

## RESEARCH ARTICLE

WILEY

# Accelerate or brake?—The connection of credit gaps and economic disequilibrium

Balázs Fazekas  | Cserne Panka Póta | Patrícia Becsky-Nagy 

Faculty of Economics and Business, Institute of Accounting and Finance, University of Debrecen, Debrecen, Hungary

## Correspondence

Balázs Fazekas, Faculty of Economics and Business, Institute of Accounting and Finance, University of Debrecen, 138 Böszörményi St, 4032 Debrecen, Hungary.

Email: [fazekas.balazs@econ.unideb.hu](mailto:fazekas.balazs@econ.unideb.hu)

## Abstract

Credit supply shocks significantly aggravate the impact of economic recessions. Understanding the underlying reasons why credit market shocks occur and detecting the market turbulences in time can give a decision support tool for the economic policy to intervene more efficiently on the market and to reduce the effect of economic downturns. The goal of the current article is to investigate the factors that signal possible credit shocks by analyzing the quarterly data of 17 European countries over the period 1995–2021. The focus of the article is on the credit given to the nonfinancial corporations. In our analysis, we have built on the credit gap methodology by determining the deviations of the lending activity from its trend, and then we have modeled these credit gaps using fundamental macroeconomic indicators, such as the balance of the current account, the ratio of short- and long-term capital investments and government debt. Our conclusion is that in the presence of fundamental disequilibrium in the economy excessive lending creates positive credit gaps that increase the chance of negative credit market shocks. According to our new findings, the existing credit gap methodology can be improved by incorporating real economic factors; slowing long-term capital investment and increasing the deficit of the current account signal the emergence of a credit gap. We found significant regional heterogeneity as in Southern European countries, and the credit gaps were more substantial. Among the investigated macroeconomic factors, the governmental indebtedness was especially high in these countries suggesting that countries with high public debt rates are more prone to develop credit gaps.

## KEYWORDS

credit gap, current account, economic disequilibrium, government debt, investment slowdown

## Key Points

- Credit gaps signal a possible credit market shock.
- Credit expansion in the presence of disequilibrium in fundamental market segments induces credit gaps.

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial-NoDerivs](https://creativecommons.org/licenses/by-nc-nd/4.0/) License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2024 The Authors. *Strategic Change* published by John Wiley & Sons Ltd.

- Using panel regression, we analyzed the quarterly data for 17 European countries over the period 1995–2021 investigating the formation of credit gaps.
- Credit expansion in the period of current account deficit and slowdown in long-term capital formation builds up credit gaps requiring later correction in the credit market.
- Countries with high government debt are more prone to develop credit gaps.

#### JEL CLASSIFICATION

D53 general equilibrium and disequilibrium: financial markets, G01 financial crises, E51 money supply, credit, money multipliers

## 1 | INTRODUCTION

The financial crisis in 2008 showed that turbulence in the banking sector and the problems of credit markets might generate a chain of events that leads to a significant economic recession. Understanding the underlying reasons behind credit market shocks, when credit supply undergoes a sharp decline would give us a tool to identify credit market problems in time to alleviate its negative impact on the economy. Several models have been proposed to identify these credit supply shocks.

The goal of the research is to identify the factors that can improve the existing models aiming to detect credit market shocks. In our approach we are incorporating financial and real economic indicators. The novelty of our study is that we propose the augmentation of the dominant credit gap methodology proposed by the Basel Committee to identify credit market shocks with fundamental real economic indicators. The underlying principle of this study is that financial booms in an economic environment characterized by real economic disequilibrium increase financial vulnerability and lead to credit shocks. Furthermore, we specified the credit gap calculations and the influencing factors to corporate lending.

The aim of this paper is to analyze the economic environment where credit shocks occur in the segment of companies by identifying the key economic factors that lead to these credit market problems in order to have a better understanding when it might be worthwhile to expand the funding available to businesses by stimulating business lending as monetary policy has a key role to play in preserving financial stability through the development of lending and the amount of capital.

The policy implication of our study is that credit support schemes might lead to such an extensive lending that must be followed by a cooldown in the credit market, thereby creating turmoil in the financial markets and in the real economy. By identifying the factors that contribute to excessive lending the monetary authorities can be more efficient in designing credit schemes without unbalancing the financial markets. This way the monetary policy can serve better the development of the entrepreneurial ecosystem. Simultaneously, entrepreneurial support schemes could be implemented concurrently with credit market trends, creating synergies.

In our study, we focus on the lending for nonfinancial companies by analyzing the credit gaps of 17 European countries over the period 1995 to 2021. Credit gaps are defined as deviations from the long-

term trend in the volume of loans. The most widely used method for measuring credit gaps is the credit-to-GDP ratio. Based on our hypotheses, disequilibrium in the economy can signal the imbalance in the credit market, which could lead to a downturn in financial markets. By analyzing these factors, we are aiming to supplement the methodology of credit gaps.

To answer the research questions, first, we estimate the credit gaps then we identify macroeconomic factors related to the occurrence of credit gaps. In this respect, we investigate the impact of the current account balance, employment, government debt, and capital investments. Our hypotheses suggest that credit booms in an environment characterized by disequilibrium in the above-mentioned economic fields signal disequilibrium in the credit markets, which requires a correction in lending and this way increases the likelihood of a credit market shock.

In the first section, we analyze the theoretical background of credit shocks and gaps and based on that we formulate our hypotheses, and then we introduce the database and the applied methodology. In the discussion, we present the results of our credit gap calculations and using panel regression, we investigate the relationship of credit gaps and the factors that might signal excessive lending. Our results can contribute to the more efficient design of government policy interventions in the credit market.

## 2 | THEORETICAL FRAMEWORK

Since the financial crisis, there has been an increasing body of literature investigating credit shocks. The funding problems after the financial crises led to a number of government backed capital schemes aiming to provide financial engineering solutions for companies, especially for small- and medium-sized enterprises (Fazekas & Becsky-Nagy, 2021). Gambetti and Musso (2017) discuss the role of credit supply shocks in the business cycles suggesting that credit supply shocks have a growing and significant impact, and their role is even more apparent in times of recession. Hristov et al. (2012) quantified the macroeconomic impact of adverse credit supply shocks, and they found that credit supply shocks during the financial crisis had a significant impact on the trend of credit and real GDP growth in all eurozone members and adverse shocks have exacerbated the post-crisis economic downturn. Hristov et al. (2012) explained the dichotomy through differences in the timing of bank capital increases.

The results of Bijsterbosch and Falagiarda (2015) show that credit supply shocks contributed positively to output growth in the pre-crisis period and negatively during the 2008–2009 downturn. In the post-crisis period, heterogeneity among euro area countries has increased, reflecting financial fragmentation associated with the sovereign debt crisis and weaker bank balance sheets. This heterogeneity decreased around 2012, but the contribution of credit supply shocks to GDP and credit growth remained negative in mid-2013. Bijsterbosch and Falagiarda (2015) concluded that credit supply constraints subsequently weakened economic activity. The impact is even stronger for enterprises that are exposed to market imperfections, such as adverse selection, information asymmetry and spillovers (Becsky-Nagy & Fazekas, 2023; Fazekas & Becsky-Nagy, 2019). Credit shocks and the concluding economic policy actions influence the strategic decisions of firms as well. Li et al. (2023) showed that in periods of economic policy uncertainty, firms are less inclined to initiate strategic changes. Financial shocks impact even corporate social responsibility (CSR), as based on the results of Karmani et al. (2023) in the period of financial distress, firms were more active in the field of CSR. Credit shocks also influence the digital financial inclusion, as digital transformation is more substantial if the banking sector is stable (Sodokin et al., 2022). At the same time, digitalization also influences the nature of credit trends, as AI use and the occurrence of FinTech and BigTech firms change the financial landscape, and these changes will be more substantial in the future (Kumar et al., 2022). The analysis of credit dynamics can be extended even to such novel areas as crowdlending (Krishnan et al., 2021). Furthermore, the trends in lending might impact the activity of microfinance institutions as well (Dhib & Ashta, 2021).

Mumtaz et al. (2018) found that credit supply shocks, which increased interest rate spreads by 10 basis points, reduced GDP growth and inflation by 1% after 1 year. These shocks have played a significant role during the counter-cyclical period, but they have also accounted for about half of the slowdown in GDP growth.

Barnett and Thomas (2013) examine the role of credit demand and supply shocks in the lending and economic weakness of UK banks. The authors found that credit supply shocks explain a large share of the weakness in bank lending and about 40% of the decline in GDP relative to its historical trend. Based on their results credit supply shocks cause output and inflation to move in opposite directions, either because they affect the potential supply in the economy or because they have a significant exchange rate effect.

In their study, Darracq Paries and De Santis (2015) examined the macroeconomic impact of the 3-year long-term refinancing operations (LTROs). They concluded that this program improved the outlook for real GDP and credit to nonfinancial corporations and increased commodity prices in 2–3 years following the measure, thus avoiding a major credit crisis.

While several studies confirm at the theoretical level that accelerating credit growth and soaring financial asset prices increase the likelihood of financial distress, identifying this in practice is methodologically challenging. Borio and Lowe (2002) defined the excess growth in credit, investment, and asset prices as the deviation of their ratio to GDP from the long-run trend, where the trend was

defined using a rolling Hodrick–Prescott filter (HP filter). However, this indicator has several shortcomings. One problem is that even though the nominal GDP may appear to be an adequate choice to normalize credits, the indicator becomes exposed to fluctuations in GDP, making the assessment of credit gaps more exposed to pro-cyclical effects. If GDP grows rapidly, the credit-to-GDP ratio falls, so a relative credit contraction may be indicated, which may lead to a desirable move to stimulate lending and reduce capital requirements, although this may lead to over-lending as a pro-cyclical move in a context of rising GDP. Conversely, if GDP growth slows, the indicator could signal over-lending and suggest a tightening of capital requirements, which would discourage lending in a slowing economy (Basel Committee, 2010; Repullo & Saurina, 2011). The stock nature of credit and the flow nature of the GDP mean that the impact of economic slowdown becomes apparent slower and more gradually in the amount of credit. From this point of view, a key factor is to examine whether the emergence of a credit gap is the result of a fall in credit or a fall in real GDP. Baba et al. (2020) point out that the HP filter used to determine the trend, in addition to being sensitive to the end-point, depends on the time period chosen and the length of the credit cycles, which may vary across countries.

Despite its many shortcomings, the credit-to-GDP ratio is the best predictor based on empirical studies. Based on Drehmann and Yetman (2020), the normalization by GDP performs statistically better than other benchmarks, but they point out that forecasting by panel performs better than estimating by country. Although both false positive and false negative signals are high, they conclude that over a 10-year time horizon, using credit gaps, decision-makers make on average 1 less wrong decision. Jokipii et al. (2021) also highlighted, that the HP credit gap measure, despite its problems, is a useful measure for detecting excessive lending.

Baba et al. (2020) investigated the effect of different additions to the above-described methodology. They focus on the problem that the models show significant negative gaps after the credit boom, but this is due to the decline from the previous peaks and is unlikely to require monetary easing. On the one hand, they examined whether the predictive power of the model could be improved by incorporating other cyclical macro factors. As a further extension, it was examined whether trends measured based on fundamentals when determining credit gaps, could improve the performance of the models. Besides the trend effect approach, factor models have emerged that look at the trend of the amount of credit based on fundamental factors shaping lending, such as income and real interest rates, and use these to examine lending trends. The use of these models, while useful as a complementary method, is not well suited for the actual determination of credit gaps, as the residuals in the model in this case may be attributable to omitted variables.

Regarding the additional factors, Davies et al. (2016) found that credit growth paired with deficit in the balance of payments is more likely to lead excessive lending and credit boom than credit growth fueled by domestic savings. Ekinci et al. (2015) concluded that the deterioration of the current account is more likely in excessive crediting, and this impact is even more stronger in cases of countries that are in the stage of financial deepening. Brzoza-Brzezina and Makarski

(2011) also emphasized the role of external economic openness and financial deepening, especially for smaller economies. Giese et al. (2014) also found that the banking crisis was mostly preceded by excessive current account deficits. Craig et al. (2008) found a significant relationship in employment and the efficiency of the credit growth.

Building on the literature, we investigate the macroeconomic factors that could be used in the detection of credit gaps. Reichlin et al. (2020) concluded that the relationship of financial and real economic conditions is hard to model. They showed that there is the relationship of financial and real economy indicators, but the predictor value of financial indicators was limited regarding the real GDP growth vulnerabilities. Therefore, we wanted to identify macroeconomic characteristics related to the identification of credit gaps. Thus, for the external balance, the balance of payments has been used, and for the internal balance we applied the employment and inflation indicators, as well as public debt. We also included the stock of investments in our model. The rationale behind these factors is that the imbalances observed in each area are linked to the imbalances in the credit markets, and thus these factors can be used to identify whether the credit market requires intervention or whether the expansion of resources at a given point in the business cycle may lead to further imbalances. Building on the results, we will have a better understanding when it might be worthwhile to expand the funding available to businesses by stimulating business lending.

Once the credit gaps have been identified, the impact of the above-mentioned factors will be tested. The hypotheses are driven by the theoretical consideration that some imbalances in the economy will also lead to imbalances in the credit market, which could lead to a downturn in financial markets. The first hypothesis is related to external imbalances:

**Hypothesis 1.** The co-presence of credit growth and current account deficit induces credit gap.

Our second hypothesis examines the relationship between changes in the stock of fixed assets and the amount of credit.

**Hypothesis 2.** The co-presence of credit expansion and slowdown in investment in fixed assets induces credit gap.

Our third hypothesis examines the relationship between government debt and the amount of credit.

**Hypothesis 3.** The co-presence of credit expansion and increasing government debt induces credit gap.

### 3 | DATA AND METHODOLOGY

The assessment of our hypotheses about the credit gaps and the fundamental economic factors is carried out using an international sample. The strongly balanced panel data set of macro-level data has been

**TABLE 1** Description of the database.

Variable name	Variable description	Data source
Country	17 countries were selected for which corporate credit was available from the BIS database.	-
credittoGDP	Nonfinancial corporations' credit-to-GDP ratio at quarterly intervals between 1995 and 2021.	BIS (2022)
GDP	Quarterly GDP in euro, current prices between 1995 and 2021.	Eurostat (2022a)
CA	Current account at quarterly breakdown in euro, current prices between 1995 and 2021.	Eurostat (2022b)
CAtoGDP	Current account to GDP ratio by quarters between 1995 and 2021.	Authors' calculation
FixedInvestment	Quarterly changes in gross fixed capital investment in euro at current prices between 1995 and 2021.	Eurostat (2022c)
GovYield	10-year government bond yields.	OECD (2022)
CEE	Dummy variable with a value of 1 for countries in the Central-Eastern European region in the sample (Hungary, Poland, and Czech Republic)	-
SE	Dummy variable with a value of 1 for countries in the Southern European region in the sample (Portugal, Spain, Greece, and Italy)	-
GovDebt	Quarterly government debt to GDP ratio between 1995 and 2021.	Eurostat (2022d)
creditgapA	Quarterly credit gaps relative to the trend calculated with the Hodrick–Prescott filter between 1995 and 2021, $\lambda = 400,000$ .	Authors' calculation
creditgapB	Quarterly credit gaps relative to the trend calculated with the Hodrick–Prescott filter between 1995 and 2021, $\lambda = 160,000$ .	Authors' calculation
creditgapC	Quarterly credit gaps relative to the trend calculated with the Hodrick–Prescott filter between 1995 and 2021, $\lambda = 50,000$ .	Authors' calculation.

Source: Authors' editing.

developed, including data for 17 European countries. The aim of the analysis of lending based on international data is to examine the trend of the amount of credit through selected indicators. Within lending,

the stock of loans granted to nonfinancial companies is analyzed. The trend of corporate credit as a share of GDP was based on Bank for International Settlements (BIS) data, so the international analysis covered European countries, where these data were available. Thus, 17 countries were included in the analysis (Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Luxembourg, the Netherlands, Poland, Norway, Portugal, Spain, Sweden, Poland, Portugal, and the Netherlands). Country data were collected at a quarterly frequency from 1995 to 2021. Table 1 shows the structure of the database and the content of each variable.

The first step was to identify the credit gaps. The literature review has shown that there is no uniformly accepted methodology for determining credit gaps. In our analysis, we used the HP filter, which is considered to be the most widely used filter, to determine the trend and cyclical components. Several assumptions have been made about the length of business cycles. In addition to smoothing with a lambda value of 400,000, perhaps the most commonly used in the literature due to long credit cycles, we have also specified the gaps for lambda = 160,000 and 50,000, reducing the error due to our assumption on cycle length.

As our database is a panel data set with both cross-sectional and time-series dimensions, panel regression was used in the modeling. With respect to the relatively large number of observations, random effect panel regression was used under the assumption that the model does not contain significant bias and that a better model can be built with a lower standard error of the random effect estimates than with the fixed effect model. First, we tested the model using the following equation to estimate the random effect model.

$$Y_{i,t} = \beta_0 + \sum_{k=1}^n x_{i,t,k} \beta_k + u_i + e_{i,t}.$$

After testing for cross-sectional dependence, we found that the assumption of cross-sectional independence does not hold; therefore, we used the approach suggested by Pesaran (2006), as the interdependence of the regressors creates a biased and inconsistent estimation. Based on Pesaran (2006), the common correlated effect (CCE) estimator leads to a consistent estimation in such cases. Following this approach, we modified the estimation with the cross-section averages of the dependent and independent variables ( $z_t$ ) and we estimated the model using the following equation:

$$Y_{i,t} = \beta_0 + \sum_{k=1}^n x_{i,t,k} \beta_k + \gamma_i z_t + e_{i,t}.$$

Prior building the model, we tested the stationarity of the variables in the model, given the high time dimensionality in our database. Table 2 shows the results of the stationarity analysis.

Based on the Im-Pesaran-Shin unit root tests, the trend of the credit-to-GDP ratio (*credittoGDP*), the government bond yield (*GovYield*), and the government debt (*GovDebt*) were non-stationary time series. In cases of the non-stationary variables, we used the first differentials, and after transformation they became stationary.

**TABLE 2** Examination of the stationarity of the variables included in the panel regression model and stationary transformations of the variables.

Variable name	Stationarity (without transformation)	Transformation and stationarity
<i>credittoGDP</i>	Non-stationary	First differential stationary
<i>CAtoGDP</i>	stationary	-
<i>FixedInvestmenttoGDP</i>	Stationary	-
<i>GovYield</i>	Non-stationary	First differential stationary
<i>GovDebt</i>	Non-stationary	First differential stationary
<i>creditgapA</i>	Stationary*	-
<i>creditgapB</i>	Stationary	-
<i>creditgapC</i>	Stationary	-

Source: Authors' editing.

\*The  $p$  value of the Im-Pesaran-Shin unit root test is 0.0242, so we can accept stationarity at  $\alpha = .05$ .

The aim of the models is to identify the factors under which credit gaps develop. In developing the models, we have assumed that each factor has an impact on lending over time, so credit gaps are explained by lagged values of the explanatory variables. In determining the degree of lagging, the value of the variable was included up to the period until it was significant in the model. In addition to the variables used to answer the hypotheses, control variables were included in the models, such as the government bond yield, which characterizes the interest rate environment, CPI, and dummy variables for the geographical location of countries to distinguish between Central and Eastern European countries and countries along the Mediterranean.

For the dependent variable, we use the “*CreditGap*” variable, where we measure the gap assuming three different business cycles with the length of 30, 25 and 19 years. This way, we specify three models. In the equation, “ $k$ ” stands for the number of explanatory variables, “ $i$ ” for the country and “ $t$ ” for the time period measured in quarter years, while “ $e$ ” represents the random error and “ $u$ ” is the unobserved effect. Among the explanatory variables, we tested the “*CAtoGDP*,” “*FixedInvestmenttoGDP*,” “*GovDebt*,” “*CEE*,” and “*SE*” with their lagged variables.<sup>1</sup>

In the model building, we tested the impact of the consumer price index and unemployment as indicators that potentially indicate underlying real economic disequilibrium. While CPI was not significant in any model specification, unemployment was only significant in the random effect estimation before we handled the problem of cross-sectional interdependence using the cross-sectional adjustment. In the CCE estimation, the unemployment variable was not significant.

## 4 | RESULTS AND DISCUSSION

In our analysis, we investigated the credit gaps and the macroeconomic factors influencing the occurrence of excessive lending. The

Country	Observations	Mean	Standard deviation	Minimum	Maximum
Austria	105	86.35	9.21	62.8	103.3
Belgium	108	125.91	29.76	68.6	171.3
Czech	105	57.95	9.24	44.3	82.3
Denmark	108	102.74	25.01	61.2	138.3
Finland	108	101.69	15.38	78.5	130.1
France	108	120.58	20.67	65.5	173.2
Germany	108	66.97	5.30	55.2	75.6
Greece	108	52.54	13.99	29.2	71.5
Hungary	108	65.11	15.27	37.7	94.5
Italy	108	68.03	11.54	48.3	83.2
Luxemburg	108	224.65	97.79	70.9	385.5
Netherlands	108	141.40	19.76	119.3	179.6
Norway	108	126.65	21.52	85.8	167.0
Poland	105	37.16	8.29	19.5	50
Portugal	108	102.88	20.67	65.0	141.1
Spain	108	97.54	29.39	46.6	141.0
Sweden	108	129.138	27.91	84.9	178.2

Source: Authors' editing.

descriptives of macroeconomic factors are presented in Appendix A. Table 3 presents the credit-to-GDP ratio of the investigated 17 countries on a quarterly basis between 1995 and 2021. The results show high heterogeneity among the European countries. There is a tendency for the more developed economies to have a higher level of corporate credit proportionately to the GDP, while countries with lesser financial deepening have a lower ratio, but there are exceptions. The volatility of the ratio is also divergent. As a tendency, the more developed economies usually show lesser standard deviation relative to their mean, but this tendency cannot be applied as a general rule.

Following Borio and Lowe (2002), we used the HP filter with 400,000 lambda assuming a cycle of about 30 years to estimate credit gaps. The descriptive statistics are presented in Table 4. Similarly to the credit-to-GDP ratio, the credit gaps also show a significant heterogeneity. As the credit gaps are calculated as the difference from the trend of lending, the means are converging to 0; therefore, we did not present it among the descriptives. On the other hand, the standard deviations are diverse with seemingly no consequent patterns on the basis of the financial deepening and economic development.

Positive skewness was the most typical among the results meaning that in the majority of the economies, the state of negative credit gap was dominant; therefore, in the given economies companies must face credit shortages most time. At the same time, they are prone to have a high level of excess lending in boom periods. These patterns are also presented in Figure 1 as well. In five cases, we can see a negative skewness suggesting that these economies are usually in the state of having positive credit gaps with periods of significant downturns in lending. The kurtosis of the sample also shows differences between the investigated countries. There is relatively high kurtosis (above 3) in five cases (the French data is the highest with a 5.881 value), but

**TABLE 3** The credit-to-GDP ratio of the examined countries on a quarterly basis between 1995 and 2021.

these countries are in a different state of financial market development, as among these countries, we found Hungary and Greece, besides countries such as Sweden or Finland. High kurtosis refers to cases where in the given economy there were times of extremely high declines or upturns in lending.

Table 5 illustrates the CCE panel regression models to describe the credit gaps for the 17 countries investigated, based on quarterly data from 1995 to 2021. Our first attempt to test our hypotheses was carried out by using a random effect panel regression model, but after testing for cross-sectional interdependence, we had to reject the assumption that the regressors are cross-sectionally independent. In order to make a consistent and unbiased estimation, we modified our model using the CCE estimation proposed by Pesaran (2006) and by adding the cross-sectional averages we eliminated the cross-sectional dependence. The results of the model are presented in Table 5.

The dependent variables are the credit gaps defined by the HP filters. To check the robustness of the model to the business cycles, we tested the model with different smoothing for different cycle length assumptions. The first model, where the dependent variable is the "creditGapA" explains the credit gap calculated with 400,000 lambda assuming a cycle of about 30 years, "creditGapB" explains the gap calculated with 160,000 smoothing assuming a cycle of 25 years, while "creditGapC" explains the gap calculated with 50,000 lambda assuming a cycle of 19 years.

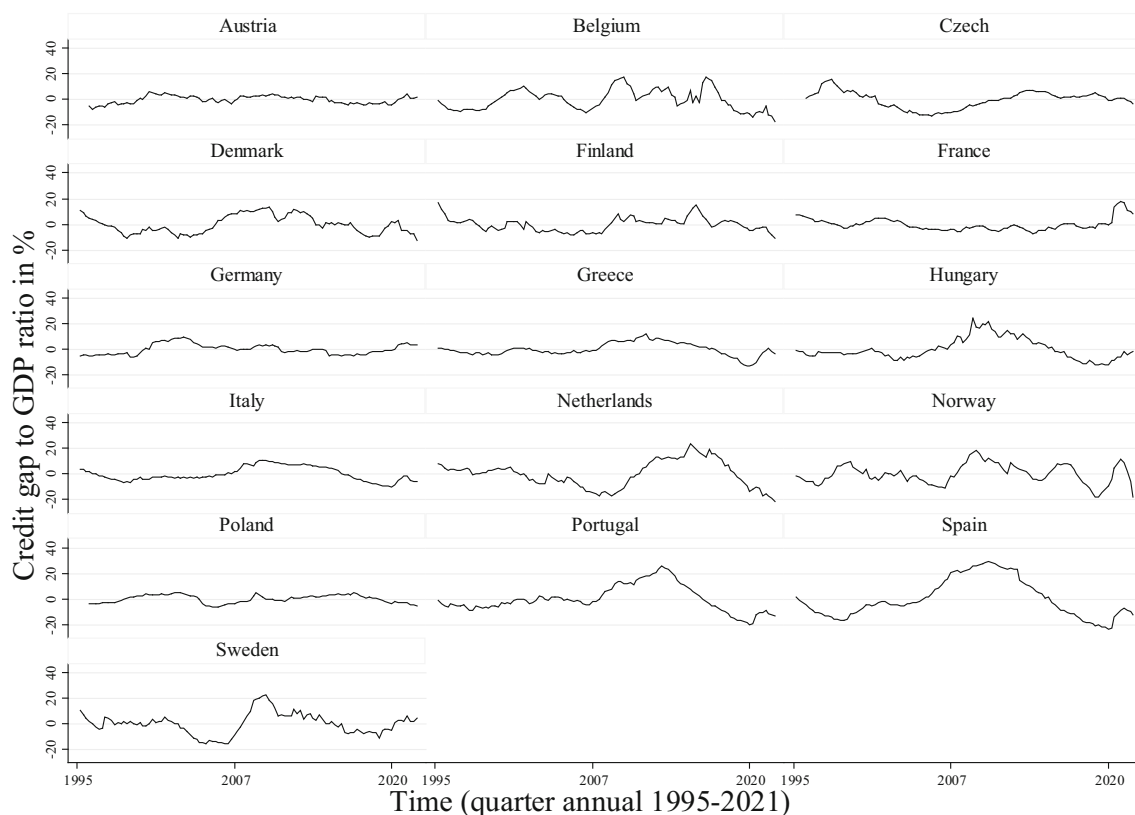
No relevant differences are observed for the different models, with the signs of each explanatory variable being the same for all dependent variables, although the significance level of some variables changes for different model specifications describing the credit gaps estimated under different business cycle assumptions. In this regard, the conclusions seem to be robust.

**TABLE 4** The descriptive statistics of the credit gap to GDP ratio of the examined countries on a quarterly basis between 1995 and 2021.

Country	Observations	Standard deviation	Minimum	Maximum	Skewness	Kurtosis
Austria	105	3.05	-7.47	6.63	-0.129	2.110
Belgium	108	8.14	-17.05	17.66	0.298	2.255
Czech	105	6.68	-12.60	15.58	-0.105	2.515
Denmark	108	6.96	-12.63	13.73	0.276	1.892
Finland	108	5.29	-10.71	16.99	.0622	3.547
France	108	4.81	-6.89	17.84	1.593	5.881
Germany	108	4.00	-6.31	9.42	0.537	2.406
Greece	108	5.11	-13.15	11.82	-0.113	3.139
Hungary	108	8.19	-12.56	24.26	0.888	3.247
Italy	108	5.46	-9.90	10.83	0.344	2.043
Luxemburg	108	25.54	-50.10	60.83	0.206	2.467
Netherlands	108	10.53	-21.56	23.54	0.056	2.221
Norway	108	7.70	-18.10	18.68	-0.038	2.708
Poland	105	3.12	-6.15	4.88	-0.263	1.867
Portugal	108	10.56	-20.17	25.62	0.552	2.763
Spain	108	15.04	-23.52	29.42	0.547	2.105
Sweden	108	8.42	-15.83	22.24	0.297	3.224

Note: The table shows the credit gaps calculated using Hodrick–Prescott filter with 400,000 lambda assuming a cycle of about 30 years.

Source: Authors' editing.



**FIGURE 1** The credit gap to GDP ratio of the examined countries on a quarterly basis between 1995 and 2021. The figure shows the credit gaps calculated using Hodrick–Prescott filter with 400,000 lambda assuming a cycle of about 30 years. Source: Authors' editing.

Dependent variable	Common correlated effects estimation		
	creditGapA	creditGapB	creditGapC
CAtogDP	−27.58** [13.40]	−24.69** [12.27]	−18.87* [9.56]
CAtogDP (t−1)	−26.45** [11.49]	−25.14** [10.68]	−20.65** [8.46]
CAtogDP (t−2)	−17.84* [10.37]	−19.06* [9.86]	−19.51** [8.75]
CAtogDP (t−3)	−21.42** [9.79]	−20.71** [8.87]	−16.40*** [6.10]
FixedInvestmenttoGDP	−12.59 [11.33]	−11.96 [11.09]	−7.64 [9.75]
FixedInvestmenttoGDP (t−1)	−34.74*** [12.58]	−35.71*** [13.24]	−32.08** [12.71]
FixedInvestmenttoGDP (t−2)	−35.41*** [11.36]	−35.80*** [11.15]	−32.12*** [9.87]
GovDebt (first differential)	−0.08 [0.13]	−0.09 [0.14]	−0.09 [0.14]
GovDebt (first differential) (t−1)	0.04 [0.14]	0.03 [0.14]	0.04 [0.14]
GovDebt (first differential) (t−2)	0.15* [0.09]	0.15* [0.09]	0.15* [0.08]
GovYield (first differential)	−0.60* [0.36]	−0.41 [0.34]	−0.24 [0.29]
CEE	0.49 [1.77]	1.22 [1.25]	2.00 [1.38]
SE	13.57* [8.13]	10.86* [6.52]	5.83 [3.69]
Constant	−4.12 [17.02]	−1.84 [16.49]	1.69 [14.67]
Summary statistics			
Observations	1321	1321	1321
Groups (countries)	17	17	17
Average observation	78	78	78
R <sup>2</sup> (mean grouped)	0.76	0.71	0.64

Note: For \*\*\*, \*\*, and \*, the individual variables are normally significant at 99%, 95%, and 90%. The table shows the coefficients for each variable, with the robust standard errors of the coefficient estimates in brackets. The term (t−l) indicates the lagged version of the given variable with “l” period. All variables are cross-sectional averaged variables except for the “CEE” and “SE” dummy variables.

Source: Authors' editing.

In Hypothesis 1, we stated that the co-presence of credit growth and current account deficit induces credit gap. This hypothesis is confirmed by the results of the models, as there is a significant and negative relationship between the credit gap and the current account-to-GDP ratio. This suggests that credit expansion at the expense of the current account deficit is inducing a positive financing gap, which should lead to a correction in financial markets.

When designing business support schemes, particular attention should be paid to external equilibrium and the current account. A current account deficit may signal a relative competitiveness gap for firms in a given country, where resource expansion is turning demand more toward imports, so the positive effects of corporate resource expansion on the domestic economy may be less than expected. In managing the cost of capital of companies, the export activity of

**TABLE 5** Results of the mean averaged common correlated effects panel regression models describing the trend of the credit gap for selected European countries over the period 1995–2021.

companies should therefore be a prime consideration. The current account balance and the credit gap have an inverse relationship and based on our results, this relationship was significant using the lag of the variable up to a three-period lag suggesting, that this variable has short-term prediction value as well.

In Hypothesis 2, we stated that the co-presence of credit expansion in the context of a slowdown in investment in fixed assets induces credit gap. The model also includes a negative coefficient for the ratio of fixed assets to GDP, which seems to confirm our second hypothesis. This implies a correction in the credit expansion as investment activity slows. The credit expansion in the context of a slowdown in investment may take the form of a shift in the share of credit toward short-term loans that contribute to the accumulation of current assets securing the liquidity of firms. The slowdown in capital investments signals a downturn in economic growth because the investment prospects are not appealing enough to attract more capital. In the absence of long-term capital formulation, the capacity of firms to obtain debt financing will decrease and the demand for short-term assets fall as well, that result in a decline in total lending. The market is then characterized by excess liquidity, which is corrected by negative credit dynamics. A key criterion for resource allocation is that the ratio of loans for investment and liquidity should not be overturned. The ratio of capital-to-GDP indicator was significant up to its two-period lag suggesting that the variable has a limited predictor value.

In Hypothesis 3, we investigated the relationship of the government debt and credit gaps. The variable proved to be significant only with two-period lag. The government debt-to-GDP ratio and its one-lag version were not significant in our model. The two-lag version had a positive coefficient in the model suggesting that excess lending in the period of increasing government debt signals a positive credit gap, but this variable was only significant at 90%. While the result seems to strengthen the hypothesis, the role of government debt in the model is not as unambiguous as in the cases of the previous hypotheses. The positive coefficient of the variable can be explained by the GDP dynamics and the government's reactions to intervene in the slowdown. Holding everything else constant the decrease in GDP results in a higher credit-to-GDP ratio. At the same time, there is a pressure on the government's budget as the economic slowdown decreases the revenues. However, governments are prone to increase expenditures to enhance economic performance even at the expense of increasing government debts. Therefore, excess lending in the period of increasing government debts might signal a possible correction in the credit market, but our results in this sense are not unambiguous.

To control for region-specific characteristics of the investigated countries, we built in the "SE" and "CEE" dummy variables for the Southern European and Central and Eastern European countries. In terms of economic development, these regions lag behind the more developed Western European countries, and the institutional conditions of the financial market were different for the Central European countries transitioning to a market economy. Based on our results,

the coefficient for the Central and Eastern European locations in the model was positive but not significant. Therefore, we can conclude that credit gaps in the CEE region do not follow a different course than in Western European countries. On the other hand, the Southern European economies' credit gap patterns are different from the other regions, as the variable controlling for this region had a positive coefficient that was significant at 90% significance. This highlights that there is a significant regional heterogeneity in credit gap patterns. Among the countries included in the sample, the largest difference can be found in the level of sovereign debt in the case of Southern European countries relative to the Western European countries. Furthermore, these countries are members of the currency area. The common currency increases financial stability, especially during periods of financial distress. However, a common currency eliminates the flexibility provided by the floating exchange rate regimes, which may transform exchange rate vulnerability into credit market fluctuations.

## 5 | CONCLUSIONS

In our research, we investigated the emergence of credit gaps in the corporate sector and the macroeconomic factors inducing them. We carried out our research using the quarterly data of 17 European countries over the period 1995 to 2021. Our results show that in most countries, the credit gap distribution is positively skewed suggesting that compared to the trend of lending countries are slightly below their trend most of the time and there are shorter intervals of excessive lending creating positive credit gaps that are followed by a downturn in the credit market.

Building on the credit gap identification methodology, we determined factors of the macroeconomic environment that increase the chance of credit gaps therefore the possibility of credit market shocks. Our goal was to give a further layer to the detection of credit gaps and consequently to manage the credit market and real economy shocks. The novel result of our study is that existing credit gap methodology proposed by the Basel Committee can be augmented with indicators signaling real economic disequilibrium.

Based on our analysis of international data, we conclude that market imbalances can be useful indicators for signaling credit gaps. If credit growth is co-present with economic disequilibrium, it could trigger a correction and signal a risk of a credit market downturn. We identified factors that proved to be significant in the explanation of credit gaps. These factors are the balance of current account, the ratio of the investment in short-term assets and long-term capital items, and the amount of sovereign debt. The first factor we identified was the current account; credit expansion at the expense of the current account deficit is inducing a positive financing gap, which should lead to a correction in financial markets. Regarding the capital investments, we concluded that the co-presence of credit expansion in the context of a slowdown in investment in fixed assets induces credit gap. The final factor was government debt, we found that excess lending in

the period of increasing government debts signals a possible correction in the credit market, although the results were not unambiguous. Our results also suggest that there is a significant regional heterogeneity in credit gap patterns. In future research, it is advisable to further expand the region-specific variables to enhance the methodology for identifying credit gaps. In this sense, reviewing the models on a larger sample and examining additional region-specific factors can enhance the methodology for identifying credit gaps.

Our results have relevance regarding the government policy interventions in the financial, more particularly in the credit market. Providing capital for companies via monetary easing and different types of supported lending schemes could be an efficient tool for supporting economic growth, but at the same time it creates a threat of aggravating the disequilibrium and economic problems that are present in the economy by increasing the financial disequilibrium. This suggests that solely the monetary easing and the support of lending cannot enhance economic growth in a sustainable way, economic policy interventions should be targeted; otherwise, they overheat the credit market that might trigger a correction and a downturn in lending. Our results highlight the importance of targeted lending programs, which can set preferences along the lines of job creation, investment, and export activity.

#### CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

#### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in OECD at <https://data.oecd.org/interest/long-term-interest-rates.htm>. BIS at <https://stats.bis.org/statx/srs/table/f4.1> and <https://stats.bis.org/statx/srs/table/k2> EUROSTAT at <https://ec.europa.eu/eurostat/databrowser/view/teibp050/default/table?lang=en>, <https://ec.europa.eu/eurostat/databrowser/view/teina041/default/table?lang=en> and [https://ec.europa.eu/eurostat/databrowser/view/GOV\\_10Q\\_GGDEBT\\_\\_custom\\_3137178/default/table?lang=en](https://ec.europa.eu/eurostat/databrowser/view/GOV_10Q_GGDEBT__custom_3137178/default/table?lang=en).

#### ORCID

Balázs Fazekas  <https://orcid.org/0000-0003-4303-1184>

Patricia Becsky-Nagy  <https://orcid.org/0000-0002-3928-7606>

#### ENDNOTE

<sup>1</sup> We tested the consumer price index and the government yields too, but they were not significant in the model.

#### REFERENCES

- Baba, C., Dell'Erba, S., Detragiache, E., Harrison, O., Mineshima, A., Musayev, A., & Shahmoradi, A. (2020). How should credit gaps be measured? An application to European countries. *IMF Working Paper WP/20/6*. International Monetary Fund. <https://doi.org/10.5089/9781513525877.001>
- Bank for International Settlements. (2022). *Total credit to non-financial corporations (core debt)*. <https://stats.bis.org/statx/srs/table/f4.1>
- Barnett, A., & Thomas, R. (2013). Has weak lending and activity in the United Kingdom been driven by credit supply shocks?. *Bank of England Working Paper No. 482*. Bank of England. <https://doi.org/10.1111/manc.12071>
- Basel Committee. (2010, December). *Guidance for national authorities operating the countercyclical capital buffer*. Bank for International Settlements.
- Becsky-Nagy, P., & Fazekas, B. (2023). Spurring entrepreneurship with public venture capital in developing industries—Evidence from Hungary. *Journal of Entrepreneurship in Emerging Economies*, Epub ahead of print, 1–22. <https://doi.org/10.1108/JEEE-06-2022-0167/full/html>
- Bijsterbosch, M., & Falagiarda, M. (2015). The macroeconomic impact of financial fragmentation in the euro area: Which role for credit supply? *Journal of International Money and Finance*, 54, 93–115. <https://doi.org/10.1016/j.jimonfin.2015.02.013>
- Borio, C., & Lowe, P. (2002). Asset prices, financial and monetary stability: Exploring the nexus. *BIS Working Papers no 114*. Bank for International Settlements. <https://doi.org/10.2139/ssrn.846305>
- Brzoza-Brzezina, M., & Makarski, K. (2011). Credit crunch in a small open economy. *Journal of International Money and Finance*, 30(7), 1406–1428. <https://doi.org/10.1016/j.jimonfin.2011.07.010>
- Craig, B. R., Jackson, W. E., & Thomson, J. B. (2008). Credit market failure intervention: Do government sponsored small business credit programs enrich poorer areas? *Small Business Economics*, 30, 345–360. <https://doi.org/10.1007/s1187-007-9050-5>
- Darracq Paries, M., & De Santis, R. A. (2015). A non-standard monetary policy shock: The ECB's 3-year LTROs and the shift in credit supply. *Journal of International Money and Finance*, 54(6), 1–34. <https://doi.org/10.1016/j.jimonfin.2015.02.011>
- Davies, S., Mack, A., & Phoa, W. (2016). Credit booms, banking crises, and the current account. *Journal of International Money and Finance*, 60(2), 360–377. <https://doi.org/10.1016/j.jimonfin.2015.09.008>
- Dhib, N., & Ashta, A. (2021). How far can we go? Determining the optimal loan size in progressive lending. *Strategic Change*, 30(4), 389–404. <https://doi.org/10.1002/jsc.2432>
- Drehmann, M., & Yetman, J. (2020). Which credit gap is better at predicting financial crises?—A comparison of univariate filters. *BIS Working Papers No 878*. Bank for International Settlements. <https://www.bis.org/publ/work878.pdf>
- Ekinci, F. M., Erdem, P., & Kilinc, Z. (2015). Credit growth, current account and financial depth. *Applied Economics*, 47(17), 1809–1821. <https://doi.org/10.1080/00036846.2014.1002897>
- Eurostat. (2022a). *Gross domestic product, current prices*. <https://ec.europa.eu/eurostat/databrowser/view/teina010/default/table?lang=en>
- Eurostat. (2022b). *Balance of payments, current account, quarterly data*. <https://ec.europa.eu/eurostat/databrowser/view/teibp050/default/table?lang=en>
- Eurostat. (2022c). *Gross fixed capital formation*. <https://ec.europa.eu/eurostat/databrowser/view/teina041/default/table?lang=en>
- Eurostat. (2022d). *Quarterly government debt*. [https://ec.europa.eu/eurostat/databrowser/view/GOV\\_10Q\\_GGDEBT\\_\\_custom\\_3137178/default/table?lang=en](https://ec.europa.eu/eurostat/databrowser/view/GOV_10Q_GGDEBT__custom_3137178/default/table?lang=en)
- Fazekas, B., & Becsky-Nagy, P. (2019). What does the ownership structure signal?—The relationship between ownership structure and firm performance under information asymmetries in the face of venture capital investment in Hungary. *Budapest Management Review*, 50(7–8), 31–38. <https://doi.org/10.14267/VEZTUD.2019.07.03>
- Fazekas, B., & Becsky-Nagy, P. (2021). A new theoretical model of government backed venture capital funding. *Acta Oeconomica*, 71(3), 487–506. <https://doi.org/10.1556/032.2021.00024>
- Gambetti, L., & Musso, A. (2017). Loan supply shocks and the business cycle. *Journal of Applied Econometrics*, 32(4), 764–782. <https://doi.org/10.1002/jae.2537>
- Giese, J., Andersen, H., Bush, O., Castro, C., Farag, M., & Kapadia, S. (2014). The Credit-to-GDP gap and complementary indicators for macroprudential policy: Evidence from the UK. *International Journal of Finance and Economics*, 19(1), 25–47. <https://doi.org/10.1002/ijfe.1489>

- Hristov, N., Hülsewig, O., & Wollmershäuser, T. (2012). Loan supply shocks during the financial crisis: Evidence for the Euro area. *Journal of International Money and Finance*, 31(3), 569–592. <https://doi.org/10.1016/j.jimonfin.2011.10.007>
- Jokipii, T., Nyffeler, R., & Riederer, S. (2021). Exploring BIS credit-to-GDP gap critiques: The Swiss case. *Swiss Journal of Economics and Statistics*, 157(7), 1–19. <https://doi.org/10.1186/s41937-021-00073-1>
- Karmani, M., Uyar, A., & Kuzey, C. (2023). How did European firms adjust their corporate social responsibility investments during the global financial crisis? *Strategic Change*, 32(1), 3–11. <https://doi.org/10.1002/jsc.2532>
- Krishnan, S., Ashta, A., & Babu, D. (2021). Business cycle prediction: Application of Markov chain to online crowdlending. *Strategic Change*, 30(4), 341–351. <https://doi.org/10.1002/jsc.2428>
- Kumar, A., Srivastava, A., & Gupta, P. K. (2022). Banking 4.0: The era of artificial intelligence-based fintech. *Strategic Change*, 31(6), 591–601. <https://doi.org/10.1002/jsc.2526>
- Li, C., Huo, M., Li, C., Li, G., & Liu, R. (2023). Economic policy uncertainty and enterprise strategic change: Evidence from China. *Strategic Change*, 32(4–5), 125–137. <https://doi.org/10.1002/jsc.2549>
- Mumtaz, H., Pinter, G., & Theodoridis, K. (2018). What do VARs tell US about the impact of a credit supply shock? *International Economic Review*, 59(2), 625–646. <https://doi.org/10.1111/iere.12282>
- OECD. (2022). *Long-term interest rates*. <https://data.oecd.org/interest/long-term-interest-rates.htm>
- Pesaran, H. M. (2006). Estimation and interference in large heterogeneous panels with a multifactor error structure. *Econometrica*, 74(4), 967–1012. <https://doi.org/10.1111/j.1468-0262.2006.00692.x>
- Reichlin, L., Ricco, G., & Hasenzagl, T. (2020). Financial variables as predictors of real growth vulnerability. *Deutsche Bundesbank Discussion Paper No. 05/2020*. <https://doi.org/10.2139/ssrn.3556506>
- Repullo, R., & Saurina, J. (2011). The countercyclical capital buffer of Basel III: A critical assessment. *CEPR Discussion Paper. No 8304*.
- Sodokin, K., Koriko, M., Hechely, D., & Couchoro, M. L. (2022). Digital transformation, banking stability, and financial inclusion in Sub-Saharan Africa. *Strategic Change*, 31(6), 623–637. <https://doi.org/10.1002/jsc.2531>

## AUTHOR BIOGRAPHIES

**Balázs Fazekas** is an assistant professor in the Department of Finance at the Institute of Accounting and Finance at the University of Debrecen. He has significant teaching experience in the field of finance. His research interests focus on corporate financing, international finance and financial markets.

**Cserne Panka Póta** is a PhD student at the Faculty of Economics, Department of Finance, Institute of Accounting and Finance, University of Debrecen. She has teaching experience in the field of finance. Her research focuses on financial digitalisation, including the impact of new financial solutions on financial markets and financial awareness.

**Patrícia Becsky-Nagy** is an Associate Professor in the Department of Finance at the University of Debrecen, Faculty of Economics and Business Administration. She has considerable experience in the field of finance and accounting education. Her main research interests include the trends in venture capital investments, financing opportunities for young enterprises and modern financial solutions and the challenges of financial digitization.

**How to cite this article:** Fazekas, B., Póta, C. P., & Becsky-Nagy, P. (2024). Accelerate or brake?—The connection of credit gaps and economic disequilibrium. *Strategic Change*, 33(3), 139–150. <https://doi.org/10.1002/jsc.2570>

## APPENDIX A

## A.1 | The descriptive statistics of the current account, fixed capital investment, and government debt to GDP ratios in % of the examined countries on a quarterly basis between 1995 and 2021

Country	Current account		Fixed assets		Government debt	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Austria	1.1	2.9	24.8	2.2	76.3	6.6
Belgium	0.9	3.3	23.4	1.7	107.9	10.4
Czech	-2.0	3.9	29.3	3.2	33.0	7.6
Denmark	6.3	2.9	21.5	1.8	41.4	7.2
Finland	2.3	3.9	23.1	2.1	52.9	12.6
France	0.0	1.5	22.4	1.5	82.8	17.7
Germany	4.4	3.7	21.5	2.1	68.2	6.9
Greece	-6.7	7.0	19.7	6.6	144.0	37.1
Hungary	-3.1	4.7	24.7	4.3	69.3	9.0
Italy	0.5	2.3	19.6	2.2	123.1	15.1
Luxemburg	5.7	8.1	19.7	3.0	15.7	7.0
Netherlands	8.0	3.1	21.2	2.5	55.6	7.0
Norway	7.7	4.9	25.4	3.0	37.5	6.9
Poland	-2.8	2.9	20.9	5.6	48.9	5.6
Portugal	-5.3	5.1	21.7	4.6	98.5	30.8
Spain	-2.1	3.9	23.4	4.1	72.1	26.5
Sweden	4.9	1.8	23.2	1.9	45.6	9.7

Source: Authors' editing.