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# Labor Market Hysteresis of Self-Employment: A Case of the Czech Manufacturing Sector

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## Abstract

The self-employed are considered key drivers of economic growth and the promotion of a sustainable society. Still, a possible economic crisis always brings threats and opportunities for self-employment. This article analyzes the hysteresis of self-employment in the Czech Republic manufacturing sector. The authors deal with the research question of whether self-employed people behave differently from employees during an economic crisis. An unemployment model was created from the analysis. This model contains independent variables (employees and self-employed in C-Manufacturing, previous unemployment, and dummy variables reflecting economic crisis). The self-employed have been identified as a tool to slow down unemployment. The authors emphasize the high level of vulnerability of the selfemployed, and therefore a part of the article is devoted to the economic policy of the state. In addition, the data are compared with Germany, which is the Czech Republic's main trading partner. The new internet services and remote controls under manufacturing seem to be an important opportunity for the self-employed and sustainable development.

**Keywords:** Hysteresis, labor market, self-employment, manufacturing, macroeconomics, Czech Republic

## Introduction

The topic of self-employment has many aspects, but above all, self-employment is recognized by many authors as one of the pillars of a long-term sustainable prosperous modern economy (Stenholm, Acs, and Wuebker 2013; Hyttinen and Rouvinen 2008). Faggio and Silva (2014) focused on self-employment and entrepreneurship in both rural and urban labor markets. They examined the link between self-employment and the salient aspect and entrepreneurship (business creation and innovation). Innovation is proving to be one of the most important aspects even at present, when the pandemic in 2020 has broken down a number of established economic processes. The role of innovation and the use of new technologies are being explored by Zhao (2020), who examines the effects of the use of

information technology on self-employment in rural areas. He found that the use of these technologies increases the likelihood of self-employment by 6 percent on average. The high level of involvement of modern IT and the impact of the development of industry 4.0 in the Czech Republic are highlighted by Tuček (2017); it is industry 4.0 that is proving to be very important for the further sustainability of economic development in the Czech Republic in the coming decade.

Equally important, according to Faggio and Silva (2014), is the aspect of job creation, especially in times of economic crisis. Bögenhold and Stabler (1991) support this idea in their article. Based on long-term research of self-employment, Bögenhold and Stabler claim that selfemployment means a solution to the slow economic growth problem caused by unemployment. Their long-run regression analysis of self-employment indicators in eight major OECD countries (1950s to 1987) shows that a higher number of self-employed can be an answer to deficiencies in labor markets rather than an indication of economic strength.

The transition from vulnerable employees (threat of unemployment) to self-employed persons is typical in times of economic crisis. However, many employees try their own business and self-employment even in good times. Le (2002) states that there is the tendency to be selfemployed at any point in time, whereas long-term studies concentrate on the change from wage/salary employment to self-employment and the survival rate in such a state over time.

As early as 1991, Bögenhold and Staber (1991) emphasized how many self-employed people created other jobs in addition to their own. They also point out that the present situation regarding work issues is developing outside common working relations, one in which so-called “job nomads” work as freelancers, doing teleworking, working from home, or having part-time work.

Job nomads become much more important at a time of the pandemic when even standard employees are sent by companies to the home office, and self-employed persons are looking for innovative internet solutions for their business.

Thurik et al. (2008) take another view of the self-employed person—the effects of the COVID-19 pandemic on this sector (Belitski et al. 2021). They ask themselves the question: “Does self-employment reduce unemployment?” They investigate the dynamic relationship between self-employment and unemployment rates. The authors say that high unemployment rates can cause the start of particular activities of self-employed people. Nevertheless, higher rates of self-employment may indicate higher entrepreneurial activity, which might decrease unemployment later on.

Thurik et al. (2008) confirmed the existence of two distinct relationships between unemployment and self-employment: the “refugee” and “entrepreneurial” effects. They also found out that the “refugee” effects are considerably weaker than the “entrepreneurial” effects. However, the effect of entrepreneurship can also be very weak or even zero to negative (Fritsch 2008). On the other hand, the refugee effect occurs when business start-ups are driven by a high rate of unemployment, and unfavorable prospects for the future (Fritsch, Kritikos, and Pijnenburg 2015). In examining these effects, Namatovu and Dawa (2017) confirm that selfemployment may reduce unemployment.

## **Literature Review**

Self-employment is a very vulnerable form of economic activity, both from a microeconomic and a macroeconomic point of view. Therefore, setting up protective mechanisms for wellfunctioning self-employment in the economy is one of the important tasks of the state’s economic policy. Congregado et al. (2010) ask a question: “Is it a good policy to promote selfemployment for job creation?” analyzing

evidence from Spain. Congregado, Golpe, and Carmona (2010) claim that one of possible policies applied in the labor market to fight unemployment is to motivate unemployed people to start up their business. Such policy can lead to higher self-employment for at least certain period of time, mainly by having a larger number of own-account workers.

The evaluation of the active state policy on the labor market for self-employment in Spain was performed by Sánchez-Canizares et al. (2020). The authors declare that due to such policy, the results show a higher probability of survival of the group with the subsidy than without it. However, the positive outcomes of the measure disappear in the long run. The role of state aid is also emphasized by Román, Congregado, and Millán (2013). They underlay determinants of an individual's decision to switch from unemployment to self-employment.

Román, Congregado, and Millán (2013, 17) set the role of three essential dimensions as following:

1. The existing heterogeneity within self-employment, by considering self-employed individuals who hire employees (employers) and self-employed individuals without personnel (own-account workers) as separated groups;
2. The effects of different measures of social capital and network contacts, as forms of micro-level institutional factors; and
3. The explanatory power of cross-country differences in the state of the economy, expenditure on start-up incentives, and the stringency of labor laws, as forms of macrolevel institutional factors. This study has useful theory and policy implications for entrepreneurship development”.

The effects of tax reform on choosing to become self-employed in South Africa are examined by Ngwaba and Azizi (2019). The results indicate that tax reform had a positive and significant effect on the probability of becoming self-employed in South Africa. An important area of research in the microeconomic and macroeconomic analysis is the issue of why individuals choose to become self-employed and how public policies affect this choice.

Narita (2020) deals with the construction and life-cycle on-the-job search model with selfemployment that captures labor market stylized facts typical of middle-income developing economies. The author revealed that lower payroll taxes can be positive for the total welfare thanks to a better allocation of workers across various areas of specialization.

The support of the state toward education for entrepreneurship also has a significant influence on the development of self-employment. Cera et al. (2020) investigate the impact of entrepreneurship education on entrepreneurial intention. The authors' findings provide an overview for government representatives and leaders of higher education institutions who are in charge of working on curricula and policies focused on encouraging university graduates to do business after they graduate from university or complete an entrepreneurship education course of study.

Ayob (2020) deals with macroeconomic factors of nascent student entrepreneurship. The author studied the influence of factors such as macroeconomic indicators, entrepreneurship education, and entrepreneurial culture. The research has shown the dominance of cultural and educational factors as opposed to macroeconomic indicators.

The statistical offices of individual states monitor the number of employees and selfemployed persons, which forms the concept of employment. Bennett and Rablen (2015) assume an integrated labor market and allow for entrepreneurship, self-employment, and wage employment. The authors state that all above mentioned may coexist.

Falco and Haywood (2016) investigate the link between earnings structure change in selfemployment and salary. The authors determined that workers decide for self-employment for various reasons, including expected earning differentials and capital accumulation.

In OECD countries, self-employment accounts for 4 to 22 percent of employment (2020a). According to Boeri et al. (2020), self-employment appears to be a transitional category between employment and unemployment. Beusch and Van Soest (2020) have a different view on the transition between employment, self-employment, and unemployment. The authors deal with the labor market trajectories of the self-employed in the Netherlands. However, the degree of vulnerability of the self-employment segment is changing dynamically—it is growing significantly in times of economic crises (Faggio and Silva 2014; (Bogenhold and Staber 1991).

The main goal of this article is to define the specifics of the behavior of self-employed persons during the economic crisis and to analyze the self-employment hysteresis in the economy. The primary research method is the analysis of statistical data. Also, the method of multivariate statistics using dummy variables was used to analyze the impact of the economic crisis on the number of self-employment in the long period 2008-2020 in the Czech Republic.

## **Methodology and Research Methods**

Research Question: How do self-employed persons behave compared to an employee in times of economic crisis? Working hypothesis “Self-employed persons behave differently in times of economic crisis compared to employees in the conditions of the Czech Republic in 2008-2020.”

Data for the research were drawn from the Czech Statistical Office (CZSO 2020) for the Czech Republic and from Eurostat (2020) for comparison with other European Union countries. The data formed a comprehensive time series by quarters from 2008 to the end of the first quarter of 2020, i.e., a total of up to fifty-one quarters. The data were based on an international methodology for monitoring the labor market from the results of the Labor Force Sample Survey (LFSS). The LFSS acquires regular information on the situation in the labor market, which helps to analyze it from various points of view, mainly economic, social, and demographic. The primary data for this research are based on the monitoring of employment, divided into employees and self-employed persons.

As differences for individual industries are also important, the NACE Rev.2 classification was used. The Czech Classification of Economic Activities CZ-NACE is derived from the International Standard Industrial Classification of All Economic Activities (ISIC). Manufacturing (section C of the CZ-NACE classification) is the basis for creating GDP in the Czech Republic. Therefore, the variable “Employment in Manufacturing NACE C” is used in the model. This variable contains both the number of employees and the number of selfemployed in C-Manufacturing in the Czech Republic.

The method of multivariate statistics with dummy variables was used to analyze the impact of the economic crisis on the number of unemployed persons. According to Cooper and Schindler (2013), multiple regression is an extension of the bivariate linear regression, predicting a variable from another’s scores. Dummy variables (nominal variables coded 1 = “crisis”, 0 = “non-crisis”) were used to identify the influence of the economic cycle-phase economic crisis.

An analysis of long-term self-employed behavior was performed compared to employment in the period of economic crises 2009, 2012-2013 and the first quarter of 2020. The Czech Republic is a highly industrially oriented economy (section C in the NACE classification). The regression analysis addressed the relationship between employment in manufacturing and total unemployment in times of economic crisis. A model was created using the dummy variable and searching the impact of the economic crisis on employment and unemployment in the long period 2008-2020 in the Czech Republic. The model uses hysteresis—the dependence of the state of unemployment on its history. The results of the model are presented in **Table 2**. Finally, a comparison of data is made with Germany in the period 2008-2017.

## Results

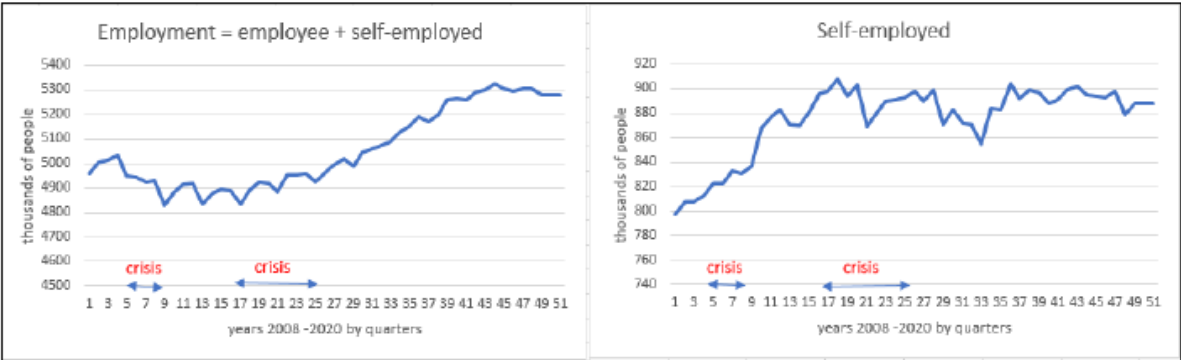
The description of the statistical data used for analysis for the long period 2008-2020 is presented (**Figure 3, Table 1, Figure 4, Figure 5**). Furthermore, a model for calculating unemployment was created and verified using the independent variables “Employment in Manufacturing NACE C” and “Previous state of unemployment in the Czech Republic four quarters ago” and dummy variable “crisis” (nominal variables coded 1= “crisis”, 0 = “noncrisis”). The results of the model are presented in **Table 2**. At the end of the chapter, there is a comparison with the number of employees and self-employed in Germany for the observed period 2008-2017 (**Figure 6 and Figure 7**).

The fundamental restrictions announced by the government of the Czech Republic caused high uncertainty among self-employed. In mid-March 2020, no one knew how long the quarantine and ban on opening shops and services would last. Some self-employed persons immediately began to change business strategies to deliver their products through e-shops and home delivery. Some tried to find a new business segment in the form of production of medical masks, protective equipment, etc. For example, Prusa Research, which produced 3D printers, immediately began offering self-employed persons supplies of simple 3D printers, on which they could produce face shields for staff in hospitals, cashiers in shops, for staff in retirement homes and social services, etc. Self-employed quickly helped meet local demand, and at the same time, they had a new source of income. Many self-employed people took advantage of the new conditions where people had to break down their stereotypes of behavior and significantly increased the offer of e-services, e-business, and all services for people working from home. Private doctors, for example, also adapted quickly; they began to communicate massively online with their clients and prescribe medication to patients in the form of e-prescriptions, where the doctor sends the patient a text message with a code, and the pharmacy dispenses medicines according to the code. Private teachers also quickly moved to the internet and taught remotely online. This solution was possible because most households in the Czech Republic are equipped with computers and internet connections. However, some self-employed people were unable to move their services to the online environment and had to close their businesses and were suddenly left with no income. The state offered quick financial assistance in the form of nursing benefits for parents with children aged 3-13 in the amount of CZK 500 per day (for self-employed people), or 60 to 80 percent of salary for an employee, for almost four months. This form was used by nearly 200,000 employees and self-employed persons.

Self-employed people whose businesses were restricted by government regulations could also apply for an extraordinary compensation bonus of up to CZK 44,500 from March 12, 2020, to June 8, 2020. Despite these compensations, however, a number of self-employed persons had to terminate or interrupt their business. These self-employed persons became employees. One part of self-employed persons was previously unemployed people, and the remaining part ceased their own business.

For the future restart of self-employed businesses in the Czech Republic, it is very important for the government to provide loans to companies and corporations, as some selfemployed people work as subcontractors for larger companies. The Czech Republic is a very industrially oriented country (NACE C- Manufacturing)—according to CZSO data, industrial production fell by 10.8 percent in March 2020. Export orientation is also crucial for the Czech Republic; the Czech Republic’s most significant export partner is Germany. In March 2020, the Czech Republic’s exports even fell by 13.3 percent. Recovery from the economic downturn will depend on both the programs of the Czech government and the speed and success of the regeneration of the German economy.

The strategy and behavior of the self-employed in times of economic crisis are crucial. The relationship between the size of employment and the economic situation is clear; in times of economic crisis, total employment is lower (marked “crisis” in the graph). For the selfemployed, however, this dependence is ambiguous, as shown in **Figure 1** in graph b). The last twelve years of development of self-employment in the Czech Republic is seen in **Figure 1**.



**Figure 1:** The Development of Total Employment in the Years 2008 to 2020 by Quarters Source: CZSO 2020

The development of total employment in the years 2008 to 2020 by quarters is shown in **Figure 1** (a). The development of self-employment in the same period is shown in **Figure 1** (b). The diagrams highlight periods of economic crisis; a comparison indicates that total employment is declining during a crisis (unemployment is rising or people are becoming economically inactive). At the same time, self-employment may even increase during economic crisis (authors’ own data; CZSO 2020)

**Table 1** shows descriptive statistics for the data used in the model. Data are monitored for the period from 2008 to 2020 by quarterly, a total of forty-nine quarters. There were three periods of the economic crisis in this period: 2009, 2012-2013, and the first quarter of 2020, which was the beginning of a new deep economic turmoil thanks to the COVID-19 pandemic, as the preliminary results of the GDP decline in the first quarter of 2020 show not only in the Czech Republic but also in many other countries in the world.

**Table 1:** Employment in Manufacturing (NACE C) and Total Unemployment in the Czech Republic in the Years 2008 to 2020 by Quarters ^ (49 Quarters)

	mean	sd	median	trimmed	min	max	range	skew	kurto sis	se
t1	25	14.29	25	25	1	49	48	0	-1.27	2.04
unemp	266.78	102.16	302.8	269.69	102.4	422.7	320.3	-0.31	-1.43	14.59
crisis	0.27	0.45	0	0.22	0	1	1	1.03	-0.96	0.06
C12	1354041.88	82791.97	1349558	1356981.44	1201121	1492695	291574	-0.11	-1.28	11827.42
C23	100991.98	8041.32	102470	101296.95	83222	117151	33929	-0.33	-0.41	1148.76
C34	1253049.86	78413.46	1254274	1255394.95	1117899	1375544	257645	-0.12	-1.44	11201.92
N = 49; 1 Time period - a quarter of the year. 2 Total employment in NACE C (self-employed + employees). 3 Self-employed in NACE C. 4 Employees in NACE C.										

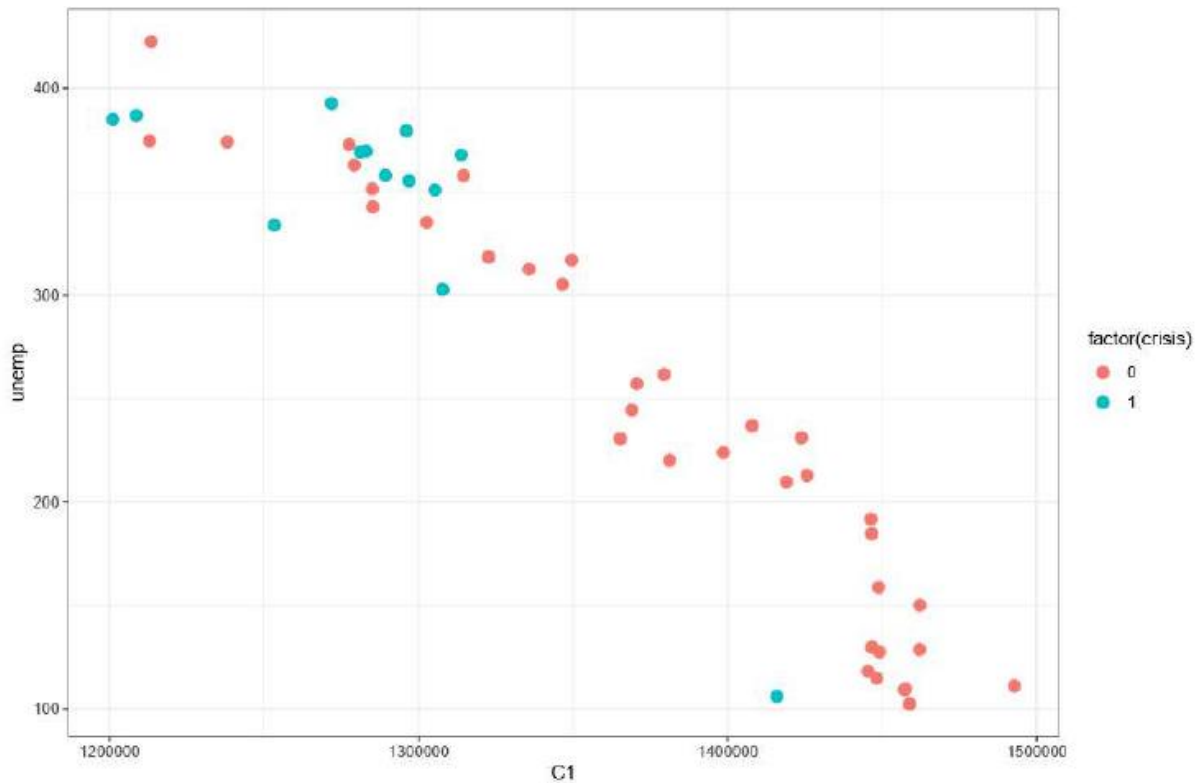
Source: Švarcová et al; CZSO 2020

The “unemp” category represents the number of unemployed according to the LFSS. This number is monitored for the whole economy, not only for the NACE C Manufacturing. In recent years, the number of unemployed in the Czech Republic has been very low and exceeded by the number of job vacancies.

The “crisis” category is used in the model as Dummy variables (nominal variables coded 1= “crisis”, 0 = “non-crisis”). Category “C1” represents the number of employed in Manufacturing in the Czech Republic (NACE C); both employees and self-employed are included among the employed. On average, there were 1,354,041 employed in the observed period with a standard deviation of 11,827; Manufacturing is the largest employer in the Czech economy. Category “C2” represents only self-employed. The average number of self-employed in Manufacturing during the observed period was 100,991 persons and the standard deviation was 1,148. It can be seen from the above figures that self-employed in the industry represent less than 10 percent of all employed in Manufacturing (C1). Category “C3” then describes the number of employees in Manufacturing; the average was 1,253,049 people and the standard deviation was 11,201.

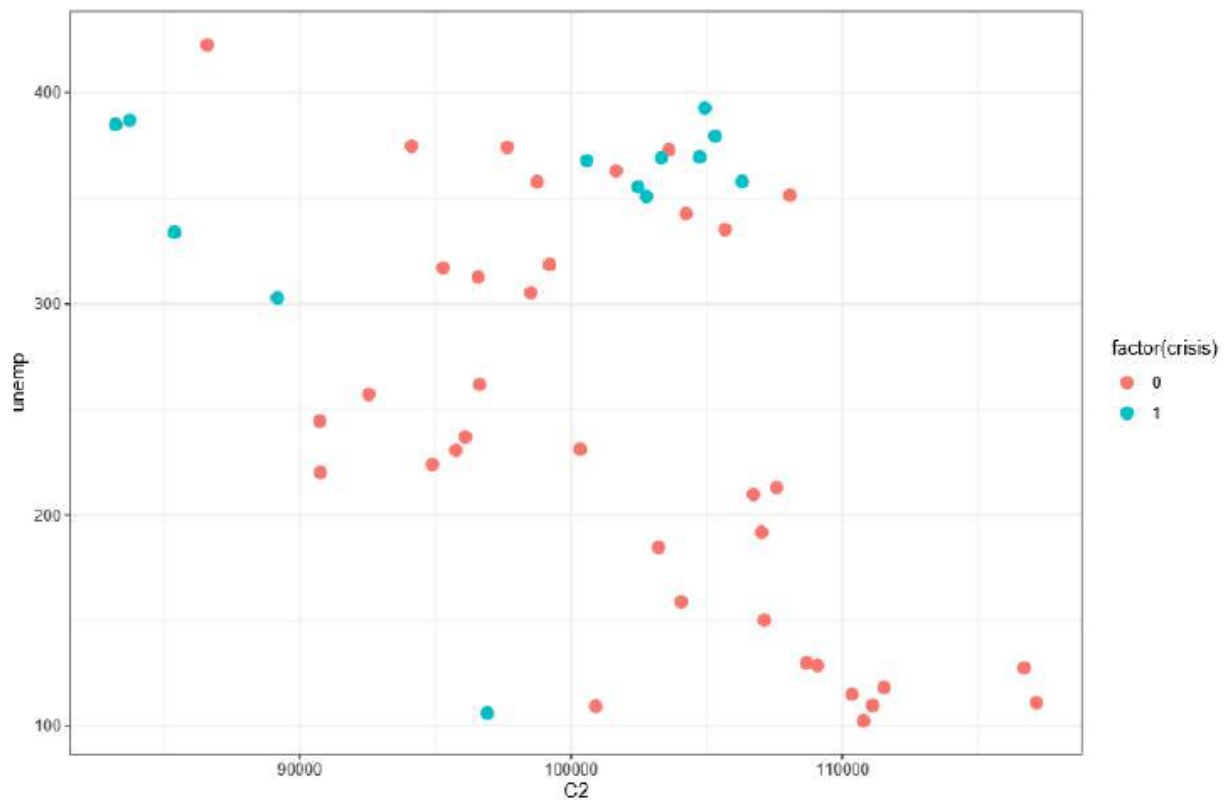
The correlation (indirect ratio) between employment in industry “C1” and total unemployment “unemp” is shown in **Figure 2**, which also indicates the dummy variable crisis.





**Figure 2:** Correlation between Unemployment and Employment NACE C Manufacturing in the Czech Republic Source: švarcová et al; CZSO 2020

However, the “C2” category, i.e., the self-employed persons themselves, behaves differently, as shown in **Figure 3**, showing the correlation between C2 and unemployment. This confirms expectations; see **Figure 1**.



**Figure 3:** Correlation between Unemployment and Self-Employment NACE C Manufacturing

Source: Švarcová et al; CZSO 2020

The variables “C1,” the previous state of unemployment with a period of four quarters, and the dummy variable “crisis” (nominal variables coded 1 = “crisis”, 0 = “non-crisis”) were used to create the model. The model is given in Equation (1):

$$unemp_t = \beta_0 + \beta_1(unemp_{t-4}) + \beta_2(C1) + \beta_3(crisis) + \epsilon \quad (1)$$

The model uses hysteresis—the dependence of the state of unemployment on its history. The results of the model are presented in **Table 2**.

**Table 2:** Results of the Model

unemp			
Predictors	Estimates	CI	p
(Intercept)	1180.827	1037.055 – 1324.598	<0.001
C1	-0.000773	-0.000867 – - 0.000680	<0.001
lag (unemp, 4)	0.460699	0.385973 – 0.535424	<0.001
Factor (crisis) 1	18.991309	6.043409 – 31.939208	0.006
Observations	45		
R <sup>2</sup> / R <sup>2</sup> adjusted	0.977 / 0.975		

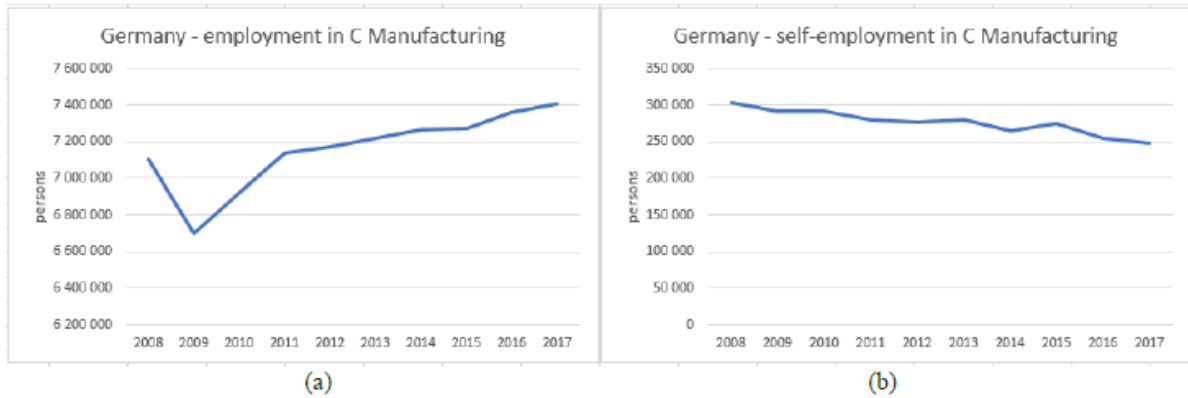
Source: Švarcová et al; CZSO 2020

The model is valid under the condition of maintaining the structure of the economy when the main part of employment is in Manufacturing. The model was processed exclusively on data in the Czech Republic. Its applicability for similar economies in the world, which have a high share of employment in Manufacturing, would have to undergo independent research. At the same time, it is necessary to take into account that a particular part of the employed and unemployed may go to economically inactive persons (retire, maternity leave, etc.), i.e., a high number of such departures outside the employed and unemployed categories may affect the results of the model.

The results obtained using the above methods support the validity of the working hypothesis “Self-employed persons behave differently in times of economic crisis than employees in the conditions of the Czech Republic in 2008-2020.”

The development in Germany, which is the main export partner, is crucial for the Czech economy. The following graphs compare employment in Manufacturing (NACE Rev.2 section C) in the Czech Republic and employment in Manufacturing in Germany in 2008-2017. The development of total employment in C-Manufacturing in Germany is shown in Figure 4 (a). Here you can see the standard development when during the economic crisis of 2009 employment decreased. In the following years of the economic boom, there was an increase in employment (employees + self-employed). However, the development of self-employed in C-Manufacturing in Germany shows that self-employed people behave differently, and during the economic crisis of 2009, their number is stable and even declined in economic boom 2016-2017 **Figure 6 (b)**.

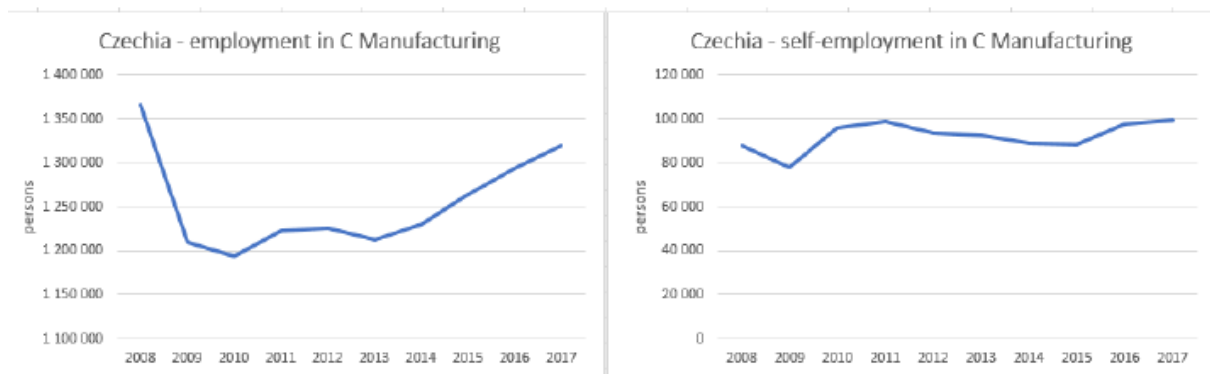
The development of employment in C-Manufacturing (NACE Rev.2) in the Czech Republic in the years 2008-2017 is shown in **Figure 5**, where total employment also has a standard course for economic crisis (a). Still, the development of self-employment is stable (b). The comparison of self-employment in the Czech Republic and Germany supports the conclusions of the research presented in this article.



**Figure 4:** The Development of Employment in Manufacturing in Germany

Source: Švarcová et al; Eurostat 2020

The development of employment in Manufacturing (NACE Rev.2 section C) in Germany from 2008 to 2017 is presented in **Figure 4** (a). The development of self-employment in the same period is shown in **Figure 4** (b). Figures were created by our own processing of Eurostat (2020b) data.



**Figure 5:** The Development of Employment in Manufacturing in the Czech Republic

Source: Švarcová et al; Eurostat 2020

The development of employment in Manufacturing (NACE Rev.2 section C) in the Czech Republic from 2008 to 2017 is presented in **Figure 5** (a). The development of self-employment in the same period is shown in **Figure 5** (b) (authors' own data; Eurostat 2020).

## Discussion

The rapid spread of the COVID-19 pandemic to many countries worldwide has shown that national governments have chosen different strategies to combat the pandemic with different economic impacts. Some states followed a liberal strategy of minimizing bans and regulations (e.g., Sweden); others quickly closed national borders and ordered widespread quarantine and regulated population movements, including the closure of shops, events, and schools (e.g., the Czech Republic). Each strategy had a different impact on the pandemic in the country and on the economic situation, especially the reduction in employment and the decline in GDP.

Self-employed persons are recognized by many authors as very important for the success of the economy and its long-term sustainable development (Stenholm, Acs, and Wuebker 2013; Hyytinen and Rouvinen 2008). Nevertheless, self-employed persons were the first and most affected by the 2020 economic crisis. Bogenhold and Stabler (1991) identify self-employed persons as one of the important means of alleviating economic problems and unemployment. Nevertheless, many self-employed people had to close their business in the early days of the COVID-19 pandemic and look for other livelihood alternatives; for example, an opera singer went to work as a saleswoman in a grocery supermarket because these stores were not closed by the government decision, a sportswear manufacturer changed the range and began to sew face masks, others chose a new strategy of a quick transition to online sales and delivering goods to homes, etc. Only a negligible part of self-employed persons went to the office to register as unemployed because unemployment benefits were minimal. This supports the conclusions of the research presented by Bögenhold and Stabler (1991) on the adaptability of self-employed persons and entrepreneurship seeking new solutions, as discussed by Thurik et al. (2008). In principle, however, the crisis in the first half of 2020 has shown that the state is a completely unforgettable and crucial actor, which in times of economic turmoil must intervene with its protection and stimulus instruments in the form of subsidies, tax cuts and guarantees for business loans. The economic crisis of 2020 also confirmed the conclusions of Congregado, Golpe, and Carmona (2010) and Sanchez-Canizares et al. (2020) on the importance of state proactive economic policy toward the group of self-employed persons.

In the analysis of **Figure 1**, the authors of this article present that the development of total employment in the Czech Republic in the economic crisis of 2009 and 2012-2013 showed standard behavior, where employment in the crisis decreased and remains low. According to the working hypothesis, the authors expected self-employment to behave differently. **Figure 1** (b) confirmed that self-employment grew or stayed at a high level during the same periods. The comparison of self-employment in Manufacturing (NACE Rev. 2 C) in the Czech Republic and Germany supports this idea' see **Figure 4** (b) and **Figure 5** (b).

Model results in **Table 2** could be influenced by choice of a key industry (in the conditions of the Czech Republic, it is the NACE Rev.2 C-Manufacturing), which has a relatively low ratio of self-employed persons (less than 10%) compared to the number of employees. An attempt to apply the model to industries with a higher ratio of self-employed persons was unsuccessful; the authors tested the application for the hotel, restaurant, and tourism industry (NACE I), where the Czech Republic had a higher ratio between self-employed persons and employees (up to 40%).

Data on self-employment could be partially distorted by the so-called false selfemployment, as spoken of by, for example, Kösters and Smits (2020). Kösters and Smits deal with identifying vulnerable self-employed workers and the mechanisms behind the growth of solo self-employment. They examine the relationship between occupational characteristics and the probability that a worker has a false self-employed arrangement instead of an employee arrangement. They found out that the probability of a false self-employed arrangement declines a little bit with the skill level of a particular occupation. However, the authors found no evidence that false self-employment is more common in low-paid routine occupations. Therefore, policies focused on lowering the prevalence of false self-employment arrangements might have various consequences for workers in various occupations.

However, for evaluating the model from equation (1), the threat of distortion of false selfemployment is minimal because self-employed persons are counted together with the employees in the model.

The phenomenon of hysteresis is very interesting, where the current unemployment in equation (1) is derived from current employment (including self-employed people) in a key sector of the economy

and previous unemployment in the whole economy four quarters ago. Hysteresis generally means the dependence of a variable on past developments. A vital sector of the Czech economy is industry, especially in the context of the automotive industry, and this sector has intensively absorbed unemployment from other sectors of the economy in recent years, helping to mitigate the effects of the economic crisis and measures against the COVID-19 pandemic. An important implication for the Czech labor market is that the state and its fiscal policy should support diversification and innovation in industry (NACE C) because it allows the creation of competitive jobs and stabilizes other sectors of the economy in the event of cyclical fluctuations. Advancing automation in the industry, commonly called INDUSTRY 4.0, takes up jobs for the low-skilled workforce but creates new, well-paid jobs for skilled workers in the development, deployment, service, and operation of new equipment. Here, another implication is needed in the form of state-offered and paid retraining courses to help people from other sectors and self-employed people who lose their jobs to learn new knowledge and skills for industrial applications.

Hysteresis in the labor market is usually related to the strong position of those who already have a job and who are more protected in the context of the Czech economy. Self-employed people in the Czech Republic were among the first to lose their jobs in the economic crisis, and it is a necessary implication for the state and its economic policy to create suitable support programs to enable these people to move quickly and smoothly to new jobs in the industry, which is currently the driving force of the Czech economy.

A positive side effect of the development of the number of self-employed persons can be found in the research of Mencken, Smith, and Tolbert (2020). Mencken, Smith, and Tolbert (2020) revealed that self-employed are more aware of civic activities and are willing to contribute more to society (trust, political activism, community closeness, community participation) than workers from the private sector. Moreover, self-employed have a closer relationship with neighbors and family, and engage more often in solving community problems.

This effect can significantly contribute to mitigating the impact not only of the economic crisis. This synergy creates strong support for affected households, and many practical examples of such pandemic assistance can be found in each affected country. Self-employed persons thus make another pillar for the long-term sustainability and development of the region.

## Conclusions

The authors of this article confirmed the importance of self-employed persons for economic growth. At the same time, self-employed persons are presented as an essential tool for slowing down the economic crisis and unemployment and supporting a sustainable society.

The authors deal with the research question of whether self-employed people behave differently from employees in times of economic crisis. The analysis of data during the economic crisis in 2009, 2012-2013, and 2020 in the Czech Republic made it possible to create an unemployment model where independent variables are employees and self-employed in Manufacturing (section C in the NACE classification), previous unemployment four quarters ago and dummy variable reflecting economic crisis (model is given in Equation (1) and the results of the model are shown in **Table 2**). The self-employed have been identified as an important tool for slowing down the economic crisis and unemployment. The authors emphasize the high level of vulnerability of the self-employed, and therefore a significant part is devoted to the impact of state intervention and economic policy of states. The results of the analysis are compared with selected countries, especially Germany, which is the

Czech Republic's main trading partner. New internet services and remote control within industry 4.0 appear to be an important opportunity for self-employed persons.

This study is not free from limitations. Firstly, this study aims at the Czech labor market only. Secondly, our findings and conclusions should be further tested over a more extensive variety of settings. One possibility is by running similar surveys in other countries and through time. Finally, respondents could have provided false or misleading answers. Therefore, the results cannot be generalized.

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