

## EVALUATION OF RESPONSES TO ENERGY PRICE CHANGES IN THE LIGHT OF PRIMARY RESEARCH AMONG HUNGARIAN ENTERPRISES

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### Summary

*For a business to survive, it is increasingly important to be resilient to shocks caused by the economy, the market and inflation, in addition to financial conditions. Our research was conducted in the second half of 2022, when 184 large and medium-sized enterprises were questioned online. The survey, and the purpose of our study, was to examine how businesses were responding to the rise in energy prices. The pandemic itself has posed challenges for both Hungarian and international businesses, but the emerging energy price shocks have added new challenges. The survey data were processed using SPSS statistical software package. Following the assessment of descriptive statistics, factor analysis was used to examine whether businesses responded differently or in the same way to questions about their operations. After data cleaning, three factors were identified, on the basis of which the enterprises were classified using cluster analysis, and it was then possible to characterise the enterprises at the group level. The factor analysis showed that firms follow a preference order in their short- and long-term decisions. The majority of the firms in the sample were sensitive to the increase in energy prices, with different responses.*

**Keywords:** sustainability, energy consumption, investments

**JEL:** G30 G40

## AZ ENERGIAÁR-VÁLTOZÁSOKRA ADOTT VÁLASZOK ÉRTÉKELÉSE EGY MAGYAR VÁLLALKOZÁSOK KÖRÉBEN VÉGZETT PRIMER KUTATÁS TÜKRÉBEN

### Összefoglalás

*Egy vállalkozás számára a túléléshez az anyagi feltételeken túl egyre fontosabb a gazdaság, piac, infláció okozta sokkoknak való ellenálló képességének megléte. Kutatásunk 2022 második felében történt, melynek keretében 184 nagy- illetve közepes vállalkozást kérdeztünk meg online formában. A felmérés és egyben tanulmányunk célja annak vizsgálta, hogy a vállalkozások milyen válaszlépéseket tettek az energiaárak növekedésének tükrében. A világvárvány önmagában is kihívások elé állította mind a magyar mind pedig a nemzetközi vállalkozásokat, azonban a kialakuló energia árváltozás újabb kihívásokat támasztott. A felmérés során SPSS statisztikai programcsomag segítségével dolgoztuk fel az adatokat. A leírós statisztika értékelését követően faktorelemzés segítségével vizsgáltuk, hogy a vállalkozások eltérően vagy azonos módon válaszoltak-e a működésükkel kapcsolatos kérdésekben. Az adattisztítást követően három faktort sikerült azonosítani, mely alapján a vállalkozások klaszter analízis segítségével csoportosítottuk és ezt követően vált lehetővé a vállalkozások csoport szintű jellemzése. A faktor elemzés megmutatta, hogy a cégek rövid és hosszú távú döntéseinél preferencia sorrendet követnek. A vizsgált mintában a vállalkozások többségét érzékenyen érintette az energiaárak emelkedése, melyre eltérő válaszreakciók*

*születtek. The majority of companies do not have the capacity to employ a dedicated specialist to ensure that their environmental objectives are met effectively. For long-term decisions, postponing investments has been the preferred solution to deal with the crisis. Short-term measures included limiting car use and finding new revenue sources.*

**Kulcsszavak:** fenntarthatóság, energiafogyasztás, beruházások

**JEL:** G30, G40

## Literature review

The past period has brought significant changes in the life of small and medium-sized enterprises, and even large companies. Following the global economic crisis of 2008, capital markets have slowly recovered, and after a period of almost ten years, the financing of companies in Hungary has also settled down. The National Bank of Hungary (MNB) has helped companies to access cheap funds in several stages. As the first step in the restructuring of financing, the MNB launched the Growth Loan Programme (NHP), which provided HUF 2811 billion to Hungarian businesses through the credit institution system between 2013 and 2017. The NHP enabled companies to repay around HUF 482 billion of high-interest, expensive loans they had previously taken out in three stages. The additional resources needed to kick-start business growth under the NHP programme amounted to HUF 1695 billion. Businesses were able to use the loans, which had a maximum borrowing rate of 2.5%, to purchase current assets and to pre-finance EU grants. As a second step in its corporate financing, the MNB made new loan facilities available under the NHP Fix programme for a total amount of HUF 564 billion, with 17269 companies taking advantage of this opportunity, with an average loan amount of HUF 81.3 million and a repayment period of 8.6 years. The NHP Fix programme also provided lease financing to support the asset purchases of companies, with an average deal size of HUF 11.1 million and an average repayment period of 4.9 years. Under the NHP Fix programme, the largest amount was drawn by enterprises in the agricultural sector, amounting to nearly HUF 140 billion. As a continuation of NHP Fix, the MNB loan programme NHP Hajrá became available from April 2020 with a volume of HUF 3,000 billion and 62244 transactions. Under the programme, these financial resources could be used to finance investments, purchase current assets and redeem previous investment loans for companies in the SME sector. Medium-sized enterprises received HUF 1 137 billion, small enterprises HUF 1 008 billion and micro enterprises HUF 855 billion. Large enterprises were not left without financial resources, either, as the Growth Bond Programme (GBP) offered them the possibility to secure the necessary funds for their investments. Within this programme, large companies were required to issue corporate bonds of at least HUF 1 billion, which were purchased by the MNB. The bonds have a minimum maturity of 3 years and a maximum maturity of 30 years. The corporate funds raised through the bond issue could be used for a variety of credit purposes, from classic investment to acquisitions. The MNB's efforts to increase cheap, easy-to-afford credit have given many Hungarian enterprises access to resources that have allowed them to grow and develop. However, development slowed considerably with the outbreak and spread of the Covid-19 pandemic. (Németh et al. 2023)

In addition to the monetary policy of the MNB, fiscal policy has also faced serious challenges in how to support Hungarian enterprises to stay on track, which also has a significant impact on employment levels. The pandemic confronted the world with challenges that had not been anticipated before, even the most extreme risk forecasts had not realistically expected such a

situation, every business and household had to adapt their daily operating routine, new solutions had to be found quickly to problems and tasks for which there was no previous experience. We now know that the economy and economic players coped well with the obstacles, and today we can almost look back on the pandemic as a thing of the past, but many businesses, families and households still bear the scars and negative experiences of the process. One of the most significant changes is the legalization and acceptance of working from home. Many companies still do not expect their employees to travel to work every day, and it has been proven that working from home can be efficient. The pandemic has also highlighted the vulnerability of supply chains, and as a consequence companies have had to rethink and adapt their procurement strategies. Businesses and households were just trying to recover when they were faced with a new economic and market challenge, namely rising energy prices, energy shortages and rising inflation. (Lencsés et al. 2023) (Kucséber and Kása 2023) (Kozák et al. 2018.)

The characteristics of successful enterprises are summarised below in Schmuck's 2012 article:

- Existence of strategic alignment
- Customer focus
- Increasing efficiency
- Innovation
- Defining the core capabilities that can make a company unique
- Ability to change. (Schmuck, 2012)

Recent years have highlighted the need for a corporate strategy, but it is not enough to apply the same tools and processes as before. The literature classifies strategy into corporate strategy, business strategy and functional strategy. The role of functional strategy has increased in recent times, as it encompasses marketing, finance, human resource management, production and services, and R&D&I. Corporate strategy may be aimed at increasing the size of the company or may be interested in stabilizing the size of the company. In times of crisis, if the business interest so requires, the strategy may be to reduce the size of the company and to narrow the scope of its activities. (Jelen – Nagy-Borsy 2023) Changes in the price of energy and other inputs have necessitated the development of a cost-dictating business strategy aimed, among other things, at reducing the firm's fixed costs. (Balaton – Tari 2016) Effective strategic planning is an indispensable component for the successful operation of companies, which includes gathering information, analysing information and data, defining corporate strategic objectives and selecting the appropriate strategy (Balaton et al. 2017).

Ernő Tari has studied in detail the evolution of corporate strategy making and its developmental stages (Tari, 2006) Companies, owners and management are confronted on a daily basis with a wealth of data and information that they need to consider, which may come from within the company, but can also come from the outside world, whether from a competitor or a supplier. This activity has now become an expert task, requiring specific expertise (Szóka et al. 2021).

In our research in the business sector, we also investigated the responses of companies to the changing market conditions, whether in terms of strategy development or the use of external experts to deal with the problem. The aim of our research is to examine the short- and long-term measures adopted by domestic enterprises. Our hypothesis is as follows: Enterprises form distinct and well-characterised groups based on their responses to the energy crisis. Different groups require different packages of measures to ensure that the most effective tools are available to address their operational problems.

## Material and method

In November 2023, we conducted an online survey of medium-sized and large businesses using a snowball method. The framework for the online survey was provided by Google Forms, which allowed the importation of the responses obtained with Excel and later processing of these data with SPSS version 26.0. After coding the questions, the results of descriptive statistics and cross-tabulation analysis between questions were performed, and later factor and cluster analysis were carried out. The questionnaire consisted of 13 questions, and a Likert scale was used for several of the responses. The most complex question asked respondents to rate 27 statements on a scale of 1 to 6 for their own company. Based on the statements, the responses were reduced using principal component analysis and then our respondent firms were grouped using K-means cluster analysis. For the principal component analysis, the suitability of the data to perform the analysis was assessed using the KMO (Kaiser-Meyer-Olkin) and Bartlett's test (Toralik et al., 2022). The total number of assessable responses was 184. The question types tested were nominal and ordinal variables comparisons. Where there was a correlation between two variables, the P value was less than 0.05. In addition to the Chi-squared test, we also examined the Cramer's V characteristics. (Nádasdi és Csernák, 2021)

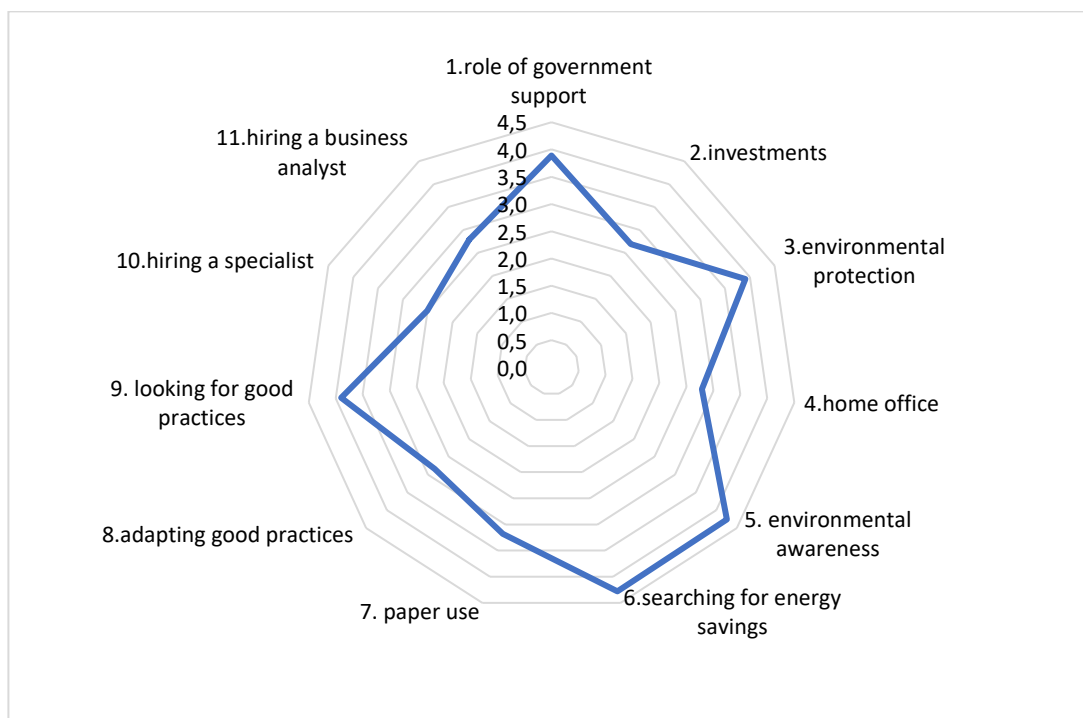
## Results

Our research looked at a number of areas of business operations, but the central question was to map the response to changes in energy prices. Of the 184 businesses in the sample, most of them met their energy needs from gas and electricity exclusively, and only 12 were using renewable energy sources to meet all their energy needs in 2021, which, as the responses showed, was mostly deriving from solar energy. This result is in line with previous data published by the Central Statistical Office (KSH), which shows that in 2021, solar energy accounted for 54.9% of all renewable energy sources (KSH, 2022). A significant proportion of the companies surveyed have had to face changes in energy prices and find ways to finance the additional expenditure. The responding companies were unable to make any significant changes to the way in which they used their energy sources (purchased, own), as investments in renewable energy generation are a significant drain on resources and slow to pay back. Of the 184 companies, 15 were able to make immediate changes to the energy situation, thus eliminating market dependence, and 62 were able to achieve partial independence in the provision of energy.

Our research hypothesis suggested that the enterprises interviewed react differently to the energy situation, but that they can nevertheless form different groups. Group formation may be important because differentiated support may be important from the point of view of the state, and different instruments may be needed to deal with difficulties from one group to another. The factor analysis was based on a question with 27 statements, which enterprises could answer on a Likert scale of 1 to 6. Some of the statements focused on how the company had responded to the crisis situation and on the extent to which the company had adopted and applied environmental protection and related good practices, either from its business partners or from other companies within the group. Access to public support for investments in renewable energy sources is a very important aspect for businesses, with 57.7% of respondents scoring a 4 or higher on a scale of 1 to 6 for the need for public involvement in this area. These responses are understandable, as the establishment of

renewable energy investments require a large capital investment at the same time as the returns can be measured over several decades. In view of the situation, 70% of enterprises responded by suspending their investments to some extent, 7% of them, i.e. 13 enterprises, decided to suspend their investments completely. 85% of respondents indicated that they were willing to make investments that were likely to pay off in the foreseeable future, with 50% of them considering return on investment as a key factor, which is important because environmental investments pay off slowly or their return to an enterprise may not be directly measurable. However, the energy crisis seems to have drawn attention not only to the need to protect the environment, but also to the need to make investments that not only reduce energy use, but also allow businesses to meet their own needs. For 10% of respondents, the energy crisis did not generate any particular change in the life of the company in terms of energy demand and use. For almost 40% of respondents, environmental awareness scored only medium. The other side of the coin is that 60% of respondents consider environmental issues to be important and a priority. 23.4% of respondents, or 43 companies, said that they do not only comply with mandatory environmental rules. 30% of the responding companies always paid attention to adopting environmentally friendly solutions.

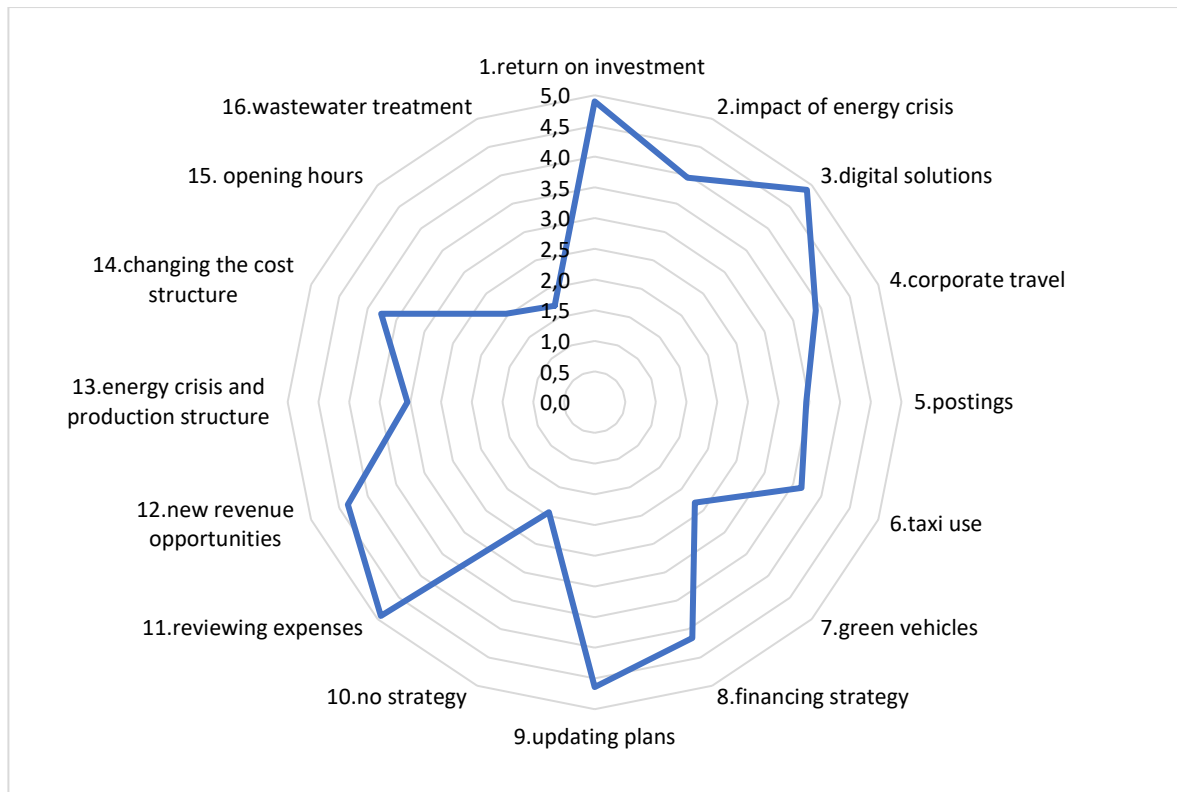
The results of the most typical actions taken in response to the energy crisis are summarised in two spider web diagrams shown in Figure 1 and 2.



**Figure 1 Evaluation of the response to the changed energy situation I.**

*Source: authors' own editing based on their research data*

In the first statement, we assumed that if companies received more state support for renewable energy investments, they would choose to invest in renewable energy projects in higher proportions. However, this was not confirmed by the responses received, as on a Likert scale of 1 to 6, statement 1 meant that the statement would not influence the decision at all, and statement 6 meant that the state support would influence the decision completely. The average response was 3.89, meaning that enterprises would welcome state aid to help finance renewable energy investments, but it is not necessarily the key to the solution, with almost 80 enterprises saying that the existence of state aid is not a decisive factor, and 52 enterprises saying that they would be completely dependent on state support to make future investments. In the next question, we asked about the situation of investments already planned, with 71% of businesses less likely to suspend investments already started, and only 13 of them opting for this drastic solution. Regarding the environment and renewable energy use, 110 enterprises stated that this is an important area for them, to the extent that they do not only comply with mandatory legislation in their operations. The importance of environmental awareness is shown by the fact that respondents gave a score of 4.26 to our statement that "we have always paid attention to environmental awareness in the company". The widespread use of home office working has transformed the conditions and circumstances of working, but in the case of the companies we interviewed, they have tried to return to working from the office. For the statement "due to the energy crisis, we have reduced office work, we have set up a home office", we obtained a score of 2.79, which is more a reflection of an uncharacteristic decision than a frequently used solution to the problem of where to work. The issue of energy saving, and its importance is a key issue in business operations, with the use of insulation, replacement of windows and doors and other good practices having a positive impact on the energy costs of businesses. In terms of paper use, environmental awareness is not necessarily present among the enterprises surveyed, with only 31 enterprises using recycled paper in a typical way. Business partners can provide good examples of environmentally responsible behaviour, with more than 1/3 of our respondents playing an important role in their operations and 17 respondents reporting very typical practices. It is important to note that we not only examined the concrete steps taken by businesses to be environmentally responsible and energy efficient, but also their future intentions, where the proportion of companies that are looking for good solutions but have not yet been able to implement them is already higher. The number of respondents who have been able to purchase "green" vehicles in the past period in the spirit of sustainability is relatively low. The efficient energy management of enterprises can be helped by a good knowledge of their processes, which can be facilitated by the use of a good business analyst, but in this question the respondents tended to select the answer "not typical", a similar result was obtained when asking how typical it is for the company/group to employ a dedicated specialist to improve energy efficiency.



**Figure 2 Evaluation of the response to the changed energy situation II.**

*Source: authors' own editing based on their research data*

The first area of assessment in the next block of statements was on the establishment of investments. The composition of the responses shows that the main expectation for the investments made by enterprises is a quick financial return. The emergence of the energy crisis has led businesses to accelerate their search for solutions that are more environmentally friendly. In 53% of the responses received, the statement that "the energy crisis has accelerated the search for environmentally conscious solutions" is very typical. The rise of digital solutions has also become a feature of corporate operations, but reducing the number of business trips, limiting outbound and Hungarian travel, and reducing taxi use are not the only ways to reduce costs. Of course, these possible solutions were selected by many respondents, but they were not the dominant operational drivers. In the literature section, the concept of strategy was discussed in terms of its areas. In our own research, we also looked at this area, with 120 respondents stating that the use of a financing strategy is a typical operational feature, along with the updating of plans. In a control question, we made a statement about the concept of strategy, provoking the respondents: 'we have no strategy because life constantly overrides it, it is superfluous!'. The results showed that 93.3% of the responding companies consider it important to have a strategy and use it, as confirmed by the fact that our statement "we regularly review our financial expenditure" was marked as a typical process by more than 90% of the respondents. In addition to reviewing expenditure, increasing revenue was also seen as a way to finance increased expenditure, with 72.3% of respondents taking up this option. Increases in prices and costs may make management think about restructuring production, but this was not a typical response to the crisis. The production structure is linked to the cost structure, and therefore firms were not able to make any significant changes in the short term. Both changes to the production structure and changes to the cost structure require long-term planning and implementation. In view of the altered economic/market environment, respondents were less

likely to see changing opening hours as a good solution, and this was also not seen as a typical solution. As a further part of the analysis, a factor and cluster analysis was carried out on the basis of the 27 statements detailed earlier. Three factors were generated based on the 27 statements.

Characteristics constituting Factor 1 (blue candlestick diagram)-strategic measures factor:

- Financial expenditure is regularly reviewed
- Our plans are constantly updated
- We prioritise digital solutions
- We have a financing strategy for the operation of the business
- We have always paid attention to environmental awareness in the company
- We explore new revenue opportunities.
- We look for good examples and practices in the use of green solutions
- We address environmental issues, not just comply with mandatory rules
- Looking for energy saving solutions e.g. insulation, replacement of windows and doors
- The energy crisis has accelerated the search for environmentally friendly solutions
- Financial return on our new investments is a priority for us
- We use white paper only when necessary, we use recycled paper
- We have taken on more applicable greener solutions from our business partners

Characteristics constituting Factor 2 (green candlestick diagram)- rapid decisions factor:

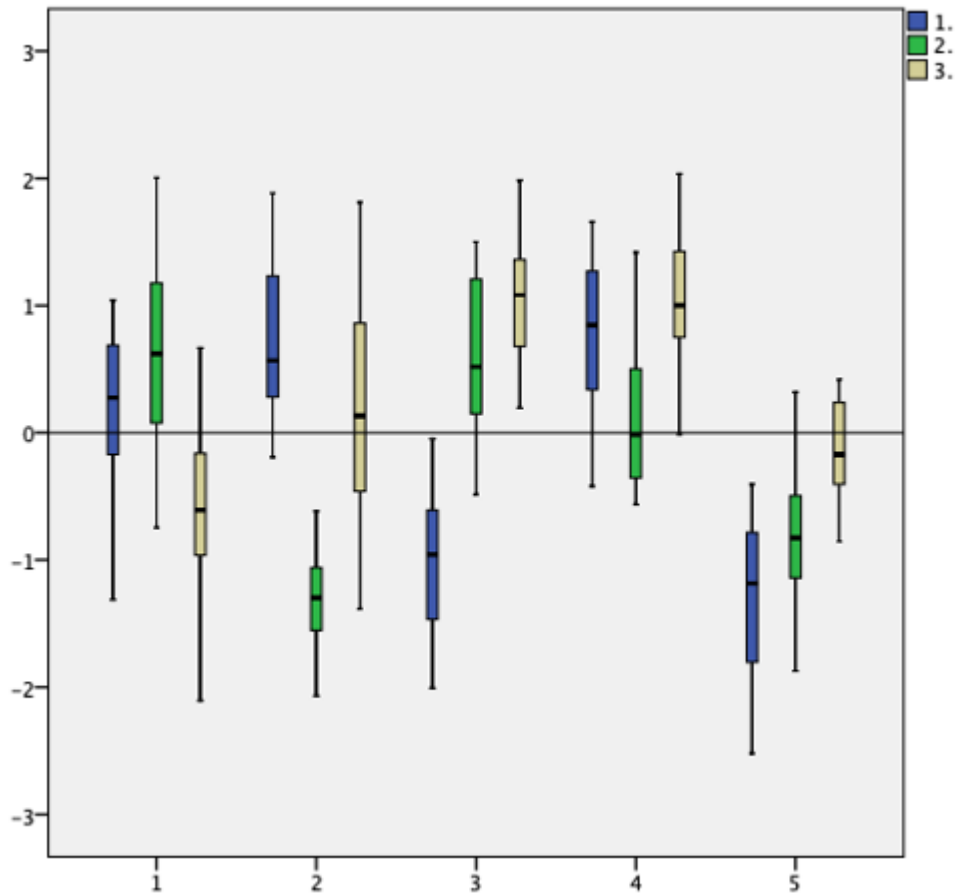
- We have minimized our corporate travel
- We have reduced the number of foreign and domestic missions
- We have reduced taxi use
- We have had to change our production structure due to the changes in energy prices
- We have had to change our cost structure due the energy crisis
- In the current economic situation, we have suspended all investments
- If our company received more government support, we would invest in alternative energy
- Due the energy crisis, we have reduced office work, we have set up a home office

Characteristics constituting Factor 3 (light coloured diagram)-environmental consciousness factor:

- At our company, a separate specialist/group/organizational unit deals with the use of renewable energy
- We have purchased green vehicles
- Wastewater is cleaned and recycled
- We employ a business analyst in order to optimize our processes
- Due the energy crisis, we have changed our opening hours

Based on these factors, Figure 3 shows the weight of the individual factors in the cluster of the examined company sample, i.e. the weight of the individual factors in the decisions of some companies.





**Figure 3 Representation of the company group formed on the basis of the three factors using candlestick charts**

*Source: authors' own editing based on their research data*

The number of enterprises belonging to the first group was 68, i.e. 37% of the sample. This group contained the largest number of elements. The businesses realized that it is necessary to take steps to solve the emerging problems as soon as possible. From the point of view of the sample, most businesses know their situation and are aware that it is necessary to react to the situation as soon as possible, mainly by reducing costs and/or searching for new revenue opportunities. The resulting clusters and their characteristics are summarised in Table 1.

**Table 1 Number of clusters formed and their constituent elements**

Name	Group 1	Group 2	Group 3	Group 4	Group 5
Number of companies in the cluster	68	52	16	25	23
Share of companies in the cluster	37%	28.3%	8.7%	13.5	12.5%

*Source: authors' own editing based on their research data*

The enterprises belonging to the second group made up 28.3% of the sample. The measures taken by this group could be termed as a package of soft measures, i.e. responses that do not represent radical changes in the life of these companies. They consciously prepare even for unforeseen events by constantly updating their financial plans, focusing on increasing revenues rather than radically reducing costs.

The common characteristic of the respondents belonging to the third group is that they, who sacrifice the most for the enforcement of environmental protection aspects, employ specialists in order to optimize their processes. The transformation of the cost structure and the modification of the production structure also play a role in company decisions. Soft measures have the smallest role in the operation of enterprises. The number of enterprises making up this group is 16, the group with the smallest number of elements in the sample.

The number of companies in Cluster 4 is 25. In addition to soft measures, long-term financial decisions involving larger expenses also determine the operation, the preference for increasing income creates the financial cover for larger expenses. The short-term financial measures fall into the medium range, so these companies could not be called indifferent with regard to the transformation of the cost structure or the future of the implementation of investments. Finally, in the case of the 23 companies belonging to the fifth and last group, we see the reaction of expectation with regard to the individual statements, the least typical of these companies is that they have a financial plan, environmental awareness is not important, and they only comply with the mandatory environmental protection rules. (Baranyi et al. 2023)

## **Conclusions and recommendations**

In the first part of our research, we reviewed the financing options offered by the MNB for large, small and medium-sized enterprises in Hungary in the past period. The financing structure following the financial crisis created favourable conditions for corporate growth and the establishment of investments. However, the Covid-19 pandemic and the altered energy situation have made regulators and financiers come up with new solutions. In the second part of our research, we provided an insight into the results of the primary survey conducted in companies. Our main hypothesis is that the responding enterprises reacted differently to the altered economic and market conditions. Our hypothesis was confirmed, as we were able to identify three factors based on our questionnaire, which included 27 statements, on the basis of which we classified the responding companies into five groups. The responses to the altered energy situation clearly show that short- and long-term financial decisions have had a significant impact on the operation of businesses and the energy situation, and solutions have been created that do not involve significant structural transformation. Businesses do not see the solution in quick measures, which entail significant cost or production structure modification. The financial return on investments is a key issue for almost every business.

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