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Changes in the structure of household disposable income in selected countries as a reflection of crises after 2000

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ABSTRACT

Wages and salaries represent the most important component of household disposable income. The aim of the article is to examine how the relationship between the shares of households' wages and final consumption expenditure in their gross disposable income has developed over the past 20 years. The presented analysis uses publicly available national accounts data for 30 countries for the period of 2000–2019. The studied indicators include the proportion of households' wages and salaries, and final consumption expenditure in their gross disposable income. Using the proposed method based on the evaluation of changes in the spatial map, it is possible to observe any significant changes in these proportion values in the years of financial crisis and recession, as well as in the years of prosperity. The procedure can therefore serve as an indicator of appreciable changes in economic development.

Key words: gross domestic product, final consumption expenditure, disposable income, mutual change of two relative indicators in space and time, indicators of income and expenditure in households.

1. Introduction

Households (represented in the national accounts by the household sector) represent an entity with a specific main economic behaviour, namely, consumption. The final consumption expenditure is funded by households' disposable income, which is the result of the distribution and redistribution of income derived from productive activity and whose most important component is labour income, i.e. wages and salaries. Households enter into the distribution process as parties that get more than they pay;

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households receive wages and salaries, social benefits and other income and have to pay taxes on production and imports, income taxes, social contributions, and other transfers. They thus generate resources sufficient for funding their consumption, and at the same time create savings. Moreover, households should be the source of most of the national saving. This role is particularly important in years of crisis, when government deficits and pressures on public budgets are growing.

From the household perspective, years of economic growth have brought not only rising income from wages (due to rising wage levels and falling unemployment) but also a rising level of confidence, which is undoubtedly important for their willingness to consume. Other factors that influence the level of household final consumption expenditure include the availability of consumer and mortgage credit (determined mainly by the level of interest rates), the inflation rate and the related development of the cost of living, housing prices, the tax burden, the unemployment rate, etc. However, wage levels and wage growth remain a key factor encouraging the appetite and courage to spend, which in turn increases the volume of final consumption expenditure. The other side of this coin, however, is that rapid growth in household consumption may result in households becoming more indebted in the form of loans. This fact, together with a declining savings rate and financial savings rate, may, despite a favourable economic climate, lead to households becoming over-indebted and jeopardise their ability to meet their obligations.

Periods of recession or even crisis accompanied by uncertainties (not only) on the labour market and stagnation of real income mean a change in household behaviour manifested by a cautious approach to consumption, reduced willingness to invest and take out long-term loans. However, this turnaround is not immediate. As a rule, the effects of the crisis will first hit governments and non-financial corporations or financial institutions, and households only after a delay. At the same time, households are reducing their non-financial investments and diversifying their financial investments, or trying to put their spare funds in less risky assets.

This paper should help answer the question to what extent the wage level is a determinant of changes in household final consumption expenditure, i.e. how household final consumption expenditure responds to changes in household income in the form of wages. For the analysis we have used publicly available data (see Eurostat) for 30 countries. The indicators monitored for the household sector are the proportion of wages and salaries received in gross disposable income and the proportion of household final consumption expenditure in their gross disposable income in the period 2000–2019. The method of analysis used is measure t, which describes changes in the values of variables in a spatial two-dimensional map, which is similar to the so-called perceptual map, known, for example, from marketing analysis.

2. Theoretical background

As mentioned above, the undisputed factor influencing household expenditure on durables and non-durables (the value of which is expressed by the final consumption expenditure indicator) is the level of income. The dominant item of household income is labour income, expressed as wages and salaries in the national accounts. The evolution of household income and its relationship to final consumption expenditure have been the subject of a number of theoretical papers. Understanding of and insight into the determinants of changes in household consumption are important aspects of economic policy, as household final consumption expenditure accounts for around half of gross domestic product (GDP) in developed countries and is an important factor in economic growth.

2.1. The relationship between income and consumption in economic theory

The basis for the discussion of the relationship between household income and consumption is undoubtedly Keynes's discussion of consumption (Keynes, 1936), where he states that as employment grows, labour income rises; this in turn leads to an increase in consumption, which, however, grows more slowly than labour income. The issue was already addressed by Modigliani and Brumberg (1954) and Friedman (1957) soon after World War II, during the post-war boom, probably as a result of reminiscences of the economic crisis of the late 1920s and early 1930s. They developed and described life-cycle models of permanent income in which they tried to show that households use savings to smooth changes in income, so that the effects of these changes on consumption levels are small.

Another model that focused on the evolution of consumption twenty years later was the Hall model, inspired by Friedman (1957, see Hall, 1978). Hall's work, to some extent, challenged the idea mentioned above – that households have only a weak propensity to consume and therefore their consumption is always closely linked to current income. On the contrary, he advocated the idea that, assuming useful and purposeful behaviour, households try to maintain a stable consumption trend in the long run. In his work, he also discussed the time lag between changes in income and changes in consumption expenditure with respect to the state of their assets. His work has had a very important impact on the further development of econometric models of consumption. The evolution of the income-consumption relationship on the background of the labour life cycle was the subject of Heckman (1974). He presented an alternative neoclassical model, in which he showed that as wages evolve over the labour life cycle, the level of consumption changes, or the level of consumption depends on the level of wages at each age. He thus confirmed the results arrived at by Thurow in the late 1960s (see Thurow, 1969).

An interesting empirical analysis of the relationship between permanent and current income and consumption can be found in Lusardi (1996), who shows in a panel data set that consumption is very sensitive to predictable income growth. Attanazio and Davis (1996) based their study on panel data on consumption, wage levels and employment in the US in the 1980s and showed that even small changes in the wage structure among different age and education groups of workers led to significant changes in household consumption expenditures. Jappelli and Pistaferri (2010) attempted to map studies dealing with the reflection of income changes in consumption levels in terms of whether the change is positive or negative and, moreover, expected or unexpected (the so-called income shock). Most models assume that consumption responds to an expected increase in income, significantly more than is assumed by permanent income models. When income is expected to fall (e.g., a transition from economic activity to inactivity), the impact on consumption is rather insignificant. However, the authors emphasise that, in such a situation, it is necessary to distinguish between higher and lower income households and hence easier or more difficult access to credit markets. Among the theoretical underpinnings of the income-consumption relationship, it is worth recalling Duesenberry's (1949) relative income hypothesis, which has, for many years, been unjustly neglected in economic theory. Its importance is presented and developed in Sanders (2010), where he shows the properties and empirical significance of this model.

The level and evolution of household final consumption expenditure provide important information for the direction of economic policy. It is clear that there are other factors besides households' income, such as various macroeconomic impulses and shocks, inflation rate, confidence in the economy, and consumer expectations. Changes in economic and non-economic conditions in the national economy (changes in interest rates, significant reversals in stock prices, natural disasters, corruption scandals, etc.) affect household economic behaviour, but their effect is usually short-lived and implemented through specific channels. For example, Aspergis et al. (2014) address the issue of the relationship between stock and house price movements on household consumption levels and conclude that a stock market slowdown may dampen households' willingness to spend. Hamburg et al. (2008) address the issue of the relationship between income, consumption and wealth in Germany and show that this relationship is dynamic and does not settle after a certain period of time. In general, it is a fact that households will not increase their consumption expenditure unless they consider their economic situation to be good and stable. Rising income, rising market prices of their financial and non-financial assets coupled with economic growth increase their willingness to spend and invest. Household investments in real estate (or financial assets), which are not taken for a part of the household final consumption expenditure indicator, give a strong signal of a satisfactory economic climate.

Conversely, a fall in consumer confidence is one of the signals of a coming recession or crisis. Campelo et al. (2020) investigated this relationship using data from Brazil, showing that indicators of consumer confidence and economic climate are better able to predict trends and changes in household final consumption expenditure, and that improvements in consumer confidence positively affect households' attitudes towards consumption.

The relationship between income shocks and consumption levels in the context of the business cycle is also addressed in Kovacz et al. (2019). Using data from the Netherlands, the authors show that income shocks observed during the years of the global crisis 2008-2009 are of a different nature than those observed during the years of the fiscal crisis 2011-2012, or that shocks induced by the fiscal crisis have a longer-term impact on consumption. This was consequently reflected in the fact that households as consumers reacted more cautiously in the fiscal crisis years than in the global financial crisis years, although the decline in their income in the fiscal crisis years was smaller. This empirical finding from the Dutch economy is very important in our consideration of households' different behaviour with respect to the nature of the economic crisis and raises the question whether this phenomenon is also observable in other, especially European, countries.

The relationship between wage levels and the level of consumption of an individual is unquestionable, although there are a number of other phenomena that influence consumer decision-making. From a macroeconomic point of view, individual consumer behaviour translates into the relationship between wages as remuneration for work and final consumption expenditure. The level of wages, or – from a macroeconomic point of view – the amount of wages received by households, is influenced by the phases of the economic cycle. In times of crisis the unemployment rate goes up, and wage growth slows down or stops. Conversely, in the boom phase, employment grows and the level of wages rises as demand for labour increases. This, of course, has an impact on the volume of household consumption expenditure. Can the relationship between wage developments and household final consumption expenditure be used to document the response of households to the phases of the business cycle? Is this relationship valid and can it be generalised to a larger set of countries? We have tried to answer this question by analysing the relationship between wages and household final consumption expenditure in a set of 30 countries over the last 20 years. For our analysis, we have used the original measure t describing the changes in the spatial map.

2.2. Statistical expression of income and consumption

However, it is useful to subsequently "put the relationships given by economic theory to the test", i.e. to verify the theoretical assumptions on statistical data. Here, we

encounter the first fundamental and ever-present problem of the discrepancy between economic theory and statistical practice, i.e. the discrepancy between the concepts of economic theory and the possibilities of their relevant quantification. This so-called adequacy gap lies at the heart of this problem – many of the concepts with which theoretical economics operates cannot be quantified to the full extent of the concept, and it is therefore necessary to resort to a certain quantitative approximation to these theoretical concepts. This mere "approximation" is therefore a necessary compromise between the needs for quantification of the concepts of theoretical economics and our real ability to carry out this quantification. The trade-off between the "necessary and the possible" is the structural content of the adequacy gap mentioned above[4].

If we are to examine the relationship between household income and consumption, it is necessary to define the data sources from which we will draw comparable data, to define the statistical population of households and to find appropriate indicators of income and consumption. The first two conditions are easy to fulfil – the basic source of internationally comparable data is given by the national accounts, whose standards[5] guarantee a common understanding and definition of indicators. The definition of the household population with respect to the national accounts data sources is also not a problem, since households form one of the five resident institutional sectors and the characteristics of the units belonging to this sector are clearly defined[6].

For indicators reporting household consumption, the national accounts offer two options – household final consumption expenditure and the actual household final consumption. Household final consumption expenditure includes the value of purchased (new and used) goods and services of short– and long-term consumption, excluding dwellings, houses and land, and the value of the so-called consumption in kind, i.e. subsistence, agricultural and food products from subsistence. The indicator also includes the so-called consumption of output for households' own final use, i.e. what households produce and consume themselves (in particular, provision of housing services to themselves, agricultural output from subsistence farming, services of employing domestic staff). This concept of household final consumption expenditure is traditional and, prior to the introduction of the ESA 1995 or SNA 1993[7], corresponded to the only indicator of household final consumption at that time.

The second indicator providing information on household final consumption is the household actual final consumption indicator. The concept of actual final consumption

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[4] A simple example of this gap is, e.g. inflation as a theoretical economic category on the one hand and the consumer price index as a quantification of this theoretical concept on the other hand.

[5] See ESA 2010 (2013) and SNA 2008 (2013).

[6] See ESA 2010 (2013) and SNA 2008 (2013), paragraphs 2.118 – 2.128. The household sector according to this definition includes not only households as consumers (employees, recipients of social, property and other income) but also small producers (employers and self-employed).

[7] See ESA 1995 (1996) and SNA 1993 (1993).

was introduced as late as in the ESA 1995 and SNA 1993[8] standards in response to the requirements of international comparability of household consumption in terms of their living standards. Actual final consumption of households is equal to final consumption expenditure plus social transfers in kind[9] that are paid to households by general government and non-profit institutions serving households.

As can be seen from the definitions presented above, there is a dual concept of household final consumption; the first emphasises "what households spend"[10] and the second "what households actually consume". Therefore, when analysing the economic behaviour of the household sector, it is always necessary to choose the appropriate indicator for the purpose of the analysis. In our case, where the relationship between income and consumption is concerned, the indicator of final consumption expenditure is the obvious choice. The indicator of actual final consumption of households contains a part (social transfers in kind) which is mainly a reflection of the social policy of the state (the extent of non-market production of government institutions) and is therefore not a direct consequence of the economic behaviour of households[11].

For the choice of income indicator, the national accounts offer a number of indicators. The most general is undoubtedly disposable income (gross/net). Disposable income is the result of the primary and secondary distribution of income (value added) and its structure consists of business income (gross/net operating surplus and mixed income) + labour income (wages and salaries) + balance of property income + balance of social income (social benefits – social contributions)[12] + balance of other current transfers – current taxes. Disposable income is directly intended to cover final consumption expenditure. In analysing the economic behaviour of households as consumers, we are therefore interested in whether or not disposable income is sufficient to cover final consumption, which is monitored by indicators of the average propensity to consume[13], not whether changes in its level motivate households to change the nature and level of consumption. Disposable income is a macroeconomic statistical variable,

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[8] See ESA 1995 (1996) and SNA 1993 (1993).

[9] Social transfers in kind correspond to the value of individual goods and services provided by non-profit institutions and government agencies to households free of charge or at economically insignificant prices, whether they are the result of non-market production (e.g. health, education, etc.) or purchased on the market for household use (housing transport services, etc.). For more details, see ESA 2010, paragraphs 4.108 through 4.111.

[10] Keeping in mind the consumption in kind. For a precise definition of the final consumption expenditure indicator, we refer to ESA 2010, paragraphs 3.94 through 3.99.

[11] For a precise definition of the indicator of actual final consumption, we refer to ESA 2010, paragraphs 3.100 through 3.109.

[12] Given the design of the compensation of employees, other investment income and net social contributions in the household sector account, social contributions are equal to households' actual social contributions + households' social contributions supplements – social insurance scheme service charges.

[13] It is the ratio of final consumption expenditure to (gross/net) disposable income.

i.e. it is not the income that an individual household may view as a certain limit to its consumption[14].

The notional limit of consumption is the wage or salary for employee households, the amount of their retirement income for pensioner households, and the amount of their so-called other income (i.e. social, property and other income) for other households. In the case of small producer households (employers and self-employed), this is undoubtedly part of their profits (mixed income), but their amount cannot be reasonably estimated.

Employee households represent the dominant group in the household sector, and their labour income (wages and salaries) provide the main component of disposable income[15]. Moreover, changes in wage levels can be viewed as a reflection of the economic situation in the national economy, i.e. they, to a certain extent, reflect the evolution of the short-term business cycle. Employee households are also understood as a crucial group in terms of the commodity structure and the volume of final consumption expenditure. Social or other income is independent of the phase of the business cycle; the demand of the corresponding households does not generally cover all commodities and is not a decisive component of household final consumption expenditure. However, ownership income is, to a certain extent, dependent on the business cycle, but the recipient households form only a small part of the units belonging to the household sector[16].

It follows from the above that if we want to analyse the evolution of changes in final consumption expenditure in response to income developments, and moreover in the context of the phases of the business cycle, then the best choice is the wages and salaries indicator. This indicator reflects both regular and irregular cash and in-kind income as remuneration for work performed under labour and other legislation[17].

Both indicators (household final consumption expenditure and wages and salaries) are indicators defined by the System of National Accounts, i.e. they are internationally comparable indicators.

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[14] In general, disposable income can be understood as the upper limit of consumption that a household can realise without becoming poorer.

[15] The proportion of gross wages and salaries received as a proportion of gross disposable income is 66% on average in the 30 compared countries (see input data for this analysis) and in none of these countries has it fallen below 40% in recent years.

[16] This is also reflected in the proportion of the balance of proprietary income in gross disposable income, which does not, in the long term, exceed 10% in any of the countries compared.

[17] Wages and salaries represent basic wages and salaries, additional payments for overtime, night work, rest days, profit sharing, holiday pay, transport allowances to and from work, severance pay, remuneration for work under special regulations, professional fees, remuneration for the performance of public functions, compensation for paid time off on public holidays, holiday pay, benefits in kind, free shares distributed to employees, etc. Wages and salaries are gross, i.e. before deductions of income tax and social contributions paid by the employee – see ESA 2010, paragraphs 4.03 to 4.07 for details.

3. Our data and methodology of our analysis

The aim of this paper is to examine the evolution of household final consumption expenditure in relation to wage and salary developments in 30 countries over the period 2000–2019. The analysis is based on publicly available and internationally comparable Eurostat data for the European Union countries (excluding Malta) and selected other countries (UK, Norway, Switzerland, USA, and South Korea). While the methodological comparability of the content of the selected indicators is guaranteed when working with national accounts data, we encounter different currency units (and therefore different levels of values) in which the values of the indicators are expressed and the fact that national accounts data are always in current prices only. The solution is to use relative, i.e. dimensionless, indicators whose values are comparable over time and space.

We have chosen wages and salaries as the income indicator and household final consumption expenditure as the consumption indicator. The choice of appropriate relative indicators is clear in this case; both indicators are components of disposable income – wages and salaries in terms of its creation, final consumption expenditure in terms of its use. It is therefore logical to base our analysis on the indicator of the proportion of wages and salaries received by households in their disposable income on the one hand and the indicator of the proportion of household final consumption expenditure in their disposable income on the other hand.

It remains to resolve the question of whether to use net or gross disposable income in the denominator of these relative indicators. In theory, net disposable income is undoubtedly the more correct option, since the consumption of fixed capital, which makes up for the difference between gross and net disposable income, is meant not for consumption but for investment. However, the use of net disposable income in international comparisons is hampered by the incomparability of methods used for estimating consumption of fixed capital in different countries; for this reason, aggregates such as "gross" are generally used in cases of international comparison. Here, we therefore also use gross disposable household income in the denominator of the chosen indicators.

However, in view of the availability of comparable data on Eurostat's website, it should be noted that only total data for the household and non-profit institutions serving households sector are available. In our case, this concerns the indicators for final consumption expenditure and gross disposable income, but does not affect the value of the wages and salaries indicator, where households as consumers are the only beneficiaries. The combination of the household sector and the non-profit institutions serving the households sector will in principle not affect the values of the indicator for the proportion of final consumption expenditure in gross disposable income and will only slightly distort (downwards) the value of the indicator for the proportion of wages and salaries in gross disposable income. Given that the distortion applies approximately equally to all countries compared, it can be considered negligible. It is also insignificant

from the point of view that households account for between three-fifths and two-thirds of gross national disposable income in the countries surveyed, while non-profit institutions serving households most often account for around 1%, rarely 2%.

The data described above, i.e. the proportion of wages and salaries received by households in gross disposable income (households and non-profit institutions serving households) and the proportion of final consumption expenditure by households and non-profit institutions serving households in their gross disposable income for 30 countries over the period 2000–2019, are the inputs to the model.

The method used to analyse the relationship between the values of the selected indicators is the evaluation of changes in a two-dimensional spatial map. This procedure, published in Hindls, Hronova (2012), consists of an original development of a measure t for the situation where the data are arranged in a two-dimensional spatial map; over a given time period (here 2000–2019), we then observe how the individual values of the dot plot shift over time (i.e. over the years of observation). Measure t is to express the Euclidean distances in the spatial map (see below). This allows us to assess how the phases of the economic cycle (in the years in question) have affected the indicators analysed. Let us now describe the procedure.

To simplify the notations, we denote the proportion of wages and salaries received (hereinafter WSh) in gross disposable household income (hereinafter GDIh) in the i-th country as x_i, i = 1, 2, ..., n, where the symbol n denotes the number of countries. Analogously, the proportion of household final consumption expenditure (hereinafter FCEh) in GDIh as y_i, i = 1, 2, ..., n. We denote the year of the first observation by the symbol "1" (for the illustration below, let us choose, e.g., 2000 as the beginning year), the year of the second observation by "2" (let us choose 2001 for the illustration). Later, we will analyse all pairs of individual years, i.e. successive pairs of years over the whole period 2000–2019.

Specifically:

- By x_{1i} we mean the ratio of WSh/GDIh in the i-th country, i = 1, 2, ..., n, (in our case n = 30) in period 1 (year 2000);
- By x_{2i} we mean the ratio of WSh/GDIh in the i-th country, i = 1, 2, ..., n, (n = 30) in period 2 (year 2001);
- By y_{1i} we mean the ratio of FCEh/GDIh in the i-th country, i = 1, 2, ..., n, in period 1 (year 2000); and
- By y_{2i} we mean the ratio of FCEh/GDIh in the i-th country, i = 1, 2, ..., n, in the 2nd period (year 2001).

Each of the n countries is thus considered in the light of two different percentages of WSh/GDIh (variable x) and FCEh/GDIh (variable y), in two different periods (years). The baseline values of the relative indicators, i.e. variables x_{1i}, x_{2i}, y_{1i}, y_{2i}, are calculated on the basis of the values of the absolute indicators from the Eurostat database[18].

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[18] See https://ec.europa.eu/eurostat/databrowser/view/nasa_10_nf_tr/default/table?lang=fr.

Next, let us denote:

- By K_1 the mean value (i.e. mean spatial localisation) of the two observed indices (i.e. WSh/GDIh and FCEh/GDIh ratios) in period 1 (here year 2000), i.e. the mean value of all points $[x_{1i} ; y_{1i}]$ located in the Cartesian coordinate space (x, y), see formulae (1) and (2) below; and

- By K_2 the mean value (i.e. mean spatial localisation) of the two observed indicators (i.e. WSh/GDIh and FCEh/GDIh ratios) in period 2 (year 2001), i.e. the mean value of all points $[x_{2i} ; y_{2i}]$ located in the Cartesian coordinate space (x, y), see formulae (1) and (2) below.

As a summary evaluation of changes in indicators, we propose – see Hindls, Hronová (2012) - a measure t, for which

$$t = \frac{\dfrac{\sum_{i=1}^{n} k_i}{n}}{\sqrt{\dfrac{\sum_{i=1}^{n} \left[k_i - \dfrac{\sum_{i=1}^{n} k_i}{n} \right]^2}{n(n-1)}}} \tag{1}$$

where

$$k_i = \text{sign}\{y_{2i}^2 + x_{2i}^2 - y_{1i}^2 - x_{1i}^2\} \sqrt{(x_{2i} - x_{1i})^2 + (y_{2i} - y_{1i})^2} \tag{2}$$

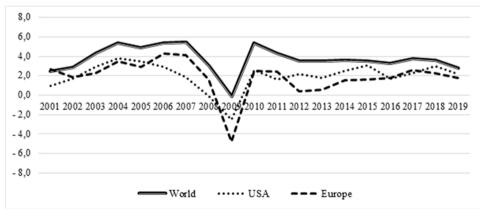$$\frac{\sum_{i=1}^{n} k_i}{n} \tag{3}$$

is the estimate of the $K_2 – K_1$ value.

The sign{...} operator above is used to determine the sign of the "aggregate spatial" change ("±") of the level of the two-indicator assessment in the second (later) period (here, in the illustration, 2001) compared with the first period (2000). The sign{...} operator thus expresses whether the i-th spatial location (i.e. the location of the i-th country) in period 2 (i.e. 2001) has moved closer to ("–") or farther away from ("+") the centre [0;0] of the coordinates than in period 1 (i.e. 2000). If, for example, the i-th spatial location has moved farther away from the centre of the [0;0] coordinates, then the "+" sign indicates that the aggregate (i.e. for the two relative indicators observed together) position of the indicators in the i-th country has moved farther away from the centre [0;0] of the coordinates (i.e. it is a kind of "geometric" aggregation of the observed indicators). The "–" sign then, of course, represents the opposite situation, i.e. an approach to the centre [0;0] of the coordinates.

Based on the values of measure t, we formulate a conclusion about time changes in the values of the WSh/GDIh and FCEh/GDIh ratios for all n observed countries.

4. Relationship of household income and consumption to the growth rate of the economy

The above relationships show that WSh and FCEh play an extremely important role in the evolution of GDP. Therefore, let us first look at the graph of GDP evolution. The data used cover 30 economically important countries. Figure 1 presents the evolution of GDP (annual growth rates) in three key geopolitical territories between 2000 and 2019, namely Europe and the USA, and finally it shows the global evolution of GDP[19]. Logically, all three time series of annual growth rates are governed by a similar pattern, characterised by an upturn in the performance of the economies in the first 6–7 years of the new millennium, followed by a deep global economic crisis in 2008–2009, then a renewed but milder moderation of the economies around 2012, and then a global slowdown in economic growth rates after 2017.

In 2017, however, there was already open talk of the possible arrival of a recession. However, the subsequent onset of the global SARS-CoV-2 epidemic drowned out any further economic considerations about the real strength of the global economy at the end of the second decade of this century, and thus overshadowed how the economy would develop globally in 2018–2020. For this reason, we have not included 2020 in our considerations, because although it was marked by a severe crisis, it did not have primarily economic causes, but even more so economic consequences. This would have only clouded our purely economic considerations in a 20-year time series.

Figure 1. Annual GDP growth rates in selected territories 2000–2019 (percentage values)

Source: https://www.imf.org/external/datamapper/NGDP_RPCH@WEO/OEMDC/ADVEC/WEOWORLD.

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[19] See: https://www.imf.org/external/datamapper/NGDP_RPCH@WEO/OEMDC/ADVEC/WEOWORLD

Figure 1 shows that one has to ask how the WSh/GDIh and FCEh/GDIh indicators respond to the aggregate data on the performance of economies (with quite significant periods of change, the 2000–2007 recovery, the crisis years 2008–2009, 2011–2013 and finally the increasing tendency towards recession after 2017). For this analysis, we use the method presented by formulae (1), (2) and (3) above. The inputs to monitoring of changes in the behaviour of the WSh/GDIh and FCEh/GDIh ratios are, naturally, WSh received by households, FCEh and GDIh, aggregated over 30 countries over the period 2000–2019.

From the input data, we determine the value of the measure t from formula (1). For the purpose of further analysis, we have evaluated the evolution of measure t in the years studied. We compute the value of the measure t for each pair of values of the indices $[x_{1i} ; y_{1i}]$ and $[x_{2i} ; y_{2i}]$, respectively, where the subscripts labelled "1" and "2" always denote a pair of years in the 20-year time series, i.e. 2000–2019.

This means that we will go for $\binom{20}{2}$ = 190 pairs of years, where we always determine the measure t according to (1). The resulting matrix of dimension $20 \cdot 19$ values of the measure t is given in Table 1 in the Appendix. There are "x" symbols on the main diagonal of the matrix because it makes no sense to compare spatial changes in the measure t in the same year (logically, there cannot be a change in t in the same year). The matrix is symmetric due to the existence of relation (2), so we only report the values above the main diagonal of the matrix.

In terms of the objective of our analysis, we are interested in two sets of values:

1. Year-to-year changes in the measure t, i.e. the relationship between WSh/GDIh and FCEh/GDIh for the economic space of all 30 selected countries. That is, year-on-year changes in the relationship of these indicators, e.g. t_{2001}/t_{2000}, etc. (19 values in total). These year-to-year values are shown in Table 1 in the grey boxes diagonally directly above the main diagonal of the matrix (from left to right and simultaneously slanted from top to bottom), and are denoted as t_y-on-y in Figure 2; and

2. Changes in the measure t against the initial period, i.e. the year 2000, i.e. basically the baseline evolution of t-values against the year 2000 (again, 19 values in total), i.e. e.g. t_{2001}/t_{2000}, t_{2002}/t_{2000}, etc. (denoted as t_basic in Figure 2)
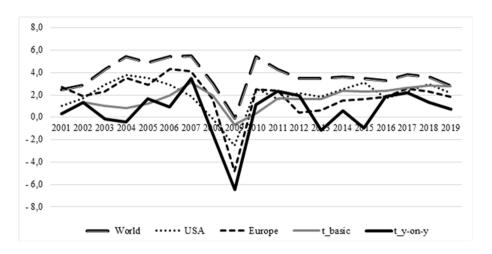
Figure 2. Annual GDP growth rates (%) and changes in measure t

Source: https://www.imf.org/external/datamapper/NGDP_RPCH@WEO/OEMDC/ADVEC/WEOWORLD; own calculations.

Figure 2 and the calculations of the values of the measure t show some important substantive facts concerning the evolution of the key indicators WSh and FCEh. Comparing the evolution of GDP growth rates and the annual values of the measure *t* in Figure 2, it is quite evident that they follow the evolution of GDP with a slight lag. For example, it can be seen that the performance of the economies (US, Europe) has been growing since 2002, to which the evolution of household income and consumption, aggregated in the measure *t*, responds with a certain lag (this is about one year). This happens until 2007–2008, when the global economic recession arrives. Again, the response of the measure *t* to the economic recovery is delayed. The WSh/GDIh and FCEh/GDIh then respond with a similar delay to the 2012–2013 recession and similarly to the 2014–2017 recovery.

Hence, the *t*-values, capturing spatial and temporal changes in household behaviour in aggregate across 30 major economies confirm the well-known and well-described phenomenon of consumption smoothing, i.e. that households tend to stabilise their expenditure even at a certain level of income and gross disposable income, and postpone consumption from periods of higher income to periods when they gain a sense of greater stability and predictability in the economy.

Similarly, we could interpret the evolution of the basic values of the measure t, as can also be seen in Figure 2. Perhaps with a slight difference: the basic values do not reach such extreme values of the peaks and troughs in their evolution, so they are a bit "smoother".

It is also interesting to look at the graphical representation (see Figure 3) of all pairs of values of the measure t given by the matrix in Table 1 in the Appendix. Figure 3 shows that in the first decade of this century, the development of the relationship between the two relative indicators examined (the share of wages in household gross disposable income and the share of household final consumption expenditure in their gross disposable income) in the 30 major countries was quieter than in the second decade. While the first decade was characterised by a fairly calm development of this relationship (this period can be described as a "carpet", see Figure 3), the deep crisis towards the end of the decade (2008–2009) severely disrupted households' behaviour and there was no corresponding calming in the second decade. After a brief recovery in 2010–2011, there was another slowdown in 2012, and soon afterwards, after 2017, the tendency towards a looming recession started to float through the economic space again. Households naturally responded to this with unease, so that the "carpet" quickly became a "mountain range", expressing the increased unease in the economy in the second decade of the new millennium, as is evident in Figure 3.
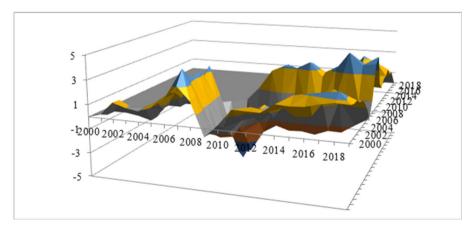

Figure 3. Summary expression of all measures t values given by the matrix in Table 1

Source: https://ec.europa.eu/eurostat/databrowser/view/nasa_10_nf_tr/default/table?lang=fr; own calculations

However, all such considerations were cut short by the arrival of the SARS-CoV-2 epidemic, so – as noted above – it makes sense to include the 2020 covariate in these considerations. It is confirmed that household behaviour is the key to the nature of the economy. It is a sensitive phenomenon, a litmus test of sorts, which we have included in the newly constructed measure t as reported in this paper.

5. Conclusions

The economic dynamics of all developed countries have been volatile in the two most recent decades. Naturally, this fact has also significantly affected the values of the indicators for the household sector, i.e. the proportion of WSh in GDIh and the proportion of FCEh in GDIh. The analysis of the newly constructed measure *t* has shown a decrease (i.e. an approach to the origin of the coordinates in the spatial map of the 30 countries) of these proportions in the years of financial crisis and economic recession and, on the contrary, an increase (i.e. a move away from the origin of the coordinates of the spatial map) of the examined proportions in the years of prosperity (economic growth).

To confirm this assumption, along with the substantive reasoning, we have also used the original measure *t*, which not only quantifies these statements sensitively, but also defines the intensity of the phenomenon (the degree of approach or departure from the origin of the coordinates). The aggregate analysis is then applicable without any limitation in terms of the number of countries (or entire territories) and years studied – the procedure can be applied, for example, to groups of countries according to their economic development, their geopolitical demarcation, etc.

Significant work for the future would of course be to extend the analysis to the crisis caused by the SARS-CoV-2 pandemic. However, this should only be done with some perspective, once there is sufficient certainty about the state of the epidemic in the world and sufficient quality and stability of the necessary data from the Systems of National Accounts. Of course, the current crisis does not primarily have economic causes, but it has strong economic consequences; it has fully exposed the fragility of the world economy. The generalisation of the analysis of household behaviour to the phenomenon of the impact of SARS-CoV-2 on the evolution of GDIh, WSh and FCEh will only be possible with the passage of a few years, when definitive reports for these specific years appear in the national accounts of the world's countries.

However, in such a post-Covid analysis, it should not be forgotten that the years 2017–2019 already signalled a certain tendency towards a slowdown in the world economy. This slowdown was quickly overshadowed by the viral epidemic. Therefore, after it has subsided, it will be necessary to revisit the phenomenon of 2017–2019, at least in part. And here the values of the measures *t* presented in this paper could provide some help to unravel the sensitive reactions and behaviour of households just before the SARS-CoV-2 epidemic and, of course, after it.

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Appendix

Table 1. Pairwise measures *t* for the years 2000-2019

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2000	x	0,29826	1,36469	1,03038	0,85586	1,23529	1,94238	3,11858	1,99492	-0,67147	0,36242	1,67676	1,64421	1,63094	2,36837	2,30511	2,36378	2,65459	2,83169	2,79898
2001		x	1,32051	0,87759	0,92312	1,47194	2,25417	4,23289	2,24036	-0,72547	-0,10735	0,72862	1,70486	1,50706	1,88671	2,89976	3,09893	3,26749	3,42782	2,61164
2002			x	-0,1621	-0,44861	0,53632	2,00938	3,48987	1,22078	-1,11714	-0,86830	0,26249	0,66656	1,16887	1,59133	0,76849	1,14005	2,61591	2,14825	2,61344
2003				x	-0,43175	1,01307	1,34989	3,20145	1,31947	-1,62119	-1,45598	0,33844	1,04146	0,43846	1,77443	1,18063	1,90221	2,06993	2,14926	2,21027
2004					x	1,69658	2,06210	3,38423	1,04445	-1,14316	-0,89803	0,53386	1,11093	0,61031	1,10829	0,79988	1,81346	2,79617	2,04110	2,08277
2005						x	0,95426	2,84829	0,86976	-1,87395	-1,65090	-0,44867	0,29986	0,14053	0,61377	0,40104	1,27680	1,39891	1,77101	1,57827
2006							x	3,47029	0,61265	-2,73657	-2,62946	-0,99084	0,03560	-0,31000	0,05859	-0,38180	-0,00629	1,42087	0,90819	0,87869
2007								x	-1,59056	-4,15338	-3,87844	-2,15845	-1,49701	-1,82421	-1,77105	-1,95049	-1,51958	-1,54713	-0,83092	-0,17887
2008									x	-6,44116	-3,02429	-1,52542	-0,45541	-1,07984	0,05274	-0,43731	-0,18733	0,22655	0,80510	1,05173
2009										x	1,15913	2,70307	3,17315	3,07984	3,64697	2,49508	3,21307	4,67435	3,68942	3,85921
2010											x	2,30519	3,11964	2,00272	3,37410	2,68539	3,27242	3,97749	3,58220	4,26108
2011												x	1,93573	1,22865	1,89018	1,12360	1,34657	1,82101	2,48325	1,77755
2012													x	-1,14056	-0,05727	-0,13561	-0,06915	1,07676	1,21494	1,15788
2013														x	0,61248	0,15407	0,65426	1,68082	1,88253	1,70917
2014															x	-0,95459	-0,05808	2,02403	1,53216	1,79170
2015																x	1,88512	3,24154	2,74352	2,16121
2016																	x	2,19472	2,26735	1,54268
2017																		x	1,31332	1,49502
2018																			x	0,73300
2019																				x