

Capital Productivity and Cost Structure: Analysis of Firm Level Data

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Abstract: Capital productivity is one of the factors that can influence the cost structure of firms. Firms are interested in using their capital as efficiently as possible to achieve higher productivity and reduce the cost per unit of output, thereby improving their competitiveness and profitability of the firm. The aim of this paper was to assess if the change in capital productivity has an impact on the cost structure in terms of personnel costs and material costs for manufacturing firms (textile industry) in EU 27 countries. An empirical study of 1407 textile firms showed that capital productivity is affected by the amount of tangible and intangible fixed assets acquired. It was found that over the period under study, as the size of fixed assets increased, firms were able to increase capital productivity and to use newly acquired assets more efficiently to increase firm revenues. The impact of the change in capital productivity of enterprises on the change in the share of personnel costs and share of material costs has not been found.

Keywords: Capital productivity, cost structure, textile industry.

JEL Classification: D24, E23, G01

1 Introduction

Making a profit is one of the basic goals of a business. Its size is significantly influenced by the size of costs and their structure. The cost structure of a company plays an essential role in the strategic management and decision making of the company. A properly set and analysed cost structure enables a company to allocate resources more efficiently, optimise processes and increase profitability. Investments in fixed assets such as machinery, technology, buildings or equipment can significantly affect the cost structure of a company. For these investments, it is necessary to assess in particular their efficiency (productivity). In the long term, the efficient use of fixed capital investments can improve the competitiveness of an undertaking and its financial stability. The aim of the paper will be to assess whether the change in capital productivity has an impact on the cost structure in terms of personnel costs and material costs with a focus on EU countries and the Czech Republic.

Productivity is a key factor for economic growth because it directly affects the ability of the economy and enterprises to produce more goods and services with fewer resources. An increase in productivity means that the efficiency of the use of capital, labour and technology increases. The neoclassical model production function is the basic starting point for considering the relationship between output and inputs (productivity). The basic production function used to measure productivity from a business perspective is the Cobb-Douglas production function. Without the influence of technology, this function can be described by saying that firm *i* produces output at time *t* through three inputs - capital, labour and materials (Demirer, 2020). Blažková et al. (2020) use a modified version of this function in measuring firm productivity, where total revenue (sales) is a function of tangible fixed assets, personnel cost and material consumption.

Generally, productivity defined as the ratio between the output of production and the input of production factors/means. The problem is to choose relevant measures of the output of production and the input of factors of production (Björkman, 1992). Productivity indicators are classified according to what resources are involved in production. Labour productivity measures the efficiency of the use of labour. Capital productivity measures how efficiently capital, i.e. equipment, machinery or investment, is used and total factor productivity (TFP), includes the total efficiency of all inputs including labour, capital and technology. TFP shows the extent to which factors such as innovation, technological progress or improvements in the organisation of production that are not explained by increases in labour or capital inputs alone contribute to output growth. According to Klaus et al. (2024), in addition to traditional factors of

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production (such as labour and physical capital), intangible factors (such as research and development (R&D), patents and software) are increasingly important for firms' economic growth

Productivity can be viewed from a macroeconomic perspective (Pavelka et al., 2014), a regional perspective (Dušek, 2018), a sectoral perspective (Buleca & Mura, 2014), a sectoral perspective (Novotnáše et al., 2021) or a firm perspective (Redlichová et al., 2023).

Productivity and costs of a firm are closely related factors that affect its overall efficiency and profitability. Higher productivity means that a firm can produce more products or provide more services in the same amount of time, leading to lower unit costs. By improving productivity, it is possible to achieve more production with less use of resources, which reduces variable and fixed costs. According to Grifell-Tatje and Lovell (2020), the productivity effect is in turn decomposed into a cost-efficiency effect and, in an intermediate context, a technical change effect. Productivity and business investment are closely related, as investment often serves as a tool to improve productivity. On the other hand, a lack of investment can lead to stagnation of productivity, which can mean a loss of competitiveness in the market. Investment in modern fixed assets can provide a firm with a competitive advantage and a greater ability to adapt to changing market conditions. A study by Gogokhia and Berulava (2021) points out that investment in innovation drives productivity. Conversely, low productivity can lead to cost increases. Long-term productivity improvements can translate into lower unit costs and thus higher competitiveness of firms. At the same time, some studies such as Brodny and Tutak (2022) point out that there are other factors that can affect the relationship between fixed asset investment and productivity.

2 Methods

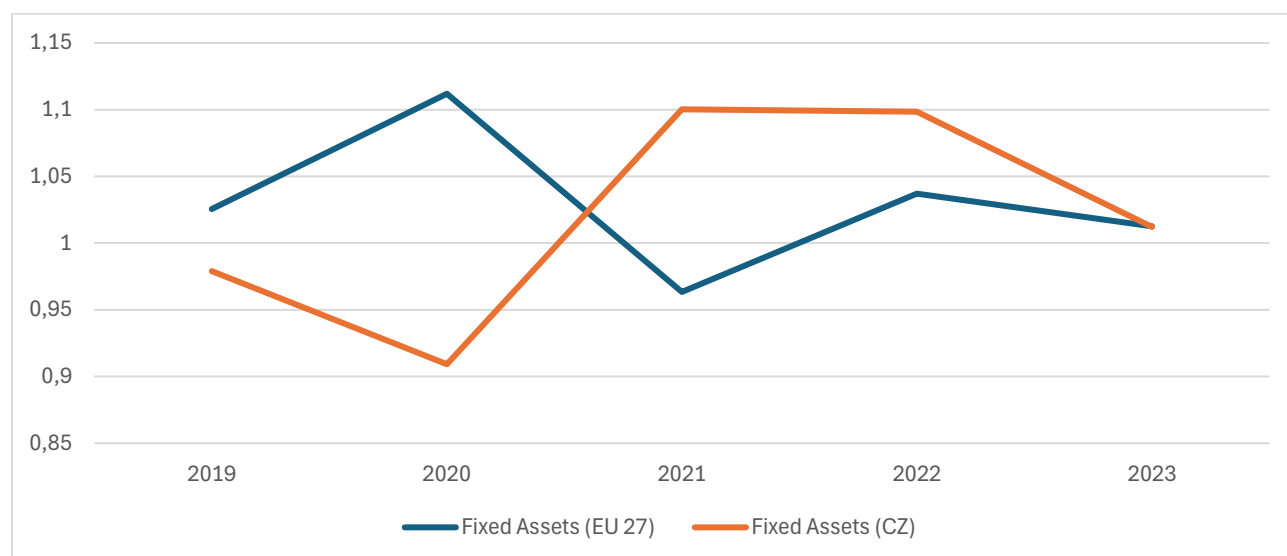
The paper focuses on the analysis of the relation of the development of enterprise capital productivity, i.e. the rate of asset turnover in textile enterprises with labour productivity and at the same time with the development of the cost of production, respectively with the development of the cost structure. The empirical analysis included 1407 textile enterprises (NACE 13) from the whole EU (27 countries), including 30 enterprises from the Czech Republic. The enterprises were represented in all size categories except micro enterprises. The same group of enterprises was surveyed in all years. The economic data of the surveyed enterprises were drawn from the ORBIS firms database. The period of observation was 6 years, between 2018 -2023.

The capital productivity was surveyed as the ratio of Operating revenues and Tangible plus Intangible fixed Assets. Labour productivity was calculated as Operating revenues and Costs of employees. Other indicators used in the analysis are Share of personnel costs (Share of Costs of employees and Total costs), Share of material costs (Share of Material costs and Total costs), Cost per unit of operating revenues (Share of Total costs and Operating revenues). The profitability of the companies was determined using the Return on Assets (ROA), which was determined as the ratio of EBITDA to Assets.

3 Research results

The capital productivity is influenced by the amount of tangible and intangible fixed assets (Fixed Assets) acquired by the enterprise. In a company, there can be a simple reproduction of fixed assets or an extended reproduction, in the case of the involvement of modern technologies, robotization or digitalization (elements of Industry 4.0). These investment activities can mean revenue growth or cost savings. The evolution of the change in fixed assets in textile enterprises in the EU (EU 27) and the Czech Republic is presented in Figure 1.

Figure 1 Development of fixed assets (index)



Source: own processing, Orbis database

Figure 1 indicates the different evolution of fixed asset investment in EU (EU 27) and Czech enterprises. While the level of fixed assets increased in the EU up to 2020, it decreased in the Czech Republic over the same period. In 2021, the evolution of fixed assets in the EU (EU 27) and the Czech Republic was completely opposite. In the Czech Republic, there was an increase of about 10% in 2021, which continued in 2022 (again an increase of 10%). In the EU, in 2021 is the only year in which investments in textile enterprises decrease by about 4%. In 2023, investment growth is the same in the EU countries and the Czech Republic (1.2%). The development of investment in fixed assets is strongly influenced by the capital productivity indicator. It is about whether revenues grow faster or stagnate than the growth of fixed assets. Table 1 provides an overview of selected indicators for the EU and Table 2 illustrates these indicators for enterprises in the Czech Republic.

Table 1 Level of selected indicators in textile enterprises in the EU (EU 27)

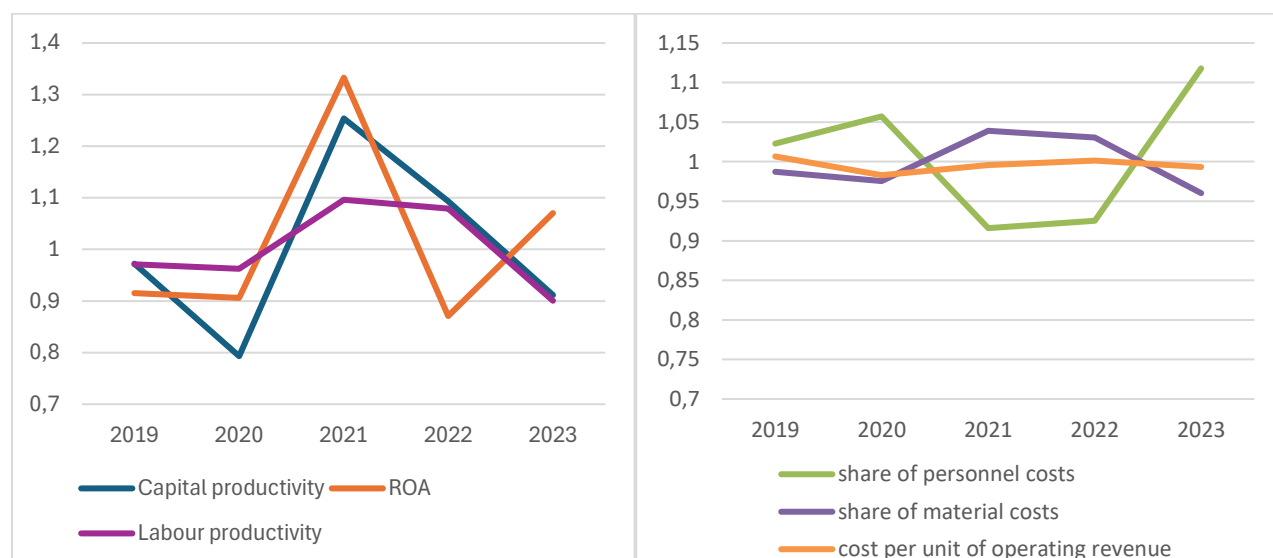
Indicators	2018	2019	2020	2021	2022	2023
Capital productivity (EUR)	3.71	3.60	2.86	3.58	3.92	3.57
ROA (%)	8.64	7.90	7.16	9.55	8.31	8.90
share of personnel costs (%)	22.19	22.70	24.00	21.98	20.34	22.74
share of material costs (%)	73.26	72.32	70.54	73.29	75.54	72.53
Labour productivity (EUR)	6.11	5.93	5.71	6.26	6.75	6.08
Cost per unit of operating revenue (EUR)	0.74	0.74	0.73	0.73	0.73	0.72

Source: own processing, Orbis database

A comparison of the level of selected indicators in textile companies (Table 1 and 2) shows that the level of capital productivity is significantly higher in the EU (EU 27), i.e. 1 Euro of fixed assets generates more operating income on average by more than a Euro (except in 2020 - the pandemic period). As regards labour productivity, it is roughly comparable, even higher in the Czech Republic than in the EU (EU 27) in some years. This is due to lower labour costs, which is also reflected in the share of labour costs in total costs. In the EU the share of wage costs in total costs is about 22 %, while in the Czech Republic it is about 18 %. The share of material costs in total costs does not differ significantly. The return on assets (ROA) is higher in textile companies in the Czech Republic until 2020, while from 2021 onwards textile companies in the EU on average have a better return on assets than companies in the Czech Republic. Figure 2 and Figure 3 illustrate the evolution of the indicators in the EU countries (EU 27). The left graph shows the indicators of

efficiency of production factors and return on assets, the right graph illustrates the evolution of the share of cost types in total costs and the cost of production.

Figure 2,3 Index of selected indicators in EU textile enterprises (EU 27)



Source: own processing, Orbis database

Figure 2 shows that capital productivity in the EU (EU 27) increased significantly in 2021, but at the same time fixed assets declined in that year (Figure 1), i.e. revenues grew in 2021 compared to 2020, while fixed assets declined. In the following year, the situation was reversed. As far as labour productivity is concerned only in this period (2020-2022) it increased, at the same time the share of personnel costs decreased. Costs per unit of operating revenue oscillated around 1 throughout the period under review.

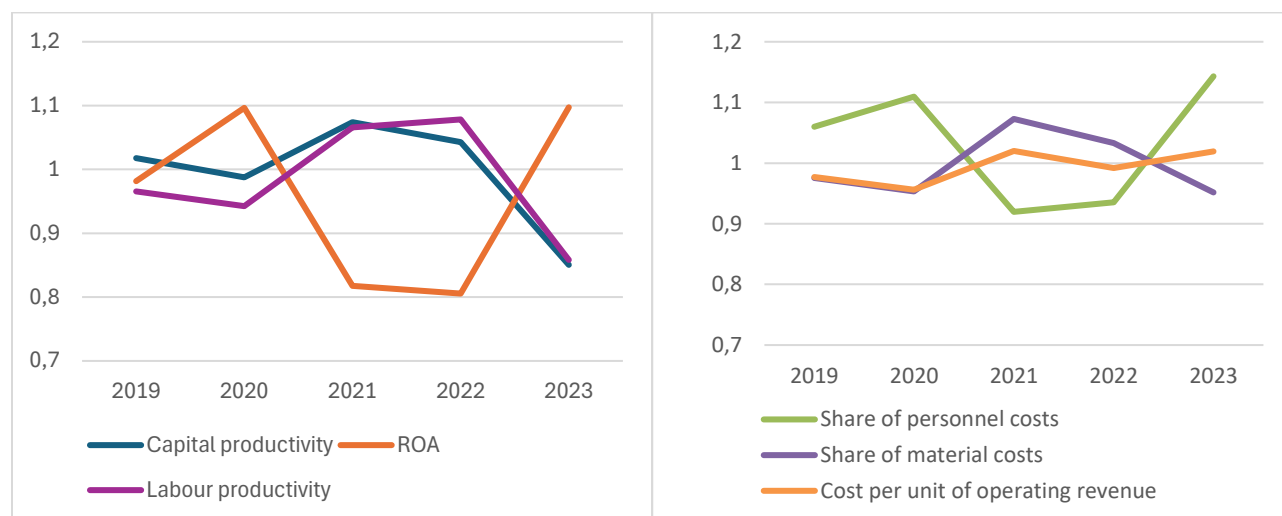
Table 2 Level of selected indicators in textile enterprises in the Czech Republic

Indicators	2018	2019	2020	2021	2022	2023
Capital productivity (EUR)	2.47	2.52	2.49	2.67	2.78	2.37
ROA (%)	9.55	9.38	10.28	8.41	6.77	7.43
share of personnel costs (%)	17.04	18.07	20.05	18.44	17.24	19.71
share of material costs (%)	76.99	75.08	71.56	76.77	79.31	75.47
Labour productivity (EUR)	7.68	7.41	6.99	7.45	8.03	6.89
Cost per unit of operating revenue (EUR)	0.76	0.75	0.71	0.73	0.72	0.74

Source: own processing, Orbis database

The development of chosen indicators in textile enterprises in the Czech Republic is different in some respects (Figure 4,5). In particular, the return on assets (ROA) in textile enterprises in the Czech Republic decreases in 2020-2022.

Figure 4,5 Index of chosen indicators in textile enterprises in the Czech Republic



Source: own processing, Orbis database

Capital productivity and labour productivity decrease in 2023 compared to 2022, identically in both EU (EU 27) and Czech enterprises, while the level of fixed assets in this year corresponds to simple reproduction (Figure 1). The evolution of the cost structure in EU (EU 27) and Czech firms is almost identical. The share of costs per unit of output increases slightly from 2020 onwards in enterprises in the Czech Republic.

4 Conclusions

Capital productivity is one of the factors that can influence the cost structure of firms. The firms want to make the most efficient use of their capital in order to achieve higher productivity and reduce the cost per unit of output, thus improving their competitiveness and profitability of the firm. In the long run, firms that increase their capital productivity become more sustainable and resilient to market fluctuations. The aim of the paper was to assess whether the change in capital productivity has an impact on the cost structure in terms of personnel costs and material costs for manufacturing firms (textile industry) in the EU (EU 27). The empirical study showed that capital productivity is affected by the amount of tangible and intangible fixed assets (Fixed Assets) acquired by the firm. Since 2021, there has been a significant increase in the size of fixed assets, where firms have been able to increase capital productivity, i.e. use newly acquired assets more efficiently to increase the operating income of firms. At the same time, the impact of a change in the productivity of capital in firms on the change in the share of personnel costs and share of material costs has not been demonstrated. The enterprise study by Caliegro et al. (2020) points out that the use of capital to increase productivity can be significantly influenced by the quality of the firm's management in terms of how efficiently it can use capital. The study found differences when comparing the development of the level of indicators for EU (EU 27) enterprises and enterprises for the Czech Republic. Enterprises in the Czech Republic have a lower share of personnel costs, a higher share of material costs and higher investment activity. In terms of productivity, enterprises in the Czech Republic have lower capital productivity but, on the other hand, higher labour productivity. On the other hand, in terms of the development of the individual variables monitored, the dynamics are very similar except for the profitability indicator (ROA). Despite these findings, capital productivity is an important indicator that needs to be further investigated. Kaus et al. (2024) point out that it is necessary to address the variance in capital productivity, which may signal distortions in market competition. In the future, they plan to focus on and the area of variance in capital productivity and the productivity of intangible fixed assets and their impact on productivity. The primary limitation of the paper is the focus on only one sector of manufacturing and the short time period when productivity was observed.

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