# Changes in the Economic Behaviour of Czech Households in the Years of Economic Crisis and Pandemic

**Stanislava Hronová**[1] | *Prague University of Economics and Business, Prague, Czech Republic*

**Richard Hindls**[2] | *Prague University of Economics and Business, Prague, Czech Republic*

## Abstract

In the period following 2000, the Czech economy went through two crises, which were different in their causes, durations and consequences. The 2009–2013 crisis resulted from the global financial and fiscal crisis. Its causes were external and purely economic, and its impact on households' economic behaviour was 'standard' – a gradual and moderate reduction in consumption and investment with high unemployment and low inflation rates. The advent of the COVID-19 pandemic in 2020 meant a sudden and unexpected change in economic conditions – the closure of shops and services, restricted population movements, and household consumption limited to only the most essential products. A reduction in household consumption generally means an increase in household savings if all other circumstances are equal. The aim of the present paper is to show, using the methods of time series analysis, the effects of these two crisis periods in terms of data for the household sector or to show whether the fall in the propensity to consume and the rise in the propensity to save in 2020–2021 can be considered statistically significant compared to the crisis period of 2009–2013. Publicly available data from the Czech Statistical Office have been used for our analysis.

---

[1]   Department of Economic Statistics, Faculty of Informatics and Statistics, Prague University of Economics and Business, Czech Republic- E-mail: hronova@vse.cz. ORCID: <https://orcid.org/0000-0002-3568-9755>.

[2]   Department of Statistics and Probability, Faculty of Informatics and Statistics, Prague University of Economics and Business, Czech Republic. E-mail: hindls@vse.cz. ORCID: <https://orcid.org/0000-0002-0887-3346>.

## INTRODUCTION

Households represent an important economic entity; they influence the national economy's performance through their economic behaviour. In analyses based on macroeconomic data (national accounts data), households are represented by the institutional sector, whose primary economic function is consumption (or production in the case of minor-scale entrepreneurs included in the household sector); the main sources for financing their activities are derived from labour income (or the sale of the results of their own activity). In the national accounts, household consumption is expressed by two indices: final consumption expenditure, which is (in simplified terms) what households spend, and actual final consumption, which is the sum of final consumption expenditure and social transfers in kind. It expresses what households consume regardless of who pays for this consumption. Final consumption is generally covered by disposable income. What is left is saving. Thus, in analyses of household economic behaviour, three indices are of primary interest: disposable income, final consumption expenditure and saving.

In general, it is typical for household spending on final consumption and investment to rise in years of economic growth. This behaviour results in decreases in their saving and financial saving rates. Households then find it difficult to fulfil their role as creators of spare funds to finance any deficits of other sectors, in particular, the general government. Households that do not generate sufficient financial resources for their consumption and investment cover the difference with the aid of credit. Years of recession or even crisis following after years of economic growth bring about a reversal in household behaviour, manifested by a cautious approach to consumption (and possibly consumption smoothing) and little interest in investment and, consequently, in long-term credit. At the same time, in years of crisis, it should be a prevailing behaviour for households to reduce their non-financial and financial investments or try to save their spare funds in less risky assets.

The economic behaviour of Czech households in the post-2000 period broadly conformed to this outline. Consumption and indebtedness increased in the years of economic growth, and consumption and investment were reduced in the years of recession and crisis. However, the crises that affected Czech (and not only Czech) households after 2000 differed in their causes, durations, and consequences. The period 2009–2013 was that of reversals in the Czech economy: a decline in economic activity in 2009, a recovery in 2010 and 2011, followed by the return of the crisis in 2012 and 2013, and growth from 2014 onwards (see Hronová and Hindls, 2013). This period is also characterised by a general decline in investment activity, low inflation, falling interest rates on deposits and loans, and a controlled depreciation of the Czech currency. The causes of this global crisis were economic factors originating from the mortgage and fiscal crisis in the US, which quickly spread to Europe and other parts of the world.

The period since 2014 was a period of prosperity in Czechia. The key sectors (industry, construction, services, and foreign trade) prospered, growth was supported by investment from both the businesses and the state, general government debt was falling in relation to GDP, and real wages were rising. The inflation rate and the unemployment rate were below 3%. But then an unexpected external stimulus intervened. The advent of the COVID-19 pandemic caused a sharp decline in economic activity in all spheres of activity, with production cutbacks in many large industrial enterprises, closure of shops and services, restricted population movements, and the resulting losses in transport and tourism, reduction of household consumption to only essential products, etc. The state mitigated the impact of the pandemic on enterprises and households through a system of massive subsidies and compensations. These measures prevented a sharp rise in unemployment and business failures but at the cost of increasing the general government deficit and debt. The root causes of this crisis were neither domestic nor economic. The pandemic situation froze the entire world economy. In addition to economic uncertainty and the inability to 'spend', household behaviour and motivation were paralysed by life and health insecurity. Consequently, the decrease in household final consumption expenditure was higher than that of GDP. As a result of the inability to travel and with the existence of unrealised

purchasing power in the market for consumer goods, demand for real estate (including holiday housing) increased significantly in Czechia, which triggered a significant rise in property prices (see Hronová et al., 2022).

With the gradual easing of the healthcare restrictions, 2022 marked the beginning of a return to normal conditions for households. However, the pandemic period undoubtedly caused lasting changes in the economic behaviour of households that have not fully recovered their consumption habits even now. High inflation rates, particularly the rise in energy and food prices in 2023, forced households to once again curb their consumption and adopt a cautious investment behaviour. Restrictions in consumption generally imply an increase in savings if all other circumstances are equal. This general rule is regularly reflected in household behaviour. But was the growth in savings (meaning gross savings of the household sector) in the COVID-19 period really extraordinary? Can the fall in the propensity to consume and the rise in the propensity to save in 2020–2021 be considered statistically significant compared to the crisis period 2009–2013? How did these crisis periods differ in terms of data for the household sector?

We will seek an answer to this question by analysing the corresponding time series. However, we will also try to identify the intensity of these changes in the individual time series by analysing the data hidden in the indices. That is to say, to answer not only whether the changes in household behaviour trends have been confirmed but also how strong these trends are and for which indices they have been stronger or weaker. Moreover, to determine whether these differences were not only evident for each of the indices but also whether there were significant differences over time, as we examined qualitatively different periods (the downturn in economic activity in 2009, the recovery in 2010 and 2011, the growth difficulties in 2012 and 2013, the growth from 2014 onwards, and finally the impact of COVID-19 and events after 2019 – see above).

For such data analysis, we will first use techniques that formulate a model for each period. We will then subject these models to stability analysis. In other words, we will compare the levels of breaks (decline/growth). That is, the models' different (i.e., unstable) structures for both individual indices and individual time phases. Due to the specific features of economic development in different countries during the COVID-19 pandemic (see below), our analysis will focus on the case of Czechia, using publicly available data from the Czech Statistical Office (*www.czso.cz*).

## 1 LITERATURE REVIEW

The arrival of the COVID-19 pandemic was sudden and unexpected, quickly affecting the whole world. National governments reacted speedily and in the only way possible in such a situation: isolation of the infected, strict hygiene measures, and restrictions on movement and assembly. This approach logically brought a reduction in economic activity; most shops and services were closed, transport and travel were severely restricted, and schools were closed. All of this meant a fundamental change in households' economic and social behaviour and significantly affected firms' economic performance. In an attempt to prevent losses to businesses, especially small-scale producers, which in many cases (restaurants, hotels and other services) had to stop their activities altogether, national governments introduced several measures in the form of exceptional subsidies and compensations. These were intended, among other things, to maintain employment and, together with a system of extraordinary social benefits, to stabilise household incomes. These measures, together with limited shopping opportunities in shops and the impossibility of travelling, meant (despite the significant development of online shopping) a substantial reduction in household consumption. A decline in the propensity to consume generally implies an increase in the propensity to save. Therefore, many studies have looked not only at the decrease in household final consumption expenditure but also at the growth in household savings.

Studies on the impact of restrictive measures during the pandemic were already appearing in 2020 and 2021, and quite logically they were primarily based on high-frequency data, as only this could provide

a practically up-to-date picture of changes in household economic behaviour. The anti-epidemic and social measures taken by governments were not the same for each country, and by analogy, household responses to the effects of the pandemic varied among countries. The specific nature of the data (from payment transactions) and the difficulties in internationally comparing the conditions were the reasons why studies of the impact of the pandemic on household behaviour were always focused on one particular country.

The Review of the Economics of Households Journal published over a dozen articles in 2020 and 2021 on various aspects of household economic and social behaviour in the context of the COVID-19 pandemic. The rationale for such an initiative was the fact that 'the pandemic and all its direct and indirect effects are mediated mainly through individuals making decisions within households' (Davis, 2021: 281).

The most common type of the data used for analysis already in 2020 was that of payment card records. Bounie et al. (2020) tracked changes in the economic behaviour of French households using card payment data. They found that households spent less because they earned less, and their purchases were concentrated in fewer outlets, but the average amount spent per purchase was higher than before COVID-19. Sheridan et al. (2020) examined the situation in Denmark and Sweden. Based on data from Danske Bank, they concluded that the decline in final consumption expenditure by Danish households was mainly a response to the threat of the pandemic; they considered the restrictions and closures of shops and establishments as well as restrictions on population movements to be less important in terms of the decline in consumption. The situation of Danish households (the source was again Danske Bank data) was also discussed by Anders et al. (2022). Their study reported that the most significant declines in final consumption expenditure occurred among pensioner and single-person households. However, the large initial decrease in consumption expenditure (by almost 30%) was offset by an increase in household savings and net worth. The differential response of different household types to pandemic-related measures was also demonstrated by Christelis et al. (2020). Using financial uncertainty models on data from six selected EU countries, they showed that the decline in consumption was most pronounced among low-income households, households in regions with high unemployment, and households of young persons. They also pointed out that these household groups should be targeted for state support in times of crisis. In contrast to Sheridan et al. (2020), they concluded that health concerns had not been shown to be an underlying factor in reducing consumption expenditure.

Data on card payments in Spain were used by Carvalho et al. (2021), who looked not only at the value of transactions made but also at the locations of the transactions concerning the economic level of the respective area. They concluded that the decline in consumption expenditure was more significant in areas with a wealthier population, in line with a significant reduction in mobility. Campos-Vazquez and Esquivel (2021) analysed point-of-sale payment transactions and mobile operator data during a pandemic shutdown in Mexico. During the first three months of the shutdown, household consumption expenditures fell by a quarter, but this decline was not uniform across the country. Logically, tourism-dependent areas were hit the hardest.

The situation in China, the country from where the COVID-19 epidemic started to spread, was, for example, studied by Li et al. (2020) and Chen et al. (2021). Li et al. compiled responses from two monthly China Household Finance Surveys (February and May 2020) and showed a drastic reduction in consumption due to income constraints. Chen et al. analysed daily payment transaction data from the UnionPay payment service provider. They showed that consumption spending fell by one-third in the three months following the outbreak.

The situation in Czechia during the COVID-19 pandemic was, for example, discussed by Botlíková et al. (2021), and Zubíková and Smolák (2022). The former authors focused on the analysis of the evolution of Czech households' final consumption expenditure and savings during the pandemic. They showed that the growth in savings was caused not only by a decrease in expenditure but also by an increase in income. The growth in household indebtedness was more pronounced during the economic crisis

years 2009–2013 than during the pandemic period (2020–2021). In their study, Zubíková and Smolák (2022) examined the macroeconomic, primarily monetary and fiscal, effects of the pandemic in the Czech Republic. Analysing data for the pre-pandemic year 2019 and the pandemic years (2020–2021), they concluded that developments in Czechia were consistent with the partial hypotheses of the Mundell-Fleming model and the modified Phillips curve hypothesis.

Studies published between 2022 and 2024 already focused more on the broader context of the pandemic impact on household behaviour using data from regular surveys and partly on the change in the economic environment with the advent of high price increases. However, such analyses again focused (for the reasons outlined above) on the situation in one country.

The financial situation of French households (and businesses) during the two years of the pandemic was analysed by Fize et al. (2022) using bank account data from Credit Mutuel Alliance Fédérale. In particular, they focused on the evolution of gross household savings, expressed as the sum of current and savings account balances, securities accounts, and life insurance. The decline in final consumption expenditure, together with government support during 2020, meant a continuous (albeit slow) increase in gross savings. The end of 2021 then meant a decline in gross savings in all but the wealthiest household groups. For the poorest households, gross savings have returned to their pre-crisis levels. The study by De Pommerol et al. (2024) also looked at the evolution of gross savings by French households. The authors found that the pandemic period led to an unprecedented increase in gross savings, thanks to the stability of income (in the category of employees) and the decline in consumption. The savings rate of French households reached a record high of 26.6% of gross disposable income in the second quarter of 2020, falling to 17.5% of gross disposable income in 2023. However, the average post-COVID-19 (2022 and 2023) savings rate (18.8%) was still about four percentage points higher than the long-term pre-COVID-19 savings rate (14.6%). High inflation rates[3] caused the real value of financial assets to fall and eliminated revaluation gains.

Ridhwan et al. (2024) analysed the impact of restrictions during a pandemic on household income and consumption in Indonesia. They used high-frequency data from Bank Indonesia's monthly consumer survey, which had more than 176.000 respondents. They found that households struggled to smooth their consumption when their incomes fell, which led to an increase in the proportion of income devoted to consumption while reducing the proportion of debt repayments and savings. However, the impact of government restrictions on households varied by type of expenditure, by region, and by the attained education level.

A summary of the findings from the pandemic period was the study by Parker et al. (2022), in which the authors mainly focused on the comparison between the 2008–2009 and the COVID-19 crises. According to the authors, the key difference was that the pandemic measures reduced households' access to a range of goods and especially services; in other words, there was nothing to spend money on. On the other hand, there were extraordinary support and compensations from the state, support programmes for small entrepreneurs and compensations of employers' wage costs to maintain employment, which managed to keep income levels stable. Together with the inability to spend, that development led to an increase in savings, especially by low-income households. These subsidies and compensations were a different 'type of cure' for the crisis; in 2008–2009, when the economic recovery was particularly strong, the main 'type of cure' was a system of tax reliefs.

The periods of the pandemic crisis (2020) and the subsequent recession and recovery were the focus of a study by Chen et al. (2024). Using panel regression methods, the authors attempted to model the fall in consumption during the pandemic and its recovery in 2022, taking into account the nature of the cities where households live. They showed that spending on non-durable items returned very

---

[3] In France, the inflation rate was 5.2% in 2022 and 4.9% in 2023.

quickly to pre-pandemic levels; the recovery rate in leisure-related expenditures was significantly slower. The largest decline in consumption in the aftermath of the pandemic was observed in cities where the service sector dominated. A milder decline and faster recovery in consumption were observed in cities with a predominant secondary sector.

MacGee et al. (2022) analysed the effects of the pandemic on Canadian household debt and savings. Using income distribution models, they showed that while low-income households faced the highest risk of unemployment, their losses were offset by social transfers. In contrast, middle-income households experienced a significant increase in debt when they lost their jobs, as social transfers were insufficient to cover the decline in labour income. The increase in savings was particularly marked among high-income households, which were virtually free of unemployment and whose consumption expenditure was most decreased due to mobility constraints.

Marangoz and Ozkoc (2023) examined changes in household spending over a longer time period (2015–2022) in Turkey based on central bank data on card payments. They used the method of structural break tests, which allowed them to demonstrate that the drop in household consumption expenditures at the beginning of the pandemic was significantly smaller than the growth of these expenditures after the relaxation of restrictions at the end of the pandemic.

Most of the studies analysing household economic behaviour during the COVID-19 pandemic were focused on the immediate period of the pandemic in an attempt to capture the effects of the restrictions and the decline in household consumption. In other words, they attempted to capture the fundamental change in household consumption behaviour brought about by a completely exceptional situation. Therefore, trying to quickly provide information on changes in household economic behaviour, the first studies focused on the analysis of high-frequency data. Crises triggered by economic factors or by the behaviour of economic agents (financial institutions or political decisions) can differ fundamentally from the impact of a pandemic. Nevertheless, time-series analyses of short-term data are rare in the presented studies (see, in part, Parker et al., 2022; or Botlíková et al., 2021) that would provide a comparison between the significance of the change in household economic behaviour induced by the impact of the 2009 economic crisis on the one hand and the impact of the 2020–2021 pandemic on the other hand. It is this gap that we would like to fill by analysing the economic behaviour of Czech households based on data from the Czech Statistical Office. The aim of the present article is, therefore, to compare the intensity of the break that occurred in the economic behaviour of Czech households in the years of the economic crisis 2009–2013 and in the years of the pandemic crisis 2020–2021.

## 2 DATA AND METHODS USED

The distinct national-specific features of the economic crises during the pandemic (see above) led us to focus on the data of only one country, i.e., Czechia. The data source was the National Accounts database of the Czech Statistical Office.[4] Our analysis has been based on quarterly national accounts data for the period 2000 to 2023, not only for the household sector but also for the general government sector. We used both absolute indices (GDP, final consumption expenditure of households, final consumption expenditure of general government, and social transfers in kind) when their values were expressed in comparable prices; and relative indices (savings rate, financial savings rate, proportion of social benefits collected by households in their gross disposable income) when the selected absolute indices were available only in current prices.

In order to answer our research questions posed in the Introduction, i.e., to compare the intensity of breaks, it is suggested to use Chow's test of the stability of different data sections in a given time series (see, e.g., Cipra, 2003). We made a reasonable substantive assumption (see the description of the

---

[4] Cf. <*https://apl.czso.cz/pll/rocenka/rocenka.indexnu*>.

economic context above) that this would be a model with one 'qualitative' change between two consecutive time periods. And because we want to compare not only the evolution within the time series but also two different critical turning points in the economy (the crisis starting in 2009 on the one hand, and the onset of COVID-19 and related events in 2020 on the other hand), we split the time sub-periods in the quarterly time series data, which are for the period 2000–2023, as follows:

**Table 1** Breakdown of time periods into sub-periods for the analysis of developmental changes

| Period | Sub-period |
|---|---|
| 2000–2013 | 2000–2008 |
| | 2009–2013 |
| 2014–2023 | 2014–2019 |
| | 2020–2023 |

The division into these periods corresponds to the definition of two qualitatively different phases in the development of the Czech economy, as described above. The divisions into sub-periods within these periods then correspond to two completely different causes of the breaks (so-called break dates): the economic crisis starting in 2009 and the crisis associated with the COVID-19 attack at the beginning of 2020. Both of these intervention breaks correspond to Chow's established methodology.

The basic idea divides a time series with $T$ observations into two sub-periods of lengths $T_1$ and $T_2$, where $T_1 + T_2 = T$. For each sub-period, we then formulate two models:

$$y_t = \beta_1 + \beta_2 x_{t2} + \ldots + \beta_k x_{tk} + \varepsilon_t, \qquad\qquad t = 1, 2, \ldots, T_1, \qquad\qquad (1)$$

and

$$y_t = (\beta_1 + \beta_{k+1}) + (\beta_2 + \beta_{k+2}) x_{t2} + \ldots + (\beta_k + \beta_{2k}) x_{tk} + \varepsilon_t, \qquad t = T_1+1, T_1+2, \ldots, T_1+T_2=T, \qquad (2)$$

where $x_t$ are the explanatory variables, i.e., independent variables (including the time variable); $\beta$ are the model parameters. In principle, we are interested in stability if the model slopes, which may be tested, for example, with the aid of the $F$-test; the alternative hypothesis here is a statistically significant change in the slope.

We must also formulate the 'overall' model for the entire (i.e., undivided) time series:

$$y_t = \beta_1 + \beta_2 x_{t2} + \ldots + \beta_k x_{tk} + \varepsilon_t, \qquad\qquad t = 1, 2, \ldots, T. \qquad\qquad (3)$$

The procedure can be applied as a test of the significance of changes in the time series evolution, i.e., a test of the evolution-instability verification, which must be followed by a detailed substantive analysis; mere statistical interpretation is probably not sufficient regarding the seriousness of this issue.

However, for our purpose of substantive analysis of the economic series behaviour, it will be more important to calculate the test statistic (4) for all of the different sub-periods (see Table 1) and then compare these calculated values of the statistic (4) with each other. In other words, a comparative analysis of the values of statistic (4) is employed to express the sensitiveness of the data in each time series with respect to the various qualitative economic stimuli and interventions affecting economic development.

The already mentioned Chow's statistic takes on the following form (cf. Cipra, 2003):

$$F = \frac{T - 2k}{k} \frac{RSS - (RSS_1 + RSS_2)}{RSS_1 + RSS_2} \sim F(k; T - 2k), \tag{4}$$

where $RSS$ is the estimated residual sum of squares in the 'undivided' model (3); that is, $RSS = \sum_{t=1}^{T} \hat{\varepsilon}_t^2$,

and $F$ (4) has the distribution $F(k; T - 2k)$, where $2k$ is the number of independent variables in model (1) or (2). Chow's test of stability thus consists of estimating three classical linear regression models (1), (2), and (3), subsequently determining, in the standard way, the estimated residual sums of squares $RSS$, $RSS_1$, and $RSS_2$.

The long time series thus allow us to compare the intensity of the impact of the 2009–2013 crisis on (mainly) household behaviour with that of the 2020–2023 pandemic.

## 3 RESULTS AND DISCUSSION

Naturally, the first step of our analysis is focused on separately examining the evolution of the Czech GDP in the two periods as defined in Table 1. We have thus applied Chow's stability test twice: first for the period 2000–2013 with a breakout sub-period at the boundary of 2008–2009 (the global economic crisis triggered by the collapse of Lehman Brothers Holdings and other US financial houses); second, analogously for the period 2014–2023 with a breakout sub-period at the break of the years 2019 and 2020 (the onset of the COVID-19 pandemic).

We have applied Formulas (1), (2), and (3) in estimating the following parameter values for the period 2000–2013:

$b_0 = 719,033.594$ and $b_1 = 10,418.439$ for the first sub-period, i.e. the years 2000–2008 according to Formula (1);

$b_0 = 971,798.214$ and $b_1 = 2,014.171$ for the second sub-period, i.e. the years 2009–2013 according to Formula (2); and

$b_0 = 777,426.106$ and $b_1 = 6,639.831$ for the entire undivided time series of 2000–2013 according to Formula (3).

Figure 1 shows the evolution of the GDP time series for both sub-periods in the 2000–2013 period (the divided (1) and (2) models in light grey and the undivided model in full colour).

Analogically, we have applied Formulas (1), (2), and (3) in estimating the following parameter values for the period 2014–2023:

$b_0 = 1,073,735.772$ and $b_1 = 11,473.348$ for the first sub-period, i.e. the years 2014–2019 according to Formula (1);

$b_0 = 1,104,314.287$ and $b_1 = 6,055.166$ for the second sub-period, i.e. the years 2020–2023 according to Formula (2); and

$b_0 = 1,130,071.438$ and $b_1 = 5,886,001$ for the entire undivided time series of 2014–2023 according to Formula (3).

**Figure 1** Time evolution of the undivided and divided 2000–2013 GDP time series in Czechia



Legend: GDP 2000–2013 · Linear trend · First sub-period · Second sub-period
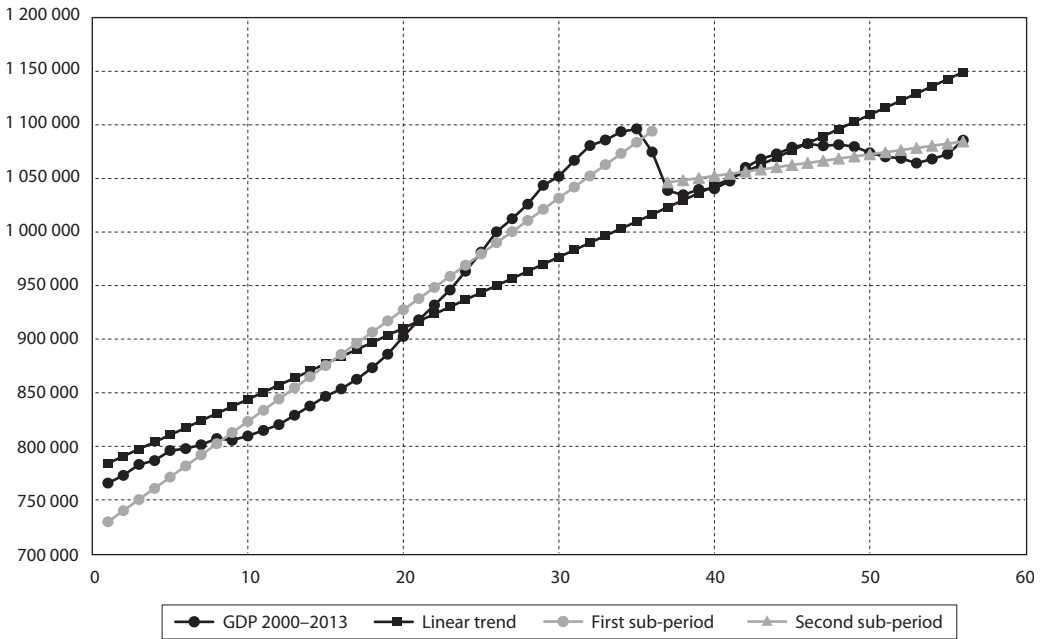
**Source:** <*www.czso.cz*>, the authors' own calculations

**Figure 2** Time evolution of the undivided and divided 2014–2023 GDP time series in Czechia



Legend: GDP 2014–2023 · Linear trend · First sub-period · Second sub-period
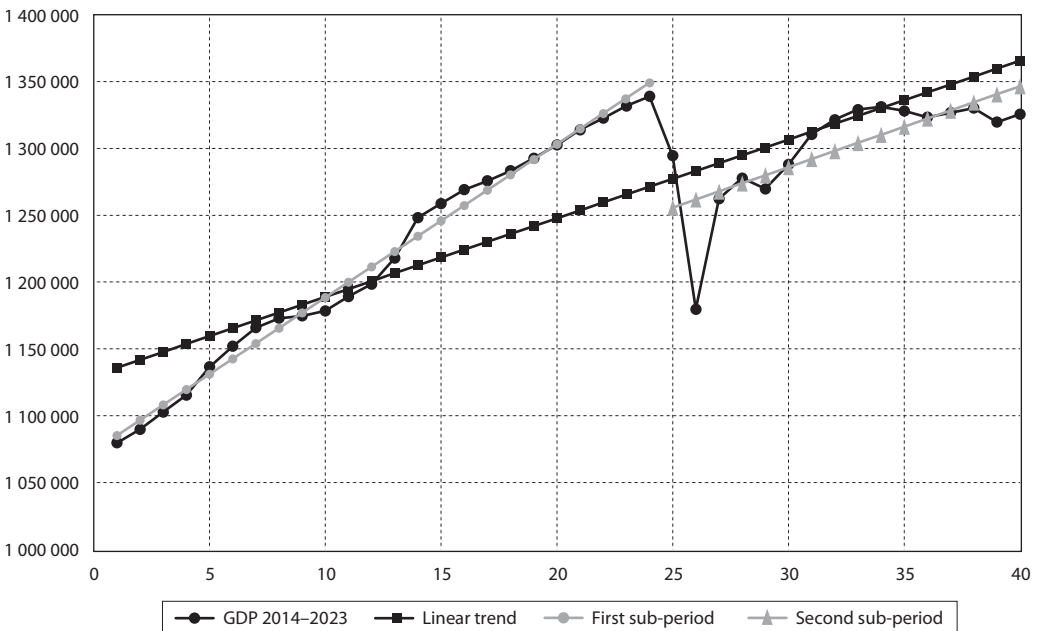
**Source:** <*www.czso.cz*>, the authors' own calculations

Table 2 below shows the *F*-statistic values for both periods and their sub-periods from Formula (4), namely, $F_{2000-2013} = 214\ 311$, $F_{2014-2023} = 137\ 569$. Both of these values are statistically significant (at a level of $1\text{-}\alpha = 0.90$, the *F*-distribution quantiles are $F_{0.90}$ (1; 54) = 2 801 for 2000–2013 and $F_{0.90}$ (1; 38) = 2 842 for 2014–2023). What we interpret as more important is, however, the fact that the break rates (expressed via the *F*-statistic values) of the GDP evolution are similar to each other for both periods. It means that the break effect (i.e., the quantitative change) for the GDP evolution in the crisis that began in 2008 was about the same as that of the COVID-19 crisis.

This partial conclusion only shows that the economic downturn phenomena in the periods under review had different causes but were quantitatively similar in nature. GDP fell twice in each period under review, and the decline rates were comparable. The annual decline in GDP was recorded in 2009 (by 4.7%) and in 2012 (by 0.8%); and in the COVID-19 sub-period in 2020 (by 5.5%) and in 2023 (by 0.3%). The pattern of quarterly data evolution[5] was also similar: the decline in the first two of the consecutive quarters was followed by a period with slight quarter-on-quarter changes (up and down). When comparing the first post-crisis value with the last pre-crisis value, we again find only insignificant differences (+0.4% when comparing Q1 2014 and Q4 2008; and –0.7% when comparing Q1 2022 and Q4 2019).

Figures 1 and 2 prove this assertion at a glance. In the first sub-periods of both periods, i.e., in the sub-periods 2000-2008 and 2014–2019, the trends were positive, and the positives were similar (the respective trend guidelines $b_1 = 10\ 418\ 439$ for the sub-period of 2000–2008, and $b_1 = 11\ 473\ 348$ for the sub-period of 2014–2019 were also numerically close). However, a completely different situation then occurred after the dramatic breaks that came in 2009, and in 2020, i.e., always in the second sub-periods Here, the trend values' evolution curves started to differ visibly because the qualitative causes of their breaks were also different. This divergence needs to be explained. Below we will therefore try to analyse why this was the case and what actually happened. It turns out that the primary driver of the qualitative differences between the two periods, i.e., between the 2000–2013 and 2014–2023 periods, was mainly household final consumption expenditure. It will now be all the more interesting to see how the breaks in the development were distributed among the indices related to the household sector and, by extension, partly also to the general government sector. The *F* statistic values for our selected absolute and relative indices are summarised in Table 2.

**Table 2** Values of the *F*-statistic for the individual time series

| Period | F statistic values for absolute indices | | | | |
|---|---|---|---|---|---|
| | GDP | FCEh | STKh | ICEg | CCEg |
| 2000–2013 | 214.311 | 54.016 | 16.736 | 9.434 | 173.997 |
| 2014–2023 | 137.569 | 123.030 | 20.980 | 22.201 | 5.195 |

| Period | F statistic values for relative indices | | | | |
|---|---|---|---|---|---|
| | FCEh/GDIh | GSh/GDIh | SBh/GDIh | STKh/GDIh | NLh/GDIh |
| 2000–2013 | 16.432 | 9.969 | 25.466 | 0.661 | 4.942 |
| 2014–2023 | 50.157 | 56.717 | 94.557 | 68.894 | 46.106 |

**Notes:** GDP – gross domestic product; FCEh – final consumption expenditure of households; STKh – social transfers in kind in favour of households; ICEg – individual consumption expenditure of general government; CCEg – collective consumption expenditure of general government; GDIh – gross disposable income of households; GSh – gross saving of households; SBh – social benefits received by households; NLh – net lending of households.
**Source:** <*www.czso.cz*>, the authors' own calculations

[5] Data in average 2015 prices, seasonally adjusted.

Let us, therefore, first look at household final consumption expenditure, representing about 50% of GDP. Here, we again determine the values of Chow's statistic from Formula (4) for both time periods: $F_{2000–2013} = 54\ 016$ and $F_{2014–2023} = 123\ 030$. These two values perceptibly differ from each other. In other words, in the second period, the break was statistically more significant than in the first period; this observation complies with the assumption that the restrictions on consumption during the COVID-19 pandemic were drastic.

From the households' perspective, a characteristic feature of the COVID-19 years was a significant decline in final consumption expenditure in both the first and second quarters of 2020 (overall by 12.5%) and subsequent quarter-on-quarter fluctuations (measured by the development of this index in comparable prices, seasonally adjusted). Spending on intermediate consumption items (mainly footwear and clothes) declined the most, by 15.0% in Q2 2020, and by 37.6% in Q1 2021 vs. the pre-COVID-19 level (Q4 2019).

A similar pattern (initial decline and subsequent fluctuations) in household final consumption expenditure could be observed in the years 2009–2013. The decrease in total household consumption expenditure lasted for three consecutive quarters in 2009, but was less significant (a decline of 2.4%) than during the COVID-19 crisis. Expenditure on non-durable consumption items was the most affected by the crisis, with total expenditure value falling throughout the sub-period 2009–2013 (overall by 2.5%). In contrast, expenditure on durable consumption items rose and expenditure on services and medium-term consumption items was rather stagnant.

The consumption behaviour of households after each crisis was different. While in the first quarter of 2022, household final consumption expenditure fell by 1.3% compared to the last crisis quarter of 2021 and by 3.8% compared to the last pre-crisis quarter (Q4 2019), in the case of the 2009–2013 crisis, we can speak of stagnation in both comparisons (Q1 2014 vs. Q4 2013, and Q1 2014 vs. Q4 2008). In 2022 and 2023, household final consumption expenditure values continued to decline quarter-on-quarter, and in the last quarter of 2023, they reached a level corresponding (in comparable prices) to the first quarter of 2017. The reason for this continuous decline was the reluctance of households to spend because of high inflation rates.[6] In contrast, since the start of the recovery in 2014, household final consumption expenditure was rising continuously quarter-on-quarter until the end of 2019. Household spending was not constrained by either high inflation or concerns about the future after 2013, as it was after the COVID-19 crisis.

In terms of the distribution of final consumption expenditure by durability, expenditure on non-durables (especially food, due to the uncontrolled increase in inflation rate) declined the most after the COVID-19 crisis, and its level (at comparable prices) returned to the level of Q2 2006 as late as in the last quarter of 2023! At the same time, the proportion of such expenditures in total household final consumption expenditure fell from 47% in 2000 to 37% in 2023 (while the proportion of expenditures on services changed only insignificantly during the whole period under review, oscillating around 45%).

In terms of relative indices, the periods under comparison were also different; the years of the COVID-19 crisis (see the *F*-statistics values in Table 2) clearly appear to be the period with the most significant break, especially in the case of the savings rate, the financial savings rate, and the proportion of social transfers in kind in household gross disposable income.

A characteristic feature of the first crisis period (2009–2013) includes the proportion of the high values of the household final consumption expenditure (FCEh) in their gross disposable income (GDIh), which ranged from 85 to 90%,[7] and the low savings rate (GSh/GDIh) in the interval between 10 and 15%.[8]

---

[6] The average inflation rate was 15.1% in 2022 and 10.7% in 2023.
[7] The average quarterly value of the propensity to consume in the 2000–2023 period was 87.3%.
[8] The average quarterly value of the savings rate in the 2000–2023 period was 13.7%.

In contrast, during the COVID-19 crisis, the FCEh to GDIh ratio fell to 78.2% in the last quarter of 2020 despite the temporary opening of many stores before the Christmas holidays. The savings rate thus reached an all-time high of 23.0%. This high value was related to the very different levels of the financial savings rate (NLh/GDIh), which averaged only 3.1% in the first crisis period. They averaged at 11.2% in the COVID-19 years. With such a high surplus, households were able to 'cover' the government financing deficit in 2020 and 2021, which was not the case in the 2009–2013 crisis (except in 2013).

The low and declining (from 86.0% in Q1 2022 to 80.4% in Q4 2023) proportion of FCEh in GDIh is also characteristic of the post-crisis years 2022–2023 (a period of high inflation). This phenomenon is, of course, reflected in the above-average savings rate and financial savings rate, which reached 19.3% and 12.8% in the last quarter of 2023.

Figures 3 and 4 show that in the first sub-periods of both periods, i.e., 2000–2008 and 2014–2019, the trend was slightly positive and stable, and these two sub-periods were similar (the respective trend guidelines $b_1 = 0.021$ for the sub-period of 2000–2008, and $b_1 = 0.026$ for the sub-period of 2014–2019 are also numerically close to each other). However, a different situation then occurred after the dramatic breaks in the trend of the monitored indices that came after 2008 and after 2019, i.e., in the seconds sub-periods. Here, the trend values were completely reversed; both slopes were negative, and quantitative as well as qualitative breaks occurred. The high savings rate in the crisis years subsequently started to decline with significant quarter-on-quarter fluctuations (which is always a very unfavourable sign for the development in the economy) and demonstrates households' uncertainty and lack of confidence towards increased demand, i.e., a kind of 'fear' of spending. This was particularly evident in the 2014–2023 period and signalled households' great concern about future developments. It shows that the significance of the break was thus much higher in COVID-19 crisis than in the crisis years 2009–2013; this difference is, in fact, also evidenced by the value of the $F$-statistic shown in Table 2.

**Figure 3** Time evolution of the undivided and divided 2000–2013 GSh/GDIh time series in Czechia
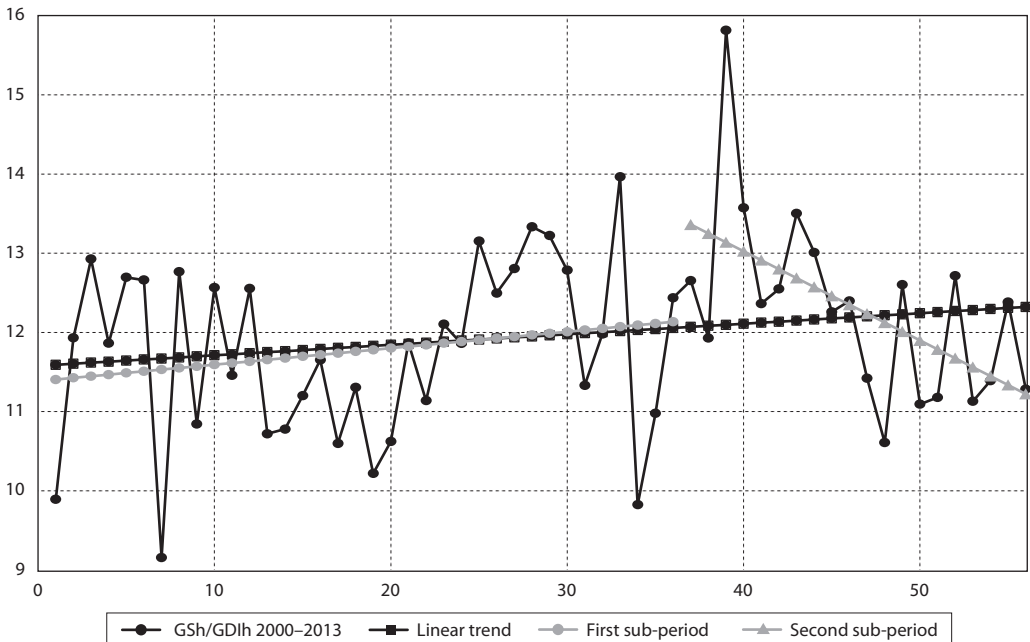
**Figure 4**  Time evolution of the undivided and divided 2014–2023 GSh/GDIh time series in Czechia
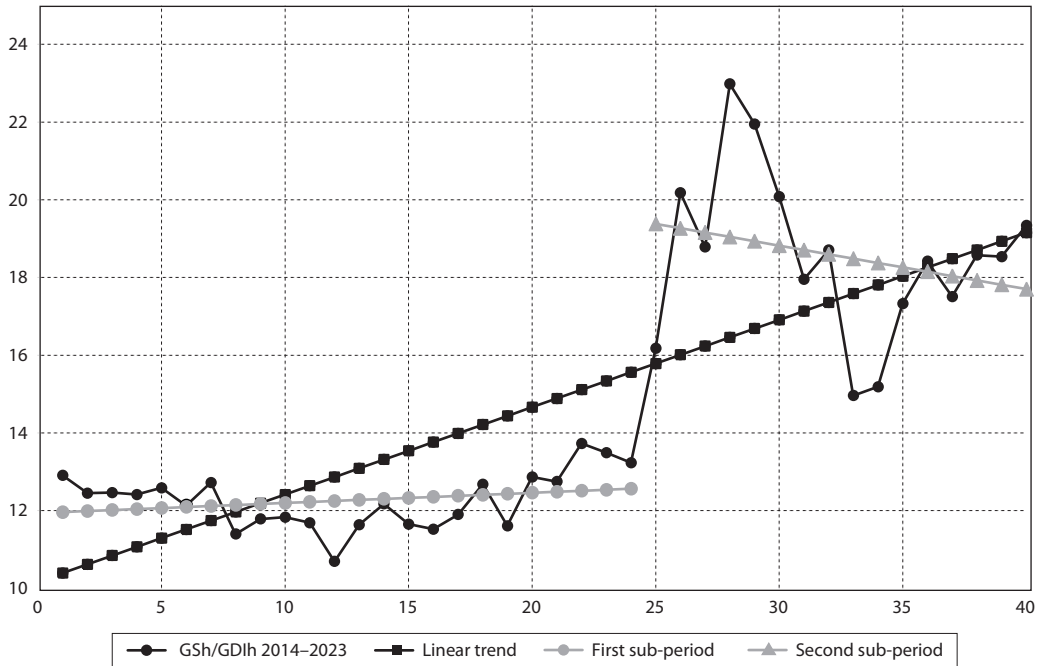
From the households' perspective, the two crisis sub-periods should also differ in the proportions of social benefits in GDIh and of social transfers in kind in GDIh, the largest part of which was spent on health care. The average level of social benefits proportion in GDIh was 25.7% in the 2009–2013 crisis, and this proportion had only insignificantly been changing over the 20 quarters under review. During the COVID-19 crisis , the average value of this proportion was 2.3 percentage points higher; it peaked (29.9%) in Q4 2020. The growth in the volume and proportion of social benefits during the COVID-19 years was mainly driven by increased payments on health care and on household-nursing care. In the case of in-kind social transfers proportion in favour of households in their GDIh, the difference was even higher, with an average of 20.4% in 2009–2013 and 24.5% in 2020–2021. This was due not only to increased spending on health care, but also to the spa support programme, where the state paid to households a substantial part of spa-resort care.[9] The values of *F*-statistics show that the break in the case of social transfers in kind proportion in GDIh cannot even be assessed as statistically significant in the first period. Even this formal conclusion is logical, since in the years of the first crisis there was no real impetus to break even in the volume of social transfers in kind, of which health and education expenditure values constitute a substantial part.

To illustrate, let us look at the two crisis sub-periods from the perspective of the entity that tried to counteract the crisis in both of these sub-periods, i.e., the data for the general government sector. Government individual final consumption expenditure (ICEg)[10] is equivalent to social transfers in kind

---

[9]  The reason for these transfers was to keep the Czech spa resorts open during the pandemic.
[10]  Mainly represented by non-investment expenditures on health, education and culture.

to households. It is therefore logical that, when considering their evolution, we reach similar conclusions as in the case of social transfers in kind 'received' by households[11] (see Table 2).

In the case of government collective final consumption expenditure[12] (CCEg), the difference in its evolution in the two crisis sub-periods can be attributed to different economic policies rather than to the different nature of the crises. CCEg declined continuously throughout the 2009–2013 period[13] as a result of restrictive fiscal policy, while during the COVID-19 crisis this spending rose through 2020 and declined through 2021, reaching the pre-crisis levels in Q4 2021 (all in comparable prices). Consistent with this, the *F*-statistic values (see Table 2) clearly rate the break in the years of the first crisis as statistically significant. However, in the COVID-19 crisis years, the CCEg proportion in total government spending was higher (26.6% on average) compared to the first crisis sub-period (24.1% on average).

To summarise, we can say that the formal method of testing the stability of the time series has allowed us to demonstrate what can intuitively be sensed but is not obvious at first glance from the data, i.e., the fact that the COVID-19 pandemic fundamentally affected (not only) the economic life of households and that its impact on the Czech economy was quantitatively and qualitatively different from that of the global crisis occurring after 2008. Formally, this change manifested itself as a statistically significant break in the evolution of basic indices' values related to the household sector.

However, from the perspective of the developments in the economic behaviour of the household sector, the COVID-19 years cannot be assessed only in purely negative terms. The drastic reduction in consumption led to a quite extraordinary increase in households' savings rate and financial savings rate, which made this period fundamentally different from the pure economic crisis, an example of which was the 2009–2013 sub-period. With high government deficits in the COVID-19 (but also post- COVID-19) years, households' high gross savings and high positive economic balance were positive factors reducing, among other things, the dependence of the Czech economy on foreign resources.

## CONCLUSIONS

The nature of the business cycle is highly variable and, in a certain sense, historically unrepeatable. The causes of cyclical development are manifold and their manifestations perhaps even more so. The present paper has aimed to show how profound the differences can be in the manifestation of economic crises and to describe their effects using specific data. We have therefore compared two different (in terms of causes, consequences and lengths) crisis sub-periods. This allowed us to go into the depth of these processes in the analysis of the individual aggregates in the national accounts, and from these details to draw connections and differences in the behaviour of households in particular, which represent a key element of the economic processes and are, at the same time, the subjects that tend to be significantly affected by the recession. A valuable insight that we have gained from the analysis of the stability of developments is that the detailed responses to the economic crisis are very specific (although, for example, the evolution of the aggregate GDP values in two different crises may have been quite similar to each other in purely numerical terms), and are strongly influenced by behavioural elements and motivational preferences. Our results show these features quite convincingly and can thus point to future directions in which the behaviour of households, in particular under economic pressure, may go.

A way to analyse how the global problem is distributed in detail was to examine the evolution stability of different national accounts aggregates. Among several options, we have opted for Chow's stability tests, which we have preferred to other options, such as CUSUM analysis, which is also used to track change

---

[11] Natural social transfers are provided to households by government institutions and non-profit institutions serving households. Natural social transfers from the government accounted for more than 90% of their total value.

[12] This includes expenditure on administration, defence, security, science and research, etc.

[13] A decrease of 5.3% in Q4 2013 as compared to Q4 2008.

---

detection but would not allow us to model the primary trend of the relevant time series to such an explicit extent. In fact, it was the estimation of the underlying trend that has allowed us to show that, although the trend may be similar in different periods of crisis development per se, its detailed decomposition into causal relationships shows where the real roots and manifestations of the crisis are.

The choice of indices is also important, namely, in terms of their substantive meaning, the methodology of their construction and their basic statistical properties. The choice is between absolute and relative indices: in the case of absolute indices, it was possible to work with only a limited number of indices at comparable prices. Therefore, we have also analysed relative indices, where it is possible to better trace the qualitative aspect of the problem being solved. Such relative indices include, in particular, household final consumption expenditure in relation to household gross disposable income, the proportion of household gross savings in household gross disposable income, social benefits received by households in relation to their gross disposable income, and others (see above). To some extent, this approach has allowed us to gain insight into the behavioural aspects of household motivations and thus better understand how households react 'under economic pressure'.

Understandably, not all indices had the same degree of instability, shown in the rate of the break; it may even not be statistically and substantively significant for some indices. Among the absolute ones, we observed significant breaks between sub-periods (see Table 2 for details) mainly for gross domestic product (GDP, which is a quite logical choice given its degree of aggregation and the severity and extent of the recession), but also for household final consumption expenditure or, for example, for the index of government collective final consumption expenditure, especially in the period 2000–2013.

For relative indices, there were also a number of very significant breaks in the development sub-periods. This was the case, for example, for household final consumption expenditure relative to their gross disposable income (FCEh/GDIh), for the savings rate (GSh/GDIh) or for the financial savings rate (NLh/GDIh). In contrast, we have observed insignificant breaks of stability in sub-periods, especially between 2000 and 2013, for social transfers in kind in favour of households proportion in relation to their gross disposable income (STKh/GDIh). This conclusion logically points to the exceptional situation during the COVID-19 pandemic (with the increased health spending) versus the years of a 'standard' economic crisis, when the volume of social transfers in kind, and their proportions in GDIh, remained virtually unchanged. In line with standard analyses of household economic behaviour, we have used gross disposable income, which is the most important index in the household sector account, in the denominator of all relative indices.

The results obtained for the questions we set out to answer show that any significant break in the development of the national economy requires careful analysis in the structures of the indices that form the substantive hierarchy and that are affected by the critical development. Thus, a verbal description of the problem is not enough, but a combination of quantitative and qualitative analysis is also needed.

## *References*

BOTLÍKOVÁ, M., BOTLÍK, J., STUCHLÍKOVÁ, J. (2021). Development of household savings and debts in small open economies during the global pandemic COVID 19 [online]. SHS Web of Conferences, 129: 01005, *The 21st International Scientific Conference Globalization and its Socio-Economic Consequences.* <https://doi.org/10.1051/shsconf/202112901005>.
BOUNIE, D., CAMARA, Y., GALBRAITH J. (2020). Consumers' mobility, expenditure and online-offline substitution response to COVID-19: evidence from French transaction data [online]. *HAL Working Paper*, 02566443. <https://telecom-paris.hal.science/hal-02566443/document>.
CAMPOS-VAZQUEZ, R. M., ESQUIVEL, G. (2021). Consumption and geographic mobility in pandemic times. Evidence from Mexico [online]. *Review Economics of the Household*, 19: 353–371. <https://doi.org/10.1007/s11150-020-09539-2>.
CARVALHO, V. M., GARCIA, J. R., HANSEN, S., ORTIZ, A., RODRIGO, T, et al. (2021). Tracking the COVID-19 crisis with high-resolution transaction data [online]. *Royal Society Open Science Journal*, 8(8): article 210218. <https://doi.org/10.1098/rsos.210218>.

CHEN, H., QIAN, W., WEN, Q. (2021). The impact of the COVID-19 pandemic on consumption: learning from high-frequency transaction data [online]. *AEA Papers and Proceedings*, 111: 307–11. <https://doi.org/10.1257/pandp.20211003>.

CHEN, R., LI, T., LI, Y. (2024). Analysing the impact of COVID-19 on consumption behaviors through recession and recovery patterns [online]. *Scientific Repports,* 14: article 1678. <https://doi.org/10.1038/s41598-024-51215-3>.

CHRISTELIS, D., GEORGARAKOS, D., JAPPELLI, T., KENNY, G. (2020). The COVID-19 crisis and consumption: survey evidence from six EU countries [online]. *Working Paper Series,* 2507, European Central Bank. <https://EconPapers.repec.org/RePEc:ecb:ecbwps:20202507>.

CIPRA, T. (2003). *Finanční ekonometrie*. 2$^{nd}$ Ed. Prague: Ekopress. ISBN 978-80-86929-93-4

DAVIS, G. (2021). The many ways COVID-19 affects households: consumption, time, and health outcomes [online]. *Review Economics of the Household*, 19: 281–289. <https://doi.org/10.1007/s11150-021-09563-w>.

DE POMMEROL, O. J., MADEC, P., PLANE, M., SAMPOGNARO, R. (2024). De la crise Covid au choc inflationniste: une analyse macro/micro du pouvoir d'achat en France [online]. *OFCE Policy brief,* 124, 15 février 2024. <https://www.ofce.sciences-po.fr/pdf/pbrief/2024/OFCEpbrief124.pdf>.

FIZE, E., PARIS, H., RAULT, M. (2022). Quelle situation financière des entreprises et des ménages deux ans après le début de la crise Covid? [online]. *Focus du CAE*, 83. <https://www.cae-eco.fr/quelle-situation-financiere-des-entreprises-et-des-menages-deux-ans-apres-le-debut-de-la-crise-covid>.

HRONOVÁ, S., HINDLS, R. (2013). Czech Households in the Years of Crises [online]. *Statistika: Statistics and Economy Journal*, 93(4): 4–23. <https://csu.gov.cz/docs/107516/a6931f2e-6b43-a1f8-70f7-876d824bd646/180213q4004.pdf?version=1.0>.

HRONOVÁ, S., MAREK, L., HINDLS, R. (2022). The Impact of Consumption Smoothing on the Development of the Czech Economy in the Most Recent 30 Years [online]. *Statistika: Statistics and Economy Journal*, 102(1): 5–19. <https://doi.org/10.54694/stat.2021.40>.

CHOW, G. (1960). Test of equality between sets of coefficients in two linear regressins [online]. *Econometrica*, 28(3): 591–605. <https://doi.org/10.2307/1910133>.

LI, J., SONG, Q., PENG, C., WU, Y. (2020). COVID-19 pandemic and household liquidity constraints: evidence from micro data [online]. *Emerging Markets Finance and Trade* 56(15): 3626–34. <https://doi.org/10.1080/1540496X.2020.1854721>.

MACGEE, J., PUGH, T., M., SEE, K. (2022). The heterogeneous effects of COVID-19 on Canadian household consumption, debt and savings [online]. *Canadian Journal of Economics*, 55(S1): 54–87. <https://doi.org/10.1111/caje.12546>.

MARANGOZ, M., OZKOC, H. H. (2023). Evaluation of the Impact of the COVID-19 Pandemic on Consumer Spending in Turkey by Structural Break Analysis [online]. *Statistika: Statistics and Economy Journal*, 103(1): 46–61. <https://doi.org/10.54694/stat.2022.21>.

PARKER, J. A., SCHILD, J., ERHARD, L., JOHNSON, D. (2022). Household spending responses to the economic impact payments of 2020: evidence from the consumer expenditure survey [online]. *NBER Working Paper Series*, 29648. <https://www.nber.org/system/files/working_papers/w29648/w29648.pdf>.

RIDHWAN, M. M., REZKI, J. F., SURYAHADI, A., RAMAYANDI, A., ISMAIL, A. (2024). The Impact of COVID-19 Lockdowns on Household Income, Consumption and Expectations: Evidence from High-frequency Data in Indonesia [online]. *Bulletin of Indonesian Economic Studies*, 60(1): 67–94. <https://doi.org/10.1080/00074918.2023.2167930>.

SHERIDAN, A., ANDERSEN, A. L., HANSEN, E. T., JOHANNESEN, N. (2020). Social distancing laws cause only small losses of economic activity during the COVID-19 pandemic in Scandinavia [online]. *PNAS,* 117(34): 20468–73. <https://doi.org/10.1073/pnas.2010068117>.

ZUBÍKOVÁ, A., SMOLÁK, P. (2022). Macroeconomic impacts of the COVID-19 pandemic in the Czech Republic in the period of 2020–2021 [online]. *International Journal of Economic Sciences*, XI(1): 117–145. <https://doi.org/10.52950/ES.2022.11.1.008>.