Assessment of Factors in the Performance of the Manufacturing Industry

Inta Kotane
Faculty of Economics and Management
Rezekne Academy of Technologies
Rezekne, Latvia
e-mail: Inta.Kotane@rta.lv

Iveta Mietule
Faculty of Economics and Management
Rezekne Academy of Technologies)
lRezekne, Latvia
e-mail: Iveta.Mietule@rta.lv

Abstract. **Any success or failure of the manufacturing industry, according to scientists, indicates the processes that are going to occur in the entire national economy in the future as well as the overall current state of the national economy. In Latvia, small and medium enterprises engaged in the manufacturing industry make up the largest proportion of market sector economically active statistical units, and the value added generated by small and medium manufacturing enterprises represents the largest proportion of total value added generated by the manufacturing industry. The research aims to identify and assess factors in the performance and development of the manufacturing industry and small and medium manufacturing enterprises in Latvia. The research employed general scientific research methods: monographic, descriptive and graphic as well as analysis and synthesis. The Cobb-Douglas model was used to assess the situation in the manufacturing industry and identify the effects of factors on economic growth. The research identified and assessed the factors in the performance and development of the manufacturing industry and small and medium manufacturing enterprises in Latvia.**

Keywords: assessment, manufacturing industry, productivity, small and medium enterprises

I. INTRODUCTION

Manufacturing is an industry that manufactures finished products from raw materials and other inputs [1], [2], typically represents a global network that uses local and global (material and energy) resources [3], [4] and is one of the most resource-intensive (e.g. material, energy and water) industries with economies of scale, lower labour costs and larger employment potential. The manufacturing industry (Section C), according to the Statistical classification of economic

activities in the European Community (NACE Rev. 2), includes 24 divisions (divisions10-33).

Increased attention is paid to the manufacturing industry because, according to scientists, this industry indicates the overall state of the economy with sufficient precision, and any success or failure of the manufacturing industry indicates the processes that are going to occur in the entire economy in the future [5], [6].

Nowadays manufacturing enterprises face an increasingly complex environment, affected by a lack of natural resources, legal regulation and a growing consumer demand for sustainable products [7], as well as complex global challenges, e.g. increasing competition, volatile commodity prices, increasing consumer expectations and unstable economic conditions [8], [9]. Manufacturing enterprises constantly reassess and modify their competition strategies as well as adapt their supply chains and technologies to increase their performance, and compete and survive in the long term [8].

The international scientific literature uses the term performance to describe an enterprise's operational results, which is widely used in all areas of management science to explain phenomena, diagnose causes, identify causal associations, as well as make forecasts and comparisons [10]. Performance is the result of achieving an enterprise's goals, a measure of success [11], an ability to present results in certain dimensions relative to the target [12], a way to identify the progress, an ability to successfully implement future actions to achieve goals and objectives [13]. Performance could be viewed as a multifaceted phenomenon that involves various perspectives (e.g. shareholder and employee), periods (e.g. long- and short-term) and criteria (e.g. market share and profit) [14].

The terms performance management, performance measurement and performance assessment could be distinguished in relation to performance [15]. An effective performance measurement system aligned with the characteristics of the external environment could help a manager to make better decisions to increase the

Print ISSN 1691-5402
Online ISSN 2256-070X
https://doi.org/10.17770/etr2024vol1.7992

enterprise's performance [16], [17]. The field of performance measurement has evolved from measurement, i.e. what to measure, how to measure and how to report the results, to management, i.e. how to use indicators in managing enterprise performance [18], considering technological, economic and social trends [19]. Performance assessment at an enterprise is an integral part of the management process [20], [21], which allows the enterprise to identify the effects of managerial decisions on the performance, as well as the progress made and the decisions necessary for an enhancement thereof.

Small and medium manufacturing enterprises (SMEs) could be characterized as the main contributors to industrial economic growth worldwide in several aspects, including innovation, output and employment [22]. For example, European SMEs employ two thirds of the workforce and account for more than half of the total output of the manufacturing industry [23].

In 2021 in Latvia, according to data from the Official Statistics Portal [24], there were 10855 SMEs, which accounted for 99.46% of the total market sector economically active statistical units operating in the manufacturing industry. The value added generated by manufacturing SMEs represented 59.7% of the total value added of the manufacturing industry in Latvia in 2021 [25].

In the period from 2006 to 2019, 80% research papers available in the Scopus and Web of Science databases focused on the requirements, design and development of performance measurement systems for SMEs in the manufacturing industry and only 20% on performance measurement as a means of improving performance management or a possibility of performing a comparative assessment [26].

The authors believe that both foreign and national scientists have insufficiently focused on measurement and assessment of performance of the manufacturing industry and manufacturing SMEs, as well as factors in the performance thereof.

The research aims to identify and assess factors in the performance and development of the manufacturing industry and small and medium manufacturing enterprises in Latvia.

II. Materials and Methods

Data from the Central Statistical Bureau and the Cobb-Douglas model, which is one of the most commonly used models for identifying the effects of factors on economic growth, were employed to assess the situation in the manufacturing industry. The Cobb-Douglas production function is characterized by the following mathematical relationship [27] (equation 1):

$$Y_t = A_t F(K_t, L_t) \qquad (1)$$

where

Y_t – output or value added in time period t, EUR;

A_tF – multifactor productivity index in time period t;

K_t – investment in equity or fixed assets in time period t, EUR;

L_t – labour input in time period t, hours

The Cobb-Douglas model is based on an assumption that output is affected by the main factors of production, which are labour and fixed assets or capital, as well as multifactor productivity, or the efficiency of the factors of production. Multifactor productivity considers changes in the quality of technology and the efficiency of the use, the efficiency of factor management, as well as other factors. An additional model uses indexes or changes in shares. In similar research studies in European Union (EU) Member States and Latvia, it has been established that the average share of income generated by fixed assets was 35%, while the share of income generated by labour was 65% [28].

The Official Statistics Portal provides data on three of the four indicators used by the Cobb-Douglas model for manufacturing enterprises not classified by size: "value added", "number of hours worked by employees" and "value of fixed assets". The Official Statistics Portal does not provide publicly available data on the assets of manufacturing SMEs or, in this particular case, the indicator "value of fixed assets"; therefore, the authors submitted a request to the Central Statistical Bureau, which is one of the statistical institutions of the Official Statistics Portal and which, at the request of the authors, collected the necessary data on manufacturing SMEs [29].

III. Results and Discussion

The manufacturing industry plays an important role in contributing to economic growth in Latvia. In 2020, the manufacturing industry accounted for 12.7% of the total value added, 14.2% in 2021 and 17.7% in 2022 [30].

The 20% target for investment as a share of GDP set by the National Development Plan of Latvia 2014-2020 for the manufacturing industry for 2020 [31] was not achieved in 2020 and also in 2021 and 2022. The Operational Strategy for 2020-2022 designed by the Ministry of Economics of the Republic of Latvia [32], based on 2018 data, set a 12.5% target investment as a share of GDP for 2022. It could be concluded that the target set for 2022 was achieved in 2020.

The authors believe that the target set by the National Development Plan of Latvia 2014-2020 for 2018 was not achieved because the output of high value-added products that would be competitive in export markets was not sufficiently developed by manufacturing enterprises.

Productivity is the most important criterion that determines the international competitiveness of the manufacturing industry. By increasing investment in equipment and training by the manufacturing industry, it is possible to significantly increase the productivity of labour, as well as to increase the competitiveness of the products manufactured, not affecting the other factors of production [31].

The authors performed a comparative analysis of manufacturing enterprises and manufacturing SMEs.

Data from the Official Statistics Portal on productivity in the manufacturing industry, expressed as a ratio of value added to the number of employees, show that the productivity increased in Latvia in 2010-2021. In Latvia in 2021 compared with 2010, productivity growth in the manufacturing industry reached 114.07% and 85.44% in manufacturing SMEs [25].

Productivity in manufacturing enterprises and changes therein are determined by the value added generated by the manufacturing industry and the number of employees (see Table 1).

TABLE 1. CHANGES IN THE VALUE ADDED, NUMBER OF EMPLOYED PERSONS AND PRODUCTIVITY OF MANUFACTURING ENTERPRISES IN LATVIA, 2010–2021, % COMPARED WITH THE PREVIOUS YEAR* (AUTHORS' CALCULATIONS BASED ON [25])

Year	Manufacturing enterprises			Manufacturing SMEs		
	Value added	Number of persons employed	Produc-tivity	Value added	Number of persons employed	Produc-tivity
2010	25.70	-0.32	26.11	21.19	0.17	20.98
2011	5.25	3.24	1.94	0.51	0.39	0.11
2012	13.97	5.39	8.15	12,32	7.55	4.43
2013	1.08	2.09	-0.99	5.00	1.31	3.64
2014	4.00	0.82	3.16	6.57	3.41	3.06
2015	5.87	-1.92	7.94	5.15	0.17	4.96
2016	3.99	0.11	3.88	2.20	-0.07	2.28
2017	8.24	-0.07	8.31	4.29	-0.02	4.31
2018	10.93	0.92	9.93	4.83	-0.64	5.51
2019	7.91	-2.08	10.20	2.77	-4.58	7.71
2020	4.15	-0.76	4.96	6.87	-0.59	7.50
2021	28.40	4.30	23.11	26.08	3.87	21.38

* *indicator values that decreased, compared with the previous year, are highlighted in green.*

As shown in Table 1, the value added by manufacturing enterprises and manufacturing SMEs increased in the analysed period compared with the previous year.

Compared with the previous year, the number of persons employed by manufacturing enterprises tended to both increase and decrease (highlighted in green in Table 1). It should be emphasized that the number of persons employed by manufacturing SMEs gradually decreased in the period 2016-2020. In the period 2010-2021, compared with the previous year, in Latvia, productivity in manufacturing enterprises and manufacturing SMEs, in percentage terms, tended to increase overall. However, it could be concluded that the increase in productivity in manufacturing SMEs was lower than that in manufacturing enterprises, except in 2013 and 2020.

In the period analysed, the year 2021 should be emphasised because the economy recovered from the pandemic, and 17 out of 22 manufacturing industries showed an increase in output, which contributed to an increase in both the number of employees and productivity, compared with 2020 [33], [34].

The level of productivity in the manufacturing industry was lower than the average in the national economy. The experience of several countries shows that the manufacturing industry plays an important role in increasing overall productivity. This could mainly be explained by the potentially higher innovation capacity of the manufacturing industry. Manufacturing is an industry that is largely oriented towards foreign markets and has a higher degree of integration in global value chains. The low level of productivity in the entire national economy is largely determined by low productivity in the manufacturing industry. In 2021, it was almost 45.7% of the EU average [33].

Growth in the manufacturing industry is determined by innovation capacity, incl. the share of high-tech segments in the manufacturing industry. In terms of technological intensity, the share of high-tech segments in the manufacturing industry increased by 4.13 percentage points in 2021 compared with 2010 [35]. The relatively low level of productivity and moderate changes in the manufacturing industry in Latvia are significantly affected by structural factors. The national manufacturing industry is strongly dominated by low-tech segments. This could be explained by the significant share of traditional industries (food and woodworking), which together make up almost half of the total value added generated by the manufacturing industry and which is almost one and a half times higher than the EU average [33].

Based on data from the Official Statistics Portal on the value added by manufacturing enterprises, the number of hours worked by employees and the value of fixed assets in Latvia in 2010-2021, the authors calculated the share of fixed assets in value added and the multifactor productivity index, using an equation of the Cobb-Douglas model. Change indices (CI) for Cobb-Douglas model indicators for manufacturing enterprises, expressed as a ratio of the indicator for the reporting period to that for the previous period, and changes in percentage terms, i.e. deviation, are shown in Table 2.

TABLE 2. COBB-DOUGLAS MODEL INDICATORS OF MANUFACTURING ENTERPRISES IN LATVIA, 2011–2021 (AUTHORS' CALCULATIONS BASED ON [36], [37])

Year	Value added Y_t		Number of hours worked by employees L_t		Share of fixed assets in value added K_t		Multifactor productivity index A_tF*	
	DI	Changes, %	DI	Changes, %	DI	Changes, %	DI	Changes, %
2011	1.05	5.25	1.04	3.77	0.97	-2.81	1.04	3.78
2012	1.14	13.97	1.04	3.85	0.90	-9.87	1.15	15.33
2013	1.01	1.08	1.01	1.34	0.92	-7,72	1.03	3.06
2014	1.04	4.00	1.01	0.91	0.99	-0,98	1.04	3.75
2015	1.06	5.87	1.08	7.77	0.99	-0.65	1.01	1.08
2016	1.04	3.99	0.88	-12.42	0.92	-7.99	1.17	16.71
2017	1.08	8.24	1.01	1.36	0.92	-8.12	1.11	10.52
2018	1.11	10.93	0.96	-4.04	0.91	-8.54	1.18	17.57
2019	1.08	7.91	1.02	1.82	0.98	-1.89	1.07	7.37
2020	1.04	4.15	0.99	-1.29	1.00	0.49	1.05	4.85
2021	1.28	28.40	1.08	7.61	0.84	-16.17	1.30	30.22

* *authors' calculations based on the Cobb-Douglas model equation.*

After analysing the performance of manufacturing enterprises in terms of percentage change in the CI and changes in the value added by manufacturing enterprises in Latvia (see Table 2), the authors concluded that the performance of manufacturing enterprises gradually improved in 2011-2021. Employment in manufacturing enterprises in Latvia, expressed as an index of the number of hours worked, has overall remained unchanged from 2011 to 2021, returning to the level of 2015 in 2021 and confirming that the production process

has become more efficient. The multifactor productivity index for the period 2011-2021 confirms increases in the performance of national manufacturing enterprises.

The factors affecting the performance of manufacturing SMEs (see Table 3) show similar trends as those for manufacturing enterprises (see Table 2).

TABLE 3. COBB-DOUGLAS MODEL INDICATORS OF MANUFACTURING SMES IN LATVIA, 2011–2021 (AUTHORS' CALCULATIONS BASED ON [25], [29])

Year	Value added Y_t		Number of hours worked by employees L_t		Share of fixed assets in value added K_t		Multifactor productivity index A_tF*	
	DI	Changes, %	DI	Changes, %	DI	Changes, %	DI	Changes, %
2011	1.01	0.51	1.01	1.13	1.01	0.36	1.00	-0.35
2012	1.12	12.32	1.08	7.75	0.91	-9.30	1.11	10.72
2013	1.05	5.00	1.00	0.46	0.94	-6.10	1.07	7.02
2014	1.07	6.57	1.03	3.00	0.98	-2.31	1.05	5.40
2015	1.05	5.15	1.09	9.04	0.95	-4.91	1.01	1.16
2016	1.02	2.20	0.88	-12.28	0.94	-6.11	1.14	13.77
2017	1.04	4.29	1.00	-0.17	0.93	-7.18	1.07	7.17
2018	1.05	4.83	0.93	-7.23	0.94	-6.53	1.13	12.70
2019	1.03	2.77	1.01	1.01	1.02	2.45	1.01	1.24
2020	1.07	6.87	0.98	-1.60	0.98	-1.96	1.09	8.74
2021	1.26	26.08	1.08	8.08	0.879	-12.11	1.25	25.41

* *authors' calculations based on the Cobb-Douglas model equation.*

The number of hours worked by employees, the share of fixed assets in value added and multifactor productivity accounted for 100% of the value added. Based on the changes in Cobb-Douglas model indicator values expressed in percentage terms, the authors constructed Figure 1, which shows the number of hours worked by employees employed by national manufacturing enterprises, the share of fixed assets in value added and the effect of multifactor productivity on the value added by manufacturing enterprises in Latvia in 2011-2021.

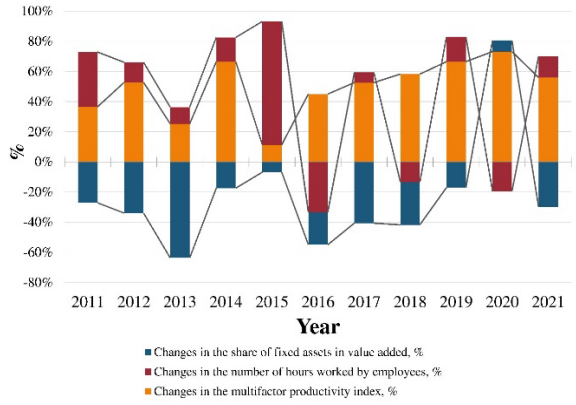

Fig. 1. Effects of the factors "Share of fixed assets in value added", "Number of hours worked by employees", "Multifactor productivity index" on the performance of manufacturing enterprises in Latvia in 2011.–2021, % (authors' calculations based on [36], [37])

The calculation results showed that the value added by or performance of manufacturing enterprises was most significantly affected by multifactor productivity, which, on average, accounted for 49.45% of the overall performance of the manufacturing industry in the period 2011-2021. Changes in the number of hours worked by employees accounted for, on average, 11.78% of the performance of manufacturing enterprises, and the effect of changes in the share of fixed assets in value added on the performance of manufacturing enterprises was negative and, on average, accounted for 25.37% of the change in the value added by manufacturing enterprises. The authors could conclude that investments in fixed assets, i.e. an increase in the value of fixed assets was insufficient to contribute to an increase in the value added by or performance of manufacturing enterprises.

It should be emphasized that in 2021 compared with 2020, the effect of the number of hours worked by employees, the share of fixed assets in value added and multifactor productivity on the performance of manufacturing enterprises changed in Latvia. The effect of an increase in the number of hours worked in manufacturing enterprises on the performance of manufacturing enterprises was positive at 14.09%, whereas the effect of a decrease in the share of fixed assets in value added on the performance of manufacturing enterprises was negative at 29.95%, while the effect of multifactor productivity was 55.96%. The authors believe that labour availability is an important factor that contributes to the manufacturing industry; however, it is not at all the main factor that affects the growth and performance of the manufacturing industry in Latvia. It is necessary to increase investments in technologies, as well as implement measures that could positively affect output efficiency or multifactor productivity.

An analysis of the effects of the number of hours worked by employees, the share of fixed assets in value added and multifactor productivity on the performance of manufacturing SMEs in the period 2011-2021 (Fig. 2) revealed that the performance of manufacturing SMEs was most significantly affected by multifactor productivity, which, on average, accounted for 38.43% of the total performance of manufacturing SMEs.

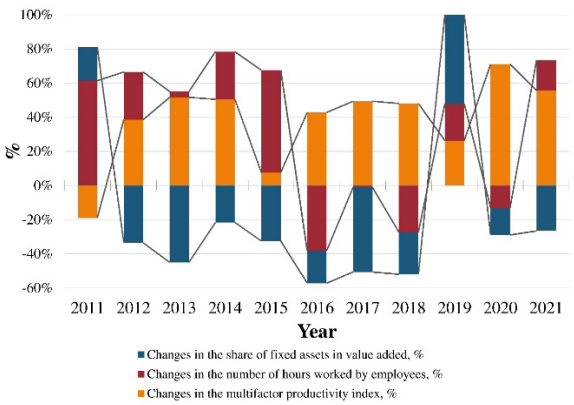

Fig. 2. Effects of the factors "Share of fixed assets in value added", "Number of hours worked by employees", "Multifactor productivity index" on the performance of manufacturing SMEs in Latvia, 2011–2021, % (authors' calculations based on [25], [29]).

Changes in the number of hours worked by employees accounted for, on average, 17.72% of the performance of manufacturing SMEs, and changes in the share of fixed assets in value added had a negative effect on the performance of manufacturing SMEs and accounted for an average of 17.85% of the change in the value added generated by the manufacturing industry.

In the period 2011-2021 in Latvia, the effect of factors on the performance of manufacturing SMEs, compared with that of manufacturing enterprises, differed significantly in 2019. In 2019 in Latvia, however, the effect of the number of hours worked by employees, the share of fixed assets in value added and multifactor productivity on the performance of manufacturing SMEs was positive, and the largest positive effect was a 52.09% change in the share of fixed assets in value added. The authors believe that in order to sustain increases in the performance of manufacturing SMEs, it is necessary to increase investments in fixed assets, incl. technologies.

The Report on Productivity in Latvia [38] has examined the possibility of granting government support to increase productivity at enterprises. The report proposed three criteria (one basic criterion and two additional ones) to be met to grant government support to an enterprise:

1. The basic criterion: in the medium term, the enterprise was able to achieve higher productivity than other similar enterprises (in the same size and age group, industry and location (distance from Riga and other cities));
2. An additional criterion (1): the enterprise belongs to a group of enterprises having a higher probability of continuing their economic activity;
3. An additional criterion (2): a significant share of economic activity is performed by the enterprise in areas with a high unemployment rate.

The authors concluded that the productivity of manufacturing enterprises increased in 2010-2021. The Report on Productivity in Latvia [38] concluded that manufacturing enterprises had a higher probability of continuing their economic activity; however, an analysis of the probability of stopping economic activity by enterprise size and age group revealed that it was higher for micro and new enterprises.

In the manufacturing industry, SMEs made up the majority of enterprises operating in the industry. Data from the Official Statistics Portal [24] show that in 2021, there were 10855 SMEs, which accounted for 99.46% of the total number of enterprises operating in the manufacturing industry, and micro-enterprises accounted for 81.71% of total number of manufacturing SMEs.

The authors believe that when considering granting government support to manufacturing enterprises, it is also necessary to assess an opportunity for manufacturing micro-enterprises to receive government support for increasing their productivity by incorporating additional criteria for evaluation of a manufacturing micro-enterprise into the eligibility criteria for granting government support, e.g. the growth of the relevant segment of the manufacturing industry, as well as investments by manufacturing micro-enterprises in modernization and innovation.

IV. CONCLUSIONS

After analysing the performance of manufacturing enterprises in terms of change in the value added by manufacturing enterprises, which includes the number of hours worked by employees, the share of fixed assets in value added and changes in multifactor productivity, it should be concluded that the performance of manufacturing enterprises gradually improved in the period 2011-2021. The performance of the manufacturing industry in 2011-2021 was most significantly affected by multifactor productivity, which, on average, accounted for 49.45% of the overall performance of the manufacturing industry, while in the case of manufacturing SMEs it was 38.43%.

Multifactor productivity involves changes in the quality and use efficiency of technology, factor management efficiency as well as other factors, and the effect of the multifactor productivity factor on changes in value added in the manufacturing industry confirms that the production process has nevertheless become more efficient.

Growth in the manufacturing industry is affected by innovation capacity, incl. the share of high-tech segments in the manufacturing industry. In terms of technological intensity, the share of high-tech segments in the manufacturing industry increased by 4.13 percentage points in 2021 compared with 2010. The relatively small increase in the period analysed explains the relatively low level of productivity not only in the manufacturing industry but also in the entire national economy of Latvia.

The recommendations for granting government support to increase the productivity of enterprises limit an opportunity for manufacturing micro-enterprises to receive government support, which make up the majority of SMEs operating in the manufacturing industry.

V. REFERENCES

[1] M. Kumar and M. Mani, "Sustainability Assessment in Manufacturing for Effectiveness: Challenges and Opportunities," Frontiers in Sustainability, vol. 8, 2022. [Online]. Available: https://doi.org/10.3389/frsus.2022.837016 [Accessed Jan. 25, 2024].

[2] R. Grēviņa, Ekonomikas skaidrojošā vārdnīca: 4478 termini ar tulkojumu angļu, vācu, franču un krievu valodā. Rīga: Zinātne. 2000.

[3] J. R.Duflou, J. W. Sutherland, D. Dornfeld, C. Herrmann, J. Jeswiet, S. Kara, M. Hauschild and K. Kellens, "Towards energy and resource efficient manufacturing: a processes and systems approach," CIRP Annals, vol. 61, no. 2, pp. 587.-609, 2012. [Online]. Available: https://doi.org/10.1016/j.cirp.2012.05.002 [Accessed Jan. 25, 2024].

[4] K. M. Chandran, M. Mani and A. Chakrabarti, "A Spatio-Temporal Network Representation for Manufacturing," In: Chakrabarti, A. (eds) ICoRD'15 – Research into Design Across Boundaries, vol. 2, no. 5, pp. 459.-470, 2015. [Online]. Available: https://doi.org/10.1007/978-81-322-2229-3_39 [Accessed Jan. 25, 2024].

[5] I. Kasjanovs, "Latvijas apstrādes rūpniecība šķērsgriezumā,"2015. [Online]. Available: https://www.makroekonomika.lv/latvijas-apstrades-rupnieciba-skersgriezuma [Accessed Jan. 25, 2024].

[6] A. W. Dametew and F. Ebinger, "Performance Analysis of Manufacturing Industries for System Improvement," Industrial Engineering and Management, vol. 6, pp. 1.-9, 2017. [Online]. Available: doi:10.4172/2169- 0316.1000228 [Accessed Jan. 25, 2024].

[7] K. R. Haapala, F. Zhao, J. Camelio, J. W. Sutherland, S. J. Skerlos, D. A. Dornfeld, I. S. Jawahir, A. F. Clarens and J. L. Rickli, ´Review of Engineering Research in Sustainable Manufacturing.,"

ASME. Journal of manufacturing Science & Engineering, vol.135, no. 4, 041013, 2013. [Online]. Available: https://doi.org/10.1115/1.4024040 [Accessed Jan. 25, 2024].

[8] M. Alomar and Z. J. Pasek, "A Performance Improvement and Management Model for Small and Medium Sized Enterprises. In: Pinson E., Valente F., Vitoriano B. (eds*)* Operations Research and Enterprise Systems. ICORES 2014. Communications in Computer and Information Science, 509, Springer, Cham., 2015. [Online]. Available: https://doi.org/10.1007/978-3-319-17509-6_6 [Accessed Jan. 25, 2024].

[9] M. Khalfallah and L.Lakhal, "The impact of lean manufacturing practices on operational and financial performance: the mediating role of agile manufacturing," International Journal of Quality & Reliability Management, vol. 38, no. 1, pp.147.-168, 2021. [Online]. Available: https://doi.org/10.1108/IJQRM-07-2019-0244 [Accessed Jan. 25, 2024].

[10] A. Pimenta da Gama, "An expanded model of marketing performance," Marketing Intelligence & Planning, vol. 29, no. 7, pp. 643.-661, 2011. [Online]. Available: https://doi.org/10.1108/ 02634501111178677 [Accessed Jan. 25, 2024].

[11] M. Abbas, T. Azid and M. H. A. Besar, ""Efficiency, effectiveness and performance profile of Islamic and conventional banks in Pakistan," Humanomics, vol. 32, no. 1, pp.2.-18, 2016. [Online]. Available: https://doi.org/10.1108/H-09-2015-0058 [Accessed Jan. 25, 2024].

[12] E. K. Laitinen, "A dynamic performance measurement system: evidence from small Finish technology companies," Scandinavian Journal of Management, vol. 18, no. 1, pp. 65.-99, 2002. [Online]. Available: https://doi.org/10.1016/S0956-5221(00)00021-X [Accessed Jan. 25, 2024].

[13] M. J. Lebas, "Performance measurement and performance management," International Journal of Production Economics, vol. 41, no. 1-3, pp. 23.-35, 1995. [Online]. Available: https://doi.org/10.1016/0925-5273(95)00081-X [Accessed Jan. 25, 2024].

[14] E. Ankrah and C. C. Y. Mensah, "Measuring Performance in Small and Medium Scale Enterprises in the Manufacturing Industry in Ghana. International Journal of Research in Business Studies and Management," vol. 2, no. 12, pp. 34.-43, 2015. [Online]. Available: https://www.ijrbsm.org/pdf/v2-i12/5.pdf [Accessed Jan. 25, 2024].

[15] P. Folan, J. Browne and H. Jagdev, "Performance management research: an alternative view to Thorpe and Beasley,". CIMRU Working Paper, pp. 1.-15, 2006. [Online]. Available: DOI:10.13140/RG.2.1.3642.5368 [Accessed Jan. 25, 2024].

[16] H. Hariyati, B. Tjahjadi and N. Soewarno, "The mediating effect of intellectual capital, management accounting information systems, internal process performance, and customer performance," International Journal of Productivity and Performance Management, vol. 68, no. 7, pp. 1250.-1271, 2019. [Online]. Available: https://doi.org/10.1108/IJPPM-02-2018-0049 [Accessed Jan. 25, 2024].

[17] A. Sardi, E. Sorano, A. Ferraris and P. Garengo, "Evolutionary paths of performance measurement and management system: the longitudinal case study of a leading SME,". Measuring Business Excellence, vol. 24, no. 4, pp. 495.-510, 2020. [Online]. Available: https://doi.org/10.1108/MBE-01-2020-0016 [Accessed Jan. 25, 2024].

[18] U. S. Bititci, P. Garengo, A. Ates and S. S. Nudurupati, "Value of maturity models in performance measurement," International Journal of Production Research, vol. 53, no. 10, pp. 3062.-3085, 2015. [Online]. Available: https://doi.org/10.1080/00207543. 2014.970709 [Accessed Jan. 25, 2024].

[19] S. A. Melnyk, U. Bititci, K. Platts, J. Tobias and B. Andersen, "Is performance measurement and management fit for the future?" Management Accounting Research, vol. 25, no. 2, pp. 173.-186, 2014. [Online]. Available: https://doi.org/10.1016/ j.mar.2013.07.007 [Accessed Jan. 25, 2024].

[20] M. Pantea, D. Gligor and C. Anis, "Economic Determinants of Romanian Firms' Financial Performance," Procedia - Social and Behavioral Sciences, vol. 124, pp. 272.-281, 2014. [Online]. Available: https://doi.org/10.1016/j.sbspro.2014.02.486 [Accessed Jan. 25, 2024].

[21] J. Narkunienė and A. Ulbinaitė, "Comparative analysis of company performance evaluation methods," Entrepreneurship and Sustainability Issues, Entrepreneurship and Sustainability Center, vol. 6, no. 1, pp. 125.-138, 2018. [Online]. Available: https://hal.archives-ouvertes.fr/hal-02121048/document [Accessed Jan. 25, 2024].

[22] E. Memili, H. Fang, J. J. Chrisman and A. De Massis, "The impact of small-and medium-sized family firms on economic growth," Small Business Economics, vol. 45, no. 4, pp. 771.-785, 2015. [Online]. Available: https://doi.org/10.1007/s11187-015-9670-0 [Accessed Jan. 25, 2024].

[23] P. Muller, A. Mattes, D. Klitou, O. K. Lonkeu, P. Ramada, F. A. Ruiz, S. Devnani, J. Farrenkopf, A. Makowska, N. Mankovska, N. Robin and I. Steigertahl, "Annual report on European SMEs 2017/2018: SMEs growing beyond borders,"PwC Luxembourg/ CARSA/LE Europe/DIW Econ., 2018. [Online]. Available: https://publications.europa.eu/en/publication-detail/-/publication/a435b6ed-e888-11e8-b690-01aa75ed71a1 [Accessed Jan. 25, 2024].

[24] Official Statistics Portal, "Economically active enterprises of market sector in regions, State cities and municipalities by size group according to the number of employees and main economic activity (NACE Rev. 2) 2021 – 2022,"2024a. [Online]. Available: https://data.stat.gov.lv/pxweb/en/OSP_PUB/START__ENT__UZ__UZS/UZS031/ [Accessed: Feb.15, 2024].

[25] Official Statistics Portal, "Key entrepreneurship indicators of enterprises by number of employees 2005 – 2022," 2024c. [Online]. Available: https://data.stat.gov.lv/pxweb/en/OSP_PUB/START__ENT__UF__UFR/UFR020/ [Accessed: Feb.15, 2024].

[26] X. Rojas-Lema, J-J. Alfaro-Saiz, R. Rodríguez-Rodríguez and M-J. Verdecho, "Performance measurement in SMEs: systematic literature review and research directions," Total Quality management & Business Excellence, vol. 32, no. 15-16, pp. 1803.-1828, 2021. [Online]. Available: https://doi.org/10.1080/147 83363.2020.1774357 [Accessed Jan. 25, 2024].

[27] D. Jeļisejevs, S. Mūriņš, E. Uzulēna un N. Knaidele, "Apstrādes rūpniecības perspektīvas nozaru griezumā, prognozējamā nozaru restrukturizācija līdz 2020. gadam. Gala ziņojums," 2007. [Online]. Available: http://petijumi.mk.gov.lv/node/1852 [Accessed Jan. 25, 2024].

[28] W. Roeger, "The Production Function approach to Calculating Potential Growth and Output Gaps. Estimates for EU Member States and the US. EU Commission," 2006. [Online]. Available: https://www.banqueducanada.ca/wp-content/uploads/2010/08/roeger.pdf [Accessed Jan. 25, 2024].

[29] Official Statistics Portal, „SME data", 2024g. Unpublished materials.

[30] Official Statistics Portal, "Gross value added by kind of activity (NACE Rev.2) 1995 – 2022," 2024b. [Online]. Available: https://data.stat.gov.lv/pxweb/en/OSP_PUB/START__VEK__IK__IKP/IKP060/ [Accessed: Feb.15, 2024].

[31] Cross-Sectoral Coordination Centre, "National Development Plan of Latvia for 2014–2020,"2012. [Online]. Available: https://pkc.gov.lv/sites/default/files/inline-files/NDP2020%20English%20Final__.pdf [Accessed Jan. 25, 2024].

[32] Latvijas Republikas Ekonomikas ministrija, "Ekonomikas ministrijas darbības stratēģija 2020.-2022.gadam," 2020. [Online]. Available: https://www.em.gov.lv/lv/darbibas-strategija [Accessed Jan. 25, 2024].

[33] LU Biznesa, vadības un Ekonomikas fakultātes Produktivitātes zinātniskais institūts, „Latvijas produktivitātes ziņojums 2022," "Latvijas Universitātes domnīca LV PEAK", 2023. [Online]. Available: https://www.em.gov.lv/lv/media/8753/download [Accessed Jan. 25, 2024].

[34] Official Statistics Portal, "In 2021, industrial production output increased by 6.5 %," 2022. [Online]. Available: https://stat.gov.lv/en/statistics-themes/business-sectors/industry/press-releases/8217-industrial-production-december-2021 [Accessed: Feb.15, 2024].

[35] Official Statistics Portal, "Entrepreneurship indicators in manufacturing by technological intensity (NACE Rev. 2) 2005 – 2021," 2024i. [Online]. Available: https://data.stat.gov.lv/pxweb/en/OSP_PUB/START__ENT__UF__UFR/UFR040/ [Accessed: Feb.15, 2024].

[36] Official Statistics Portal, „Entrepreneurship indicators of enterprises 2005 – 2022," 2022e. [Online]. Available:

https://data.stat.gov.lv/pxweb/en/OSP_PUB/START__ENT__UF__UFR/UFR010 [Accessed: Feb.15, 2024].

[37] Official Statistics Portal, **"**Assets and liabilities of merchants by kind of activity at the end of year (NACE Rev.2), (million euro) 2006 – 2022, " 2022h. [Online]. Available: https://data.stat.gov.lv/pxweb/en/OSP_PUB/START__ENT__UF__UFF/UFF040/ [Accessed: Feb.15, 2024].

[38] LU Biznesa, vadības un ekonomikas fakultātes Produktivitātes zinātniskais institūts, "Latvijas produktivitātes ziņojums 2020," 2020. [Online]. Available: https://www.em.gov.lv/lv/media/8753/download [Accessed Jan. 25, 2024].