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UNVEILING VULNERABILITIES: FACTORS SHAPING HOUSEHOLD INCOME DECLINE RISK DURING CRISES

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ABSTRACT. Unexpected crises disrupt household incomes and create new groups of vulnerable individuals. This paper contributes by identifying individuals at risk of income decline during a pandemic. Using a questionnaire, the study obtained a representative dataset (n = 2,368). Applying ordinal logistic regression, it identifies categories of life-aspect attitudes and socio-economic and demographic factors associated with a higher probability of income decline. A robustness analysis assesses model performance across three household income groups. The model appears most appropriate for low-income households with monthly income below CZK 40,000. Individuals unable to adapt to new work organization and online communication emerge as particularly vulnerable, as do entrepreneurs residing in small towns. Identifying vulnerable groups during periods of economic volatility, such as a pandemic, enables targeted social support that can reduce social inequalities and promote sustainable development.

JEL Classification: P46, D31

Keywords: household income, change in income, decrease in income, crisis, aspects of life

Introduction

The pandemic precipitated a global health, economic, and social crisis that forced widespread behavioral change (Muneer et al., 2022; Karaba, 2020). National governments responded with a range of measures intended to mitigate the pandemic's impact and curb transmission; however, these interventions also disrupted individuals' daily lives. The Covid-19 pandemic and the ensuing economic downturn led to unprecedented increases in sick leave and job losses, adversely affecting personal incomes. According to Eurostat (2021), median employment income in the European Union declined by 5.2% on average in 2020 relative to 2019.

This paper examines individual income in the context of efforts to reduce poverty rates, a core social objective within the EU's social pillar of sustainability (European Commission, 2024). Household income strongly shapes living conditions (Yu et al., 2020), acting as a key determinant of consumption and the capacity to meet needs (Burlacu et al., 2016). Individual income is also an appropriate basis for welfare assessment, as it captures a consumer-specific perspective (Stiglitz et al., 2019). Income fluctuations alter consumption patterns and, consequently, overall quality of life (Li et al., 2021).

The research question is: Which groups of individuals are at risk of poverty during periods of economic uncertainty in a pandemic due to changes (declines) in income, considering demographic, socio-economic characteristics, and attitudes toward pandemic-related aspects of life?

The study aims to identify groups at elevated risk of income loss during the pandemic. First, it determines the factors associated with changes in individual income; then, it estimates the strength of these effects in relation to the risk of income decline. Understanding determinants of income change is essential for targeting social assistance effectively during periods of economic volatility.

1. Literature review

Consequences of the pandemic crisis have raised concerns about the world's preparedness for unexpected pandemic outbreaks (Muneer et al., 2022). Government measures put in place during the pandemic to ensure social distancing and thus reduce transmission of the virus had both positive and negative social and economic consequences (Khan et al. 2021; Teslya et al. 2021). The crisis has affected many areas of individuals' lives, health, and performance of employment (Teramura et al., 2022; Nyatanga, 2020).

In periods of economic turbulence, when individuals' incomes are subject to decline, deleterious consequences may ensue for their living conditions (Pickett and Wilkinson, 2015; Pasqualini et al., 2017).Kulic et al. (2020) emphasize the importance of government support for the population to prevent the pandemic from increasing gaps in the labor market. Temporary policy measures adopted in response to Covid-19 were intended to ensure that the pandemic would not affect incomes. However, the findings published by Li et al. (2022) predicted an increase in income inequalities and changes in living conditions.The measures have affected the income of individuals. According to Almeida et al. (2021), a decline in the income of individuals is on a scale similar to the financial crisis in 2008–2009. During the pandemic, individuals of different income levels experienced changes in their living situation (Lee and Singh, 2021; Young, 2022). Low-income households are at direct risk in terms of the impact of the pandemic on their income (Hall et al., 2021).

Pinkovetskaia (2022) estimates that among the economically active population, 53% of households experienced a decline in income during the first waves of the pandemic, while only

4% of households experienced an increase in income. Changes in income have occurred in many occupations (Janys et al., 2021). The problem is the loss of income for the self-employed who have been pushed to the poverty by income shortfalls (Schneck, 2021). Lee et al. (2015) and Roy and Chaudhuri (2008) report that economic activity further influences the fulfilment of the need for medical care. Individuals with low incomes, such as single mothers, are less likely to have their health needs met than employees or entrepreneurs (Socías et al., 2016).

Changes in income varied with economic activity, but also with gender and age. Doorley et al. (2022) argue that the pandemic changed the gender pay gap because it affected men's and women's incomes differently. Also, Dao et al. (2022) and Kulic et al. (2020) states that there are there are income disparities by gender and by age in a pandemic.

Another discussed indicator is the effect of education on income change. Changes in income are slightly stronger on people with less education than those with more education (Li et al., 2022). Li et al. (2022) also stated that income in a pandemic varies by the residence individuals. This is consistent with Lee and Singh (2021).Based on the sources reviewed, the hypothesis (H1): the change in income during a pandemic is not the same across individuals with different socioeconomic characteristics arises that the change in income during a pandemic is not the same across individuals with different socioeconomic characteristics.

Individuals approach life in a pandemic differently because of different attitudes and values. The change in income is not the same across categories of perception of a pandemic is another hypothesis (H2) based on a study by Sakib et al. (2020) explaining that the fear of contracting the disease affects each individual differently. Individuals are also differently affected by the available information. As Chatterjee and Dinda (2022) explain there is information asymmetry in uncertain times. So, the next hypothesis assumes that income change in a pandemic is not the same across categories of the perceptions of the available information (H3).

Individuals spent more time in the online environment due to self-isolation in the pandemic (Gu et al., 2021), so adaptable individuals have been able to start working from home and entrepreneurs have increased the visibility of online businesses. The ability to communicate online influences the change in income in a pandemic so the change in income in a pandemic is not the same across categories of the attitude to online communication (H4). Online communication has accelerated digitalization in many fields and enabled a change in the organization of work towards remote working (Dimitrova et al., 2022). Another hypothesis focuses on whether the way an individual manages the new organization of work affects the change in his or her income in a pandemic (H5). The pandemic has disrupted social ties as the social distancing put in place to reduce the spread of the disease brought stress and exhaustion (Ellis and Jacobs, 2021; Brooks et al., 2020). The impacts of the pandemic including the context of household income can further cause psychological problems for individuals, leading to low productivity and an inability to return to the former economic activity (Huato and Chavez, 2021; Stroud and Gutman, 2021). Emotional stress is considered an important factor in the current pandemic, having a high impact on the human psyche and mental states (Yao et al., 2020). This leads to the last hypothesis, namely that the change in income in a pandemic is not the same across categories of the mental state of the individual (H6).

The coronavirus pandemic has been described as a crisis associated with decision-making based on existential anxiety under pressure (Kornberger et al., 2018). In uncertain situations, when individuals are exposed to stress and pressure, their response is based on their level of resilience, which takes cognitive, emotional, and physical forms. These forms of resilience are also evident in the occupational context (Kossek and Perigino, 2016). Hallgren et al. (2018) talk about the important role of institutions providing guidelines and coordination during emergency and risk situations.

2. Methodological approach

The study focuses on the situation of households in the Czech Republic. According to Usunier and Lee (2013), the Czech Republic can be considered as a representative of the countries of Central Europe. In the field of social policy and household living conditions, all EU countries share the objectives (Stiglitz et al., 2009). According to Wawrzyniak's ranking (2016), the Czech Republic is the 11th country (of 27) in terms of the best standard of living for individuals in the EU. According to the World Health Organization (2023), the Czech Republic is one of the EU countries moderately affected by the pandemic in terms of infections and deaths.

A representative questionnaire was conducted between November 2020 and October 2021 to determine the impact of the Covid-19 pandemic on individuals' incomes and behaviour. The survey focused on the subjective attitudes and perceptions of the individuals about aspects of life in the pandemic (A1: Perception of the pandemic, A2: Sufficient information, A3: Online communication, A4: Organization of work, A5: Mental state) in the Czech Republic. Data were collected in person and online. 2 368 respondents completed a questionnaire. In order to guarantee the representativeness of the data sample, five quotas were applied. A comparison of the structure of the sample and the structure of the population according to the representative EU-SILC (EU-Statistics on Income and Living Conditions) survey is provided in *Table 1*.

Table 1. Sample file (n = 2 368)

	Sample structure	**Population structure**		**Sample structure**	**Population structure**
Sex			**Highest education**		
Male	48%	47%	Primary	1%	0%
Female	52%	53%	Secondary	79%	76%
Economic activity			University	20%	24%
Full-time employee	45%	49%	**Average monthly net income**		
Part-time employee	4%	-	40,000 or less	64%	62%
Self-employed	9%	8%	40,001 – 80,000	30%	32%
Unemployed	2%	4%	80,000 or more	6%	6%
Student	7%	6%	**Size of municipality of residence**		
Old age pensioner	29%	26%	Less than 5,000 inhabitants	37%	33%
At home (parental or maternity leave)	3%	5%	5,000 – 49,999 inhabitants	28%	34%
Other	1%	2%	50,000 or more inhabitants	35%	33%

Source: *own questionnaire and Eurostat, 2022*

The primary data from the own questionnaire survey were processed using non-parametric tests and an ordinal regression. Non-parametric tests were applied to test the effect of aspects of individuals' lives and identifying features on change in income. The authors chose the Mann-Whitney U test to determine whether there were statistically significant differences between the two categories of the independent variable. The Kruskal-Wallis test allows testing differences between more than two categories of the independent variable (Wilson, 2018). The significance level has been set as $\alpha = 0.05$. The null hypothesis for both tests was: The

distribution of Change in income is the same across categories of aspects of life and identifying features. The aspects of life and identifying factors listed in the following paragraph are variables in the tests; the individual features/factors are the same as independent variables used in the logistic regression.

Ordinal logistic regression was applied to determine which categories of factors under consideration lead to a higher probability of a decrease in income. The dependent variable in the regression is the Change in Income variable. The independent variables are perceived aspects of life in the pandemic (A1: Perception of the pandemic, A2: Sufficient information, A3: Online communication, A4: Organization of work, A5: Mental state) and identifying factors (Economic activity, Age, Education, Household type, Household income and Size of the municipality of residence). The logistic regression model has been generalized for categorical variables with a finite number of values. The cumulative odds model considers the ordinal ordering of the categories in the Y variable and is defined by the relation:

$$\ln \frac{P^{(x)}(Y \geq y_j)}{P^{(x)}(Y < y_j)} = \propto_j + \sum_i \beta_i x_i , \qquad j = 2, \ldots, k.$$

for a categorical variable that has k values. The model is based on one reference category (y = 1) and k – 1 logistic regression. The yj parameters are threshold parameters for each category of the Y variable representing the logarithm of the chance that Y acquires at most the j value of the category (Greene, 2018).

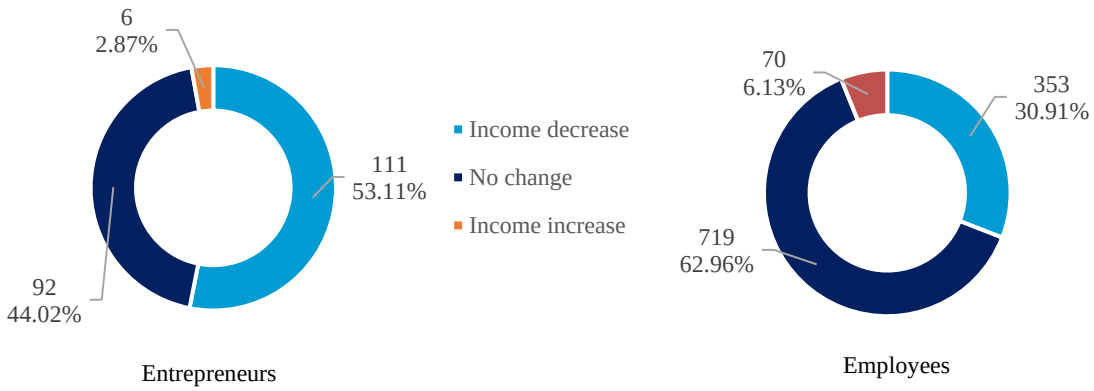
Statistical analyses were performed in IBM SPSS Statistics 25.

3. Conducting research and results

The results of the primary survey of 2,368 respondents show the seriousness of the individuals' income situation in times of economic uncertainty in a pandemic, as 31% of respondents expect a decline in their income. 33% of respondents reported that a pandemic has serious impacts on their economic situation and living conditions (e.g., job changes).

3.1. Factors influencing changes in income due to the pandemic

The survey results showed that expectations regarding the change in income in a pandemic differed depending on the identification features, aspects of working life during the pandemic. As for the economic activity, about 31% of the employees believed that income would decrease, while about 6% expected incomes to increase. The *Graph 1* also shows that more than half of the entrepreneurs expected a decline, while only 3% expected an increase in income – this finding illustrates the vulnerability of entrepreneurs to changes in market conditions.



Graph 1. Expected development of the income situation of entrepreneurs and employees
Source: *own questionnaire data (n = 2 368)*

Economic activity is not the only factor influencing changes in the income situation of individuals. All stated hypotheses (H1–H6) was verified and it is possible to conclude that changes in income during a pandemic depend on household income, individuals' income, economic activity, household type, age, size of municipality of residence and all examined aspects of life in a pandemic, i.e. perception of the pandemic, sufficient information, attitude to online communication and to organization of work and individuals' mental state (*Table 2*).

The Mann Whitney U Test did not confirm the relevance of Sex to Change in income, and the authors did not reject the null hypothesis of equal distribution of Change in income across gender categories. The Kruskal-Wallis test was applied to other factors with more than two groups of categories (Table 2). The influence of Education on Change in income was not confirmed at the significance level of 0.05.

Table 2. Effect of aspects of individuals' lives and identifying factors on change in income based on the Mann Whitney and the Kruskal-Wallis tests

	p-values		p-values
Household income	0.000*** (H1)	Size of municipality of residence	0.000*** (H1)
Economic activity	0.000*** (H1)	A1: Perception of the pandemic	0.000*** (H2)
Household type	0.000*** (H1)	A2: Sufficient information	0.000*** (H3)
Sex	0.333 (H1)	A3: Online communication	0.000*** (H4)
Age group	0.000*** (H1)	A4: Organization of work	0.000*** (H5)
Education	0.068* (H1)	A5: Mental state	0.000*** (H6)

Source: *own questionnaire data (n = 2 368)*

The detail provided in *Table 3* indicate that most individuals perceived the pandemic as a serious problem and behaved with caution. Only 6 % of respondents don't perceive the pandemic as risky situation. The answers differed in whether the government provided sufficient information about the measures taken and whether individuals were willing to accept this information. Here, the respondents were roughly split in half, which may also reflect the overall trust in the government. Most of the respondents talked about accepting the pandemic and accelerating digitalization when asked about online communication. 70% of the individuals did not mind using online communication. It suits half of them perfectly, they can set time limits for work and leisure. 16% could not respond to the questions because they did not use online means of communication. Only 4 % of respondents feel that they have no free time using online communication, so it doesn't suit them.

Half of the individuals saw positively the newly established regime of work or study. Half of the respondents have experienced working from home. One third of the respondents stated that working from home suits them. Working from home was a new experience for 20% of the respondents. 53% of the respondents agreed and 47% disagreed that the pandemic has affected individuals' mental health. However, when making prognoses, it must be considered that the current situation of the individual also influences their mental state (psychological well-being).

Table 3. Perceived aspects (A1-5) of life in the pandemic

A1: How do you perceive the current pandemic?				
Seriously. I'm being cautious.	Seriously but no distress.	I don't perceive it as risky.	I don't care about it.	
65.5%	26.8%	6.3%	1.4%	
A2: I have sufficient information on the pandemic government measures.				
I strongly agree	I rather agree	I rather disagree	I strongly disagree	
9.6%	40.2%	35.6%	14.7%	
A3: Online communication makes us constantly available.				
It suits me perfectly.	It suits me partially.	It rather doesn't suit me.	It doesn't suit me at all.	I don't use online communication.
34.8%	36.2%	8.7%	4.3%	16.1%
A4: I am not comfortable with the "pandemic mode" of organization of work.				
I strongly agree	I rather agree	I rather disagree	I strongly disagree	
19.8%	36.6%	29.1%	14.6%	
A5: The pandemic situation negatively affects my psychological well-being.				
I strongly agree	I rather agree	I rather disagree	I strongly disagree	
12.8%	40.2%	28.5%	18.5%	

Source: *own questionnaire data (n = 2 368)*

A reliability test was conducted for the items measuring agreement with specific statements, yielding a Cronbach's alpha of 0.530. This relatively low value suggests limited internal consistency, which may be attributed to the fact that only three items were included in the analysis. Other items were excluded due to differences in the response scale format.

The logistic regression results verified which categories of income determinants have led to a higher probability of a decrease in income (*Table 4*). Those variables that proved to be statistically significant in the previous analysis (*Table 2*) in terms of the effect on the Change in income variable entered the ordinal logistic regression. The authors also included the Education variable because it was found to be borderline significant. The Pearson Chi Square test verified the goodness of fit of the model with the following values (Chi-Square 6405.59; df 1831 and Significance 0.000). The summary statistics for the logistic regression model are as follows (Cox and Snell R Square 0.283; Nagelkerke R Square 0.346).

Variables showing significance (Sig. <0.05) are indicative of the fact that the variable categories differ from the reference (redundant) category. The **Perception of the pandemic** variable – which has three categories and a redundant category for respondents who do not perceive or care about the pandemic – shows that perceptions of the pandemic affect expected trends or changes in income. The highest likelihood of income decrease has been found in those individuals who do not perceive a pandemic as a risk.

Table 4. Parameter estimates of the logistic regression model

		Estimate	Std. Error	Sig.
Threshold	[Change in income = increase]	1.147*	0.677	0.090
	[Change in income = no change]	5.510***	0.691	0.000
Location	[A1: Perception of the pandemic = serious, need to be wary]	1.472***	0.426	0.001
	[A1 = serious, but no distress]	1.312***	0.429	0.002
	[A1 = monitoring but not perceiving the risk]	2.440***	0.456	0.000
	[A1 = indifference]	0[a]	.	.
	[A2: Sufficient information = absolutely yes]	1.736***	0.231	0.000
	[A2 = rather yes]	0.194	0.166	0.243
	[A2 = rather no]	0.344***	0.165	0.037
	[A2 = absolutely no]	0[a]	.	.
	[A3: Online communication = completely convenient]	-1.388***	0.194	0.000
	[A3 = partially convenient]	-0.743***	0.187	0.000
	[A3 = rather inconvenient]	-0.648***	0.238	0.007
	[A3 = completely inconvenient]	-0.800***	0.287	0.005
	[A3 = not used]	0[a]	.	.
	[A4: Organisation of work = definitely not convenient]	1.349***	0.191	0.000
	[A4 = rather not convenient]	1.671***	0.175	0.000
	[A4 = rather convenient]	1.130***	0.173	0.000
	[A4 = absolutely convenient]	0[a]	.	.
	[A5: Mental state = highly negative effects of the pandemic]	1.042***	0.192	0.000
	[A5 = rather negative effects of the pandemic]	1.418***	0.157	0.000
	[A5 = rather not experiencing any negative effects of the pandemic]	0.588***	0.161	0.000
	[A5 = definitely not experiencing any negative effects of the pandemic]	0[a]	.	.
	[Economic activity = employee]	0.269	0.236	0.254
	[Economic activity = entrepreneur]	1.381***	0.276	0.000
	[Economic activity = unemployed]	0.173	0.396	0.662
	[Economic activity = student]	-0.189	0.288	0.512
	[Economic activity = old-age pensioner]	-0.497	0.435	0.253
	[Economic activity = other]	0[a]	.	.
	[Age group 18-34]	0.140	0.387	0.717
	[Age group 35-64]	0.374	0.366	0.306
	[Age group 65 and more]	0[a]	.	.
	[Education = primary]	1.252**	0.707	0.077
	[Education= secondary]	0.583***	0.128	0.000
	[Education = university]	0[a]	.	.
	[Household type= one adult, no children]	-0.361	0.267	0.177
	[Household type = one adult and children]	0.903***	0.352	0.010
	[Household type = two adults, no children]	0.300	0.244	0.219
	[Household type = two adults and children]	0.042	0.238	0.860
	[Household type = other]	0[a]	.	.
	[Size of municipality = less than 5,000 inhabitants]	0.610***	0.128	0.000
	[Size of municipality = 5,000 – 49,999 inhabitants]	0.807***	0.127	0.000
	[Size of municipality = 50,000 inhabitants and more]	0[a]	.	.

Link function: Logit.

[a]. This parameter is set to zero because it is redundant.

Source: *SPSS processing, own questionnaire data (n = 2 368)*

Regarding **information sufficiency**, the highest likelihood of a decrease in income is associated with the group of respondents who reported having definitely enough information related to the pandemic. These may be entrepreneurs who need to monitor the pandemic situation more intensely.

Individuals who reported feeling completely comfortable **using online communication** tools are the least likely to experience a decrease in income during the pandemic. Specifically, those who are completely convenient with online communication are 4 times ($e^{1,388}$) less likely to experience a drop in income than those who do not use online communication.

Respondents who could not adapt to the **new organization of work**, or whose organization of work during the pandemic did not suit them, are more likely to expect a decrease in income (5.3 times more likely than those who were ok with the new organization of work).

Individuals who have felt the negative **impact of the pandemic on their mental health** are more likely to experience a decrease in income. Those who experience negative impacts on mental health are 4.1 times more likely to experience a decrease in income; and those who strongly feel negative impacts are 3.8 times more likely to experience a decline in income than those who do not feel such impacts.

Logistic regression allowed for a deeper analysis of the effects of identifying features on income change. The previous analysis, in which the Mann Whitney U Test was applied, already showed no effect of gender on income changes during the pandemic. Therefore, this variable was not included in the logistic regression. The logistic regression showed that there is no difference between age categories. As for the other identifying features, significance was found except for several individual categories.

In terms of **economic activity**, entrepreneurs have the highest probability of a decrease in income – this finding was in line with the expectations of the authors (see Graph1). There are no significant differences between the unemployed, students, and other respondents in terms of expected income changes in the pandemic. Respondents with higher education are less likely to experience a decrease in income. Those with primary education are 3.5 times more likely to experience a decline than those with university education). The analysis of the **Type of household** feature revealed the most at-risk group of respondents, i.e. those expecting the highest decline in income – those are households consisting of one adult living with at least one child. There is no conclusive difference between the groups two adults with children, two adults without children, and the other. In terms of the **size of the municipality of residence** (number of inhabitants), individuals from larger cities of 50,000 inhabitants or more are the least vulnerable group – i.e. the group with the lowest probability of income decline. Individuals living in small towns (5,000-49,999 inhabitants) are most at risk, being 2.2 times more likely to experience a decrease in income compared to inhabitants in the largest municipalities.

The logistic regression results identified a group of individuals most likely to experience a decrease in income. These are mainly individuals who do not perceive the pandemic as a risk and have enough information at the time of the pandemic but, on the other hand, do not use online communication tools. Another characteristic of this at-risk group is that they are not comfortable with organization of their work and feel the negative impact of the pandemic on their mental health. In terms of identification data, these are mainly entrepreneurs, with primary education and living in small towns (5,000–49,999 inhabitants). In terms of household type, the most at risk group are single parents with children, i.e. households consisting of one adult and at least one child.

3.2. Robustness analysis

As an additional step, we have checked the sensitivity of the logistic regression model with respect to various income groups. Individuals are divided into three household income groups: disposable monthly income less than CZK 40,000; CZK 40,000–80,000 and more than CZK 80,000. According to Nagelkerke R Square for three logistic regression models (*Table 5*), it is clear that the first model for the low-income group explains the most variability of the dependent variable.

Table 5. Parameter estimates of the logistic regression models (M1-M3) in different income groups

		M1: less than CZK 40,000	M2: CZK 40,000–80,000	M3: more than CZK 80,000
	Nagelkerke R Square	0.515	0.251	0.381
Threshold	[Change in income = increase]	1.429	1.608**	-0.411
	[Change in income = no change]	1.786***	0.588	-0.278
Location	[A1: Perception of the pandemic = serious, need to be wary]	2.799***	2.078***	0.328
	[A1 = serious, but no distress]	1.429	1.608**	-0.411
	[A1 = monitoring but not perceiving the risk]	1.786***	0.588	-0.278
	[A1 = indifference]	0[a]	0[a]	0[a]
	[A2: Sufficient information = absolutely yes]	2.675***	-0.133	-0.198
	[A2 = rather yes]	0.728***	-0.796***	-0.666
	[A2 = rather no]	1.034***	-0.240	-0.581
	[A2 = absolutely no]	0[a]	0[a]	0[a]
	[A3: Online communication = completely convenient]	-1.545***	-2.865***	0.575
	[A3 = partially convenient]	-0.369	-2.748***	1.546
	[A3 = rather inconvenient]	-0.075	-2.651***	0.759
	[A3 = completely inconvenient]	-0.324	-3.556***	2.718
	[A3 = not used]	0[a]	0[a]	0[a]
	[A4: Organisation of work = definitely not convenient]	1.989***	0.479	0.066
	[A4 = rather not convenient]	2.257***	0.524*	1.736**
	[A4 = rather convenient]	1.592***	0.257	1.679***
	[A4 = absolutely convenient]	0[a]	0[a]	0[a]
	[A5: Mental state = highly negative effects of the pandemic]	1.163***	0.472	-.578
	[A5 = rather negative effects of the pandemic]	1.643***	0.640***	0.100
	[A5 = rather not experiencing any negative effects of the pandemic]	0.720***	0.090	-0.277
	[A5 = definitely not experiencing any negative effects of the pandemic]	0[a]	0[a]	0[a]
	[Economic activity = employee]	0.444	0.470	1.665
	[Economic activity = entrepreneur]	1.697***	1.935***	2.868***
	[Economic activity = unemployed]	-0.250	1.399*	-
	[Economic activity = student]	-0.691	0.908**	1.220
	[Economic activity = old-age pensioner]	0.246	-	-
	[Economic activity = other]	0[a]	0[a]	0[a]
	[Age group 18-34]	0.783	-0.589	-1.198***
	[Age group 35-64]	0.854*	-0.281	0[a]
	[Age group 65 and more]	0[a]	0[a]	-
	[Education = primary]	-0.563	1.075	2.482
	[Education= secondary]	-0.009	0.820***	0.007

	[Education = university]	0[a]	0[a]	0[a]
	[Household type= one adult, no children]	-0.580	-0.775	1.638
	[Household type = one adult and children]	1.430***	-0.579	3.447*
	[Household type = two adults, no children]	0.556	-0.494	1.829
	[Household type = two adults and children]	0.479	-0.443	1.698
	[Household type = other]	0[a]	0[a]	0[a]
	[Size of municipality = less than 5,000 inhabitants]	1.043***	-0.203	-0.813
	[Size of municipality = 5,000 – 49,999 inhabitants]	1.542***	-0.427**	0.328
	[Size of municipality = 50,000 inhabitants and more]	0[a]	0[a]	0[a]

Link function: Logit.
[a]. This parameter is set to zero because it is redundant.
Source: *SPSS processing, own questionnaire survey (n = 2 368)*

In the original model for all income groups (*Table 4*), the categories of Age and Economic activity (besides the entrepreneur category) emerged as statistically insignificant in influencing the decline in income. In terms of the number of significant categories of variables in the models for the three income groups (*Table 5*), the model for the low-income group (income less than CZK 40,000) is the closest to the original model (*Table 4*). In contrast to the original model, the categories of Education and some categories of Online communication emerged as insignificant. It is still true that those who are comfortable with online communication have the lowest chances of a drop in income. On the other hand, all categories of Online communication are significant in the income group CZK 40,000–80,000. Again, those who do not use online communication are most likely to experience a decrease in income. Based on the low number of statistically significant categories in the third model, it can be assumed that the presented model is not suitable for the highest income group (more than CZK 80,000). The high-income model has in common with the other models that entrepreneurs are more likely to experience a decline in income compared to the others.

4. Discussion

The research question of this study was as follows. Which groups of individuals are at risk of poverty during a pandemic due to a change (decrease) in income in terms of demographic and socio-economic factors and according to their attitudes towards aspects of life in a pandemic. The study first brought the alarming finding that 33% of respondents said that the measures had seriously disrupted their living conditions (loss of employment, etc.). More positively, up to 70% of the respondents do not mind online communication and the adoption of new digital technologies. According to Schneck (2021), the pandemic can also be seen as an opportunity to change and improve established processes and better face uncertain economic situations in the future. The expectation of Almeida et al. (2021) of a decline in income due to the pandemic was confirmed by our data, but not to the extent predicted by Pinkovetskaia (2022), who estimated a decrease in income in 53% of households. The pandemic also brought uncertainty about expected inflation (Detmers et al., 2022). Although more than half of the survey respondents did not expect a change in their incomes, maintaining the same level of living conditions is threatened by the rising inflation rate.

According to the survey results, more than half of the entrepreneurs expected a decrease in income, which is in line with Schneck (2021). In crises and volatile situations such as pandemics, the growth of low-income households threatens to stop the sustainable development of society. Presented data of the study are consistent with Eurostat findings (2021), with the main causes being job losses or reduced working hours.

Reducing income inequality and, in particular, reducing the number of low-income households is one of the goals of social policies in all EU countries (Stiglitz et al., 2009). Social assistance should not be distributed across the board, but should be targeted at an identified group facing a decline in income over the next year. For this reason, one research question aimed to identify individuals at risk of low income in a pandemic. Close attention should be paid to single parents with children, who in many countries were also at income risk in the pre-pandemic era (Di Meglio et al. 2018; Kramer et al. 2016). Data received from the time of the pandemic shows that one adult household with children is the most likely to experience a decline in income compared to other household categories. This is in line with Hall et al. (2021), who suggest that low-income households are the most vulnerable to the economic impacts of the pandemic. Another at-risk group with a higher likelihood of a drop in income in a crisis are entrepreneurs in small towns who depend on at least short-term support from the state. The hypothesis tested regarding the change in income with the category of economic activity of the individual confirmed the relationship.

In terms of the demographic determinants of income change, the logistic regression model showed that the 35-64 age group is more likely to face an income decline than the 65+ and 18-34 age groups. The 35-64 age group represents the economically active population, which may be affected by job losses in a crisis like a pandemic, or by a drop in earnings in the case of small entrepreneurs. Conversely, the senior age group of 65 and older was not financially affected in the pandemic. The youngest age groups able to adapt to change, communicate online, etc. were also not as affected by the change in conditions. In terms of the highest attained education, individuals with only primary education face the highest risk. In terms of the size of the municipality of residence, individuals from municipalities with a population between 5 and 49 thousand are most at risk. When the variables economic activity and size of residence are combined, entrepreneurs from small towns emerge as an income vulnerable group during a crisis.

Regarding the effect of individuals' attitudes towards the five aspects of life in the pandemic examined, it was found that individuals who are reluctant to use online communication tools and accept the new organization of work are also at risk. This was confirmed by the findings of Huato and Chavez (2021) and Stroud and Gutman (2021), who also reported a link between psychological problems and declines in income. The connection between psychological state of individuals and the change in income was confirmed by the rejection of the null hypothesis which stated that there are no differences in change of income between categories of mental state of individuals. Individuals experiencing psychological problems are more likely to experience a decrease in income. Their attitudes and behaviour depend on their psychological and emotional resilience (Kossek and Perigino, 2016). Individuals experiencing the negative effects of the pandemic on their psyche are more vulnerable to a decrease in income. Robustness analysis verified the fit of the model for three groups of individuals according to the level of their household income. The model is most appropriate for the group of households with monthly income less than 40 000 CZK, which is desirable given the use of the results in the field of social assistance. Temporary targeted assistance from the state is essential during a pandemic to avoid a deterioration in living conditions, for which income is a critical factor – see also Yu et al. (2020) and Boter (2020).

Social assistance should be distributed to individuals who have experienced a significant decline in their income. The specific conditions for a decline in income below a defined threshold should be defined taking into account the income level and the specificities of the country concerned. The recommended procedure for distributing social benefits to vulnerable individuals is on the basis of an appeal in the media, whereby vulnerable groups apply and receive social benefits for a certain period of time if the conditions for a significant drop in

income are met. Before vulnerable households and small entrepreneurs receive social assistance in the form of benefits, part of the solution to the difficult situation may be to promote alternative business models, such as re-use, upcycling or community economies, which can reduce actors' current expenditure and increase their resilience to future crises through their ability to respond to changing conditions.

The use of questionnaire data appears appropriate for the theoretical contribution of this study in validating how uncertain economic situations impact the lives and behaviour of individuals. The model created by the application of logistic regression seems appropriate to identify categories of income determinants leading to higher probabilities of a decrease in income. The availability of information about the pandemic crisis situation represents both resources and positive or negative triggers, as Kossek and Perrigino (2016) discuss. Strong individuals are able to react dynamically and adapt to the situation (e.g. ability to communicate online, work remotely, etc.), but mentally unstable individuals or low-income households may get into trouble and face loss of income.

Data from individuals in the Czech Republic were used as the data base for this study. As Usunier and Lee (2013) state, the Czech Republic is one of the representatives of Central Europe in terms of cultural affinities and is also one of the countries joining the EU in 2004. The proposed data model could also be applied to other countries related to the Czech Republic, especially countries from the same cultural affinity zone and which joined the EU in the same year. Similar effects of income determinants can be assumed. On the other hand, it is important to note that each country has a different social policy set-up and the specific approaches to state assistance in uncertain economic times may differ, although the aim of minimizing the number of low-income households is common in the EU.

Conclusion

The pandemic crisis and the measures taken to counter it have raised concerns about the world's preparedness for unexpected crises such as pandemics. This is in accordance with Muneer et al. (2022) findings on actions taken during times of uncertainty.

Economic and political measures adopted in times of emergency, i.e. in times of crisis, are taken under conditions of uncertainty and their exact future effect is unknown. All measures are taken with the intention of having a positive impact on individuals' lives. Therefore, it is important to monitor how aspects of working life and individuals' perceptions of the pandemic are changing. The findings presented in this paper have confirmed that such monitoring must at the beginning of the implementation of the measures.

There is a broad scope for communication with the public and informing them about the future economic development of society, as many of the measures will have consequences later on and will affect the standard of living of a relatively large part of society. Economic measures must be accompanied by social policy measures taken by national governments to mitigate the negative financial impact on households. Both measures and social assistance must be communicated directly and truthfully to the public. Measures must be implemented in a timely manner and the public must be informed of their intended effects.

Low-income households and households at income risk due to the across-the-board nature of the measures will be the drivers of the intensity and duration of negative economic developments. Individuals facing online communication problems, unable to adapt to work changes, small entrepreneurs or single parent households are particularly at risk in a crisis. The number of low-income households can be expected to grow as high inflation, rising prices, job losses, etc. State support should be targeted at those at risk of income decline to avoid deepening poverty during crises from which households take many years to emerge.

Furthermore, integrating circular economy principles into crisis recovery strategies can help build more resilient economies. Policies encouraging sustainability, resource efficiency, and waste reduction can mitigate the long-term economic and environmental impacts of crises. By promoting circular economy initiatives, such as reusing materials, reducing waste, and fostering responsible consumption, societies can enhance their ability to withstand future economic shocks while also supporting social and environmental well-being.

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References

Almeida, V., Barrios, S., Christl, M., De Poli, S., Tumino, A., & van der Wielen, W. (2021). The impact of COVID-19 on households' income in the EU. *Journal of Economic Inequality, 19*(3), 413–431. https://doi.org/10.1007/s10888-021-09485-8

Boter, C. (2020). Living standards and the life cycle: reconstructing household income and consumption in the early twentieth-century Netherlands. *Economic History Review, 73*(4), 1050–1073. https://doi.org/10.1111/ehr.12997

Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *The Lancet, 395*, 912–920. https://doi.org/10.1016/S0140-6736(20)30460-8

Burlacu, M. (2016). The Population' Income, Expenses and Savings as Descriptive Aspects of the Standard of Living. *Ovidius University Annals, Series Economic Sciences, 16*(2), 175–180.

Chatterjee, T., & Dinda, S. (2022). Preference Distortion, Information Cost and Comparative Advantage:A Theoretical Quest to Claim Trade Posture in Post-Pandemic Era. *Foreign Trade Review, 57(*2), 127–147. https://doi.org/10.1177/00157325211060934

Dao, Q. T., Le, T. Y., & Phaw, V. H. (2022). Changes in Income Distribution During the COVID-19 Pandemic: Empirical Evidence from Vietnam. *Journal of Asian Finance Economics and Business, 9*(1), 241–248. https://doi.org/10.13106/jafeb.2022.vol9.no1.0241

Detmers, G. A., Ho, S. J., & Karagedikli, O. (2022). Understanding Consumer Inflation Expectations during the COVID-19 Pandemic. *Australian Economic Review, 55*(1), 141–154. https://doi.org/10.1111/1467-8462.12460

Di Meglio, E., Kaczmarek-Firth, A., Liteinska, A., & Rusu, C. (2018). *Living conditions in Europe*. Luxembourg: Publications Office of the European Union.

Doorley, K., O'Donoghue, C., & Sologon, D. M. (2022). The Gender Gap in Income and the COVID-19 Pandemic in Ireland. *Social Science-Basel, 11*(7), 311. https://doi.org/10.3390/socsci11070311

Ellis, C., & Jacobs, M. (2021). The Cost of Social Distancing for Persons with Aphasia During COVID-19: A Need for Social Connectedness. *Journal of Patient Experience, 8*. https://doi.org/10.1177/23743735211008311

European Commission. (2024). *Social protection & social inclusion*. Retrieved December 1, 2023, from https://ec.europa.eu/social/main.jsp?langId=en&catId=750

European Parliament. (2022). *The Enlargement of the Union*. Retrieved November 18, 2023, from https://www.europarl.europa.eu/factsheets/en/sheet/167/the-enlargement-of-the-union

Eurostat. (2022). *European Union - Statistics on Income and Living Conditions*. [Data set]. Eurostat. https://doi.org/10.2907/EUSILC2004-2021V.1

Eurostat. (2020). *COVID-19 impact on employment income*. Retrieved November 30, 2023, from https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20201210-2

Eurostat. (2021). *Impact of COVID-19 on household consumption and savings*. Retrieved October 05, 2023, from https://ec.europa.eu/eurostat/en/web/products-eurostat-news/-/ddn-20210510-1

Greene, W. H. (2018). *Econometric analysis*. New York: Pearson.

Gu, S., Slusarczyk, B., Hajizada, S., Kovalyova, I., & Sakhbieva, A. (2021). Impact of the COVID-19 Pandemic on Online Consumer Purchasing Behavior. *Journal of Theoretical and Applied Electronic Commerce Research, 16*(6), 2263–2281. https://doi.org/10.3390/jtaer16060125

Hall, L. R., Sanchez, K., da Graca, B., Bennet, M. M., Powers, M., & Warren, A. M. (2021). Income Differences and COVID-19: Impact on Daily Life and Mental Health. *Population health management, 25*(3), 384–391. https://doi.org/10.1089/pop.2021.0214

Hallgren, M., Rouleau, L., & de Rond, M. (2018). A Matter of Life or Death: How Extreme Context Research Matters for Management and Organization Studies. *Academy of Management Annals, 12*(1), 111–153. https://doi.org/10.5465/annals.2016.0017

Huato, J., & Chavez, A. (2021). Household Income, Pandemic-Related Income Loss, and the Probability of Anxiety and Depression. *Eastern economic journal, 47*, 546–570. https://doi.org/10.1057/s41302-021-00199-3

Janys, L., Zimpelmann, Ch., von Gaudecker, H. M., Siflinger, B., & Holler, R. (2021). Hours and income dynamics during the Covid-19 pandemic: The case of the Netherlands. *Labour economics, 73*, 102055. https://doi.org//10.1016/j.labeco.2021.102055

Karabag, S. F. (2020). An Unprecedented Global Crisis! The Global, Regional, National, Political, Economic and Commercial Impact of the Coronavirus Pandemic. *Journal of Applied Economics and Business Research, 10*(1), 1–6.

Khan, M. A., & Husnain, M. I. U. (2019). Is health care a luxury or necessity good? Evidence from Asian countries. *International Journal of Health Economics and Management, 19*(2), 213–233. https://doi.org/10.1007/s10754-018-9253-0

Khan, A. G., Kamruzzaman, M., Rahman, M. N., Mahmood, M., & Uddin, M. A. (2021). Quality of life in the COVID-19 outbreak: influence of psychological distress, government strategies, social distancing, and emotional recovery. *Heliyon, 7*(3), e06407. https://doi.org/10.1016/j.heliyon.2021.e06407

Kornberger, M., Leixnering, S., & Meyer, R. E. (2018). The Logic of Tact. "How Decisions Happen in Situations of Crisis. *Organization Studies, 40*(4), 239–266. https://doi.org/10.1177/0170840618814573

Kossek, E. E., & Perrigino, M. B. (2016). Resilience: A Review Using a Grounded Integrated Occupational Approach. *Academy of Management Annals, 10*(1), 729–797. https://doi.org/10.1080/19416520.2016.1159878

Kramer, K., Myhra, L., Zuiker, V., & Bauer, J. (2016). Comparison of Poverty and Income Disparity of Single Mothers and Fathers Across Three Decades: 1990-2010. *Gender Issue, 33*(1), 22–41. https://doi.org/10.1007/s12147-015-9144-3

Kulic, N., Sani, G. M. D., Strauss, S., & Bellani, L. (2020). Economic disturbances in the COVID-19 crisis and their gendered impact on unpaid activities in Germany and Italy. *European societies, 23*(S1), 400–416. https://doi.org/10.1080/14616696.2020.1828974

Lee, S., Kim, C., Kang, J., & Seo, N. (2015). Unmet healthcare needs depending on employment status. *Health Policy, 119*, 899–906. https://doi.org/10.1016/j.healthpol.2014.09.007

Lee, H., & Singh, G. K. (2021). Monthly Trends in Access to Care and Mental Health Services by Household Income Level During the COVID-19 Pandemic, United States, April: December 2020. *Health Equity, 5*(1), 770–779. https://doi.org/10.1089/heq.2021.0036

Li, J., Song, Q., Peng, C., & Wu, Y. (2021). COVID-19 pandemic and household liquidity constraints: Evidence from micro data. Emerging markets finance and trade, 56(15), 3626–3634. https://doi.org/10.1080/1540496X.2020.1854721

Li, J., Vidyattama, Y., La, H. A., Miranti, R., & Sologon, D. M. (2022). Estimating the Impact of Covid-19 and Policy Responses on Australian Income Distribution Using Incomplete Data. *Social Indicators Research, 162*, 1-31. https://doi.org/10.1007/s11205-021-02826-0

Muneer, M. A, Osama, F. A., & Ashraf, K. (2022). What do we know about business and economics research during COVID-19: a bibliometric review. *Economic Research-Ekonomska Istraživanja, 35*(1), 1884 –1912. https://doi.org/10.1080/1331677X.2021.1927786

Nyatanga, B. (2020). COVID-19 pandemic: changing the way we live and die. *British journal of community nursing*, *25*(5), 254. https://doi.org/10.12968/bjcn.2020.25.5.254

Pasqualini, M., Lanari, D., Minelli, L., Pieronni, L., & Salmasi, L. (2017). Health and income inequalities in Europe: What is the role of circumstances? *Economics & Human Biology, 26*, 164–173. https://doi.org/10.1016/j.ehb.2017.04.002

Pickett, K. E., & Wilkinson, R. G. (2015). Income inequality and health: A causal review. *Social Science & Medicine, 128*, 316–326. https://doi.org/10.1016/j.socscimed.2014.12.031

Pinkovetskaia, I. (2022). Impact of Covid-19 pandemic on household income: results of a survey of the economically active population. *Studia Universitatis „Vasile Goldis" Arad – Economics Series*, *32*(1), 43–57. https://doi.org/10.2478/sues-2022-0003

Roy, K., & Chaudhuri, A. (2008). Influence of socio-economic status, wealth and financial empowerment on gender differences in health and health care utilisation in later life: evidence from India. *Social Science & Medicine, 66*, 1591–1962. https://doi.org/10.1016/j.socscimed.2008.01.015

Sakib, N., Bhuiyan, A. K. M. I., Hossain, N. S., Mamun, A. F., Hosen, I., Abdullah, A. H., & Sarker, M. A. (2020). Psychometric validation of the bangla fear of COVID-19 scale: confirmatory factor analysis and rasch analysis. *Int. J. Ment. Health Addict,11*, 1–12, https://doi.org/10.1007/s11469-020-00289-x

Schneck, S. (2021). Income loss among the self-employed: implications for individual well-being and pandemic policy measures. *Review of economics of the household, 21*, 37–57. https://doi.org/10.1007/s11150-021-09583-6

Socías, M. E., Koehoorn, M., & Shoveller, J. (2016). Gender Inequalities in Access to Health Care among Adults Living in British Columbia, Canada. *Women's Health Issues, 26*(1), 74–79. https://doi.org/10.1016/j.whi.2015.08.001

Stiglitz, J. E., Sen, A., & Fitoussi, J. (2009). *Report by the Commission on the Measurement of Economic Performance and Social Progress*. Commission on the Measurement of Economic Performance and Social Progress.

Stiglitz, J. E., Fitoussi, J. P. & Durandm, M. (2019). *Measuring what counts: The global movement for well-being.* New York: The New Press

Stroud, I., & Gutman, L. M. (2021). Longitudinal changes in the mental health of UK young male and female adults during the COVID-19 pandemic. *Psychiatry research, 303*, 114074. https://doi.org/10.1016/j.psychres.2021.114074

Teramura, A., Kimura, Y., Hamada K., Ishimoto, Y., & Kawamori, M. (2022). COVID-19-Related Lifestyle Changes among Community-Dwelling Older Adult Day-Care Users: A Qualitative Study. *International Journal of Environmental Research and Public Health*, 19(1), 256. https://doi.org/10.3390/ijerph19010256

Teslya, A., Pham, T. M., Godijk, N. G., Kretzschmar, M. E., Bootsma, M. C. J., & Rozhnova, G. (2020). Impact of self-imposed prevention measures and short-term government-imposed social distancing on mitigating and delaying a COVID-19 epidemic: A modelling study. *PLOS Medicine, 17*(7), 1–21. https://doi.org/10.1371/journal.pmed.1003166

Usunier, J. C., & Lee, J. A. (2013). *Marketing across cultures*. London: Pearson

Wawrzyniak, D. (2016). Standard of Living In The European Union. *Comparative Economic Research-Central and Eastern Europe, 19*(1), 14 –155. https://doi.org/10.1515/cer-2016-0008

Wilson, A. (2018). *Marketing Research: Delivering Customer Insight*. London: Red Globe Press

World Health Organization (2023). WHO Coronavirus (COVID-19) Dashboard. https://covid19.who.int/ Last access 06 18 2023

Yao, H., Chen, J. H., & Xu, Y. F. (2020). Patients with mental health disorders in the COVID-19 epidemic. *Lancet Psychiatry, 7*(4), e21. https://doi.org/10.1016/S2215-0366(20)30090-0

Young, D. (2022). Income Insecurity and the Relational Coping Strategies of Low-Income Households in the UK. *Journal of Social Policy, 53*(1), 1–19. https://doi.org/10.1017/S004727942200006X

Yu, G. B., Lee, D. J., Sirgy, M. J., & Bosnjak, M. (2020). Household Income, Satisfaction with Standard of Living, and Subjective Well-Being. The Moderating Role of Happiness Materialism. *Journal of Happiness Studies, 21*(8), 2851–2872. https://doi.org/10.1007/s10902-019-00202-x