presents the network visualisation of the allied authors (appearing in the same colour) regularly gathered together. Valaskova, Katarina; Lazaroiu, George; Kliestik, T.; Kovacova, Maria; Nica, Elvira; Suler, Peter; Vagner, Ladislav, for example, collaborate completely and conduct research together regularly.

**Figure 8. Network Visualization Map of The Co-Authorship**



**Figure 9. Network Visualization Map of the Co-Authorship**



#### **4. Discussions and Conclusion**

A bibliometric analysis is utilised in the present study to analyse the progression of research on EM. The amount of work done in research and publications in a certain field can be measured using bibliometric analysis. The bibliometric analysis also assists policymakers and managers in making critical decisions before entering a specific field since the analysis findings could disclose the performance and influence of the studied research field (Ellegaard & Wallin, 2015). In addition, the results of the bibliometric study can assist academics in producing pertinent and recent research since the outcomes will highlight the critical areas in which research should be conducted. These results can greatly help academics (Ellegaard & Wallin, 2015).

Consequently, the current study concentrates on earnings management publications compiled from the WOS database. The current study employed a search query to find 1721 documents from the avowed database. Earnings management research (as per documents from the WOS database) was started by DYE (1988), titled Earnings Management in an overlapping generations model. After that, the publications in this area began to increase after 2015. Until now, the number of publications on earnings management has been rising.

According to the results, compared with other documents, most were published as articles, followed by proceedings papers and early access. The results indicated that English was the predominant language utilised in producing 96.46% of the research articles. The results also show that earnings management publications expand into disciplines such as Business Economics, Social Sciences, Other Topics, Public Administration, Computer Science, and Operations Research Management Science.

Regarding the research question of finding the impact of publications on earnings management, citation matrices have been employed. The value of the earnings management publications can be clarified by the citation metrics deliberated in the current research. Based on 33 years of publications (1988-2021), 1721 documents have been published with 54714 citations. The current study also discloses that further authors from diverse countries work together annually, indicating that earnings management spreads across different regions.

Even though the bibliometric analysis yielded informative results, the findings' quality can be enhanced in future studies. The initial masquerade is in the context of keyword utilisation in the search process. In the current research, we highlighted the aspects of earnings management that scholars often discuss to answer the research question. The results of the keyword analysis, title analysis, and summary analysis that VOS-Viewer created provide insight into the most important aspects of this field. For example, based on the current study results, capital markets, ownership structure, accrual earnings management, and real earnings management were among the most used keywords in the gathered documents.

In addition, it has been noted that no search query is perfect 100% to catch all academics interested in this area. Thus, undesirable results are predictable. Although the WOS database is considered one of the primary databases that index academic literature in various fields, the search query can also include results from other databases, such as Scopus and Google Scholar. When the search inquiry is implemented on all accessible academic databases, the outcomes could be richer and more visions could be assembled. Nevertheless, despite the



limits on the search database, the current study at least indicates a charming trend in earnings management research up to 2021. The current study also contributes by performing the bibliometric technique to expand the knowledge of earnings management literature.

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## ***SUMMARIES***

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### **IMPORT SUBSTITUTION OR JUST “CATCHING THE WAVE”? EVIDENCE FROM THE GREEK MANUFACTURING EXPORTS**

The purpose of the present paper is to investigate the prospects of expanding domestic manufacturing production in Greece, through the review of merchandise imports from China. This strategy does not presuppose a targeted implementation of import substitution policies, but rather a strategy for the recovery of dormant productive sectors in Greece, in light of the restructuring of the country's productive model. National economies often gain a comparative advantage in exports through imports of products belonging to the same product group, which are further processed and re-exported to other countries, thus a comparative advantage in exports can eventually be accompanied by a comparative “disadvantage” in imports. We introduce here the Revealed Comparative Disadvantage (RCD) index as an additional control of the countries' export performance by industry, in complementarity with the use of the Revealed Comparative Advantage (RCA) estimations. The results suggest that a preferable strategy to import-substitution would rather be to deploy imports, in order to effectively promote targeted domestic production and boost export performance. There is strong evidence for the favourable prospects of expanding domestic production, and consequently exports, into various sub-sectors related to the clothing and footwear industry.

Keywords: China; Greece; Revealed comparative advantage; Revealed comparative disadvantage  
JEL: F13; L16; M20

*Zhanar Yeszhanova, Nazym Zaitenova*

### **FOOD SECURITY OF THE REPUBLIC OF KAZAKHSTAN: ASSESSMENT OF PUBLIC SATISFACTION WITH LOCALLY PRODUCED FOOD**

This study assessed the quality and safety, physical and economic availability of Kazakhstani food products in the regional market. The aim of the research is to assess the satisfaction of the local population with the availability, affordability, quality and safety of food products produced in Kazakhstan. The empirical data of 297 people who participated in the survey were analyzed using Partial Least Squares Structural Equation Modelling. The results of the study confirm the positive relationship between the presence of Kazakhstan-made food products on the market and the degree of public satisfaction with their diet, a positive relationship between the affordability of Kazakhstan-made food and the degree of public satisfaction with their diet, as well as proved the existence of a direct relationship between the quality and safety of food products made in Kazakhstan and the degree of public satisfaction with their diet. In addition, an analysis of official statistical data on the volume of production and imports of food products was carried out, which made it possible to make a more detailed analysis of the degree of provision of the country's population with basic foodstuffs.

Keywords: food security; food quality; food safety; availability; affordability; Kazakhstan  
JEL: F00; Q10; Q18

*Ikhsan Ikhsan, Khairul Amri*

### **SECTORAL GROWTH IMPACTS OF BANK CREDIT ALLOCATION: THE ROLE OF COVID-19 PANDEMIC AS MODERATING VARIABLE**

Our study aims to investigate the effect of bank credit on sectoral output growth in Indonesia. The sectoral output comprises the agricultural, manufacturing, construction, wholesale & retail trades, and transport & storage sectors. We position the Covid-19 pandemic as a moderating variable between sectoral economic growth and bank credit. Using monthly time series data from 2015.M1 to 2020.M12, we employ hierarchical linear regression to estimate the functional relationship between variables. The study points out that bank credit positively affects sectoral output. In contrast, the covid-19 pandemic has had a negative effect. Nevertheless, the pandemic moderates the influence of bank credit on the manufacturing, construction, transport & storage sectors but not on the agriculture, wholesales & retail trades sectors.

Keywords: Bank credit; Sectoral output; Covid-19 pandemic; Hierarchical linear regression  
JEL: G01; G21; E51; O41

*Ummu Salma Al-Azizah, Bagus Pamungkas Wibowo*

### **IMPACT OF INTELLECTUAL CAPITAL ON FINANCIAL PERFORMANCE: PANEL EVIDENCE FROM BANKING INDUSTRY IN INDONESIA**

This research investigates the impact of intellectual capital (IC) on the financial performance of Indonesian bank enterprises. Data were collected from 42 Indonesian banks between 2017 and 2021. IC was measured using descriptive statistics, correlation coefficients, and panel data regression techniques, as well as the Value Added Intellectual Coefficient (VAIC) component through Human Capital Efficiency (HCE), Capital Employed Efficiency (CEE), and Structural Capital Efficiency (SCE), and their impact on financial performance through Return on Assets (ROA), Return on equity (ROE), and Asset Turnover (ATO). The analysis was conducted with secondary data extracted from the firms' annual reports. The results show the impact of the VAIC model and the VAIC component on financial performance. The VAIC model significantly affects financial performance, namely ROA, ROE, and ATO. The VAIC component does not significantly affect financial performance results, although SCE significantly affects financial performance as measured by ATO. This research expands the knowledge and evaluates financial performance and the creation of corporate bank value. It can be used across industries, and the findings have implications for the banking industry in the context of competitive advantage and for company managers. This study presents empirical evidence and broadens our understanding of the use of IC to enhance the financial performance of Indonesian banking firms.

Keywords: IC; Banking Industry; Financial Performance; Resource Based Theory; Value Added Intellectual Coefficient  
JEL: G21; G32; J24; O34

*Gaziza Yessenzholova, Raushan Dulambayeva, Saltanat Kapysheva*

### **ASSESSMENT OF THE IMPACT OF CUSTOMS REGULATION FACTOR ON FOREIGN TRADE OF KAZAKHSTAN**

The development of Kazakhstan's foreign trade is a central factor in Kazakhstan's economic growth, and therefore it is important to understand which trade procedures have a negative and positive aspect on the development of trade relations between countries. Customs procedures are an integral part of

the passage of international borders. It is significant that such procedures do not have a negative impact on trade. The article on the basis of the gravitational model of foreign trade assesses the influence of the factor of customs regulation, namely the implementation of customs procedures at the border for the development of exports and imports of Kazakhstan. The models are based on bilateral trade data from Kazakhstan with 53 countries for the period 1995-2021, with partner countries divided into three groups depending on the income level of the countries to obtain better results. Independent variables reflecting customs regulation were countries' participation in the Revised Kyoto Convention (RKC), time and cost of customs formalities at the border according to the World Bank Report «Doing Business» (Trading across borders). The study concluded on the impact of customs regulation on the foreign trade of Kazakhstan, with the time factor playing a more significant role than transaction costs on customs clearance. At the same time, the participation of countries in the RKC has a positive impact on the development of bilateral trade. The assessment of the impact of customs procedures on the development of foreign trade confirms the need for customs regulatory reforms.

Keywords: customs regulation; customs procedures; foreign trade; gravity model; trade and customs policy

JEL: F13; F14; F17

*Ventsislava Nikolova-Minkova*

### **BULGARIAN AND FOREIGN PATENT ACTIVITY IN BULGARIA AND BULGARIAN PATENT ACTIVITY ABROAD BY TECHNOLOGICAL AREAS AND FIELDS FOR THE PERIOD 2010-2021**

As an indicator of technological changes in the economy, patents also express the inventive potential of a specific country to use knowledge and transform it into potential economic benefits. In this regard, the main goal of the study is: to determine the state and dynamics of patent activity through an analysis of Bulgarian and foreign patent activity in Bulgaria and Bulgarian patent activity abroad for the period 2010-2021. The trends of technological development are revealed – by certain technological areas and fields and by patent-holder countries. Some of the existing trends in patent research and their role as an indicator of the rate and technological change in the economy are also considered. The significance of the study is to consider the role of patents in revealing trends of technological development and to lay the foundations for future in-depth research on the issue.

Keywords: patent activity; patent applications; patent grants; technology areas; technology fields

JEL: O32; O34; O55

*Olena Serhiienko, Maryna Tatar, Lidiya Guryanova, Olena Shapran, Mykhailo Bril*

### **IMPROVEMENT OF FINANCIAL INSTRUMENTS OF THE AGRICULTURAL SECTOR AND FOOD SECURITY EFFICIENCY INCREASING**

The methodical toolbox of lending to entities in the agricultural sector provides three levels of hierarchy management interaction – macro, meso and micro levels (state – region – agricultural enterprises) on the bases of the complex usage of economic and mathematical models and which contains six interrelated and sequential blocks was proposed. The method of agricultural enterprises crediting improvement is implemented in accordance with the strategic position of lending to agricultural enterprises through targeted support and the creditworthiness level, which can solve the following problems: observation and evaluation of the financial and economic indicators;

classification of enterprises, recognition, and identification of enterprises in terms of creditworthiness; assessment of the differences between classes given dimension enterprises.

Keywords: agricultural sector; business entities; credit; creditworthiness level; food security; interaction; lending; loans; risks.

JEL: C1; G2; O13; O23; P32; Q12; Q14; Q17

*S Kannadas, Mousumi Sengupta*

### **IMPACT OF LOCUS OF CONTROL ON FINANCIAL RISK-TAKING BEHAVIOUR: A PERCEPTION STUDY AMONG MARRIED EARNING WOMEN IN INDIA**

The locus of control measures how much a person thinks they, rather than outside influences, are in charge of how things turn out in their lives. Financial self-efficacy is influenced by locus of control. Individuals are more likely to believe they can handle their finances when they feel more capable of doing so. In particular, this study focused on married working women in India. They are more likely to effectively manage their finances if they think they can get out of financial difficulties. A questionnaire that was distributed to a convenience sample of 278 yielded responses from married working women across PAN India. The study made use of exploratory factor analysis (EFA), which reveals the scale's factor structure. The study offers statistical evidence to support the scales' reliability and validity. The statistical findings of the investigation show that locus of control and financial literacy has a favourable impact on financial behaviour. The authors also demonstrate how the relationship between internal locus of control and financial behaviour is altered by financial literacy. As a moderator variable that affects the locus of control, financial literacy is an important factor. The research's conclusions are crucial in providing empirical support for the theoretical relationships. This study has confirmed the beneficial effects of internal locus of control and financial literacy on the financial behaviour of married working women, supporting the current literature. Additionally, it has been found that a person's financial conduct and internal locus of control have different relationships depending on their financial literacy.

Keywords: Locus of control; psychological factors; risk-taking; perception

JEL: G10; G11; G40; G41

*Dochka Velkova, Yana Kirilova*

### **CHALLENGES IN SETTING THE MUNICIPAL WASTE FEE TARIFF IN BULGARIAN MUNICIPALITIES**

The present waste fee tariff in Bulgaria is calculated per mill on property value, which is the grounding reason why the business pays much more than the population for the generated waste amounts, thus cross-subsidizing the population costs. Legislative amendments enforced in 2017 require the waste fee to be determined based on waste amounts and a number of waste service users. Since then, the actual enforcement date for the introduction of the new waste tariff has been postponed several times due to a number of serious challenges that may undermine the future operation of the waste management systems in the municipalities. These challenges cover the need for an entire transformation of the current waste collection and transportation system, require significant additional costs in terms of capital investments, necessary massive awareness-raising campaigns, insufficient data, affordability and willingness to pay issues.

Keywords: municipal waste fee; waste tariffs; local budgets; municipal waste management; polluter pays principle

JEL: H71; H72; Q57

*Marwan Altarawneh, Mohammad Abedalrahman Alhmood, Ala'a Zuhair Mansour, Aidi Ahmi*

## **COMPREHENSIVE BIBLIOMETRIC MAPPING OF PUBLICATION TRENDS IN EARNINGS MANAGEMENT**

This research aims to trace the evolution of published articles, quotations, and themes on earnings management from 1988 to 2022. Therefore, the Web of Science (WOS) database is employed in the current study to identify the most-cited earnings management articles and the most-involved authors, institutions, and countries in earnings management. This research employs bibliometric exponents and tools like Microsoft Excel for frequency analysis, the VOS viewer for the visualisation of data, and Harzing's Publish or Perish for metrics of citation and earnings management analysis. According to the findings, after 2015, research in this field significantly increased. The United States has been ranked the most active nation in earnings management research. State University System of Florida from the US was the most prolific publisher of significant earnings management research publications. Accounting Review, Contemporary Accounting Research, and the Journal of Accounting and Public Policy are the leading publications in earnings management. The results of the current study are collected based on data from the Web of Science (WOS) database, and any limitations of the database impact the results. Through the integration of bibliometric information and graphical networks, this research has the potential to add to the growing body of knowledge by providing a broad overview of the trends shown in studies on earnings management that appeared in the WOS database between 1988 and the start of 2022.

Keywords: Earnings Management; Web of Science; Harzing's Publish or Perish; VOSviewer; Bibliometric analysis

JEL: M41; M42