

UNIVERSITY OF LJUBLJANA  
SCHOOL OF ECONOMICS AND BUSINESS

ANA OBLAK

**ESSAYS ON CORPORATE INDEBTEDNESS: FIRMS' AND BANKS'  
PERSPECTIVES**

DOCTORAL DISSERTATION

Ljubljana, 2022

## AUTHORSHIP STATEMENT

The undersigned Ana Oblak, a student at the University of Ljubljana, School of Economics and Business, (hereafter: SEB), author of this written final work of studies with the title Essays on corporate indebtedness: Firms' and banks' perspectives (Prispevki o zadolženosti do bank: vidik podjetij in bank), prepared under supervision of prof. dr. Janez Prašnikar

### DECLARE

1. this doctoral dissertation to be based on the results of my own research;
2. the printed form of this written final work of studies to be identical to its electronic form;
3. the text of this doctoral dissertation to be language-edited and technically in adherence with the SEB's Technical Guidelines for Written Works, which means that I cited and / or quoted works and opinions of other authors in this doctoral dissertation in accordance with the SEB's Technical Guidelines for Written Works;
4. to be aware of the fact that plagiarism (in written or graphical form) is a criminal offence and can be prosecuted in accordance with the Criminal Code of the Republic of Slovenia;
5. to be aware of the consequences a proven plagiarism charge based on this doctoral dissertation could have for my status at the SEB LU in accordance with the relevant SEB LU Rules;
6. to have obtained all the necessary permits to use the data and works of other authors which are (in written or graphical form) referred to in this doctoral dissertation and to have clearly marked them;
7. to have acted in accordance with ethical principles during the preparation of this doctoral dissertation and to have, where necessary, obtained permission of the Ethics Committee;
8. my consent to use the electronic form of this doctoral dissertation for the detection of content similarity with other written works, using similarity detection software that is connected with the SEB LU Study Information System;
9. to transfer to the University of Ljubljana free of charge, non-exclusively, geographically and time-wise unlimited the right of saving this doctoral dissertation in the electronic form, the right of its reproduction, as well as the right of making this doctoral dissertation available to the public on the World Wide Web via the Repository of the University of Ljubljana;
10. my consent to publication of my personal data that are included in this doctoral dissertation and in this declaration, when this doctoral dissertation is published.

Ljubljana, July 14th, 2022

Author's signature:

## ACKNOWLEDGEMENTS

Jošt in Mila,

profesor (prof. dr. Janez Prašnikar, op. a.),

Ada,

hvaležna sem vam.



# **ESSAYS ON CORPORATE INDEBTEDNESS: FIRMS' AND BANKS' PERSPECTIVES**

## **Summary**

The severe consequences of the 2007–2009 global financial crisis posed two main questions relevant to this dissertation. Williamson (in Miller & Stiglitz, 2010) exposed the question “how such major consequences can flow from such a seemingly minor event,” which is related to macrofinancial linkages. At the core of macrofinancial linkages, there are interactions between the real economy and the financial sector with financial market imperfections playing a key role in crisis transmission and amplification (Claessens & Kose, 2018). The second question is “why were particular regions (countries) distressed more and for longer than others during the Great Recession.” It opens the debate on the core (Europe) and the periphery, and related policy issues.

The first part of the dissertation is devoted to a study of the debt accumulation process and its influence on liquidity through the boom-bust-recovery regimes (2006–2010) in the Balkan countries benchmarked against the Mediterranean and Central European countries. A database encompasses financial data for more than 11,000 non-financial corporations in the three studied regions in the period from 2006–2010. The large inflow of capital from core European countries at the onset of the crisis, its domestic amplification, and a sudden stop are at the core of the study. The financial accelerator in the Balkan countries was several times stronger (twice as strong for core investments) than in the Mediterranean and especially Central European countries in the boom period of the Great Recession. Implying a bubble, the financial accelerator of financial investments was significant and positive in the Balkan region unlike in the other two regions. Following the crisis eruption (2009), the process of debt accumulation started to reverse and the financial accelerator of core investment decreased to a similar level in all three regions, implying a similar dynamic of the debt decumulation process. A liquidity squeeze resulting from high levels of accumulated financial debt and intercompany debt was, however, considerably stronger and more disastrous in the Balkan region.

A study on the determinants of credit supply to households and firms throughout the boom (2007–2008), bust (2009–2010), and recovery (2011–2013) periods of the Great Recession, namely, indebtedness of firms and households from the perspective of the banks represents the second part of the dissertation. Using an unbalanced panel of financial data for 55 banks from Croatia, Montenegro, and Slovenia with coverage of more than 85 percent of the total assets of each banking system, a liquidity channel is studied. Again, foreign capital inflows play a key role in the transmission mechanism of the shock through the availability of mostly foreign wholesale funds. The wholesale funding channel was a crucial driver in procyclical swings of credit supply, more so for credit supply to firms than to households and in Slovenia and Montenegro than in Croatia. This is in line with previous empirical findings (de Haan, van den End, & Vermeulen, 2017). Retail funding effects were considerably lower for credit

to firms but not statistically significant for credit to households. In the boom period and bust period, credit supply to households was driven by demand.

The third main part of the dissertation is the study on the role of policy in the credit supply to households and firms and the liquidity of firms. Firstly, credit supply and policy are comparatively analyzed in three selected countries using the same methodology and data as in the second part. The results indicate that in the boom and bust periods, the total policy effects in all three observed countries were countercyclical but weak (apart from policy effects of systematic intervention for Croatia in the boom period) in comparison with the other variables of interest. This is probably due to horizontally unaligned policy interventions. Only macroprudential policy seems to have a countercyclical effect on the credit supply to households and firms of a median bank in Slovenia in the recovery. Standard macro and structural policy measures in Slovenia and Montenegro even amplified the credit crunch driven by the collapse of wholesale funding in the recovery.

Secondly, liquidity of firms and policy in the Great Recession and the pandemic year is studied using a comprehensive database of financial data of Slovenian non-financial corporations and data on public support. A simple descriptive analysis enables us to (partially) evaluate the effectiveness of support measures. Unlike in the previous crisis, liquidity provision through direct grants was one of the key policy responses. In 2009, the share of firms able to sustain positive cash flow plummeted by more than 8 percent and the decrease is comparable to the pandemic-induced shock to the non-financial corporations' cash flows when support measures are not accounted for. Due to policy intervention, an additional 3.4 percent of firms from the analyzed sectors were able to sustain positive cash flow and 0.6 percent of firms to recover. Strikingly, the share of inactive firms decreased in 2020 compared to 2019, which might indicate that measures supported de facto dead companies. Acting in concert, the governments and the European Union (EU) institutions concerned prevented massive illiquidity. So far, it thus seems that the policymakers learned the lesson. Yet the reaction of banks (at least in Slovenia) remains similar, just less decisive than in the previous crisis. The tightening of credit standards by Slovenian banks in the second quarter of 2020 was followed by a tightening of credit standards in the third and fourth quarters of 2020.

Keywords: macrofinancial linkages, firms' indebtedness, liquidity, credit supply, capital flows

## **PRISPEVKI O ZADOLŽENOSTI DO BANK: VIDIK PODJETIJ IN BANK**

### **Povzetek**

Razsežnosti svetovne finančne in gospodarske krize postavljajo številna vprašanja. Disertacija je motivirana predvsem z dvema vprašanjema in posledično naslavlja dve vprašanji: "Kako navidezno nepomemben dogodek lahko povzroči tako nezanemarljive posledice (Williamson v Miller & Stiglitz, 2010)?" ter "Zakaj so bile določene regije (države) bolj prizadete in so v času t.i. Velike recesije potrebovale več časa za okrevanje kot druge?" Prvo vprašanje je povezano z makrofinančnimi povezavami, katerih osrednji element je povezanost realnega sektorja s finančnim sektorjem preko nepopolnih finančnih trgov. Drugo vprašanje izpostavlja odnos jedrnih (evropskih) držav in perifernih držav.

Prvi ključni del disertacije je posvečen analizi procesa zadolževanja in njegovega vpliva na likvidnost nefinančnih družb v treh obdobjih, obdobju gospodarskega razcveta (2007–2008), upada (2009) in okrevanja (2010). Države balkanske regije primerjamo z državami Mediterana in jedrne (centralne) Evrope. Baza podatkov zajema finančna poročila za več kot 11.000 nefinančnih družb v omenjenih regijah. Poudarek študije je na nesorazmerno velikih pritokih kapitala v obdobju pred krizo, mehanizmi znotraj države, ki povečujejo nihanja, ter na pripadajočem problemu nenadne ustavitve kapitalskih tokov. Velikost finančnih akceleratorjev za balkansko regijo je nekajkrat večja (dvakrat za investicije v produktivni kapital) kot za Mediteran in centralno-evropsko regijo. Statistično značilen koeficient akceleratorja finančnih investicij nakazuje na razvoj balona v balkanski regiji, medtem ko to ne velja za ostali obravnavani regiji. Izbruhu krize je sledil proces razdolževanja, katerega dinamika pa je primerljiva v vseh treh regijah. Ključna razlika med balkansko regijo primerjalno z mediteransko in centralno-evropsko pa se v fazi upada in okrevanja pojavi pri vplivu zadolženosti, tako do bank kot do podjetij, na likvidnost. Negativni učinki dolga so bili neprimerno bolj škodljivi za podjetja v balkanski regiji.

V drugem glavnem delu disertacije obravnavamo dejavnike kreditne ponudbe podjetjem in gospodinjstvom v času gospodarskega razcveta (2007–2008), upada (2009–2010) in okrevanja (2011–2013). Zadolževanje podjetij in gospodinjstev torej analiziramo z vidika bank. Baza podatkov vključuje 55 bank v Sloveniji, na Hrvaškem in v Črni Gori, ter pokriva več kot 85 odstotkov skupne bilančne vsote bančnih sistemov v posamezni državi. Transmisijski mehanizem, ki ga poglavje obravnava, je tako imenovani likvidnostni kanal. Kapitalski tokovi predvsem v banke držav gostiteljic ponovno predstavljajo pomemben vir nestabilnosti, in sicer večina bančnih grosističnih virov v državah v razvoju (oziroma manj razvitih državah) priteka iz tujine ravno zaradi pomanjkanja domačega kapitala. Zlom medbančnih trgov predstavlja bankam likvidnostni šok in v odgovor na omenjeni šok banke zmanjšajo kreditno dejavnost, ki posledično prinaša širše makroekonomske posledice. Grosistični viri financiranja so v celotnem obdobju 2007–2013 v vseh treh državah najpomembneje prispevali k procikličnosti ponudbe kreditov. To velja predvsem za podjetja, učinki so namreč bili manjši, če vzamemo v obzir kreditno ponudbo gospodinjstvom.

Ugotovitev je skladna s predhodnimi empiričnimi raziskavami (de Haan, van den End, & Vermeulen, 2017). Učinki virov financiranja nebančnega sektorja na kreditno aktivnost bank so manjši za podjetja in neznačilni za gospodinjstva. Dejavniki na strani povpraševanja so ključno prispevali k ponudbi kreditov gospodinjstvom.

Tretji del disertacije se ukvarja z vlogo ukrepov ekonomskih politik, njeno povezanostjo s ponudbo kreditov bank ter likvidnostjo podjetij. Prvič, v primerjalni analizi ukrepov ekonomskih politik v treh državah analiziramo vpliv na kreditno ponudbo. Metodološko poglavje sledi drugemu delu disertacije. V obdobjih razcveta in upada so bili skupni učinki ukrepov ekonomskih politik (makrobonitetne politike, standardne makroekonomske politike in strukturne politike) proticiklični, vendar zanemarljivi, primerjalno z učinki ostalih spremenljivk. Izjema je vpliv ekonomskih politik na kreditno ponudbo bank podjetjem na Hrvaškem v obdobju razcveta, ko je sistematično ukrepanje uspešno prispevalo k omejevanju prekomernega zadolževanja s strani podjetij. Splošno so učinki ukrepov ekonomskih politik nepomembni, kar najverjetneje izhaja iz nekonsistentnosti le-teh. Makrobonitena politika je skozi celotno obravnavano obdobje delovala proticiklično, medtem ko so na primer ukrepi standardnih makroekonomski politik in strukturnih politik v Sloveniji in Črni gori dodatno prispevali k kreditnemu krču, povzročenem z nenadno ustavitvijo grosističnih virov financiranja.

Drugič, analiziramo likvidnost podjetij v odnosu do ekonomski politik v obdobju Velike recesije in pandemije. Ponovno empirična analiza temelji na obsežni bazi finančnih podatkov slovenskih nefinančnih družb. Opisna analiza omogoča (delno) oceno ustreznosti ukrepov za omilitev posledic pandemije, ki so v nasprotju z ukrepi v odgovor na svetovno gospodarsko in finančno krizo pravočasni in usmerjeni k zagotavljanju likvidnosti. Padeč (okrog 8 odstotkov) v deležu podjetij, ki so uspela ohraniti pozitiven denarni tok, je primerljiv v obeh kriznih obdobjih, če ne upoštevamo direktne pomoči podjetjem v času pandemije. Rezultati sicer kažejo, da so bili protikrizni ukrepi usmerjeni predvsem v podjetja, ki so v letu pred pandemijo zabeležila pozitiven denarni tok. Dodatnih 3,4 odstotka teh podjetij je upoštevajoč državno pomoč ohranilo pozitiven denarni tok, 0,6 odstotka podjetjem iz vseh analiziranih sektorjev pa je državna pomoč omogočila prehod iz negativnega denarnega toka v letu pred pandemijo k pozitivnemu denarnemu toku. Delež neaktivnih podjetij se je v Sloveniji v letu 2020 presenetljivo zmanjšal v primerjavi z letom 2019, kar lahko nakazuje, da so ukrepi podpirali tudi de facto mrtva podjetja. Le-to odpira vprašanje o smotnosti porabe davkoplačevalskih sredstev. Množično nelikvidnost je vladam in zadevnim institucijam Evropske Unije z usklajenostjo ekonomskih politik (za zdaj) uspelo preprečiti. Vedenje bank kljub usklajenemu odzivu ostaja slično obnašanju v prejšnji krizi.

Ključne besede: makrofinančne povezave, zadolženost podjetij, likvidnost, kreditna ponudba, kapitalski tokovi



# TABLE OF CONTENTS

<b>INTRODUCTION</b> .....	<b>1</b>
<b>Motivation</b> .....	<b>1</b>
<b>Research topic and research questions</b> .....	<b>2</b>
<b>Data and methodology</b> .....	<b>5</b>
<b>Contribution to the field of knowledge</b> .....	<b>6</b>
<b>Limitations</b> .....	<b>8</b>
<b>1 A HISTORICAL PERSPECTIVE</b> .....	<b>9</b>
<b>2 DEBT ACCUMULATION PROCESS, INDEBTEDNESS OF FIRMS AND ITS IMPACT ON LIQUIDITY: FROM CORE TO PERIPHERY</b> .....	<b>11</b>
<b>2.1 Introduction</b> .....	<b>11</b>
<b>2.2 A macroeconomic perspective on the crisis in the three regions</b> .....	<b>13</b>
<b>2.3 The model</b> .....	<b>23</b>
<b>2.4 Empirical analysis</b> .....	<b>27</b>
2.4.1 Data .....	27
2.4.2 Descriptive statistics.....	29
2.4.3 Empirical specification.....	31
2.4.3.1 <i>Debt accumulation equation</i> .....	32
2.4.3.2 <i>Cash flow migration equation</i> .....	34
2.4.4 Debt accumulation model.....	36
2.4.5 Cash flow migration model.....	39
<b>2.5 Conclusion</b> .....	<b>42</b>
<b>3 BANKS' PERSPECTIVE OF FIRMS' AND HOUSEHOLDS' INDEBTEDNESS</b> .....	<b>43</b>
<b>3.1 Introduction</b> .....	<b>43</b>
<b>3.2 A macroeconomic perspective on the crisis in the three countries</b> .....	<b>47</b>
<b>3.3 The credit model of the open economy</b> .....	<b>56</b>
<b>3.4 Empirical analysis</b> .....	<b>61</b>
3.4.1 Data .....	61
3.4.2 Descriptive statistics.....	63
3.4.3 Empirical specification.....	65
3.4.4 Determinants of credit supply to firms and households.....	68
3.4.5 The model estimated contributions to credit supply to firms and households .....	70

3.5	<b>Discussion and conclusions .....</b>	<b>73</b>
<b>4</b>	<b>HOW CREDIT SUPPLY AND LIQUIDITY ARE RELATED TO POLICY: A COMPARISON ON A COUNTRY LEVEL AND A COMPARISON IN TIME.....</b>	<b>75</b>
4.1	<b>Introduction.....</b>	<b>75</b>
4.2	<b>Comparing the estimated policy effects of the analyzed components in the Great Recession.....</b>	<b>79</b>
4.2.1	A review of policymakers' responses: a comparison on a country level .....	79
4.2.2	Empirical analysis .....	82
4.2.2.1	<i>Data.....</i>	82
4.2.2.2	<i>Empirical specification .....</i>	82
4.2.2.3	<i>The estimated policy effects on credit supply.....</i>	82
4.3	<b>How policymakers' responses impact the liquidity of firms: a comparison in time .....</b>	<b>85</b>
4.3.1	A review of policymakers' responses: a comparison in time.....	85
4.3.2	Empirical analysis .....	90
4.3.2.1	<i>Data.....</i>	90
4.3.2.2	<i>Descriptive statistics .....</i>	92
4.3.2.3	<i>Cash flow dynamics .....</i>	98
4.4	<b>Conclusion .....</b>	<b>101</b>
	<b>CONCLUSION.....</b>	<b>103</b>
	<b>REFERENCE LIST .....</b>	<b>107</b>
	<b>APPENDIX .....</b>	<b>113</b>

## LIST OF FIGURES

<i>Figure 1: Real GDP growth (percentage) .....</i>	15
<i>Figure 2: Market capitalization of listed domestic companies (percentage of GDP) .....</i>	15
<i>Figure 3: Household and NPISHs consumption (percentage of GDP) .....</i>	15
<i>Figure 4: Investment (percentage of GDP).....</i>	15
<i>Figure 5: Consumption (contribution to growth of GDP) .....</i>	16
<i>Figure 6: Investment (contribution to growth of GDP) .....</i>	16
<i>Figure 7: Household debt (percentage of GDP).....</i>	16
<i>Figure 8: Non-financial institutions debt (percentage of GDP) .....</i>	16
<i>Figure 9: Capital inflows into equities and FDI (all sectors) (percentage of GDP).....</i>	20
<i>Figure 10: Capital outflows into equities and FDI (all sectors) (percentage of GDP).....</i>	20

<i>Figure 11: Net capital flows into equities and FDI (all sectors) (percentage of GDP)</i> .....	20
<i>Figure 12: Net capital flows into debt instruments (all sectors) (percentage of GDP)</i> .....	20
<i>Figure 13: Capital inflows into debt instruments (all sectors) (percentage of GDP)</i> .....	21
<i>Figure 14: Capital outflows into debt instruments (all sectors) (percentage of GDP)</i> .....	21
<i>Figure 15: Capital inflows debt instruments (other sectors) (percentage of GDP)</i> .....	21
<i>Figure 16: Capital outflows debt instruments (other sectors) (percentage of GDP)</i> .....	21
<i>Figure 17: Net capital flows into debt instruments (other sectors) (percentage of GDP)</i> .....	22
<i>Figure 18: Net capital flows into debt instruments (deposit-taking corporations) (percentage of GDP)</i> .....	22
<i>Figure 19: Capital inflows into debt instruments (deposit-taking corporations) (percentage of GDP)</i> .....	22
<i>Figure 20: Capital outflows into debt instruments (deposit-taking corporations) (percentage of GDP)</i> .....	22
<i>Figure 21: Financial debt (marginal effects on the probability of positive cash flow for a one-year horizon)</i> .....	41
<i>Figure 22: Collateral coverage (marginal effects on the probability of positive cash flow for a one-year horizon)</i> .....	41
<i>Figure 23: Non-financial debt (suppliers) (marginal effects on the probability of positive cash flow for a one-year horizon)</i> .....	41
<i>Figure 24: Receivables (marginal effects on the probability of positive cash flow for a one-year horizon)</i> .....	41
<i>Figure 25: Growth of real GDP</i> .....	48
<i>Figure 26: Current account balance (percentage of GDP)</i> .....	48
<i>Figure 27: Central government bond yields with a residual maturity of around 10 years</i> .....	49
<i>Figure 28: Average interest rate on loans, up to 1 year, non-financial corporations</i> .....	49
<i>Figure 29: Average interest rate on loans, over 1 year, non-financial corporations</i> .....	49
<i>Figure 30: Average interest rate on loans, over 1 year, households</i> .....	49
<i>Figure 31: New and existing dwellings, price index (base=2006)</i> .....	49
<i>Figure 32: Net capital flows into equities and FDI (all sectors) (percentage of GDP)</i> .....	51
<i>Figure 33: Net capital flows into debt instruments (all sectors) (percentage of GDP)</i> .....	51
<i>Figure 34: Capital inflows into debt instruments (other sectors) (percentage of GDP)</i> .....	51
<i>Figure 35: Capital inflows into debt instruments (deposit-taking corporations) (percentage of GDP)</i> .....	51
<i>Figure 36: Capital outflows into debt instruments (other sectors) (percentage of GDP)</i> .....	51
<i>Figure 37: Capital outflows into debt instruments (deposit-taking corporations) (percentage of GDP)</i> .....	51
<i>Figure 38: Loans to households (percentage of GDP)</i> .....	53
<i>Figure 39: Loans to non-financial corp. (percentage of GDP)</i> .....	53
<i>Figure 40: Bank deposits (percentage of GDP)</i> .....	53
<i>Figure 41: Bank loans to bank deposits (percentage)</i> .....	53
<i>Figure 42: Increment of loans to households (percentage of total assets of the banking system)</i> .....	55

<i>Figure 43: Increment of loans to non-financial corporations (percentage of total assets of the banking system)</i> .....	55
<i>Figure 44: Increment of deposits of the non-financial sector (percentage of total assets of the banking system)</i> .....	55
<i>Figure 45: Increment of wholesale funding (percentage of total assets of the banking sector)</i> .....	55
<i>Figure 46: Credit standards and demand</i> .....	75
<i>Figure 47: Cumulative distribution of cash flow per unit of the balance sheet with and without support measures in years 2018–2020 by segment</i> .....	97
<i>Figure 48: Cumulative distribution of cash flow per unit of the balance sheet with and without support measures in years 2018–2020 for utilities</i> .....	98

## **LIST OF TABLES**

<i>Table 1: Definition of variables and calculation of the variables</i> .....	28
<i>Table 2: Wilcoxon-Mann-Whitney test of the difference in sectoral distributions of revenue per employee</i> .....	29
<i>Table 3: Mean (and standard deviation) of selected variables by year and region</i> .....	30
<i>Table 4: Results of the GMM estimation on equation (1)</i> .....	36
<i>Table 5: GMM estimation of the total regional effects on financial debt accumulation</i> .....	37
<i>Table 6: Model of cash flow migration</i> .....	40
<i>Table 7: Definition of variables and calculation of the variables</i> .....	63
<i>Table 8: Mean of selected variables by period and country</i> .....	64
<i>Table 9: Results of the 2GSLs estimation of loans to households and loans to firms</i> .....	68
<i>Table 10: Funding and policy effects on credits to households</i> .....	71
<i>Table 11: Funding and policy effects on credits to firms</i> .....	72
<i>Table 12: Macroprudential interventions, standard macro policy measures, and structural policy</i> .....	81
<i>Table 13: Disaggregated policy effects on credits to households</i> .....	83
<i>Table 14: Disaggregated policy effects on credits to firms</i> .....	84
<i>Table 15: Macroprudential interventions</i> .....	87
<i>Table 16: Macroprudential interventions</i> .....	88
<i>Table 17: Covid-19 measures adopted by the Slovenian government</i> .....	89
<i>Table 18: General government debt and General government surplus (+) / deficit (-)</i> .....	89
<i>Table 19: List of variables and calculation</i> .....	91
<i>Table 20: Financial and intercompany debt, cash flow and potential collateral in periods 2007–2009 and 2019–2020</i> .....	95
<i>Table 21: Financial and intercompany debt, cash flow with and without state aid and potential collateral in period 2018–2020</i> .....	96
<i>Table 22: The cash flow migration matrix</i> .....	99

## **LIST OF APPENDICES**

Appendix 1: Summary in Slovenian language .....	1
---	---

## **LIST OF ABBREVIATIONS**

sl. – Slovene

**BS** – (sl. Banka Slovenije); Bank of Slovenia

**EU** – (sl. Evropska unija); European Union

**ECB** – (sl. Evropska centralna banka); European Central Bank

**HBN** – (sl. Hrvatska centralna banka); Croatian national bank

**IMF** – (sl. Mednarodni denarni sklad); International Monetary Fund

**SME** – (sl. Mala in srednje velika podjetja); Small and medium-sized enterprises

## **INTRODUCTION**

### **Motivation**

Even after more than a decade, the Great Recession is a highly debated issue in the economic literature. The literature on the financial crisis focuses, on the one hand, on a discussion of why a financial crisis arises, how it unfolds and what its consequences are, and on the other hand, basic assumptions of existing models are called into question. It is crucial to advance the economic theory to reflect the actual developments in the real economy and financial sector and to be able to inform the formulation of policies. This includes the policy response to a recent pandemic-induced crisis, which became a subject of intensive studies following the outbreak of Covid-19. A notable dissimilarity in the causes of both crises does not make the analysis of policymakers' responses to the Great Recession irrelevant and provides helpful insights. This is especially the case since the new strand of literature does not only focus on the predicted effects and evaluation of policy measures implemented to counter pandemic-induced crisis but also to provide the right set of policy actions.

Resulting in more pronounced macroeconomic fluctuations, the study of macrofinancial linkages has gained interest after the Great Recession. At the core, there are interactions between the real economy and the financial sector with financial market imperfections playing a key role. "The financial markets can be the source of shocks, which are propagated through the real economy, and vice versa. The shocks arising in the real economy can be propagated through financial markets (Claessens & Kose, 2018)." The common denominator is the strength of households', financial and non-financial corporations' balance sheets, which is closely related to the ability of non-financial corporations and households to access bank credit, and in turn banks' ability to extend credit.

Ideas on a debt-driven crisis are not new. Authors such as Fisher (1933), Minsky (2008), and Kindleberger (1978) were among the pioneers. In their book *Manias, Panics, and Crashes: A History of Financial Crises* (2005), Kindleberger and Aliber documented selected financial bubbles since 1636. Building upon the model of the financial crisis by Hyman Minsky, the thesis of the book is that "the cycle of manias and panics results from the pro-cyclical changes in the supply of credit; the credit supply increases relatively rapidly in good times, and then when economic growth slackens, the rate of growth of credit has often declined sharply." And we can learn from history.

In the studied countries, the indebtedness of firms and households has increased rapidly over the past decade (ECB, 2012). This increase to a high level has exposed their vulnerability to adverse shocks or at least undermined their capacity to absorb them. A high level of indebtedness "hinders the ability of households and enterprises to smooth consumption and investment and of governments to cushion adverse shocks" (Sutherland, Hoeller, Merola, & Ziemann, 2012). Excessive indebtedness, besides the institutional environment (e.g. bank or macroprudential regulation), can also depress the recovery after the crisis (Taylor, 2015).

We could thus easily relate the crisis of 2008–2009 to the thesis of the book presented. Two main questions posed by the global financial crisis arise, which are of interest to the dissertation and also for future research. One is “how such major consequences can flow from such a seemingly minor event (Williamson in Miller & Stiglitz, 2010, p. 1).” and the other one is “why particular regions (countries) were distressed more than others during the Great Recession and for longer.”

### **Research topic and research questions**

Arising from a decade-long expansion of real estate market activity, a massive bubble in the real estate market in the United States resulted in a global economic downturn unseen since the World War II. It was coupled with financial innovation and consequently the expansion of credit to subprime borrowers, too. The implosion of the bubble revealed macroeconomic and financial imbalances not only in the United States but worldwide.

Analyzing financial bubbles since the seventeenth century, Kindleberger and Aliber (2005, page 44) claim that “each crisis has its own unique features: the nature of the shock, the object of speculation, the form of credit expansion, the ingenuity of the swindlers and the nature of incident that touches off revulsion.” Yet similar patterns emerge, and the Great Recession is not an exception. In the latter periods, the “objects of speculation” were primarily real estate or stocks and as a rule, the bubbles were fueled by the expansion of money and credit.

The sources of credit booms are numerous from positive shocks to productivity, and economic policies to capital flows. According to Claessens and Kose (2013), capital inflows can lead to an increase in the availability of loanable funds in the domestic financial markets. Consequently, the credit constraints are relaxed for the nonfinancial corporations and households alike, and access to credit is eased. Driven by large capital inflows, the pre-crisis period was indeed noted for excessive expansion of credit and an increase in asset prices in many countries, including the countries of the Balkan region. Hoffman and Schnabl (2016) and Hunya (2009) document an increase in the wholesale funding (foreign interbank markets) in the boom period in the Balkan countries and a corresponding sudden stop. Capital inflows from developed countries to catching-up economies were sizable and their nature destabilizing.

The consequences of the crisis were severe. Intensifying fluctuations from the real economy to the financial sector and from the financial sector to the real economy, financial market imperfections, related to underdeveloped financial markets, can partially explain the amplification and propagation of a shock. In the dissertation, the focus is on the transmission channels from the financial sector to the real sector. The Basel Committee on Banking Supervision (2011) and Claessens and Kose (2018) identified three main transmission channels. The first borrower balance sheet channel operates through the demand side of finance and describes how changes in borrowers' balance sheets can amplify macroeconomic fluctuations. The best-known model is the financial accelerator model. The second channel,



associated with the supply side of finance, emphasizes the importance of the balance sheets of banks and other financial institutions in lending and liquidity provision to the real economy. The third channel is the liquidity channel, which analyzes the impact of liquidity on banks' ability to extend credit and thereby on economic activity. It stresses the rigidities that can be present in altering banks' balance sheet variables. It follows that indebtedness can be studied from two different perspectives, namely, demand or firms' (households') perspective and supply or banks' perspective. Recently, models have been developed to account for both aspects of debt accumulation processes. Gertler and Kiyotaki (2011) and Gertler, Kiyotaki, and Prestipino (2016) develop a model of accelerated indebtedness of non-financial firms due to demand-side financial frictions and the simultaneous increase of debts incurred by banks due to increased wholesale funding followed by a sudden stop. A historical perspective on the story outlined above is extended in the next chapter.

In Chapter 2, we focus on the transmission and amplification mechanism of the crisis from the core of Europe to the periphery and the domestic amplification mechanism. To provide a context, actual macroeconomic developments are also given. The study is based on the financial accelerator mechanism that endogenously drives the amplification and propagation of the debt accumulation process through firms' investments. Favorable economic conditions positively influence the strength of non-financial corporations' and households' (as well as financial corporations') balance sheets. This increases their net worth and in turn creditworthiness, and decreases the external finance premium, which arises due to financial market imperfections. With a decrease in the external finance premium, the cost of credit declines, which increases investment and consumption appetites and enhances the boom. In a crisis, adverse macroeconomic conditions weaken the balance sheets of borrowers through a decline in profits and incomes, but also possibly through a decline in asset prices, which increases the external finance premium, deters borrowing, and consequently investments and spending (Bernanke, Gertler, & Gilchrist, 1999). In the dissertation, the extended theoretical model of financial accelerator by Bole, Oblak, Prašnikar, and Trobec (2018) is used, which enables us to compare the size of the financial accelerator in the three regions, in the boom, boost, or recovery phase of the business cycle and for different types of investment. The cash flow model is based on the ideas of Miller and Stiglitz (2010), and Krishnamurthy (2010). The research questions, which serve as a basis for the formulation of hypotheses, are:

**Q1.** How does the size of the financial accelerator differ for the three regions (taking into account the macroeconomic situation, thereby optimism in the Balkan region and large capital inflows before the crisis) according to the phase of the business cycle (boom, bust, and recovery) and type of investment?

**Q2.** How do financial debt, intercompany indebtedness, receivables, and collateral coverage influence the probability of achieving a negative cash flow of firms in the three groups of countries according to the phase of the business cycle (boom, bust, and recovery)?

The third chapter is devoted to a study of credit supply and its determinants with an emphasis on the liquidity channel. Following a distortion in the wholesale funding market (or retail funding market), banks adjust their credit supply to households and firms and transmit the shock through the activation of the liquidity channel to the real economy. In the dissertation, we build on the credit model by Prašnikar, Bole, Dominko, Lakićević, and Oblak (2021) and the model of Gertler and Kiyotaki (2011) and Gertler, Kiyotaki, and Prespitino (2016). One of the focus points is the role played by large capital inflows in driving (excessive) supply of bank credit to households and firms in the pre-crisis period and a credit crunch afterward. Interestingly, Huang and Ratnovski (2011) suggest that, at the refinancing stage, wholesale financiers could suddenly withdraw their funds given a mere hint of negative news, which could diminish the credit activity of banks. In the three selected countries, the majority of wholesale funds are indeed represented by foreign capital inflows. It is thus studied how large capital inflows with distinct characteristics for each of the three countries analyzed influenced credit supply in Montenegro, Croatia, and Slovenia during the Great Recession. The following research questions are addressed:

**Q3.** How do the wholesale and retail funding influence bank credit supply in the three countries according to the phase of the business cycle (boom, bust, and recovery) and type of borrower (households and firms)?

**Q4.** How do impairment and demand variables influence bank credit supply in the three countries according to the phase of the business cycle (boom, bust, and recovery) and type of borrower (households and firms)?

In the fourth chapter, the ideas and methodology of chapters 2 and 3 are employed and extended to assist in studying policy intervention effects. Firstly, credit supply and policy are comparatively analyzed in the three selected countries; secondly, liquidity of firms and policy in two time periods is studied. In the study on liquidity, the key aspect is how the liquidity of Slovenian firms' compares when we consider coherent versus incoherent policy responses during the Great Recession and the pandemic. The empirical analysis draws upon the study of cash flow dynamics and illiquidity contagion of non-financial companies in Slovenia during the Great Recession by Bole et al. (2014). In the analysis of the intertwinement of policy interventions and credit supply, we account for standard macroeconomic policy interventions, macroprudential policy and structural policy interventions. So far, empirical literature has mostly examined the influence of monetary policy and macroprudential policy actions on credit supply separately (de Haan, van den End, & Vermeulen, 2017; Giannone, Lenza, Pill, & Reichlin, 2012; Budnik & Kleibl, 2018; Čehajić & Košak, 2021). The research question is:

**Q5.** How does policy (non-systematic versus systematic) influence bank credit supply and firms' liquidity?

## **Data and methodology**

The thesis is hierarchical in structure, from core to periphery and super-periphery, from regions to comparison of countries and a single country in two crisis episodes. At the highest level, the countries are classified into three groups, core, periphery and super-periphery. Geographical region and proximity (in light of contagion), the nature of capital flows and indebtedness provide reasoning for grouping of the countries (for more see Section 2.2). In the pre-crisis period, the countries of the Balkan region faced similar dynamics of foreign flows of capital. Namely, due to the developments after the breakup of Yugoslavia, the new countries were only able to enter international financial markets at the beginning of the 21st century. Not being very successful in implementing reforms in the first decade of transition, the same is true for Bulgaria. Balkan countries include Bulgaria, Bosnia and Herzegovina, Croatia, North Macedonia, Montenegro, Serbia, and Slovenia. Mediterranean countries are Italy, Greece, Spain, and Portugal. The Central European region is represented by Austria, the Czech Republic, France, Germany, Hungary, and Slovakia. We use this classification in studying the indebtedness of firms from firms' perspective and its impact on liquidity in the second chapter. In the third and fourth chapters, the comparison is at a country level, namely the developments in bank credit supply and policy response during the Great Recession are studied in Croatia, Montenegro, and Slovenia. Another dimension of comparison is added, namely the time dimension. The policy response in Slovenia during the Great Recession is compared to the policy response during the Covid-19 pandemic. Regional comparison and comparison of economic developments are exploited in parts of the second and third chapter, where some stylized facts are documented.

The empirical analysis exploits numerous sources of data. Sections 2.2 and 3.2, where macroeconomic developments are depicted, are based on secondary sources of data. These include national statistical offices and national central banks as well as international institutions (data providers) such as Eurostat, the European Central Bank (ECB), the World Bank, International Monetary Fund (IMF), and Bank for International Settlements (BIS). The studies of the indebtedness of firms from firms' perspective and of indebtedness of firms' and household' from banks' perspective are studies at a micro-level, based on financial data of firms and banks. The main sources of data are Bureau van Dijk's Amadeus database and the Bankscope database. The main variables to study determinants of loans to firms and households were hand-collected from banks' annual reports. Also, firms' financial data were supplemented, where needed. Additional sources of data were the Central Bank of Montenegro, the Central Register of Macedonia, the Austrian Firmen-Compass, and a comprehensive database of financial data provided by the Agency of the Republic of Slovenia for Public Legal Records and Related Services (AJPES). The data on state aid were retrieved from ERAR, an application for the portrayal of public money use in the Republic of Slovenia. The final databases include data of more than 10,000 firms from 2006 to 2010 for 17 countries analyzed, banks' financial data with a coverage of more than 85 percent of the total assets of the banking sectors in Croatia, Montenegro, and Slovenia for the period 2006–2013,

and the whole population of limited and unlimited liability companies in Slovenia in the period from 2007 to 2020 (68,125 in 2020).

To illustrate the macroeconomic perspective of the Great Recession and document stylized facts, we use descriptive statistics. The empirical specification of the model in the second chapter, which follows the extended model of financial accelerator by Bernanke, Gertler, and Gilchrist (1999), is estimated with the general method of moments. The cash flow model is estimated using binomial logistic regression. In the third chapter, the equations of credits to households and credits to firms are estimated with instruments assuming that the key explanatory variables, retail and wholesale bank funding, might be driven by the very same factors that drive firm and household credit. To take advantage of the panel data, we use 2GOLS. The chapter further documents the model estimated contributions to credit supply for a median bank. The same methodology is employed in the fourth chapter when studying the role of policy in credit supply. In a comparative study of policy and liquidity in Slovenia in the fourth chapter of the dissertation, a simple descriptive statistic is employed.

### **Contribution to the field of knowledge**

The topic of macrofinancial linkages is vast and its consolidation is more and more of interest to scholars and practitioners alike. The paper *Frontiers of Macrofinancial Linkages* by Claessens and Kose (2018) illustrates that vividly with more than 60 pages devoted to references in an attempt to review the existing literature. The dissertation contributes to the discussion on the role of macrofinancial linkages in transmitting, propagating, and amplifying the crisis. Arising from financial market imperfections, interactions between the real economy and the financial sector are at the core. Mechanisms, for example, balance sheet recession (Koo, 2008), could explain why a financial crisis arises and the same theoretical framework could also reveal the mechanism of the deteriorated economic performance in the crisis. Yet, the actual crisis dynamics remain unclear. The dissertation adds to an understanding of the demand side (perspective of the borrower, namely, firms and households) and the supply side of macrofinancial linkages (perspective of lenders, in particular, banks). The comparison on a regional level (in Chapter 2), when considering financial frictions, allows us to better understand the exact trajectory of the crisis in regions at different levels of development. Underdeveloped institutions in the Balkan region coupled with large capital flows resulted in a considerably larger endogenous amplification of the shock than the other two regions studied.

Secondly, the dissertation provides an insight into the relation core-periphery. In the pre-crisis period, one important policy goal was a real convergence between the developed core and less-developed peripheral European countries. It was aimed to be achieved through capital flows to less-developed economies and into the sectors with high labor productivity (Praet, 2014). Disproportionately large flows of foreign capital into households, non-financial corporations, and deposit-taking corporations of peripheral economies of the Balkan region (and partially also the Mediterranean region) at the onset of the crisis, followed by a sudden

stop, not only failed to achieve the goal but amplified the shock. “While the size and source of potential asymmetric shocks as hypothetically crucial drawbacks of the euro area have been studied in detail, the mechanism of asymmetric amplification (from the core towards the periphery) of the same (or symmetric) shocks as a crucial characteristic of the EU and euro area performance volatility has hardly been tackled (Bole, Oblak, Prašnikar, and Trobec, 2018).”

Only after developing an extended model of the financial accelerator (Bernanke, Gertler, & Gilchrist, 1999) by Bole, Oblak, Prašnikar, and Trobec (2018), could the mechanism of asymmetric amplification of the shock from the core towards the periphery be studied. The basic premise of the model is that the size of the financial accelerator varies along with the phase of the business cycle (boom, boost, or recovery), the type of investments (core investments, financial investments, or real estate investments), industry, region (the Balkan region, Mediterranean region, or Central European region), and among firms’ solvency category (sizes of capital and collateral). Another model was developed by Prašnikar, Bole, Dominko, Lakićević, and Oblak (2021), namely, the credit model of the open economy. The empirical work is again based on this theoretical model, which allows the disentangling of supply and demand factors of the credit supply to households and firms. The effects of two main variables of interest, namely wholesale and retail (deposit) funding mainly driven by foreign capital inflows, on the credit activity of banks could thus be studied. A solid theoretical background coupled with rich datasets enabled a profound empirical analysis.

Lastly, the policy-relevance of the studies should not be overlooked. Documenting the actual transmission mechanism when studying the debt accumulation process and its influence on liquidity enables us to propose two main pillars of economic policy. By focusing on foreign capital inflows from core to periphery, macroprudential policy in a booming phase coupled with country-specific expansionary fiscal policy in a bust and recovery phases could be the most effective policy mix for the countries of the periphery. Analyzing macroprudential, standard macroeconomic and structural policy actions and their effects in a single study further allows us to shed light on the importance of alignment of policy actions horizontally. Only coherence and consistency of standard macroeconomic policy, structural policy, and macroprudential policy interventions resulted in a sizable and significant contribution of policy to the containment of excessive credit growth. The effects of incoherent and inconsistent policy intervention on credit supply were trivial. A comparison of economic policy in two crisis episodes, namely, the global financial crisis in 2008–2009 and the pandemic-induced crisis 2020–2021, reinforces these implications. With public support measures, which were exceptional in size and aligned, horizontally (monetary policy, fiscal policy and macroprudential policy) and vertically (at a national and supranational level), policymakers seemed to prevent a disastrous deterioration of firms’ liquidity positions during the pandemic. The study mentioned also raises the concern of suboptimally targeted beneficiaries.

## **Limitations**

Despite an immense number of hours devoted to the collection of the data, the availability remains limited. Since the data on loans to firms and households separately as well as data on division of deposits is not available in the Bankscope database, the data were hand-collected for the whole sample of banks. Studying credit supply, capital adequacy and its dynamics is also a relevant variable but the data available did not allow for even a basic division of capital (e.g. equity and hybrid instruments). The data on capital adequacy were not reported for all banks. Thus, costs of impairment are included to account for changes in capitalization of banks. Some studies also use superior matched bank-firm data.

The coverage in terms of total assets of banks in the sample compared to the total assets of the whole banking sector narrowed down our options to the three selected countries. The data were satisfactory and comparable for Croatia, Montenegro and Slovenia, countries analyzed in chapters 3 and 4. A study with a similar design was intended to be conducted on a set of 17 countries grouped in the three regions. Namely, the Balkan region covering Bulgaria, Bosnia and Herzegovina, Croatia, North Macedonia, Montenegro, Serbia, and Slovenia, the Mediterranean region with Italy, Greece, Spain, and Portugal, and the Central European region encompassing Austria, the Czech Republic, France, Germany, Hungary, and Slovakia. It is a work in progress, yet data availability remains the main obstacle. The sample of banks for the Central European and the Mediterranean region covers an incomparably lower share of the total banking sector assets not covering the whole distribution in comparison to the sample for the Balkan region.

The quality and availability of data were also a problem when estimating the effects of policy intervention on the liquidity of firms in the pandemic year compared to the Great Recession. Accurate data are not available for types of support other than direct grants (mostly employment support). Since our methodological approach is based on the state aid paid and not approved, the policy measures are estimated to also positively contribute to corporate liquidity in 2021. The effects of the policy intervention are thus underestimated in 2020. Another limitation of the study on liquidity is related to the methodology used. A simple descriptive analysis falls short of providing an insight into the transmission mechanism.

In Chapter 4 of the dissertation, one focus point is the role of policy in bank credit supply. Standard macroeconomic policy indicators (fiscal balance, sales of state firms, government borrowing, central bank credits to banks, effective exchange rate and interest rate), structural policy measures (wages in the public sector, privatization, labor market, and capital flows), and macroprudential policies are analyzed and accounted for. However, it was not possible to study the effects of the changes in policy stance on changes in the selected indicators separately. The policy interventions are included in the model through the so-called amalgam variables. The exchange rate was thus only one of the indicators and not a key variable in studying credit supply. It was assumed that the exchange rate regime is to be reflected in the country-specific dummy variable in an empirical specification. This, however, does not allow

for establishing causality. Generally, a credit boom in Slovenia and Montenegro with a less flexible monetary regime was more pronounced and the credit supply more volatile than in Croatia. This, however, might also be due to other factors not accounted for by the variables in the model, not the monetary regime.

## **1 A HISTORICAL PERSPECTIVE**

A financial crisis is a multidimensional crisis, mostly related to more than one destabilizing factor. It could be associated with credit booms, substantial increases in asset prices, most commonly in real estate and stock prices, disruptions in financial intermediation or access to external finance, or deterioration of balance sheets of firms, households, financial intermediaries, or sovereigns (Claessens & Kose, 2018). Taylor (2015) defines the global financial crisis 2007–2009 as a financial crisis recession. It was deep and lengthy and thus it became known as the Great Recession. Not only is such a recession an infrequent phenomenon compared to a normal recession, but also its economic and social consequences are much more severe in the short- and medium term. It is almost as a rule related to (excessive) indebtedness (Taylor, 2015).

Ideas on debt-driven crisis date back to authors like Fisher (1933), Minsky (1986), and Kindleberger (1978). In the book *Manias, Panics, and Crashes: A History of Financial Crises*, Kindleberger and Aliber (2005) documented ten financial bubbles since 1636. “By definition, a bubble involves a nonsustainable pattern of price changes or cash flows” and thus “bubbles always implode” (Kindleberger & Aliber, 2005, p. 1). Historically, the implosion of the asset price bubble or extremely large swings in foreign exchange values of national currencies (often larger than those that would have been implied by the differences between national inflation rates) resulted in financial crises. As a rule, the bubbles were fueled by the expansion of money and credit.

In the 1970s, there was a surge in bank loans to Mexico and other developing countries. The second half of the 1980s was noted for a massive bubble in the real estate and stock markets in Japan. Ample money was available for the Japanese industrial firms, and they could borrow as much as they wanted (“free money”). The excessive growth of credit was put to a halt by the Bank of Japan, posing a limit on growth of the new real estate loans as a share of total loans. A decrease in the growth rate from around 30 percent to 5 or 6 percent a year followed. Not being able to obtain loans to pay interest, some investors sold real estate and the bubble imploded at the beginning of the 1990s. A large number of banks and other types of financial firms failed, and more than a decade of sluggish economic growth followed. A bubble in the real estate and stock markets, which was associated with financial liberalization, emerged in the second half of the 1980s in Finland, Norway, and Sweden. It resulted in a collapse in asset prices and bank failures. The fourth bubble was related to the surge in foreign investment in Mexico from 1990–1993. In the early 1990s, Thailand, Malaysia, Indonesia, and most of the nearby Asian countries experienced a bubble, when they become an attractive investment opportunity as a low-cost and low-wage source of supply for Japanese, European, and US

firms. The stock prices increased around 100 percent in each country. Banks rapidly increased loans in these countries, but unlike domestic banks, foreign banks, mostly European and Japanese, were more selective. In 1996, large loan losses incurred by domestic lenders led to a decrease in purchases of Thai securities by foreign lenders. A sharp decline in the value of the Thai baht resulted in a sharp decline in stock prices throughout the region. The last bubble documented by the authors is the 1995–2000 bubble in over-the-counter stocks in the United States (Kindleberger & Aliber, 2005). The seventh, the bubble in the real estate market in the United States in the early- and mid-2000s can easily be added.

While “each crisis has its own unique features: the nature of the shock, the object of speculation, the form of credit expansion, the ingenuity of the swindlers and the nature of incident that touches off revulsion” (Kindleberger & Aliber, 2005, p. 44), patterns still emerge. The model of general financial crises, built upon the model by Hyman Minsky, makes a distinction between two periods, the boom and the subsequent bust, the mania and the subsequent crisis. A crisis starts with a “displacement”, some exogenous shock to the macroeconomic system, which improves economic outlook and profit opportunities.<sup>1</sup> During the expansion phase<sup>2</sup> investors, as well as firms and individuals, become more optimistic about the future, they revise their estimates of profitability upward and borrow more to make investments and to take advantage of the increase in the anticipated profits. Lenders’ assessment of the riskiness of investments and risk aversion declines, and funds are made available even to subprime borrowers. Credit is abundant, which facilitates investment and consumption spending. A rapid increase in asset prices ensues, which drives an increase in the net worth of borrowers and lenders, and even though the indebtedness is at a higher level, the leverage may decrease. The key characteristic is that investors seek short-term capital gains from increases in these asset prices. Speculation for capital gains leads away from normal, rational behavior to a “mania” or a “bubble.”

Then a signaling event, e.g. the collapse of Lehman Brothers, leading to a pause occurs. Interest in buying lessens and interest in selling strengthens, investors become less optimistic and lenders more cautious. An uneasy period of financial distress leads to a realization that “it is time to become more liquid.” A relatively small number of investors sell at prices just below the peak values and heavily indebted investors become “distress seekers” because interest payments on borrowed money are larger than investment income or an increase in assets prices proves to be lower than expected.<sup>3</sup> When uncertainty grows and prospects of

---

<sup>1</sup> Among others, deregulation of bank and financial institutions, financial innovation such as derivatives, mutual and hedge funds, bank flotation of loans and mortgages as marketable securities, initial public offerings can be seen as “displacement”.

<sup>2</sup> Hyman Minsky used term “euphoria” for a period of excessive optimism, which starts with a “displacement” or shock to some structural characteristics of the system and induces investors to buy riskier assets, including banks making riskier loans.

<sup>3</sup> Based on the relation between the operating income and the debt service payments, Minsky (2008) makes a distinction between three types of financial positions: “hedge finance” is when operating income covers interest payments and scheduled reduction of debt, “speculative finance” is when investors generate enough income to



good times lessen (revulsion), “speculative” investors are transformed into “Ponzi” investors, and “hedge” investors are transformed into “speculative” investors and illiquidity arises. Since over-indebted units (firms) need to sell their assets to pay their financial commitments, the asset prices decline. The deflation and generalized economic crisis may arise as a result (Minsky, 2008).

Being built upon the model by Hyman Minsky, the thesis of the book by Kindleberger and Aliber (2005, p. 12) is “the cycle of manias and panics results from the pro-cyclical changes in the supply of credit; the credit supply increases relatively rapidly in good times, and then when economic growth slackens, the rate of growth of credit has often declined sharply.” Is this time different?

## **2 DEBT ACCUMULATION PROCESS, INDEBTEDNESS OF FIRMS AND ITS IMPACT ON LIQUIDITY: FROM CORE TO PERIPHERY<sup>4</sup>**

### **2.1 Introduction**

Due to the developments following the breakup of Yugoslavia, the new countries were able to enter international financial markets only at the beginning of the 21st century. Their economic policies were founded on the integration with developed countries that promote financial (broadly defined) and labor market integration (Schadler, 2011). The inability to implement reforms in the first decade of transition put Bulgaria in a similar situation. With the accession of Slovenia to the European Union in 2004, “a success story” was written and it became “a role model” for the Balkan countries (Juvan, 2011). This heightened the levels of optimism among agents (households, firms, banks...) and resulted in a marked economic expansion in the region at the onset of the recent financial crisis.<sup>5</sup>

A real convergence between the developed European countries and the catching-up economies was an important policy goal, which was to be enabled by the free movement of capital. Not being focused on activities with high productivity, capital inflows did not result in real convergence. Even more, a capital surge became the main driver of crisis development in the Balkan region. According to Baldwin and Giavazzi (2015, page 19), a capital surge and a corresponding sudden stop was also the main culprit behind the Eurozone crisis:

*From the euro’s launch and up until the crisis, there were big capital flows from Eurozone core nations to Eurozone periphery nations like Ireland, Portugal, Spain and Greece. A major slice of these were invested in non-traded sectors, housing and government consumption. When the Eurozone crisis began, triggered ultimately by the Global Crisis, cross-border capital inflows stopped. This ‘sudden stop’ in investment financing raised*

---

pay interest but need to increase their indebtedness to repay the scheduled reduction of debt and “Ponzi finance” is when income does not even cover the interest payment (firm increases indebtedness or sells assets).

<sup>4</sup> This chapter of the dissertation is partially the paper published as Bole, Oblak, Prašnikar, and Trobec (2018).

<sup>5</sup> See Figures 1 and 2.

*concerns about the viability of banks and, in the case of Greece, even governments themselves.*

Although a capital surge is considered a common denominator in the crisis development in both regions mentioned, the nature of the capital flows is distinct for the two regions and also differs from the nature of capital flows in the Central European region. For the countries of the Central European region gross capital inflows and gross capital outflows mostly balance out but not for the Mediterranean and Balkan countries. The countries of Central Europe recorded the highest gross capital inflows into equities in 2005, and afterwards, a decreasing trend is evident. A peak in capital inflows into equities followed in 2006 in the countries of the Mediterranean region and in 2007 in the Balkan region. At the core of our study, there is the flow from core to periphery, in our case to super-periphery, in particular from Central European countries to countries of the Mediterranean region and lastly to the countries of the Balkan region.

The grouping of countries in the three regions considers the aforementioned division on core, periphery and super-periphery and partially geographical proximity.<sup>6</sup> The analysis in Section 2.2 shows that peaks and bottoms in economic activities are aligned among the three regions, yet a decrease to a lower level of economic growth, and a lower level of capital inflows seems to follow with a 1-year delay in the Balkan region. There are also differences in the main receiving sector between the Mediterranean and the Balkan regions. In the Mediterranean region banks intermediated large gross capital inflows, whereas the direct lending from banks and also intercompany lending to the so-called other sectors (households, non-financial corporations, and other financial corporations) were of higher significance in the Balkan region. Analysis at the micro-level, conducted in the continuation, is anticipated to unmask the actual mechanism of crisis amplification and propagation.

In the following section, the dissertation deals with the relationship between core Europe and its periphery in the financial crisis. The first objective of the chapter is to show the debt accumulation process in the Balkan region. It is hypothesized that the real convergence-driven surges in capital led to a “mania” and investors increased their indebtedness to take advantage of high anticipated profits. To be able to estimate whether the boom did grow into a bubble in the regions mentioned (to study firms’ behavior in generating their debt), in the study by Bole, Oblak, Prašnikar, and Trobec (2018) we made a distinction between core investments, i.e. investments in the productive capital formation of firms, and financial (including real estate) investments. Indebtedness driven not only by core investments but also by financial investments implies a bubble. The second objective is to show endogenous amplification and propagation of the capital surge reflected in the debt build-up. The extended theoretical framework of the balance-sheet-based model of the financial accelerator (Bernanke, Gertler, & Gilchrist, 1999) is used. The study of liquidity performance is another objective. Namely,

---

<sup>6</sup> The criteria mentioned are relevant when studying contagion.

debt accumulated in the booming phase of the business cycle might lead to a lack of liquidity in the bust phase. Again, the Balkan countries are compared to the Central European and Mediterranean countries.

## **2.2 A macroeconomic perspective on the crisis in the three regions**

In the following section, macroeconomic developments which played a key role in the crisis dynamics in the Balkan region are documented, namely, developments that led to the overheating in the boom phase, to a substantial contraction in the real sector after the eruption of the financial crisis, and sluggish recovery. The economies of the Balkan region are analyzed and benchmarked against the Central European region and the Mediterranean.

Figures 1–6 show selected macroeconomic indicators. The Balkan region grew faster in the boom period than the countries of the Central European and the Mediterranean region. The average annual growth rate of real GDP was 5.4 percent, whereas it reached 3.4 percent in the Central Europe and 2.1 in the Mediterranean. The growth of real GDP was still at a high level in 2008 with an average of 4.9 percent in the Balkan region. It was followed by a sharp drop in the bust period (2009), a slow recovery in 2010, and another fall in 2012. The countries of the Mediterranean region experienced modest economic growth in the boom. A marked slowdown in growth of real GDP or turn to negative is already visible in 2008 and an even more pronounced fall in economic activity after 2010 than in the Balkan region. This coincides with the eruption of the Eurozone crisis in May 2010 with the main players being Spain, Greece, and Portugal, countries classified as the Mediterranean in the study (besides Italy).<sup>7</sup> The Central European countries' rebound was stronger, on average, without a second dip to negative in economic activity in 2012.

Consumption as a percentage of GDP was rather stable throughout the observed period in all three regions, as shown in Figure 3. On average, consumption accounted for about 70 percent of GDP in the Balkan region. Its growth and its contribution to growth in the boom period were notably higher especially for the less developed countries of the Balkan region relative to the Central European and Mediterranean regions. The contribution of consumption to the growth of real GDP, on average, fluctuated between 3–6 percent in the Balkan region but only attained values up to 2 percent in the Central European and Mediterranean region (see Figure 5). Accelerated economic growth in the pre-crisis period was, besides consumption, driven by investment spending in the Balkan region (see Figures 4 and 6). Its contribution to growth was 4–5 percent in the period 2006–2008. Gross capital formation contributed up to 2 percent to the growth of real GDP before 2007 in the Mediterranean and Central European regions. It decreased to zero, on average, in the Central Europe and to -2 percent in the Mediterranean in 2008. A collapse in investment spending only came with a delay (in 2009) in the Balkan

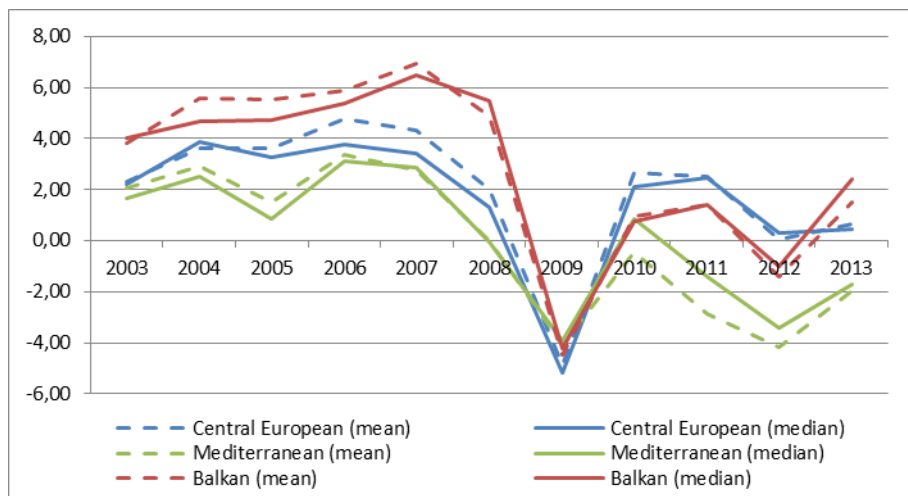
---

<sup>7</sup> Gräbner and Hafele (2020) classify Italy together with the other three Mediterranean countries as a periphery country since it has rather low productivity and it has a high level of public debt. Campos-Martins and Amado (2022) also provide evidence on the long-run contagion effects across peripheral countries. Another common aspect to all Mediterranean countries is highlighted, namely, flight-to-quality to Germany in times of crisis.

region but was considerably more pronounced relative to the other two regions. It amplified the fluctuations in real GDP. A sharp drop in investment after the eruption of the crisis was prolonged in the recovery period in the Balkan and Mediterranean regions.

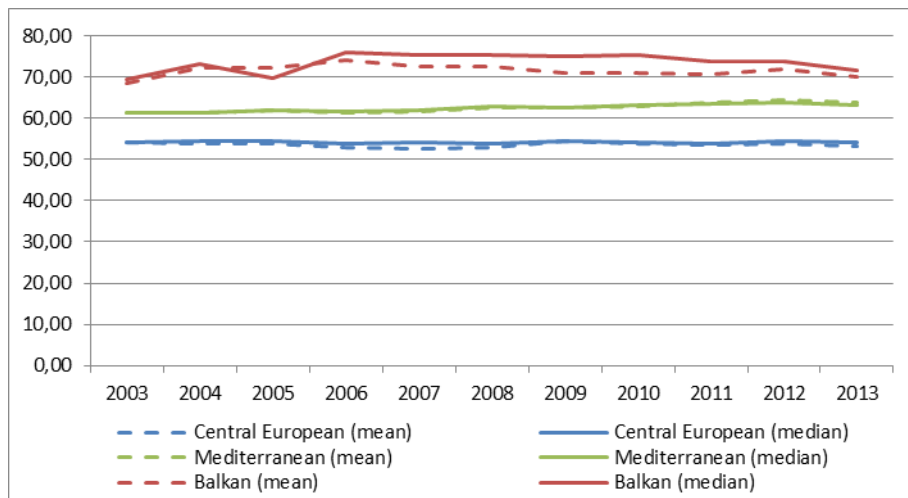
Figures 7 and 8 illustrate household and non-financial institutions debt as a percentage of GDP. It is evident that accelerated investment activity was coupled with increasing indebtedness of non-financial corporations in the Balkan region. Namely, indebtedness increased by more than 40 percentage points to 71 percent of GDP in the period from 2003 to 2010. Similarly, already highly indebted non-financial institutions in the Mediterranean region increased their indebtedness considerably (by 31 percentage points). An increase in household indebtedness was similar (26 percentage points) unlike in the Balkan region where household debt increased by 16 percentage points to 27 percent of GDP in the period from 2003 to 2010. Indebtedness of non-financial corporations seems to have a central role in crisis development in the Balkan region. In Central European countries, indebtedness increases were more conservative at around 10 percentage points in each sector.

Figure 1: Real GDP growth (percentage)



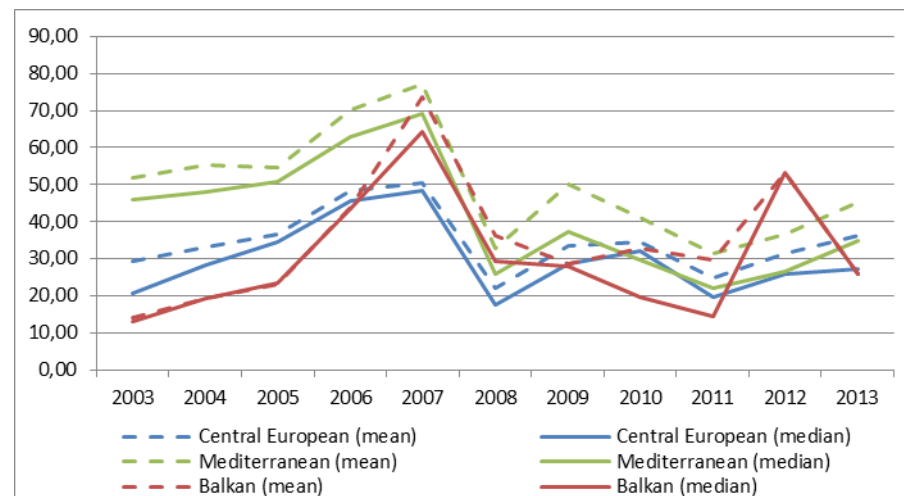
Source: The World Bank (no date), own work.

Figure 3: Household and NPISHs consumption (percentage of GDP)



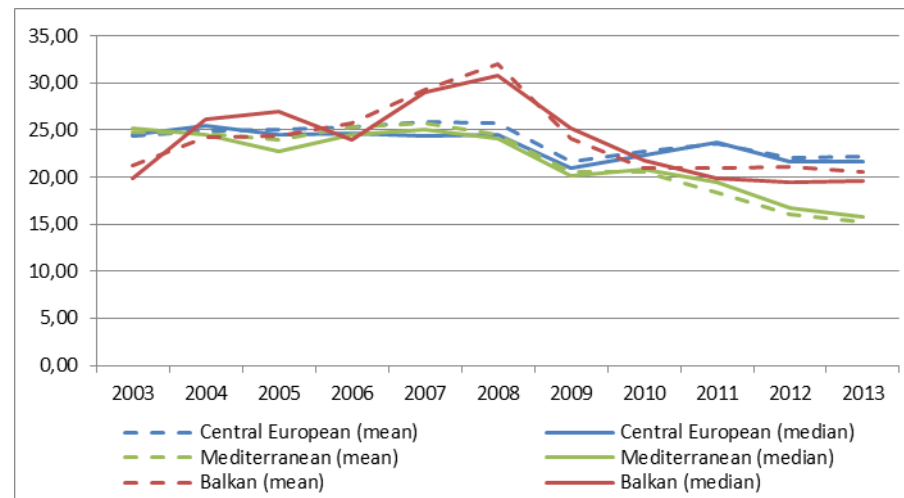
Source: The World Bank (no date), own work.

Figure 2: Market capitalization of listed domestic companies (percentage of GDP)



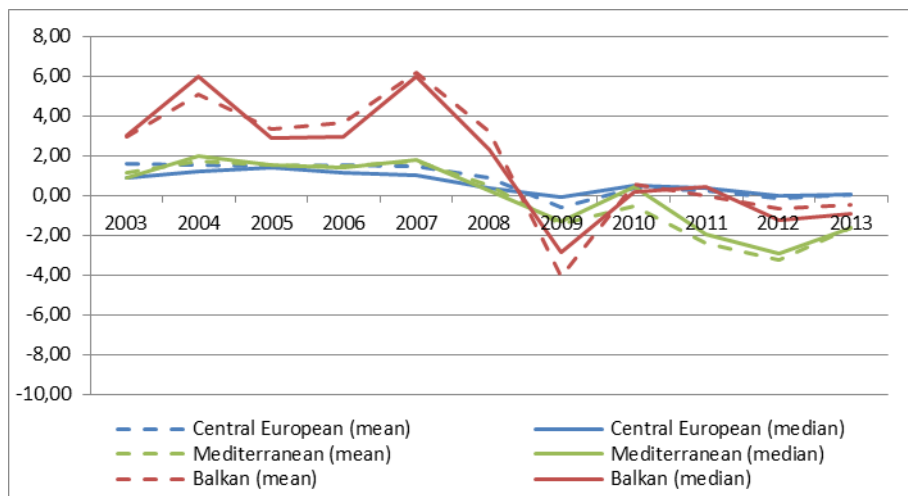
Source: The World Bank (no date), own work.

Figure 4: Investment (percentage of GDP)



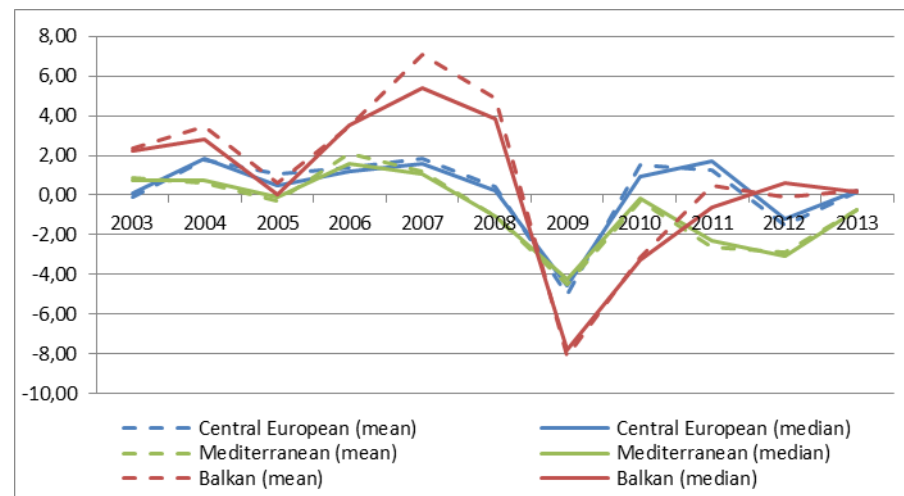
Source: The World Bank (no date), own work.

Figure 5: Consumption (contribution to growth of GDP)



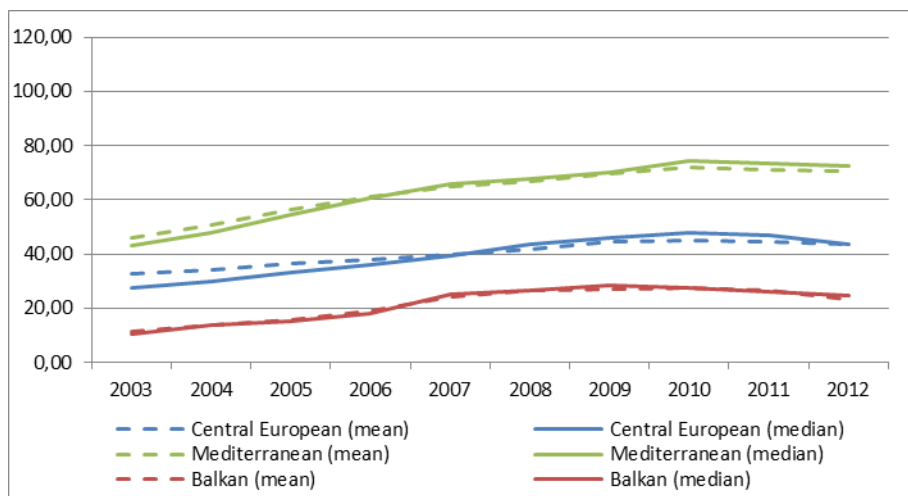
Source: The World Bank (no date), own work.

Figure 6: Investment (contribution to growth of GDP)



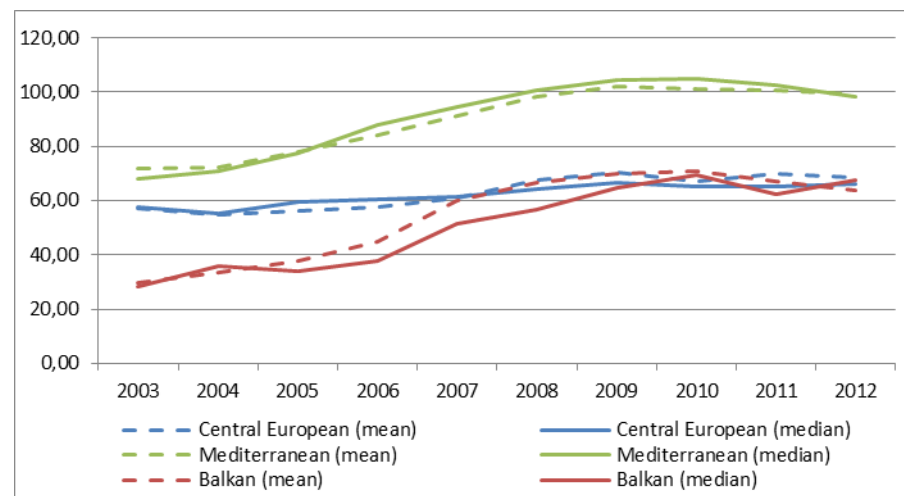
Source: The World Bank (no date), own work.

Figure 7: Household debt (percentage of GDP)



Source: Eurostat (no date), National Bank of Serbia (no date), National Bank of the Rep. of Macedonia (no date), Central Bank of Bosnia and Herzegovina (no date), Central Bank of Montenegro (no date), own work.

Figure 8: Non-financial institutions debt (percentage of GDP)



Source: Eurostat (no date), National Bank of Serbia (no date), National Bank of the Rep. of Macedonia (no date), Central Bank of Bosnia and Herzegovina (no date), Central Bank of Montenegro (no date), own work.

Figure 9 documents gross capital inflows in the form of portfolio investment in equities and direct investment. The Balkan region recorded a high inflow of capital into equities and direct investment in the years 2006, 2007 and 2008. At the peak in 2007, the gross inflow of capital into the Balkan region, on average, amounted to almost 15 percent of GDP and after a decline, 10 percent in 2008. In the Mediterranean region, gross capital inflows into equities already started to decrease in 2006 and in Central Europe in 2005. A stabilization followed in the recovery period at around 3 percent of GDP in the Balkan region. A similar dynamic can be observed in the stock market, namely, market capitalization of listed domestic companies in percentage of GDP surged in the pre-crisis period, especially in the Balkan region (see Figure 2). Praet (2014) argues that returns from investment and consequently capital formation remained high in less-developed economies due to a lack of competition (incumbents being able to extract rents) in sectors such as telecommunications and utilities. Capital formation remained at a high level in construction and real estate due to relaxed credit standards. Hunya (2009) documents that inward foreign direct investment indeed flowed into the service sector, especially banking, telecommunications, and real estate.

Figure 10 depicts gross capital outflows of portfolio investment into equities and direct investment. There was a minor outflow of capital, on average, through portfolio investment in equities and direct investment observed for the countries of the Balkan region in a pre-crisis period but a more significant outflow of capital from the other two regions.<sup>8</sup> Figure 11 shows a distinct nature of net capital flows in the observed regions. Gross capital inflows through portfolio investment into equities and direct investment are considerably higher than the outflows in the Balkan region but mostly balanced out in the Central European and Mediterranean region. Net capital flows more closely follow gross capital flows in the Balkan region.

Besides inflows into equity instruments, real convergence in the boom period encouraged inflows into debt instruments and an increase in the availability of loanable funds for the Balkan countries. In Figures 12, 13, and 14, we document portfolio investment in debt instruments and other investment (mostly debt-related) as a share of GDP for all sectors of the economy. The pre-crisis period was noted for a sizable increase in gross capital inflows into debt instruments in the analyzed regions. Unlike in the Mediterranean and Central Europe where an increase was gradual, an instant jump is observed for the Balkan region. In the recovery period, capital inflows into debt instruments stabilized in the Balkan and Central European region but not in the Mediterranean region. In the Mediterranean region gross capital inflows and gross capital outflows were already decreasing from 2005. Faced with a sovereign debt crisis, there was a notable reduction in external liabilities in 2012 and 2013. Gross capital inflows amounted, on average, to more than 10 percent of GDP in 2013 but domestic investors simultaneously retrenched their funds when debt-related assets are

---

<sup>8</sup> The average capital inflows and outflows to GDP in the Central Europe are dominated by high inflows and outflows of capital into Hungary in the period 2005-2008 and Austria in years 2005 and 2007.

considered.<sup>9</sup> Taking into account capital outflows related to investment in the form of debt instruments, the countries of the Balkan region were more conservative (see Figure 14). This was especially the case in the pre-crisis period when the capital outflows amounted even to more than 10 percent of GDP in the Central European and Mediterranean regions, but not in the Balkan region.

Figure 15 shows net capital flows into debt instruments. As noted by Claessens and Ghosh (2013), “capital flows are more about risk-sharing and the benefits of diversification” for the advanced economies and capital inflows mostly balance out capital outflows. This fits the dynamic of net capital flows into debt instruments and equities for the Central European countries well. Interestingly, it is not consistent with the dynamics of net capital flows in the form of debt instruments for the Mediterranean countries. A similar pattern of net capital flow can be observed in the region as for the Balkan countries in the pre-crisis period. At the peak in 2007, net capital inflows, on average, amounted to about 10 percent of GDP but less than 2 percent in Central Europe. Considerably higher net capital inflows (than outflows) are usually related to access to external finance, especially for the emerging economies (Claessens & Ghosh, 2013). This significantly increases the vulnerability of these economies to a sudden stop. A decrease in capital inflows limits access to external finance and even puts pressure on households, non-financial corporations, and financial corporations to deleverage. This hinders the ability to recover. A prolonged and sluggish recovery, when compared to Central Europe, might imply that the countries of the Balkan and the Mediterranean regions were indeed more vulnerable.

Sectoral analysis of capital flows into debt instruments reveals a considerably different nature of flows in the observed regions (see Figures 15–20). Gross capital outflows nearly even out the gross capital inflows to deposit-taking corporations and also to other sectors, namely, households and non-financial corporations and other financial corporations, in the countries of Central Europe. This makes them less vulnerable to the volatility of capital flows. Though capital inflows into deposit-taking corporations are at a similar level in the Mediterranean and Central European regions in the pre-crisis period, gross capital outflows from deposit-taking corporations are considerably higher in Central Europe.<sup>10</sup>

The Mediterranean and Balkan regions documented sizable gross capital inflows into debt instruments with a distinction in the main receiving sector (see Figures 15 and 19). Gross capital inflows into other sectors were negligible in the Mediterranean region until 2009 but not into deposit-taking corporations, which were the main recipient of foreign capital. Deposit-taking corporations’ capital outflow was also rather high and even higher than inflows in the year of the crisis eruption (2008). After 2008 a retreat of foreign capital from

---

<sup>9</sup> Italy had considerably lower negative gross capital inflows than the other three countries at around 2 percent of GDP, but the retrenchment (negative gross outflows) is also visible similarly to other Mediterranean countries.

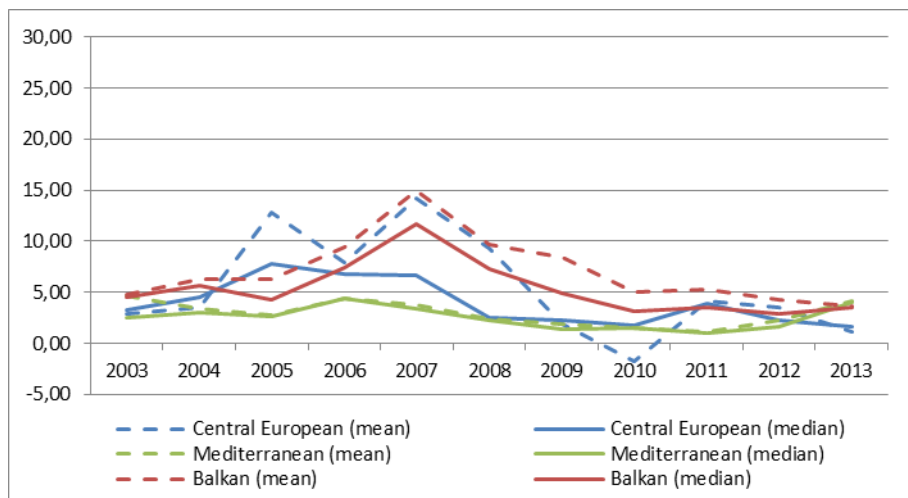
<sup>10</sup> Gross capital outflows of Slovenian deposit-taking corporations were at around 13 percent in 2007 and were at a comparable level as of Austrian and German deposit-taking corporations. Interestingly, capital outflows in the years after the crisis are closer to the countries of the Mediterranean region.



deposit-taking corporations accelerated and reached its peak of just less than 12 percent of GDP in 2012. The withdrawal was also noted in the Balkan region but not nearly as dramatic as in the Mediterranean. A key distinction is that foreign capital flows were mostly intermediated by banks in the Mediterranean, whereas the highest flow of capital was directed towards other sectors in the Balkan region in years just before the crisis (around 7 percent of GDP in 2007 and 2008). Remarkably, households', non-financial corporations', and other financial corporations' outflows of capital were higher than in the other two regions in 2008. This was probably due to increased optimism before a sudden stop in 2009.

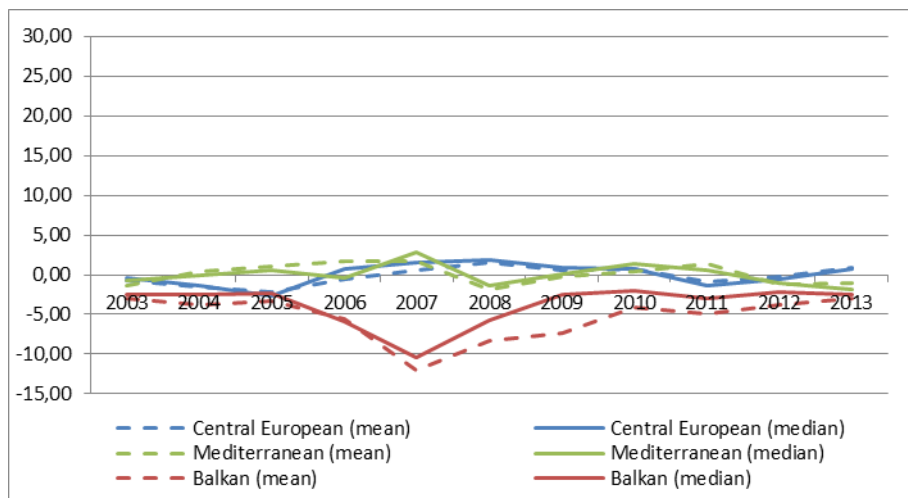
Based on the presented macroeconomic indicators some stylized facts could be derived, also assisting in better understanding the grouping of countries in the three regions and results. In the observed period, economic activity dynamics was similar for the analyzed countries when considering peak and bottom. Unlike in the Central Europe and Mediterranean regions, growth remained high in the Balkan region in 2008, too. Amplitudes of swings differed considerably. Investment activity was roughly synchronized with swings in the gross and net foreign financial flows through portfolio investment in equities and direct investment as well as through investments in debt-related instruments in the Balkan region. For the amplification of foreign shocks studied in Chapter 2, an increase in the availability of loanable funds which enabled accelerated accumulation of capital through increases in indebtedness of non-financial institutions (at least partially) are crucial. Non-financial institutions of the Mediterranean and Balkan regions increased their indebtedness notably in the analyzed period, by around 30 percent and 40 percent, respectively. Unlike in the Balkans with low indebtedness of households, in the Mediterranean region indebtedness of households was an important factor in the unfolding of the crisis. Considering sectoral distribution of gross capital inflows, the main receiving sector was the so-called other sectors in the Balkan region, whereas deposit-taking corporations' foreign liabilities were lower in the pre-crisis period. Direct lending from banks to other sectors, and in case of companies also intercompany lending, thus seems to be central to the amplification mechanism in the Balkan region. In the Mediterranean region, deposit-taking corporations had higher international exposure indicating the higher relative importance of bank intermediation in comparison with the Balkan region. Interestingly, the dynamics of economic activity and capital flows seems to have a delay of one year in the Balkan region in the pre-crisis period.

Figure 9: Capital inflows into equities and FDI (all sectors) (percentage of GDP)



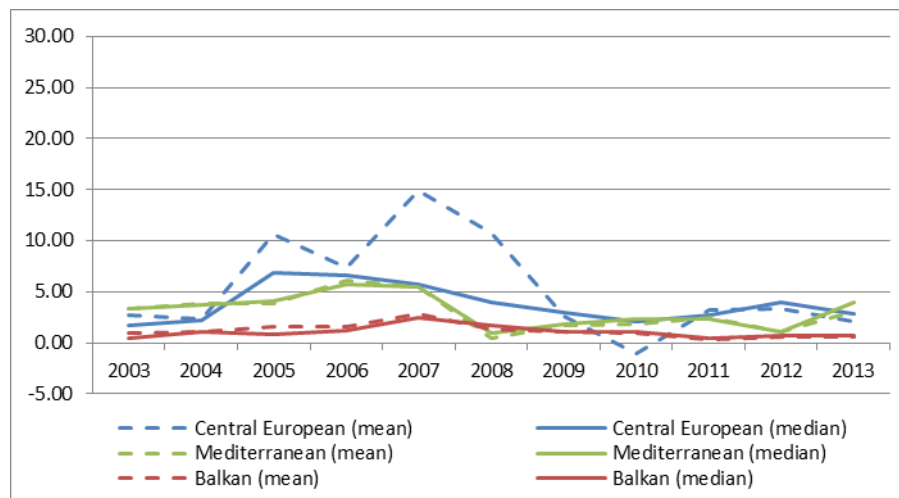
Source: IMF, Balance of payments statistics (no date), own work.

Figure 11: Net capital flows into equities and FDI (all sectors) (percentage of GDP)



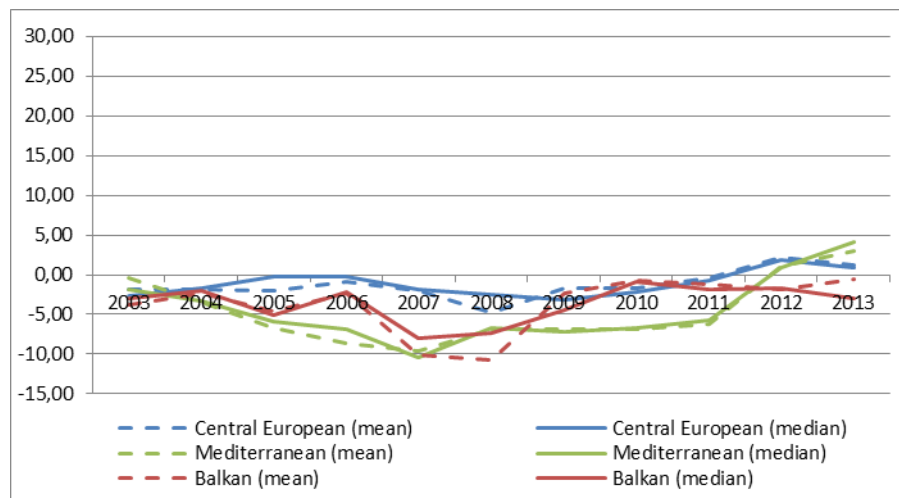
Source: IMF, Balance of payments statistics (no date), own work.

Figure 10: Capital outflows into equities and FDI (all sectors) (percentage of GDP)



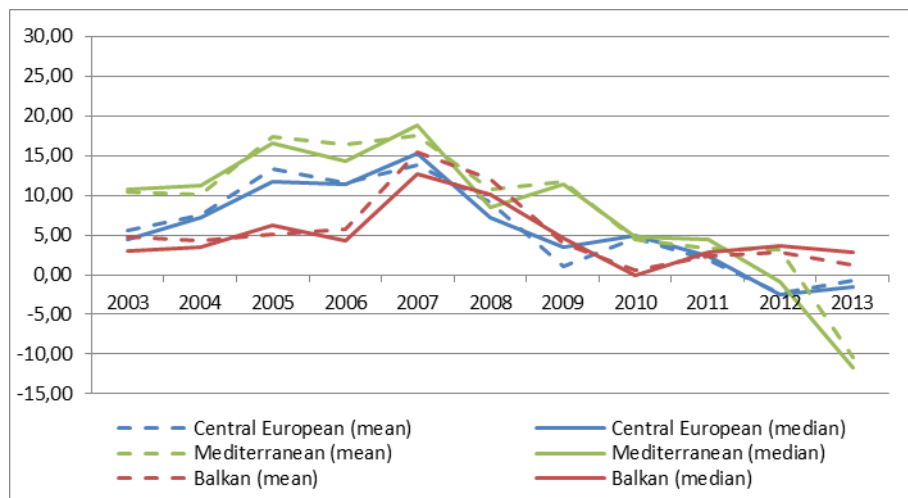
Source: IMF, Balance of payments statistics (no date), own work.

Figure 12: Net capital flows into debt instruments (all sectors) (percentage of GDP)



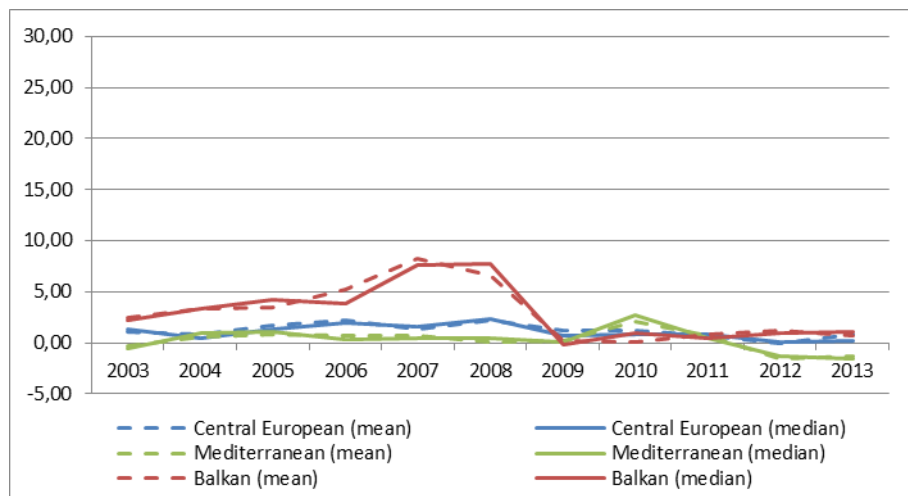
Source: IMF, Balance of payments statistics (no date), own work.

Figure 13: Capital inflows into debt instruments (all sectors) (percentage of GDP)



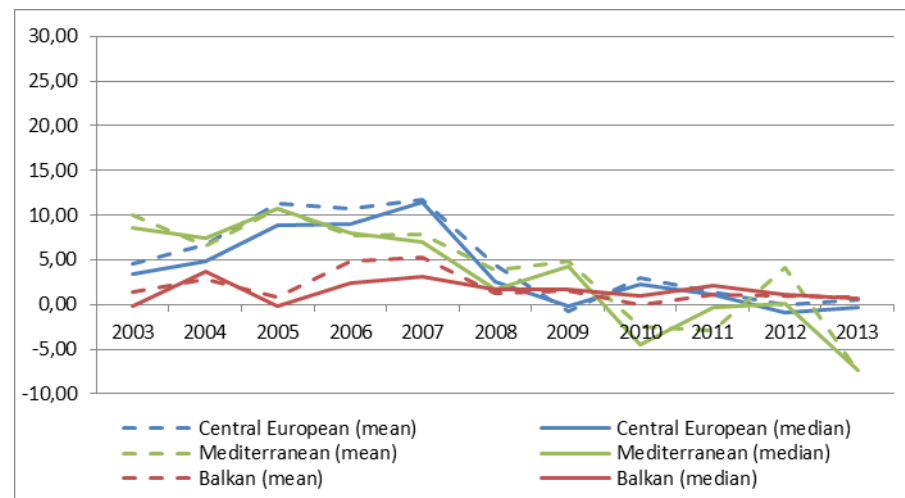
Source: IMF, Balance of payments statistics (no date), own work.

Figure 15: Capital inflows debt instruments (other sectors) (percentage of GDP)



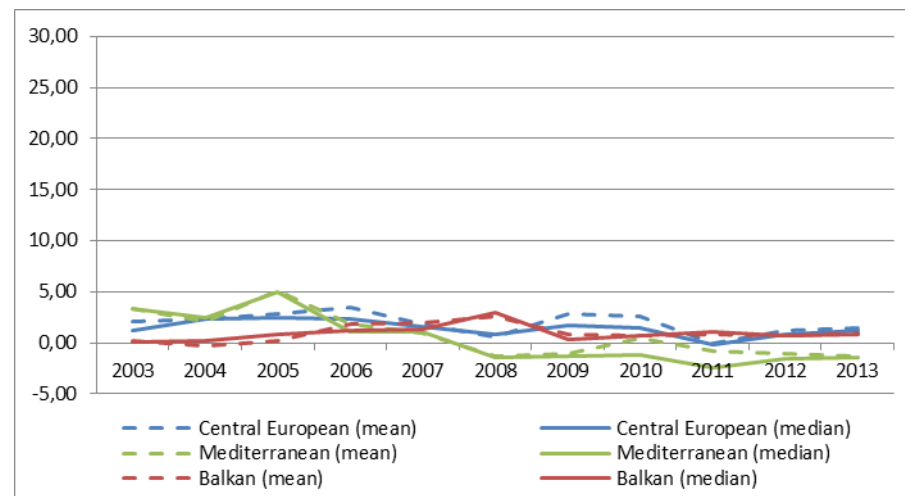
Source: IMF, Balance of payments statistics (no date), own work.

Figure 14: Capital outflows into debt instruments (all sectors) (percentage of GDP)



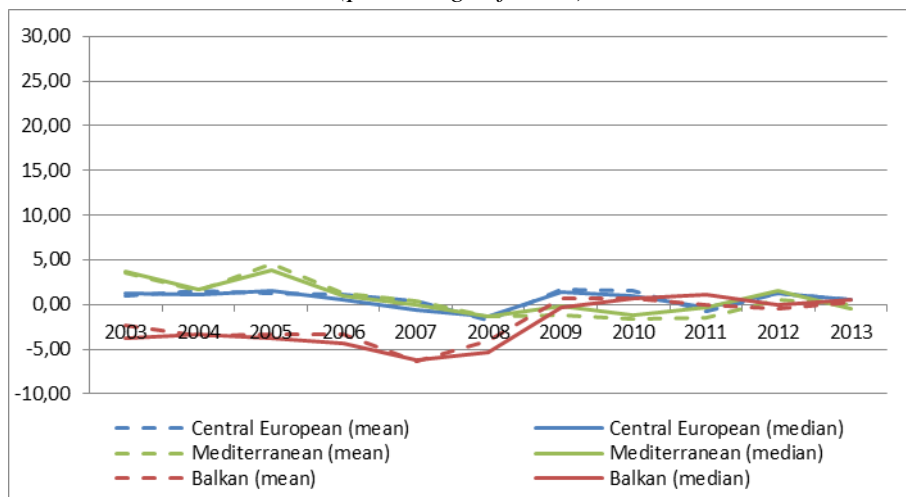
Source: IMF, Balance of payments statistics (no date), own work.

Figure 16: Capital outflows debt instruments (other sectors) (percentage of GDP)



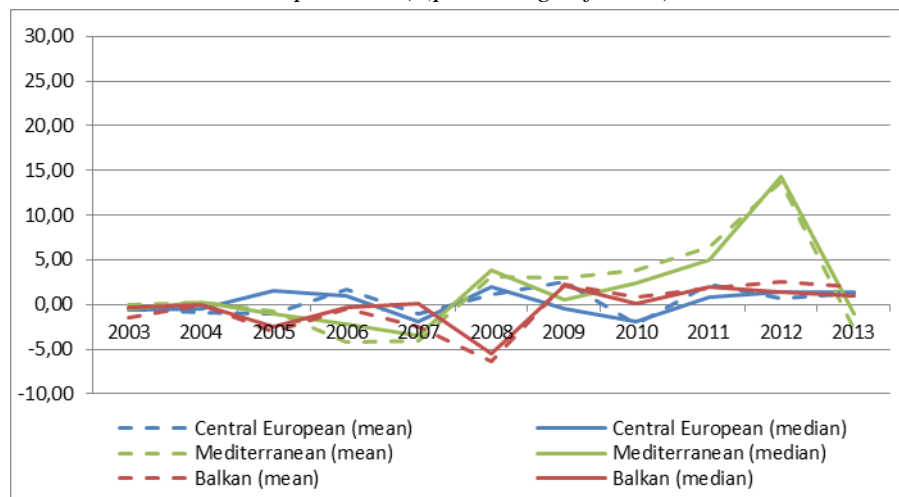
Source: IMF, Balance of payments statistics (no date), own work.

Figure 17: Net capital flows into debt instruments (other sectors) (percentage of GDP)



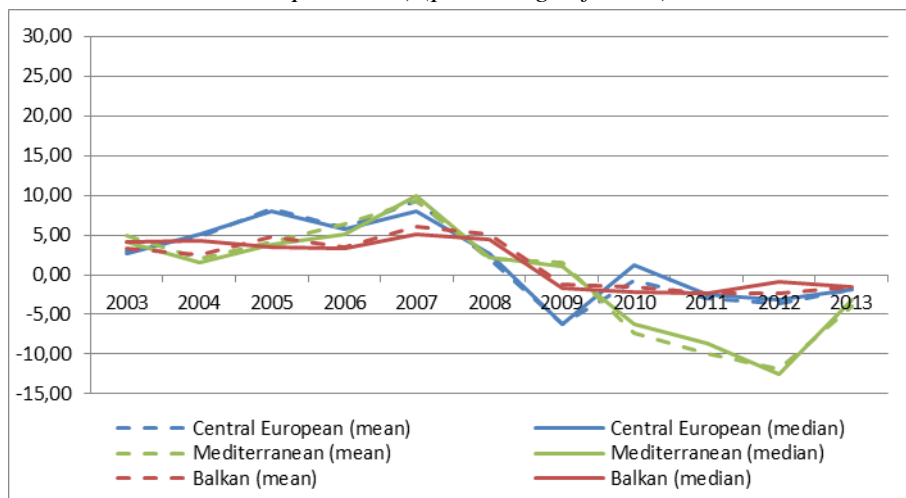
Source: IMF, Balance of payments statistics (no date), own work.

Figure 18: Net capital flows into debt instruments (deposit-taking corporations) (percentage of GDP)



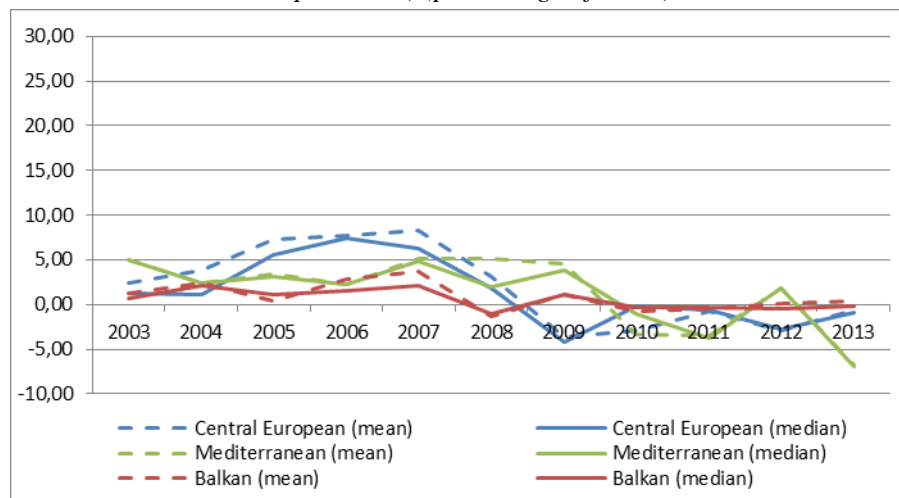
Source: IMF, Balance of payments statistics (no date), own work.

Figure 19: Capital inflows into debt instruments (deposit-taking corporations) (percentage of GDP)



Source: IMF, Balance of payments statistics (no date), own work.

Figure 20: Capital outflows into debt instruments (deposit-taking corporations) (percentage of GDP)



Source: IMF, Balance of payments statistics (no date), own work.

### 2.3 The model

Not only allowing for comparison of the size of the financial accelerator but also identification of the transmission and amplification mechanism of the shock from core to the periphery, the extended (balance sheet-based) model of the financial accelerator (Bernanke, Gertler, & Gilchrist, 1999) is operationalized in the empirical analysis. The basic premise of the model is that the size of the financial accelerator varies along with the phase of the business cycle (boom, boost, or recovery), the type of investments (core investments, financial investments, or real estate investments), industry, region (the Balkan region, Mediterranean region, or Central European region), and among firm's solvency category (sizes of capital and collateral). The extension of the theoretical model of debt accumulation and net worth change by Bole, Oblak, Prašnikar, and Trobec (2018) is replicated below:

In a partial equilibrium of the costly state verification model of an optimal contract between an entrepreneur and a lender, the financial accelerator endogenously drives (amplifies) the effects of exogenous shocks on the expected capital return through two crucial relations, namely:

The supply of investment finance

$$Q_t K_{t+1} = \Psi(s_t) N_{t+1} \quad \Psi(1) = 1 \quad \Psi'(\cdot) \geq 0 \quad (1)$$

and net worth

$$N_t = R_t^k Q_{t-1} K_{t-1} - (1 + \zeta(Q_{t-1} K_{t-1} / N_{t-1})) R_t B_t \quad (2)$$

where

$Q_t$  is the price,

$R_t^k$  is the fundamental (gross) capital return,

$R_t$  is the riskless rate (the opportunity cost for bank lenders),

$K_{t+1}$  and  $K_t$  is the volume of capital invested,

$N_t$  is the net worth invested in the project,

$B_t$  is borrowing ( $Q_{t-1} K_{t-1} - N_{t-1}$ ),

$\zeta$  is the premium for external finance (increasing function of the uncollateralized part of the debt ( $Q_{t-1} K_{t-1} / N_{t-1}$ ), and

$\Psi$  is the increasing function of the expected discounted return on capital  $s_i = E \left( \frac{R_{t+1}^k}{R_{t+1}} \right)$ .

By explicitly taking into account that an investment project is financed by borrowing and net worth (previously accumulated), the supply function for external investment finance could be written (normalizing on borrowing) as

$$B_{t+1} = Q_t K_{t+1} \left(1 - \frac{1}{\Psi(s_{0t})}\right). \quad (3)$$

In what follows, it is shown that model captured by equations (2)-(3) is effective in also dealing with regions having different levels of financial system development, different sectors, and different types of investments, whereas notation remains the same as in the original paper. To disaggregate investment effects in equation (3), it is necessary to extend the theory behind the model of investment finance (see equation (1)).

Let us consider that at the beginning of period  $t+1$  an entrepreneur has a net worth of  $N_{t+1}$  and that he intends to allocate his net worth to three different projects:

$${}_1N_{t+1}, {}_2N_{t+1}, {}_3N_{t+1} \text{ where } {}_1N_{t+1} + {}_2N_{t+1} + {}_3N_{t+1} \leq N_{t+1}.$$

The first project entails productive capital formation, the second is an investment in real estate, and the last project is a financial investment. For every project, the entrepreneur also borrows funds from a bank according to the optimal finance plan given in equation (1), taking into account that the discounted capital returns (of corresponding projects) differ.

If  $\Gamma(\omega)$  is the expected gross share of profits going to the lender, then the entrepreneur's expected profit from all three projects equals:

$$(1 - \Gamma(\omega_1))E\left(\frac{{}_1R_{t+1}^k}{R_{t+1}}\right) {}_1Q_t {}_1K_{t+1} + (1 - \Gamma(\omega_2))E\left(\frac{{}_2R_{t+1}^k}{R_{t+1}}\right) {}_2Q_t {}_2K_{t+1} + (1 - \Gamma(\omega_3))E\left(\frac{{}_3R_{t+1}^k}{R_{t+1}}\right) {}_3Q_t {}_3K_{t+1}$$

The projects are indexed by  $i$ , for  $i = 1, 2, 3$ . Optimal values for (default determining) cut-off values  $\omega_1, \omega_2, \omega_3$  depend on the different values of discounted capital returns, namely:

$$s_i = E\left(\frac{{}_iR_{t+1}^k}{R_{t+1}}\right) \text{ for investment projects } i = 1, 2, 3.$$

Cut-off values are determined by discounted capital returns through the function  $s_i = \rho(\omega_i)$  for  $i = 1, 2, 3$  and  $\rho(\cdot)' < 0$ .

A rational entrepreneur or a firm would structure projects (allocate their net worth) so that their total profit would be the largest possible for a given size of the total (invested) net worth  $N_{t+1}$ . Hence, the entrepreneur would find the optimal structure of the allocated net worth  ${}_1N_{t+1}, {}_2N_{t+1}, {}_3N_{t+1}$ , by solving the optimization problem:

$$\max (1 - \Gamma(\omega_1))s_1\Psi(s_1) {}_1N_{t+1} + (1 - \Gamma(\omega_2))s_2\Psi(s_2) {}_2N_{t+1} + (1 - \Gamma(\omega_3))s_3\Psi(s_3) {}_3N_{t+1} \quad (4)$$

for the given constraints

$$s_i = \rho(\omega_i) \text{ for } i = 1,2,3$$

$${}_1N_{t+1} + {}_2N_{t+1} + {}_3N_{t+1} \leq N_{t+1}, {}_1N_{t+1} \geq 0, {}_2N_{t+1} \geq 0, {}_3N_{t+1} \geq 0$$

The structure of the objective function is simple, and the solution is straightforward. A rational entrepreneur would put his net worth into those project(s) in which the discounted return on capital  $s_i$  gives the highest value of  $(1 - \Gamma(\omega_i))s_i\Psi(s_i)$ . If two projects have the same discounted return on capital  $s_i$ , a firm could invest in both projects (the proportions are not important), or invest in all three projects if the discounted capital returns on all three projects are equal (the proportions are again not important).

The final version of the supply function for external investments financing a firm belonging to a sector with a discounted capital return equal to  ${}_i s_{0t}$  would be:

$$B_{t+1} = \sum_i {}_i Q_t {}_i K_{t+1} \left(1 - \frac{1}{\Psi({}_i s_{0t})}\right). \quad (5)$$

including only those items (kinds of investments)  $i$  for which

$$(1 - \Gamma(\omega_i))s_i\Psi(s_i) = \max_{\alpha} (1 - \Gamma(\omega_{\alpha}))s_{\alpha}\Psi(s_{\alpha}). \quad (6)$$

It is clear from equations (5) and (6) that a firm's borrowing capacity additively depends on a firm's kind of investments. Because the industry and the region affect the marginal effect of investments in equation (5) only through  ${}_i s_{0t}$  and solvency category (size of the equity and collateralization) only through the type of function  $\Psi$ , the marginal effect of specific kind of investments in equation (5) is constant among all firms from the same sector, region, and solvency category. Therefore, in the investment finance supply, the function contrasts of investments differ only among groups of firms stratified by sector, region, and solvency category.

Using model captured by equations (2)-(3) and project allocation criteria (4) it is also possible to model the transmission mechanism of symmetric shocks amplification from core countries to periphery countries. Let us suppose that a rational entrepreneur in a core country would like to allocate his net worth to a technologically specific project. He could choose between a project in a core country and a technologically equivalent project in a periphery country. Both projects would be financed from the available net worth and a loan from a bank in the core country.

For both alternative projects, generating net worth is in principle determined by equations (2)-(3) of the model and the conditions for optimal project allocation (4). The only difference between the core country and periphery country models is the sovereign risk premium, which has to be taken into account for the periphery country. It is assumed that the sovereign risk premium of the core country is 0, as well as that the price of equipment  $Q_t$  is the same in both countries (coming from the same broader economic environment, possibly with fixed cross exchange rates). Let us suppose that  $P_t$  denotes risk premium coefficient  $(1 + p_t)$ .

Because the same technology would be used in both projects, with labor costs being much lower in the periphery country, it is obvious that the expected capital return in a risk-free environment would be much higher in the periphery country, that is  ${}_pR_{kt} > {}_cR_{kt}$ .

Taking into account also the sovereign risk premium, discounted capital return in the core country is:

$${}_cS_{t-1} = E_c \left( \frac{R_t^k}{R_t} \right)$$

and in the periphery country:

$${}_pS_{t-1} = E_p \left( \frac{R_t^k \frac{1}{P_t}}{R_t} \right)$$

Obviously, for a low enough risk premium, discounted capital return in the periphery country would be larger than discounted capital return in the core country ( ${}_pS_{t-1} > {}_cS_{t-1}$ ).

Using the same argument for mixing projects as in equation (4), we could conclude that the entrepreneur would choose a project in the core country if the sovereign risk premium of the periphery country was high enough

$$P_t \geq \frac{E_p R_t^k}{E_c R_t^k} \quad \text{and the other way around.}$$

Because the sovereign risk premium of less developed countries is highly negatively correlated with the economic activity (it normally decreases with the increase of their economic activity and vice versa), positive (symmetric) shock to investment in the core (developed) and periphery countries would increase the economic activity in both countries and also decrease a risk premium in the periphery country. But drop in the sovereign risk premium would trigger migration from the core to periphery country in all new projects for which

$$P_t \leq \frac{E_p R_t^k}{E_c R_t^k}.$$

Every additional positive (symmetric) shock on the core country's economic activity would therefore be relatively smaller, whereas the one on the periphery country's economic activity would be larger because more and more projects would migrate to the periphery country! In the case of a negative (symmetric) shock to investment, both impacts would vanish. The entrepreneur from the core country would namely not choose the project in the periphery country because it would not be the optimal solution to the corresponding criteria (4) for the increased sovereign risk premium. The flow of projects from the core country to the periphery would fall or even stop if a negative shock to economic activity (an increase in the sovereign risk premium) was high enough. Symmetric shocks to the economic activity in the common



economic environment would therefore be asymmetrically amplified from the countries in the center to the countries in the periphery. Asymmetry in amplification of symmetric shocks would be larger than linear. As shown, every kind of investment additively increases debt. The characteristics specific to the firms, namely, sector, region, capital, and collateral, only multiplicatively modify the effect of the investment. This is accounted for in the empirical estimation of the model.

## **2.4 Empirical analysis**

### **2.4.1 Data**

The empirical analysis covers 17 European countries categorized in three groups. The Balkan region includes Bulgaria, Bosnia and Herzegovina, Croatia, North Macedonia, Montenegro, Serbia, and Slovenia. The Mediterranean region encompasses Italy, Greece, Spain, and Portugal and the Central European region countries are Austria, the Czech Republic, France, Germany, Hungary, and Slovakia. The data covers the period 2006–2012. The main source of data is Bureau van Dijk's Amadeus database, which provides financial data only for companies with operating revenue exceeding 1 million euros, or total assets exceeding 2 million euros, or more than 150 employees. Additional sources of data were AJ PES, the Austrian Firmen-Compass, Central Bank of Montenegro, and Central Register of Macedonia. In Table 1, an overview of variables is given. In the second column of Table 1, the notation used to denote a particular variable in the estimated equation is presented, and in the third column, the variables are described.

Comparing the sectoral distribution of revenue per employee in the economy and the distribution of sectoral averages of revenue per employee in the sample, the data were checked for structural representativeness. The difference is tested by a nonparametric Wilcoxon Mann-Whitney (rank-sum) test for the years 2009 and 2010. The results presented in Table 2 show that the company structure of the sample is not significantly different from the company structure in the whole economy for the analyzed countries and periods.

Outliers were identified based on the distributions of core investments, financial investments, increment in financial debt and capital (all normalized by the balance sheet sum) for each year and each country. Companies from the first and last 0.1 centile were filtered out. Further, the sample was adjusted to represent the actual relative size of the economies. To neutralize possible divergence, (normalized size) random samples of companies were used and then a weighted regression for each country was employed. Normalization of the number of companies was made by random sampling. The normalized sample size was determined for four groups of countries for 2008. The first group consists of the largest countries (France, Germany, Italy, and Spain). For each country, a sample of 500 companies is chosen randomly from the corresponding set of admissible companies. Austria, Bulgaria, Greece, the Czech Republic, Hungary, Portugal, and Serbia are represented by a random sample of 400 companies in 2008. For Bosnia and Herzegovina, Croatia, and Slovakia, a random sample of

Table 1: Definition of variables and calculation of the variables

Variable used	Notation in the estimated equation	Description of the variable	Calculation of the variable using Amadeus export variables
Financial debt	<i>dbil_fdebt</i>	yearly difference in total financial debt per unit of the balance sheet sum	$(TOT\_FIN\_DEBT_{year\ n+1} - TOT\_FIN\_DEBT_{year\ n}) / TOT\_ASSETS$
Core investments	<i>dbil_core</i>	the sum of the yearly difference of tangible noncurrent assets, the yearly difference of inventories, and amortization in the observed year less profit, and calculated per unit of the balance sheet sum	$((TAN\_NONCURR\_ASSETS_{year\ n+1} - TAN\_NONCURR\_ASSETS_{year\ n}) + (INVENTORIES_{year\ n+1} - INVENTORIES_{year\ n}) + AMORTISATION - NET\_INCOME) / TOT\_ASSETS$
Financial investments	<i>dbil_fininv</i>	yearly difference in financial assets per unit of the balance sheet sum	$(TOT\_FIN\_INVESTMENTS_{year\ n+1} - TOT\_FIN\_INVESTMENTS_{year\ n}) / TOT\_ASSETS$
Capital	<i>bil_capt</i>	total equity per unit of the balance sheet sum	$TOT\_EQUITY / TOT\_ASSETS$
Available collateral	<i>bil_dif_colat_debt</i>	tangible fixed assets per unit of the balance sheet less financial debt per unit of the balance sheet sum	$(TOT\_NONCURR\_ASSETS / TOT\_ASSETS - (TOT\_FIN\_DEBT / TOT\_ASSETS))$
Dependent variable for the cash flow model		binary variable having a value of 1 if the cash flow of the firm in t+1 is positive and 0 in the opposite case	1 if $(EBT + AMORTISATION)_{year\ n+1} > 0$ 0 if $(EBT + AMORTISATION)_{year\ n+1} < 0$
Cash flow	<i>cash_flow</i>	net income before tax plus depreciation	$EBT + AMORTISATION$
Lack of collateral coverage	<i>colat_cover</i>	financial debt per unit of tangible fixed assets	$TOT\_FIN\_DEBT / TAN\_NONCURR\_ASSETS$
Net receivables	<i>bil_nonfdebt</i>	short-term receivables less short-term liabilities per unit of the balance sheet	$(RECEIVABLES\_DEBT - TOT\_NONFIN\_DEBT) / TOT\_ASSETS$
Receivables	<i>bil_receivables</i>	short-term receivables to buyers per unit of the balance sheet	$RECEIVABLES\_DEBT / TOT\_ASSETS$
Mediterranean countries	<i>med</i>	dummy variable	has a value of one if an observation (company) is from the country included in the region, otherwise zero
Balkan countries	<i>bal</i>	dummy variable	has a value of one if an observation (company) is from the country included in the region, otherwise zero
Manufacturing sector	<i>id_man</i>	dummy variable	has a value of one if an observation (company) is from the manufacturing sector, otherwise zero

Source: Bole, Oblak, Prašnikar, and Trobec (2018), own work.

350 companies is chosen. Montenegro, Macedonia, and Slovenia are in the group of the smallest analyzed countries. In principle, a random sample of 300 companies would have to be chosen (from admissible firms) for each country from this group. Macedonia and Montenegro, however, have a smaller number of all admissible companies, so they are represented by the actual number of admissible companies.

*Table 2: Wilcoxon-Mann-Whitney test of the difference in sectoral distributions of revenue per employee*

	2009		2010	
	WMW test	Significance	WMW test	Significance
Austria	0.02	0.98	0.52	0.61
Croatia	0.27	0.79	-0.24	0.81
Czech Republic	-0.77	0.44	-	-
France	-0.04	0.96	-0.83	0.40
Germany	1.12	0.26	1.34	0.18
Greece	1.64	0.10	-	-
Hungary	0.38	0.70	0.58	0.57
Italy	1.30	0.19	-	-
Portugal	1.40	0.16	0.42	0.68
Slovakia	0.76	0.45	0.32	0.75
Slovenia	0.98	0.32	0.66	0.51
Spain	0.98	0.33	0.92	0.36
Serbia	-0.07	0.95	-0.32	0.75

*Source: Bole, Oblak, Prašnikar, and Trobec (2018).*

Note: For every country separately, two sectoral distributions of revenue per employee are compared; the first distribution of revenue per employee is calculated from official data on two-digit NACE sectors; the second distribution of revenue per employee is calculated using data for companies from the sample used in the experiment; the test of the distribution difference is made for 2009 and 2010; the Wilcoxon-Mann-Whitney test is used for testing the difference. Bulgaria, North Macedonia, and Montenegro are excluded due to the lack of data.

Finally, when estimating the models, each observation is weighted (a corresponding weighted regression method is used). Weights are calculated from total employment in NACE sectors included in the analyses. Weights for each country are calculated as total employment (in thousand) per normalized number of companies in the sample in 2008.

#### 2.4.2 Descriptive statistics

In Table 3, a mean and standard deviation of the selected variables by region for the period 2007–2010 are presented. Financial debt, financial investment, and core investment variables are documented as the yearly difference per unit of the balance sheet sum. Capital, collateral, collateral available, cash flow, and net receivables are given per unit of the balance sheet sum.

Table 3: Mean (and standard deviation) of selected variables by year and region

Year	Central European countries				Mediterranean countries				Balkan countries			
	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010
N	3,560	3,689	3,624	3,747	3,022	3,043	3,080	3,098	2,093	2,199	2,199	2,123
Employees	752	782	744	790	1326	1349	1326	1282	519	514	491	486
Share of manufacturing firms	0.44	0.43	0.43	0.42	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.44
Financial debt	0.022 (0.122)	0.010 (0.104)	-0.005 (0.095)	-0.008 (0.092)	0.029 (0.118)	0.021 (0.122)	-0.002 (0.110)	0.006 (0.119)	0.061 (0.134)	0.033 (0.117)	0.003 (0.115)	0.003 (0.133)
Financial investments	0.002 (0.042)	0.002 (0.040)	0.002 (0.033)	0.000 (0.041)	0.005 (0.058)	0.010 (0.061)	0.006 (0.059)	0.008 (0.071)	0.018 (0.071)	0.002 (0.060)	0.002 (0.055)	0.001 (0.069)
Core investments	0.050 (0.176)	0.058 (0.167)	0.025 (0.156)	0.024 (0.148)	0.045 (0.136)	0.052 (0.138)	0.027 (0.135)	0.034 (0.153)	0.141 (0.226)	0.079 (0.164)	0.033 (0.162)	0.044 (0.152)
Capital	0.403 (0.241)	0.412 (0.251)	0.407 (0.254)	0.415 (0.261)	0.336 (0.225)	0.334 (0.230)	0.342 (0.241)	0.337 (0.262)	0.423 (0.281)	0.394 (0.281)	0.398 (0.292)	0.376 (0.360)
Collateral	0.349 (0.238)	0.357 (0.240)	0.362 (0.243)	0.349 (0.242)	0.280 (0.217)	0.291 (0.222)	0.297 (0.225)	0.288 (0.223)	0.476 (0.245)	0.469 (0.245)	0.477 (0.246)	0.467 (0.246)
Collateral available	0.206 (0.288)	0.209 (0.279)	0.212 (0.276)	0.213 (0.270)	0.040 (0.268)	0.038 (0.272)	0.045 (0.273)	0.034 (0.276)	0.286 (0.310)	0.267 (0.312)	0.268 (0.317)	0.248 (0.343)
Cash flow	0.125 (0.150)	0.118 (0.135)	0.094 (0.133)	0.110 (0.136)	0.100 (0.114)	0.083 (0.114)	0.071 (0.119)	0.072 (0.128)	0.101 (0.138)	0.085 (0.140)	0.075 (0.133)	0.070 (0.182)
Net receivables	-0.002 (0.130)	0.002 (0.149)	-0.002 (0.162)	-0.011 (0.198)	-0.002 (0.130)	0.011 (0.149)	-0.002 (0.162)	-0.011 (0.198)	0.009 (0.200)	0.012 (0.134)	-0.006 (0.160)	0.004 (0.168)

Source: Amadeus (no date), national statistical offices (no date), Eurostat (no date), own work.

The sample contains the data for 3,747 companies located in the Central European countries in 2010, followed by the 3,098 companies in the Mediterranean region and 2,213 in the Balkan countries.<sup>11</sup> Companies in the Mediterranean countries on average employ the largest number of employees. The manufacturing sector accounts for 42 percent to 45 percent of all companies in the three regions.

An increment in financial debt was the highest in 2007 in all three regions. There was an increase of 2.2 percent in the Central European region, 2.9 percent in the Mediterranean, and even 6.1 percent in the Balkan region.<sup>12</sup> In the year 2008, financial debt increased on average in all three regions but amounted to about half of the increase of the previous year in Central Europe and the Balkans. The countries of the Mediterranean recorded, on average, a 2.1 percent increase. The mean value of the yearly difference of financial debt was negative in 2009 and 2010 in the Central European countries and positive but considerably lower compared to the pre-crisis period in the Balkan region.

The average yearly difference in core investment per unit of balance sheet sum was positive in all three regions in the observed period but considerably higher in the Balkan region. In 2007 and 2008, investment in productive capital formation increased by 14.1 percent and 7.9 percent, respectively. The increments of core investment were around 5 percent in the pre-crisis period in the Mediterranean and the Central European region and around 2.5–3.5 in the post-crisis period. As evident, there was a significant drop in investment activity in 2009–2010. The core investment plummeted to 3.3 percent in 2009 and 4.4 percent also in the Balkan region.

The increments in financial investments as a share of total assets were rather low and stable in all three regions in the observed period. A notable exception were firms of the Balkan region in the year 2007 when an average firm increased financial investments by 1.8 percent. An average Central European company increased financial investment by 0.2 percent in the years 2007–2009. Financial investments fluctuated, on average, between 0.5 percent (2007) and 1.0 percent (2008) in the period 2007–2010 in the Mediterranean region.

Capital and collateral variables capture solvency. On average, capital accounted for 40.3–41.5 percent of total assets in the Central European region and 33.7–34.2 percent in the Mediterranean region in the observed period. Changes in capital were minor in the regions mentioned but not in the Balkan region. Following the peak of 42.3 percent in 2007, the capital per unit of balance sheet decreased by 4.7 percent to 37.6 percent in 2010. The value of collateral also remained rather stable in the three countries throughout the observed period. Available collateral, defined as collateral per unit of total assets minus financial debt per unit of total assets, is more of interest since it is related to the ability to borrow. Considering the

---

<sup>11</sup> Due to the small number of sufficiently large companies, data for only 195 North Macedonian companies and 136 Montenegrin companies were collected.

<sup>12</sup> As a result of changes in the accounting standards used in the Balkan countries in 2005, a comparison with previous years is impossible.

average company in the Mediterranean countries, available collateral has a very unfavorable effect. It stood at only 3.4 percent of total assets at the end of the observed period. In the Balkan region, collateral available exhibits a similar dynamic as capital. It was at a high level of 28.6 percent of total assets in 2007 but dropped to 24.8 percent in 2010. The average value of collateral available in the Central European countries throughout the observed period is around 20 percent.

The average values of cash flow per unit of the balance sheet were at 12.5 percent, 10.0 percent, and 10.1 percent in Central Europe, the Mediterranean, and the Balkan region, respectively, in the most favorable year (2007). A decrease in cash flow by approximately 30 percent followed the eruption of the crisis in all three regions but unlike in the Central European and the Mediterranean countries, cash flow continued to decline in the Balkan region even in 2010.

Net receivables are calculated as short-term receivables less short-term liabilities per unit of the balance sheet sum and provide an alternative to financial debt. There is no evident pattern in the movement of net receivables. On average, short-term receivables were less than short-term liabilities in Central Europe and the Mediterranean except in 2008. Apart from 2009, the average company in the Balkan region was a net lender in the observed period.

### 2.4.3 Empirical specification

#### 2.4.3.1 Debt accumulation equation

Based on the theoretical model presented in Chapter 2.3, the specification of the estimated equation is as follows:

$$\begin{aligned}
 dbil\_fdebt = & \alpha + \beta_1 dbil\_core + \beta_2 dbil\_fininv + \beta_3 bil\_capt(-1) + \beta_4 bil\_dif\_colat\_debt(-1) + \\
 & \beta_5 baldbil\_core + \beta_6 meddbil\_core + \beta_7 baldbil\_fininv + \beta_8 meddbil\_fininv + \beta_9 balbil\_capt(-1) \\
 & + \beta_{10} medbil\_capt(-1) + \beta_{11} balbil\_dif\_colat\_debt(-1) + \beta_{12} medbil\_dif\_colat\_debt(-1) + \\
 & \beta_{13} id\_man + \varepsilon
 \end{aligned}
 \tag{7}$$

where *baldbil\_core*, *baldbil\_fininv*, *balbil\_capt(-1)*, and *balbil\_dif\_colat\_debt(-1)* show the specific effects of the Balkan countries (variables multiplied by a Balkan dummy) on the initial variables; *medbil\_core*, *medbil\_fininv*, *medbil\_capt(-1)*, and *medbil\_dif\_colat\_debt(-1)* show specific effects of the Mediterranean countries (variables multiplied by a Mediterranean dummy) on the initial variables, whilst the Central European countries serve as a reference. As shown in the model, the specific regional effect has to be specified multiplicatively. Finally,  $\varepsilon$  is the error term. For details, see Table 1.

At the onset of the global financial crisis, the countries of the Balkan region liberalized their economies and started their globalization processes. This could be seen as a “displacement” in Minsky’s terminology, an outside event, which changes expectations and anticipated profit opportunities. Optimism pushes investment and consumption up, drives economic activity,

and at the same time pushes sovereign risk premium down. The latter is negatively correlated with economic activity. Besides, developed economies of the core were in an expansionary phase of the business cycle. The model in Section 2.3 implies that a positive shock to investment would increase economic activity in a country of the core as well as in a country of the periphery, but due to a decrease in the sovereign risk premium, a migration of projects from the periphery to the core would take place. The effect would thus be higher for a country in the periphery. In the case of a negative (symmetric) shock to investment, this impact would vanish due to an increase in the sovereign risk premium. In the bust regime (2009), the accelerator of core investments is thus expected to decrease and the accelerator of financial investments to disappear. The expected effects will be milder in Central Europe and the Mediterranean countries because of less overheated economies prior to the crisis eruption. The recovery regime (2010) would push the financial accelerator up, especially that of core investments. It follows:

H1. The financial accelerator of the core investments of non-financial firms is higher in the Balkan region compared to the Mediterranean region and the Central European region ( $\beta_5 > \beta_6 > \beta_1 > 0$ ) in the boom regime (2007–2008).

H2. The financial accelerator of core investments is lower in the bust regime (2009) than in the boom regime (2007–2008) in all three regions.

H3. The financial accelerator of core investments is higher in the recovery regime (2010) than in the bust regime (2009) in all three regions.

Due to high returns on core investment (in the Balkan region), firms are enthusiastic about increasing their financial investments. Financial investments per unit of the balance sheet were indeed at 1.8 percent in the Balkan region in the pre-crisis (2007) period but considerably less or equal to 0.5 percent in the Core European region and the Mediterranean, respectively. It is assumed that the boom did not grow into a bubble in the regions mentioned.

H4. The financial accelerator on financial investments in the Balkan region is positive in the boom period ( $\beta_7 > 0$ ).

H5. The financial accelerator of financial investments is not different from zero in the Central European countries and the Mediterranean countries ( $\beta_2 = \beta_8 = 0$ ).

H6. The financial accelerator of financial investments is not different from zero in the bust regime (2009).

Both solvency categories, collateral available and capital are expected to have a positive effect on financial debt accumulation in all regimes and regions. The hypotheses are based on the behavior of banks, namely, collateralization of loans serves as insurance (it is especially relevant in times of crisis) and a lower ratio of debt versus equity is more favorable for lenders.

H7. Collateral available ( $\beta_4 > 0$ ) and capital ( $\beta_3 > 0$ ) have a positive effect on financial debt accumulation in all regimes and regions.

#### 2.4.3.2 *Cash flow migration equation*

According to Bole, Oblak, Prašnikar, and Trobec (2018), equation (2) in Section 2.3 shows that the increment in net worth could be written as a linear function of a firm's operating revenue, its indebtedness, and a product of the firm's external finance premium and indebtedness. The latter could be written as a linear combination of debt (deviation from the sample average) and collateralization of debt (deviation from the sample average). Based on this specification, a logit model of cash flow migration is constructed, where the dependent variable is the status of cash flow (negative cash flow or positive cash flow) in the period  $t$ . The independent variables used are financial debt, collateral coverage, intercompany debt, and short-term receivables (buyers) in the period  $t$ .

Financial debt is deemed a relevant variable as the unfolding of the crisis lessens the prospect of good times, and leads to uncertainty and potentially to a decrease in the net worth and illiquidity. Investors and lenders alike become less optimistic and more alert, and the lenders might demand that the borrowers repay their financial debt (to deleverage). The non-financial (and household) sector of the Balkan region was especially susceptible to these developments due to the sudden stop in capital flows. Since over-indebted units (firms) need to sell their assets to pay their financial commitments, asset prices fall and consequently also the value of collateral. Fire sales, namely, represent a way out of a liquidity squeeze but add to the downward pressure on asset prices (nominal value of collateral), which accelerates deleveraging even more, and highly leveraged borrowers become insolvent very easily. The crucial role of debt collateralization in accessing bank credits is well documented in the theoretical models<sup>13</sup> and practice<sup>14</sup>, especially for the bust regimes (in equation (2) external premium  $\zeta$  encompasses the corresponding collateralization effect). Therefore, debt collateral coverage is added as an explanatory variable.

Intercompany debt provides an alternative way of financing firms' working capital and is especially relevant in periods of forced decumulation of financial debt. This was indeed noted for the Balkan region after the financial crisis. The variable receivables provides another perspective on intercompany debt, in particular on the inability of buyers to pay their liabilities in the due period. Country dummies and a dummy variable for manufacturing firms are added. Both are necessary to account for the differences in the economic activity in the year of the cash flow analysis.

---

<sup>13</sup> See Kiyotaki and Moore (1997); Miller and Stiglitz (2010); Brunnermaier and Sannikov (2014).

<sup>14</sup> See Bole, Prašnikar, and Trobec (2014) on the use of collateral coverage in Slovenia.



Therefore, the equation is the following:

$$\text{probability (cash\_flow > 0)} = \phi(\alpha_0 + \alpha_1 \text{bil\_fdebt}(-1) + \alpha_2 \text{bil\_nonfdebt}(-1) + \alpha_3 \text{bil\_receivables}(-1) + \alpha_4 \text{kolat\_cover\_t}(-1) + \alpha_5 \text{id\_man} + \alpha_6 * \text{id\_countries}))$$

(8)

where variables included in the specification (8) are defined in Table 1. The service sector serves as a reference. Country dummies capture the differences in economic activity and other unspecified (mostly institutional) differences between countries. The term  $\alpha_6*$  indicates coefficients for all country dummies in the equation. The model is estimated for each year and each region separately.

The hypotheses addressed are:

H8. Financial debt does not affect the probability of achieving a positive cash flow in either region in the boom regime ( $\alpha_1 = 0$ ).

H9. Financial debt has a negative effect on the probability of achieving positive cash flow in all regions in the bust and recovery regimes ( $\alpha_1 < 0$ ).

H10. Financial debt has a higher effect (in absolute terms) on the probability of achieving a positive cash flow in the Balkan region compared to the Central European and Mediterranean regions in the bust and recovery regimes ( $\alpha_1 < 0$ ).

H11. Intercompany debt does not affect the probability of achieving a positive cash flow in either region in the boom regime ( $\alpha_1 = 0$ ).

H12. Intercompany debt has a negative effect on the probability of achieving a positive cash flow in all regions in the bust and recovery regimes ( $\alpha_1 < 0$ ).

H13. Intercompany debt has a higher effect (in absolute terms) on the probability of achieving a positive cash flow in the Balkan region compared to the Central European countries and the Mediterranean countries in the bust and recovery regimes ( $\alpha_1 < 0$ ).

H14. The variable receivables ( $\alpha_3 > 0$ ) does not affect the probability of achieving a positive cash flow in neither region in the boom regime.

H15. The variable receivables ( $\alpha_4 < 0$ ) has a positive effect on the probability of achieving a positive cash flow in all regions in the bust and recovery regimes.

H16. The variable receivables has a higher effect (in absolute terms) on the probability of achieving a positive cash flow in the Balkan region compared to the Central European and Mediterranean regions in the bust and recovery regimes ( $\alpha_1 < 0$ ).

H17. Collateral available ( $\alpha_4 = 0$ ) does not affect the probability of achieving a positive cash flow in neither region in the boom regime.

H18. Collateral available ( $\alpha_4 < 0$ ) has a negative effect on the probability of achieving a positive cash flow in all regions in the bust and recovery regimes.

#### 2.4.4 Debt accumulation model

Table 4 documents the estimated GMM system coefficients of the debt accumulation model given by equation (7). In Table 5, total effects of the individual debt-generating variables for a specific region and a specific year are presented.

*Table 4: Results of the GMM estimation on equation (1)*

Variable	2007	2008	2009	2010
Financial investments	0.226	0.123	0.117	-0.046
	(0.277)	(0.183)	(0.257)	(0.163)
Core investments	0.064	0.166 ***	0.146 ***	0.111 **
	(0.073)	(0.063)	(0.056)	(0.052)
Specific financial investments effect in Balkan	0.400	0.187	0.012	0.143
	(0.312)	(0.226)	(0.293)	(0.229)
Specific financial investments effect in Mediterranean	-0.005	-0.254	0.120	0.159
	(0.330)	(0.226)	(0.288)	(0.202)
Specific core investments effect in Balkan	0.248 ***	0.137	-0.034	0.003
	(0.075)	(0.086)	(0.072)	(0.071)
Specific core investments effect in Mediterranean	0.142	-0.010	-0.021	-0.153 *
	(0.099)	(0.078)	(0.074)	(0.087)
Manufacturing sector dummy	-0.001	0.001	0.006	-0.004
	(0.005)	(0.004)	(0.004)	(0.004)
Capital	0.033 ***	0.005	-0.003	0.007
	(0.013)	(0.011)	(0.012)	(0.009)
Specific capital effect in Balkan	-0.041 **	-0.009	-0.008	0.002
	(0.017)	(0.015)	(0.013)	(0.011)
Specific capital effect in Mediterranean	-0.010	0.018	0.011	0.020 **
	(0.013)	(0.012)	(0.012)	(0.010)
Available collateral	0.008	0.075 ***	0.076 ***	0.048 ***
	(0.008)	(0.024)	(0.017)	(0.017)
Specific available collateral effect in Balkan	-0.001	-0.040	-0.013	-0.016
	(0.020)	(0.029)	(0.025)	(0.021)
Specific available collateral effect in Mediterranean	0.018	-0.028	-0.035	-0.002
	(0.021)	(0.029)	(0.024)	(0.025)
Constant	0.000	-0.004	-0.018 ***	-0.013 ***
	(0.006)	(0.005)	(0.005)	(0.005)
Observations	4775	5438	5108	5089

(table continues)

(continued)

Hansen J statistic (p-value)	0.553	0.689	0.804	0.953
Under-identification test				
Kleibergen-Paap (p-value)	0.000	0.000	0.000	0.000

Source: Bole, Oblak, Prašnikar, and Trobec (2018).

Note: IV GMM method is used; the dependent variable is the yearly difference in financial debt per unit of the balance sheet; standard errors are reported in parentheses; \*\*\*, \*\*, and \* denote statistically significant values at 1, 5, and 10 percent on a two-tailed test, respectively; instruments used in the GMM version comprise averages of independent variables for two-digit NACE classification, firm number of employees (rate of growth), and sectoral FDI (per unit of value added); weighted regression is used; weights for each country are calculated as total employment in NACE sectors C, G, H, I, J per number of firms in the normalized sample; Sargan-Hansen statistic is a test of the over-identifying and Kleinbergen-Paap for under-identifying restrictions (p-value reported).

Table 5: GMM estimation of the total regional effects on financial debt accumulation

		Coeff.	2007	2008	2009	2010
Core investments	Central Europe	$\beta_1$	0.064	0.166 ***	0.146 ***	0.111 **
	Mediterranean	$\beta_6$	0.206 ***	0.157 ***	0.125 **	-0.043
	Balkan	$\beta_5$	0.312 ***	0.303 ***	0.112 **	0.113 **
Financial investments	Central Europe	$\beta_2$	0.226	0.123	0.117	-0.046
	Mediterranean	$\beta_8$	0.222	-0.132	0.236 *	0.113
	Balkan	$\beta_7$	0.626 ***	0.309 **	0.129	0.097
Available Collateral	Central Europe	$\beta_4$	0.008	0.075 ***	0.076 ***	0.048 ***
	Mediterranean	$\beta_{12}$	0.026	0.047 ***	0.041 ***	0.046 ***
	Balkan	$\beta_{11}$	0.007	0.035 **	0.063 ***	0.032 **
Capital	Central Europe	$\beta_3$	0.033 ***	0.005	-0.003	0.007
	Mediterranean	$\beta_{10}$	0.023	0.024 *	0.009	0.027 **
	Balkan	$\beta_9$	-0.008	-0.004	-0.010	0.009
Manufacturing sector effect			-0.001	0.001	0.006	-0.004

Source: Bole, Oblak, Prašnikar, and Trobec (2018).

Note: IV GMM method is used; the dependent variable is the yearly difference in financial debt per unit of the balance sheet); \*\*\*, \*\*, and \* denote statistically significant values at 1, 5, and 10 percent on a two-tailed test, respectively.

Table 5 provides an insight into crisis development in the Balkan region. In the boom period, financial accelerators of core investments are highly positive ( $\beta_5 = 0.312$  in 2007 and 0.303 in 2008) and statistically significant. Besides, the financial accelerator of financial investments is of considerable size and statistically significant in 2007 ( $\beta_7 = 0.626$ ) as well as in 2008 ( $\beta_7 = 0.309$ ). The optimism fueled by high actual returns pushed the evaluation of the expected profitability up (so actual returns undershoot expected returns). Firms (and individuals) might

even borrow to take advantage of the expected capital gains during the “euphoria”. The value of the coefficient of core investment ( $\beta_1 = 0.064$ ) is lower in the Central European region in 2007 compared to both other regions but is not statistically significant. In 2008, it attained the value of  $\beta_1 = 0.166$ . The size of the financial accelerator of the core investment for the Mediterranean region is rather high in 2007 ( $\beta_6 = 0.206$ ), implying an investment boom. The key difference to the Balkan region is, however, that the coefficients of the financial investments are not statistically significant in the boom. This is consistent with hypothesis H3, which assumes that the boom did not grow into a bubble in the Central European and Mediterranean regions. The results presented also comply with hypothesis H1.

Following the crisis eruption, the process of debt accumulation started to decelerate. The size of the financial accelerator of core investment is thus presumed to be lower in the bust regime (2009) than in the boom regime (2007 and 2008). The results given in the fifth and the sixth column of Table 5 provide support for H4. Since the economies of the Central European and Mediterranean regions were less overheated before the crisis eruption, a milder decrease in the accelerator of core investment is expected. For the Balkan region the value was  $\beta_5 = 0.112$  in 2009 down from  $\beta_5 = 0.303$  in 2008, for the Mediterranean the value was  $\beta_6 = 0.125$  down from  $\beta_6 = 0.157$  and for the Core Europe the value was  $\beta_1 = 0.146$  down from  $\beta_1 = 0.166$ . All coefficients listed were statistically significant. The financial accelerators of financial investments are not different from zero in the bust regime (2009) for the Central European and the Balkan regions. Interestingly, the accelerator is positive and significant at the 10 percent level for the Mediterranean region. This might indicate the deleveraging of firms due to sales of financial assets.

Taking into consideration the Balkan region and the coefficient of core investment, the year 2010 (recovery) shows a minor improvement ( $\beta_5 = 0.113$ ). The accelerator decreased in the Central European and even turned negative in the Mediterranean region. H6 is only partially confirmed.

H7 assumes that collateral available and capital have a positive effect on financial debt accumulation in all regimes and regions. Unlike the share of equity not exhibiting any particular pattern and for the most part not playing a significant role in debt accumulation throughout the observed period, this does not hold for the available collateral. The coefficient of available collateral is insignificant in all three regions in the year 2007 but not in the following years. The coefficients are positive and significant in the period 2008–2010 in all three regions. This might be due to changes in the bank credit policies towards more strict insurance of credits and/or drops in (prices of) available collateral (because of mark-to-market evaluation of collateral) when economic performances deteriorate (see, for example, Bole, Prašnikar, and Trobec, 2014).

#### 2.4.5 Cash flow migration model

Since the actual recovery and extent of liquidity constraints or even insolvency of firms is not evident from the results of the debt accumulation model, the cash flow model was constructed (equation (8)). Table 6 documents the results of binomial logit regressions for each year of the period 2008–2010 and each region. The marginal effects of each explanatory variable on the probability of positive cash flow status in the one-year horizon are also given.

Table 6 and Figures 21–24 complement the results given in Tables 4 and 5. Since operating income is assumed to be high enough to cover interest payments and scheduled reduction in financial debt in the boom phase of the business cycle, financial debt is expected not to have a statistically significant effect on the probability of migrating to a positive cash flow. H8 is partially confirmed. The marginal effects of financial debt on the probability of migrating to positive cash flow are not statistically significant for the Balkan and Central European region but are significant for the Mediterranean. As Figure 21 makes evident, accelerated debt accumulation had a larger impact on the cash flow in the Balkan region in comparison to the countries of Central Europe. This is consistent with the results of the debt accumulation model since the debt build-up process in the boom and the process of (forced) debt reduction in the bust were of higher intensity in the Balkan region. Despite more pronounced debt dynamics in the Balkan region, financial debt already negatively affected the probability of achieving a positive cash flow one year earlier than hypothesized (in the boom phase in 2008) in the Mediterranean region. H10 is thus not confirmed.

The unfolding of the crisis lessens the prospect of good times, increases uncertainty, and investors and lenders alike become less optimistic and more alert. It might even result in economy-wide illiquidity and solvency problems. As the financial crisis potentially decreases the net worth of economic agents, the lenders might be unwilling to roll over debts and demand that borrowers to repay their financial debt (to deleverage). It is thus assumed that financial debt becomes an important determinant of firms' cash flow status. Consistent with H9, financial debt is assumed to have a negative impact on the probability of achieving a positive cash flow in all regions in the bust and recovery regimes ( $\alpha_1 < 0$ ). The hypothesis can be confirmed. All marginal effects are statistically significant and negative in the bust and recovery. It should additionally be noted that debt accumulated has a disastrous (twice as large) impact on cash flow in the Mediterranean and Balkan regions in the bust and also in recovery (a prolonged effect is visible for the Balkan region). According to Bole, Oblak, Prašnikar, and Trobec (2018), "In the deleveraging phase, such (debt generated) cash flow developments in the Balkan region could result in mass illiquidity (see Miller in Stiglitz, 2010), especially because the Balkan region faced a massive reversal of capital inflows from Central Europe after 2011."<sup>15</sup>

---

<sup>15</sup> See, for example, Vienna initiative, CESEE deleveraging Monitor (2013).

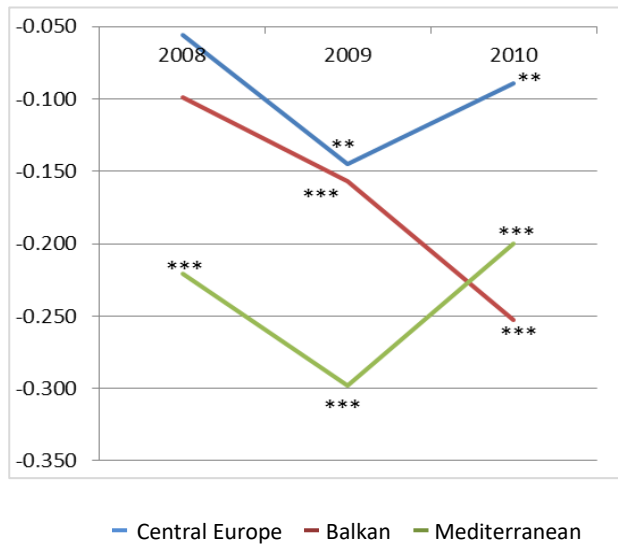
Table 6: Model of cash flow migration

		Central Europe		Balkan		Mediterranean	
		Coefficient	Marginal effects	Coefficient	Marginal effects	Coefficient	Marginal effects
<b>Cash flow in 2008</b>							
Lack of collateral coverage	$\alpha_4$	-0.075 ***	-0.006 ***	0.018	0.002	0.001	0.000
Financial debt	$\alpha_1$	-0.736	-0.056	-0.950	-0.099	-2.187 ***	-0.221 ***
Non-financial debt	$\alpha_2$	-1.423 **	-0.108 **	-1.184 **	-0.124 **	-1.683 ***	-0.170 ***
Receivables	$\alpha_3$	0.860	0.065	1.840 ***	0.193 ***	0.513	0.052
Manufacturing sector dummy	$\alpha_5$	-0.521 **	-0.040 **	-0.420 **	-0.044 **	-0.464 **	-0.047 **
Constant	$\alpha_0$	3.782 ***		2.808 ***		3.404 ***	
Observations		2046		1554		1548	
<b>Cash flow in 2009</b>							
Lack of collateral coverage	$\alpha_4$	-0.024	-0.003	-0.011	-0.001	0.001	0.000
Financial debt	$\alpha_1$	-1.091 **	-0.145 **	-1.193 ***	-0.157 ***	-2.132 ***	-0.298 ***
Non-financial debt	$\alpha_2$	-0.767 *	-0.102 *	-1.859 ***	-0.244 ***	-1.768 ***	-0.247 ***
Receivables	$\alpha_3$	-0.755	-0.101	2.100 ***	0.276 ***	0.952 **	0.133 **
Manufacturing sector dummy	$\alpha_5$	-0.581 ***	-0.077 ***	-0.435 **	-0.057 **	-0.896 ***	-0.125 ***
Constant	$\alpha_0$	2.883 ***		2.739 ***		2.848 ***	
Observations		2273		1699		1627	
<b>Cash flow in 2010</b>							
Lack of collateral coverage	$\alpha_4$	0.000	0.000	-0.007	-0.001	0.002	0.000
Financial debt	$\alpha_1$	-1.291 **	-0.089 **	-1.972 ***	-0.253 ***	-1.723 ***	-0.200 ***
Non-financial debt	$\alpha_2$	-1.211 **	-0.084 **	-2.485 ***	-0.319 ***	-1.411 ***	-0.163 ***
Receivables	$\alpha_3$	1.167 *	0.081 *	2.446 ***	0.314 ***	1.414 ***	0.164 ***
Manufacturing sector dummy	$\alpha_5$	-0.041	-0.003	-0.363 **	-0.046 **	-0.822 ***	-0.095 ***
Constant	$\alpha_0$	2.947 ***		3.095 ***		2.835 ***	
Observations		2121		1622		1547	

Source: Bole, Oblak, Prašnikar, and Trobec (2018).

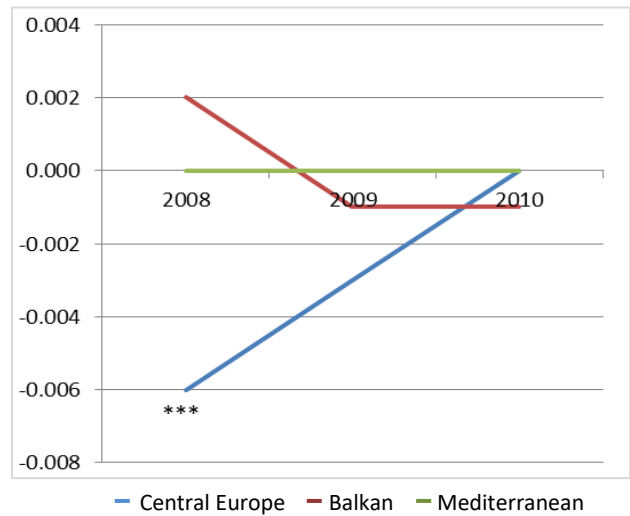
Note: The dependent variable is cash flow status in the following year; status of cash flow: 0 negative cash flow, 1 positive cash flow; manufacturing is an indicator variable for the manufacturing sector; dummy variables for countries are not shown in the Table; all continuous variables are in units of the balance sheet; weighted regression is used; weights for each country are calculated as total employment in NACE sectors C, G, H, I, J per number of firms in the normalized sample; standard errors are reported in parentheses; \*\*\*, \*\*, and \* denote statistically significant values at 1, 5, and 10 percent on a two-tailed test, respectively.

Figure 21: Financial debt (marginal effects on the probability of positive cash flow for a one-year horizon)



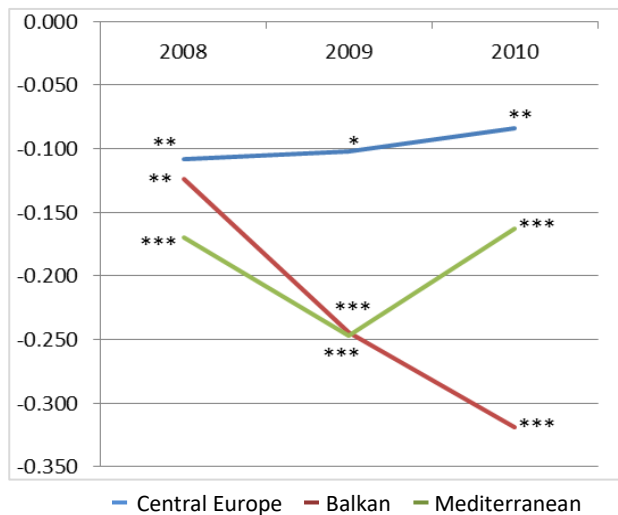
Source: Bole, Oblak, Prašnikar, and Trobec (2018).

Figure 22: Collateral coverage (marginal effects on the probability of positive cash flow for a one-year horizon)



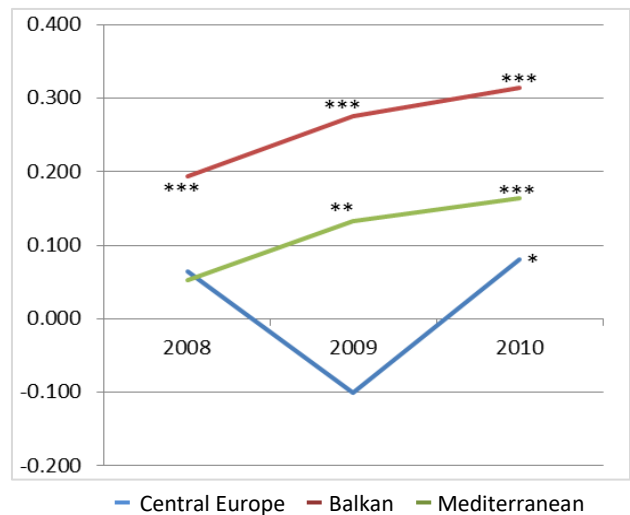
Source: Bole, Oblak, Prašnikar, and Trobec (2018).

Figure 23: Non-financial debt (suppliers) (marginal effects on the probability of positive cash flow for a one-year horizon)



Source: Bole, Oblak, Prašnikar, and Trobec (2018).

Figure 24: Receivables (marginal effects on the probability of positive cash flow for a one-year horizon)



Source: Bole, Oblak, Prašnikar, and Trobec (2018).

Note: The dependent variable is cash flow status; status of cash flow: 0 negative cash flow, 1 positive cash flow; Balkan (red), Central Europe (blue) and Mediterranean (green); \*\*\*, \*\*, and \* denote statistically significant values at 1, 5, and 10 percent on a two-tailed test, respectively.

Similarly to financial debt, non-financial debt (as an alternative to financial debt) had the lowest (negative) and statistically significant impact on the probability of achieving positive

cash flow throughout the whole observed period in Central Europe (see Figure 23). The marginal effects were negative and statistically significant also for the Balkan and Mediterranean regions in the observed period. Their impact on the probability of achieving a positive cash flow is considerably higher (in absolute terms) than for Central Europe. Interestingly, the effect of intercompany debt increased in the recovery in the Balkan region. Based on the discussion above, H11 and H13 cannot be confirmed. H12 is supported by the empirical result.

Short-term operating receivables had positive marginal effects for firms in the Balkan and Mediterranean regions. A higher level of receivables implies a higher probability of positive cash flow in the following year and might indicate the inability of firms to effectively recover their debts. Marginal effects are positive for firms that migrate to positive cash flow and negative for firms that migrate to negative cash flow.

Figure 24 illustrates an increasing impact of receivables on the probability of positive cash flow in the Balkan and Mediterranean regions. Receivables had a statistically significant effect on the probability of migrating to positive cash flow throughout the whole observed period in the Balkan region. H14 is thus not confirmed. Their impact was larger than for the other two regions as hypothesized by H16. Receivables had a positive impact on the probability of achieving a positive cash flow in the bust and recovery regimes only in the Balkan and Mediterranean regions. H15 is not supported by the results. Collateral coverage was not significant (Figure 22) except for Central Europe in the boom period. Hypotheses H14 and H15 are not confirmed.

## **2.5 Conclusion**

Political and economic consolidation in the Balkan region in the pre-crisis period enabled the economies to attract foreign capital flows. Besides investment into equity instruments, real convergence in the boom period encouraged investment into debt instruments and an increase in the availability of loanable funds for the Balkan countries. In the study by Bole, Oblak, Prašnikar, and Trobec (2018), we show that the underdeveloped financial system and “weak regulation in the Balkan countries were not able to control the dynamics of massive foreign capital inflows or to mitigate their endogenous amplification. Through the financial accelerator and skyrocketing collateral valuation, the latter resulted in a huge accumulation of debt in (predominantly) the non-financial corporations’ sector.” In the boom period of the Great Recession, the financial accelerator in the Balkan countries was considerably stronger (twice as strong for core investments) than in the Mediterranean and especially Central European countries. Implying a bubble, the financial accelerator of financial investments was significant and positive in the Balkan region unlike in the other two regions. An increase of more than 40 percent of GDP in market capitalization of listed domestic companies underpins this proposition.



A sudden stop in foreign capital flows in 2009 decelerated the process of debt accumulation and revealed a failed real convergence process. In the bust and recovery periods, the Balkan countries again faced considerably larger and longer macroeconomic effects (costs) than the Mediterranean and especially Central European countries, only the mechanism was different. The financial accelerators of core investment were of comparable size in all three regions, but the effect of the decumulation of debt on firms' liquidity squeezes and contagion were much larger (at least 50 percent) in the Balkan countries. Especially strong were the effects of the intercompany debt, which aggravated the liquidity of companies in the Balkan countries at least twice as much as in the Mediterranean and Central European countries. Interestingly, capital inflows into the other sectors in the form of debt instruments (intercompany debt included) were considerably higher in the Balkan region compared to the Mediterranean region. Capital inflows into deposit-taking corporations were of a comparable level. Bole, Oblak, Prašnikar, and Trobec (2018) summarize:

*The presented empirical evidence documents that periphery (catching-up) economies must be alert to their macro soundness when entering a broader, even supportive, economic environment, and that even in the supportive environment free trade and open financial flows make the real convergence of such economies uncertain and prone to bubbles in “good” times and drastic adjustments in “bad” times. In both cases, the effects are of the same direction but much more pronounced in periphery (catching-up) countries than in the corresponding core countries.*

This does not only hold for the Balkan region but also for the Mediterranean region as a part of euro area periphery. Praet (2014) suggests to “re-run the convergence process” in the euro area but with appropriate institutions in place to prevent distortions. In his view, lack of competition and loose credit conditions enabled elevated accumulation of capital (also in sectors with low productivity not resulting in real convergence). A shift to evaluation of the profitable projects based on the net present value rather than on familiarity of local and incumbent firms increase is believed to be achieved through complete integration of the euro area retail banking.

### **3 BANKS' PERSPECTIVE OF FIRMS' AND HOUSEHOLDS' INDEBTEDNESS<sup>16</sup>**

#### **3.1 Introduction**

The real economy might be severely hit by sharp contractions in credit arising from adverse shocks to banks' balance sheets (Basel Committee on Banking Supervision, 2011). Two preconditions are needed for transmission from the financial sector to the real sector to materialize. Firstly, the dependency of firms and households (borrowers) on bank loans must

---

<sup>16</sup> This chapter of the dissertation is partially the paper published as Prašnikar, Bole, Dominko, Lakićević, and Oblak (2021).

be at a high level.<sup>17</sup> Interestingly, the majority of studies on the transmission mechanisms are based on the data on US banks, despite the lower relative importance of banks compared to other sources of external finance. Recently, some studies also deal with the credit supply of the euro area banks (de Haan, van den End, & Vermeulen, 2017; Iyer, Peydró, Da-Rocha-Lopes, & Schoar, 2020). Baskaya, di Giovanni, Kalemli-Özcan, Peydró, and Ulu (2017) provide a study on Turkey. Secondly, the transmission mechanism is relevant only if the banks are not able to sustain their credit supply in response to shocks. The presence of financial frictions in the interbank markets or retail markets is thus the second precondition.

Gertler and Kiyotaki (2010) show that if the interbank market is frictionless, deficit institutions easily obtain funds from surplus institutions. In the presence of financial frictions, disruptions in the interbank market put a strain on the real economy. Firm-level balance sheet constraints are taken into account. Theoretical contributions of Bernanke, Gertler, and Gilchrist (1999) and Holmstrom and Tirole (1997) support a view that the transmission of financial shocks to the economy requires imperfect financial markets.

In the traditional bank lending channel shocks to banks' balance sheets, e.g. negative monetary policy shock, have an effect on the cost and availability of credit and thus on the real economy. Another channel, namely the bank capital channel, has been identified in the literature (Holmstrom & Tirole, 1997; Stein, 1998). The former study assumes that all bank lending is financed by capital, serving as an incentive for banks to monitor borrowers. A shock to banks' capital leads to a reduction in credit supply. In Stein's study (1998) the model resembles the financial accelerator model for non-financial corporations. An external finance premium is inversely related to capital (net worth). When capital decreases, an external finance premium leads to an increase in the cost of funds faced by banks and borrowers. Van den Heuvel (2002) finds that regulatory capital requirements place an upper limit on bank assets and credit.

“When the crisis hit, the epicenter featured malfunctioning of the wholesale banking sector,” Gertler, Kiyotaki, and Prestipino (2016, page 5) vividly justify why another channel of financial transmission should be considered besides those mentioned above. A liquidity channel is activated when a shock to liquidity (e.g. a collapse of the interbank market) results in a reduced credit supply to firms and households and thus transmits and propagates the shock to the real economy. Due to rationing in the funding market, banks have fewer means to support their asset side activities (de Haan, van den End, & Vermeulen, 2017). The liquidity channel is studied in two possible ways, namely, as an extension of the bank lending channel,

---

<sup>17</sup> Banks in the Balkan region remained the most important source of external finance for firms (Šević, 2000; Cottarelli, Ariccia, & Vladkova-Hollar, 2005) but a non-transparent privatization of the so-called social ownership contributed substantially to less than optimal governance (Koman, Lakicević, Prašnikar, & Svejnar, 2015). After the collapse of Yugoslavia, its former republics embarked on the process of transition to market economies and a two-tier banking system needed to be re-established being under social and political influences of the previous regime (Šević, 2000; Jovančević, 2000). By pushing former republic-level banks and other banks to meet regulatory conditions, it was envisaged that they would improve the evaluation of loan applications, reduce operating costs, and increase profitability (Bonin, 2004).

where the bank's liquidity risk strengthens the working of the channel (Basel Committee on Banking Supervision, 2011) or as an independent channel. The latter operates mostly through leverage (Adrian & Shin, 2010), where the key mechanism begins with rising asset prices leading to an increase in net worth and a decrease in leverage. The ability to obtain funds is thus higher.

Banks' adjustments to funding liquidity shocks are at the core of the liquidity channel, in particular, the question is how the liquidity position of banks' balance sheets alters the behavior of banks, lending rates and volumes, and the structure of their balance sheets. The liquidity is generally divided into two crucial components, namely, funding liquidity (ability to get funding immediately through asset sales or borrowing to meet obligations) and market liquidity (asset side – the ease with which an asset can be traded). (Brunnermeier & Pedersen, 2009). In the dissertation, the former is of particular interest.

Considering theoretical contributions, Fisher (1933) has already illustrated the behavior of distressed banks and assets sales. A liquidity shock prompts banks to sell assets, and consequently create excess supply and downward pressure on asset prices. The loop continues and might result in a downward spiral. Diamond and Dybvig (1983) noted the same mechanism. Diamond and Rajan (2005) theoretically examine the interaction between liquidity shortages and solvency problems of a bank, and the interaction between the two. Demanding payments, depositors might cause a liquidity shortage and force banks to foreclose on loans, which would soon create liquidity. In anticipation of a liquidity shortage, banks are also theoretically proven to hoard liquidity (Diamond & Rajan, 2009).

Empirically, de Haan, van den End, and Vermeulen (2017) provide evidence of banks' responses to funding liquidity shocks on bank credit supply, to households and corporates, and interest rates. The database includes monthly data of 181 euro area banks over the period from August 2007 to June 2013. The main characteristics of banks, which are accounted for, are country, the volume of Eurosystem borrowing, bank size, and capitalization. The authors show that shocks in the interbank market have significant effects on loan rates and volumes, particularly for banks in stressed countries of the periphery. The latter also experienced the outflow of retail funding. These developments resulted in a reduction of maturity mismatches, a switch to alternative sources of funds, and deleveraging.

Ivashina and Scharfstein (2010) show that banks funded mostly with retail deposits curbed the credit supply to a lesser extent. Cornett, McNutt, Strahan, and Tehranian (2011) upgraded their study of banks' responses to the liquidity shock during the global financial crisis of 2007–2009 in a few ways. The authors base their empirical study on the banks' liquidity risk management view (Diamond & Dybvig, 1983) and propose four key drivers, namely, liquidity of assets, core deposits, and capital as a share of the total balance sheet and loan commitments. The study indicates that banks with a higher share of equity and deposits relative to banks reliant on wholesale funding were able to sustain their credit supply. The

illiquidity of the asset side of the bank's balance sheet also seems to have an effect on lending.

Studying the development of financial crises in less developed economies, the funding liquidity channel, focusing on the liability side of the bank balance sheet and the crucial role that capital inflows had directly or indirectly on its dynamics, is of particular importance. Here, swings in capital inflows to deposit-taking corporations (wholesale channel) as well as to other sectors (retail channel) are propagated through banks as key providers of external finance. A (positive or a negative) shock to funding reflects itself in credit supply to firms and households, and consequently it is transmitted to the real economy.<sup>18</sup> Ongena, Peydró, and Neeltje (2015) show that financial shocks were indeed transmitted to the real sector through the wholesale funding variable and the foreign ownership of local banks. Jiménez, Ongena, Peydró, and Saurina (2011; 2012) also expose another relevant aspect of bank credit supply, namely, the relative importance of the demand and supply frictions. Availability of a high-quality dataset of loan applications in Spain matched with complete bank and firm balance-sheet data allowed them to study demand and supply side determinants of credit supply to firms simultaneously. Thus, authors were able to identify bank and firm balance-sheet channels. It was found that in a crisis period, supply factors (in particular, bank balance-sheet strength) are crucial to the bank supply of loans to firms. Similar findings are presented by Everaert et al. (2015). Results indicate that supply factors gained explanatory power relative to the demand side factors in the post-crisis period. A decline in supply of funds is also identified as a driver of bank credit in Taiwan in the Asian crisis (Chen & Wang, 2008). A study by Burlon, Fantino, Nobili, and Sene (2016) in part contradicts previous studies. The authors show that bank credit rationing depends more on the demand-side variables, namely, two crucial determinants are banks' level of non-performing loans and firms' ability to provide collateral against bank loans.

The main objective of Chapter 3 is to present the transmission mechanism of shocks (foreign capital flows and real demand) to domestic economies. Determinants of credit supply to households and firms are studied with an emphasis on the retail and wholesale funding variables. Also, policy specificities of the three analyzed countries (Slovenia, Croatia, and Montenegro) are added to the empirical specification. The period covered is from 2006–2013 and within this period three phases of the business cycle are identified, namely, boom (2007–2008), bust (2009–2010), and recovery (2011–2013) periods of the Great Recession. Firstly, the selection of countries is justified by similarities. Slovenia, Croatia, and Montenegro all inherited bank-dominated financial systems, and the banks are mostly foreign-owned (branches of the same foreign banks). Additionally, their final demand was almost synchronized (see Figure 25). Secondly, since capital flows are considered to be a key driver of the funding channel, large disparities in the increase and structure of capital inflows

---

<sup>18</sup> It is also found that it is easier to explain the dynamics of output and productivity in emerging countries by using the concept of the capital surges combined with domestic financial frictions (Claessens & Kose, 2013).

regarding instruments and the receiving sectors in all three periods provide a solid starting point. Thirdly, their independence in terms of macroprudential, standard macroeconomic, and structural policy differs. For more, see Section 3.2. Fourth, the three countries provided good enough data to conduct the research.<sup>19</sup>

In Section 3.2, an overview of stylized facts on macroeconomic developments in the three countries is given. Secondly, the credit model of the open economy is presented. It enables us to separate the demand and supply effects of the credit supply to firms and households. In Section 3.4, the empirical specification and results are given.

### **3.2 A macroeconomic perspective on the crisis in the three countries**

The following chapter aims to provide a broader context to the study of the transmission mechanism of wholesale and retail funding swings driven by the real economy and foreign financial flows at a bank level. Stylized facts are documented for the period from 2005–2013 and countries for all three segments under consideration: the real economy, foreign financial flows, and the banking sector.

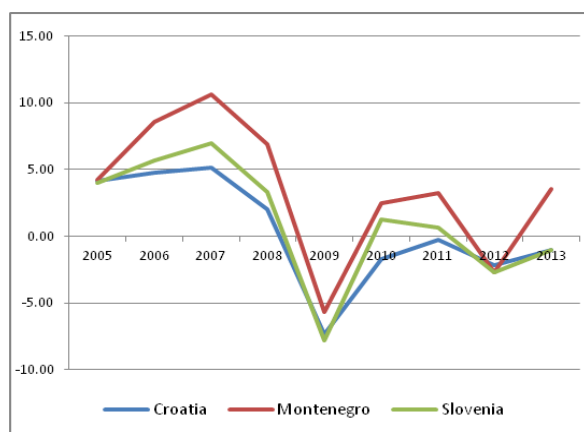
In Figures 25–26 selected macroeconomic indicators are illustrated. Figure 25 presents the real GDP growth dynamic and indicates a relatively synchronized final demand in the three countries. A rapid expansion with a peak in 2007, a trough in 2009 and a mild recovery afterward, and another slump in 2012. Despite a common business cycle, the swings are considerably more pronounced in Montenegro, to a lesser degree in Slovenia. Montenegro achieved its peak growth rate of real GDP at 11.7 percent and a trough at -5.7 percent. Slovenia documented the highest fall in economic activity of -7.8 percent. The volatility of Croatian economic activity was moderate, falling from 5.2 percent in 2007 to -7.4 percent in 2009. However, it remained negative until 2015.

The current account balance deteriorated in all three countries (Figure 26) in the boom period which was characterized by massive capital inflows. Following a peak in 2008, the current account deficits adjusted sharply. This coincides with a reversal in capital inflows in 2009. The Montenegrin deficit of 50.0 percent of GDP stood out on the upper limit in 2008, as it did its adjustment, which was more than 30 percent of GDP but not more than five percentage points in Croatia and Slovenia. The current account even turned to positive values in 2011 in Slovenia and in 2013 in Croatia.

---

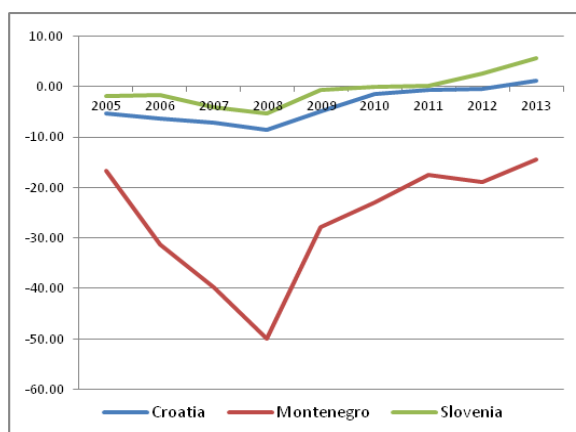
<sup>19</sup> A study with a similar design was intended to be conducted on a set of 17 countries grouped in the three regions consistent with methodology used in Chapter 2. Data availability yet remains the main obstacle, namely, the sample of banks for the Central European and the Mediterranean region covers (at the moment) an incomparably lower share of the total banking sector assets in comparison to the sample for the Balkan region.

Figure 25: Growth of real GDP



Source: The World Bank (no date), own work.

Figure 26: Current account balance (percentage of GDP)

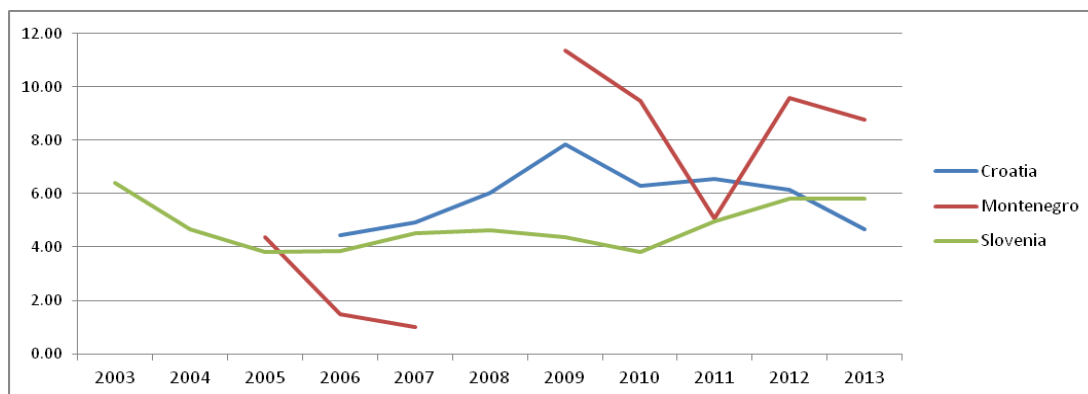


Source: The World Bank (no date), own work.

Figures 27–31 give information on interest rates and prices of new and existing dwellings. Data on central government bond yields decreased in the boom period. Also, average interest rates on loans up to and over one year in Montenegro had a similar dynamic consistent with the gradual inclusion of Montenegro in the broader financial area. Consequently, a convergence of interest is observed in the boom period in the three countries. Namely the booming economic activity and vigorous prices pushed nominal interest rates up in Slovenia and Croatia.

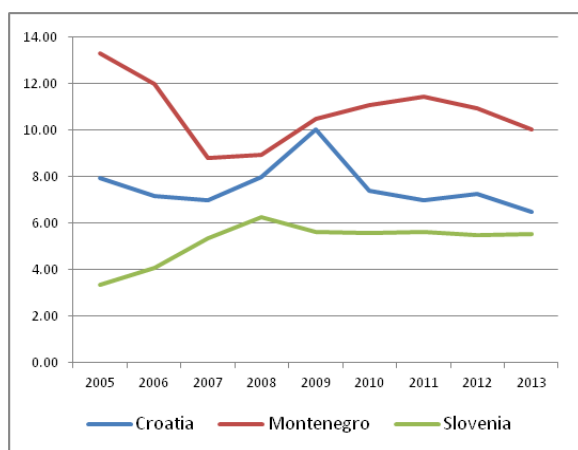
After a sudden stop (2009) the situation sharply deteriorated. Firstly, government bond yields in Croatia and Montenegro increased which might imply constraints on the two countries to raise funds internationally (Figure 27). Secondly, the interest rates on loans increased, too. Namely, uncertainty in the international financial markets resulted in disruptions in the wholesale and retail markets for loanable funds (Figures 28–29). For Slovenia, the problems of financing of government debt came to the fore in 2012 coinciding with public debt crisis in the countries of EU periphery. Its policymakers lingered over reforms. Falling interest rates in retail markets after capital inflow reversals in the three countries might be somehow deceptive. Namely, the period was notable for a decrease in disintermediation and a change in bank policies. Banks not only increased the necessary credit collateral coverage, but also considerably enhanced credit rationing of properly collateralized credit (see, Bole, Prašnikar, and Trobec (2014) for Slovenia).

Figure 27: Central government bond yields with a residual maturity of around 10 years



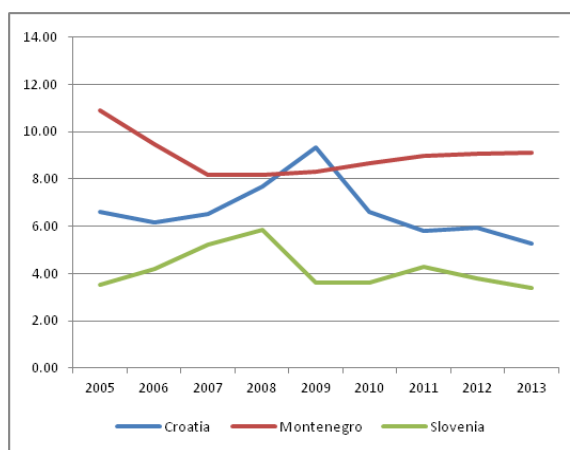
Source: Monstat (no date), CBCG (no date), ECB (no date), own work.

Figure 28: Average interest rate on loans, up to 1 year, non-financial corporations



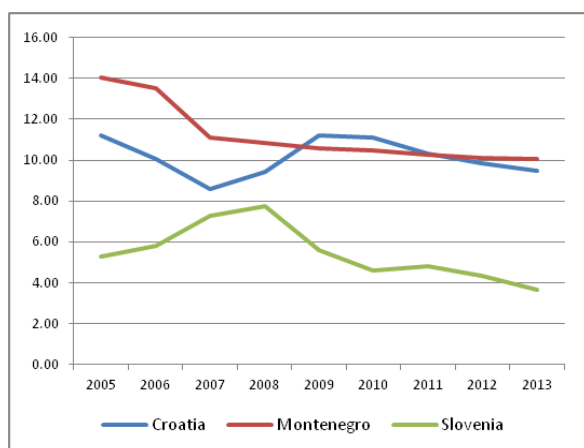
Source: Monstat (no date), CBCG (no date), ECB (no date), own work.

Figure 29: Average interest rate on loans, over 1 year, non-financial corporations



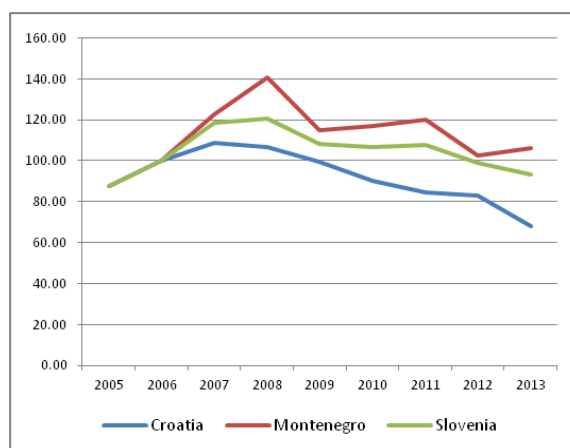
Source: Monstat (no date), CBCG (no date), ECB (no date), own work.

Figure 30: Average interest rate on loans, over 1 year, households



Source: Monstat (no date), CBCG (no date), ECB (no date), own work.

Figure 31: New and existing dwellings, price index (base=2006)



Source: Monstat (no date), CBCG (no date), ECB (no date), own work.

Note: For Montenegro only data for new dwellings are available.

Figures 30–31 show that the real estate market in the observed countries peaked just before the global crisis erupted. After the reversal of capital inflows, severe credit cuts and a drop in demand pushed real estate prices considerably downwards. In 2009, the prices of new dwellings decreased by almost 20 percent in Montenegro, and by more than 10 percent in Slovenia. Croatia experienced the most pronounced drop at around eight percent a year later.

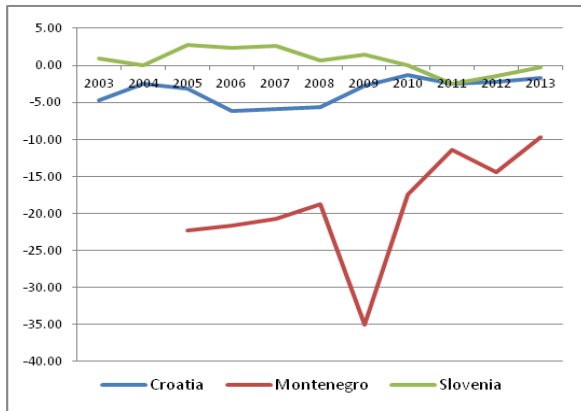
Figures 32–37 portrays capital flows in the three countries in the period 2003–2013. All numerical values are given as a percentage of GDP unless stated otherwise. Figure 32 depicts net capital flows in the form of portfolio investment in equities and direct investment. Notable differences exist among countries. Net capital inflows into Montenegro were massive throughout the entire period. Even after a sharp adjustment in 2010, the level remained high at around 15 percent of GDP yearly. Croatia also recorded net capital inflows but compared to Montenegro these were significantly lower. After reaching its highest value of 6.2 percent of GDP in 2006, net capital inflows turned to net capital outflows of around -2 percent. Capital outflows exceeded capital inflows in Slovenia in the pre-crisis period. Domestic investors actively acquired assets abroad with an average of 2 percent in the period 2005–2009. Net capital outflows turned to inflows in 2010.

In Figure 33, net capital flows in the form of portfolio investment in debt instruments and other investment (mostly debt-related) for all sectors of the economy are documented. It is evident that in the boom period more capital in the form of debt instruments flowed into rather than out of the three countries, but the trend was abruptly put to a halt after 2009. Net capital inflow started to contract and gradually turned to net capital outflow in Croatia and Slovenia. This reversal coincides with the collapse of the Vienna Initiative, a commitment by foreign banks to maintain their exposure in the region and to keep subsidiaries adequately capitalized in host countries (Sanfey, 2011). The adjustment in Montenegro was rapid and outflows already surpassed inflows in 2009.

Gross capital inflows in the form of portfolio investment in debt instruments and other investment into deposit-taking corporations and other sectors are presented in Figures 34 and 35. Again the highest swings are evident for Montenegro, which received large capital inflows into both deposit taking-corporations (18.1 percent in 2007) and other sectors (almost 20 percent). A corresponding collapse was more pronounced for the deposit-taking corporations, namely, -7.9 percent in 2009. Averaging at 9.2 percent of GDP per year in the period 2005–2008, Slovenia also experienced high inflows of capital in deposit-taking corporations. There was a collapse in 2009 and cumulative retrieval of funds in the period from 2009 to 2013 as a share of 2013 GDP sums up to 28.0 percent. Despite more abrupt retrieval of capital from Montenegro, its cumulative amounted to -17.1 percent in the same period. The nature of capital flows was distinct for Croatia with high inflows of capital into other sectors but not into the deposit-taking corporations. Foreign flows were not (directly) intermediated by banks but went directly into other sectors (mostly households and non-financial corporations). Figure 35 also shows a negative capital inflow (decrease in liabilities) into Croatian banks after 2011. Foreign investors reduced their exposures.

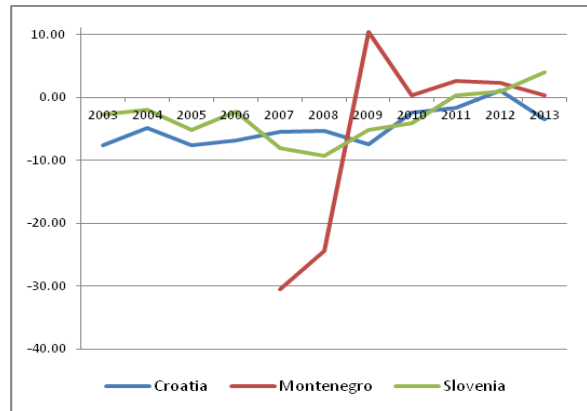


Figure 32: Net capital flows into equities and FDI (all sectors) (percentage of GDP)



Source: IMF, Balance of payments statistics (no date), own work.

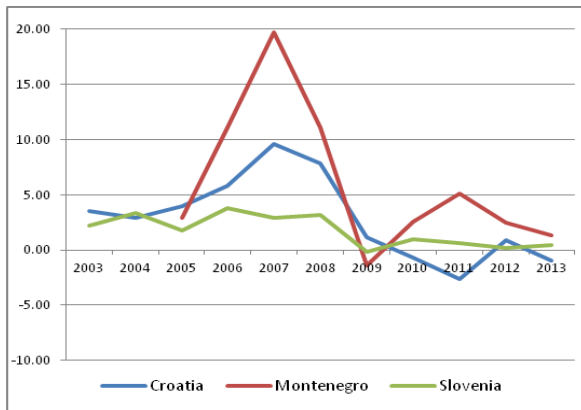
Figure 33: Net capital flows into debt instruments (all sectors) (percentage of GDP)



Source: IMF, Balance of payments statistics (no date), own work.

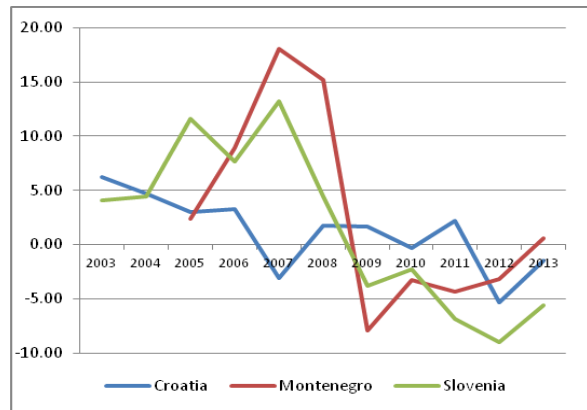
Note: Data for Croatia do not include IMF funds.

Figure 34: Capital inflows into debt instruments (other sectors) (percentage of GDP)



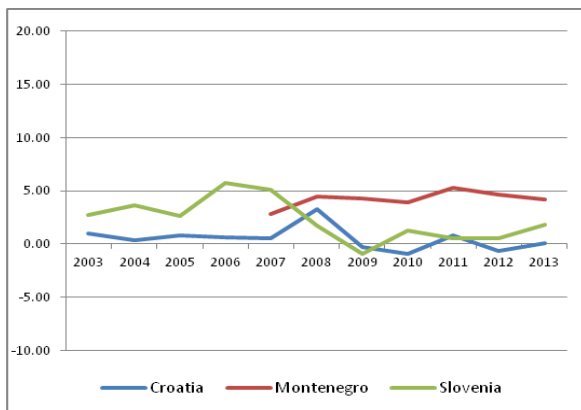
Source: IMF, Balance of payments statistics (no date), own work.

Figure 35: Capital inflows into debt instruments (deposit-taking corporations) (percentage of GDP)



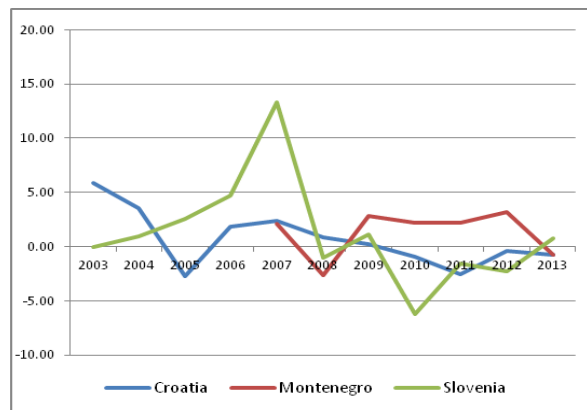
Source: IMF, Balance of payments statistics (no date), own work.

Figure 36: Capital outflows into debt instruments (other sectors) (percentage of GDP)



Source: IMF, Balance of payments statistics (no date), own work.

Figure 37: Capital outflows into debt instruments (deposit-taking corporations) (percentage of GDP)



Source: IMF, Balance of payments statistics (no date), own work.

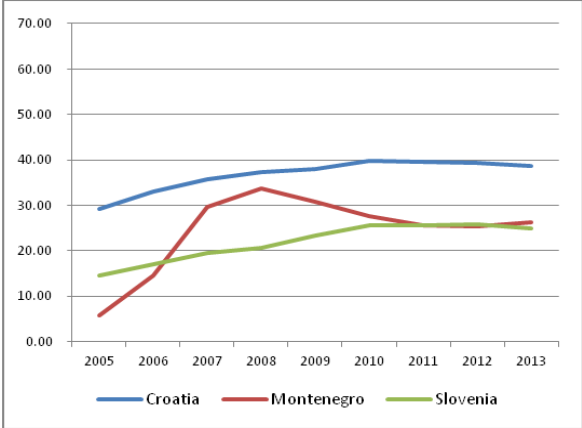
Analyzing gross capital outflows in the form of portfolio investment (debt securities) and other investment reveals that in the boom period domestic investors in Slovenia invested most actively abroad (Figures 36 and 37). This increased the vulnerability (especially of deposit-taking corporations) to foreign-country shocks compared to Croatia and Montenegro. The cumulative outflow of capital from deposit-taking corporations was at 23.7 percent of 2005 GDP in the period from 2005–2008. A risk related to exposure to foreign-country shock materialized (the three main banks were recapitalized by the government). After the eruption of the crisis, however, deposit-taking corporations decreased their acquisition of assets abroad to reach negative value. Domestic investors, deposit-taking corporations, and other sectors alike were considerably more conservative in Croatia and Montenegro. Apart from 2008, capital outflows from other sectors fluctuated between 1 and -1 percent in Croatia. Capital outflows from deposit-taking corporations were positive in the boom period and in relative terms higher. A shift to negative in 2010 indicates retrenchment of capital from abroad. The outflows of capital from other sectors in Montenegro were rather stable with an average of 4.2 percent in the observed period. Deposit-taking corporations invested less abroad, namely, 1.3 percent on average annually.

Figures 38–41 depict basic indicators for the banking sectors of the three countries. All numerical values are given as a percentage of GDP unless stated otherwise. Measured by loans outstanding (Figure 38), Croatian households had the highest indebtedness of the three but a moderate increase (from 29.3 in 2005 to 37.2 percent in 2008). Unlike in Croatia, indebtedness jumped from 5.8 to 33.6 percent in Montenegro but not in Slovenia from 14.7 to 20.6 percent. Analyzing loans outstanding to non-financial corporations (Figure 39) shows a different story. Croatian non-financial corporations were the least indebted. In comparison to Slovenia and Montenegro, more moderate credit expansion in the boom period was followed by more moderate decumulation of debt (by 5 percentage points) in the bust period. A rapid expansion can be observed for Slovenia (an increase of 21 percentage points) and Montenegro (an increase of almost 42 percentage points) in the period 2005–2008. This is consistent with the studies by Mendoza and Terrones (2008), Magud, Reinhart, and Vesperoni (2014), Magud and Vesperoni (2015), which found that credit booms are of higher intensity (and frequency) under less flexible exchange rate regimes. Also, Bakker and Gulde (2010) found evidence that it is more difficult to contain credit booms in countries with fixed exchange rate regimes. An abrupt deleveraging is evident after 2008. In Slovenia, loans to non-financial corporations reached 30.1 percent in 2014, a level lower than in 2005.

Considering banks' liability-side, Figures 40 and 41 provide useful insights. Rising deposits provided Croatian banks with a stable source of funds throughout the observed period (except 2013). The bank loans-to-deposits ratio was around 100 percent, which indicates the lower importance of non-deposit funding. Deposits were also increasing in Slovenia, but more moderately and more importantly, deposits did not cover loans. The bank loans-to-deposits ratio was above 100 percent throughout the entire period and increased considerably in the period 2005 to 2008. Slovenian banks, thus, had higher needs for non-deposit (as a rule wholesale external) funding. An increase in bank deposits in the years 2006 to 2008 was to

some extent linked to financial deepening in Montenegro. After the crisis erupted, bank deposits as a percentage of GDP decreased and stabilized at just below 50 percent.

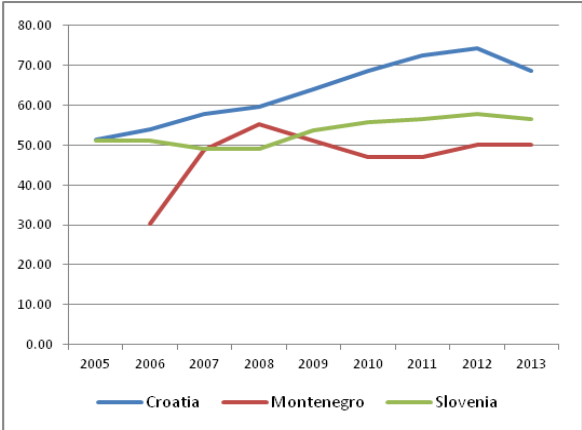
Figure 38: Loans to households (percentage of GDP)



Source: The World Bank (no date), CBCG (no date), ECB (no date), own work.

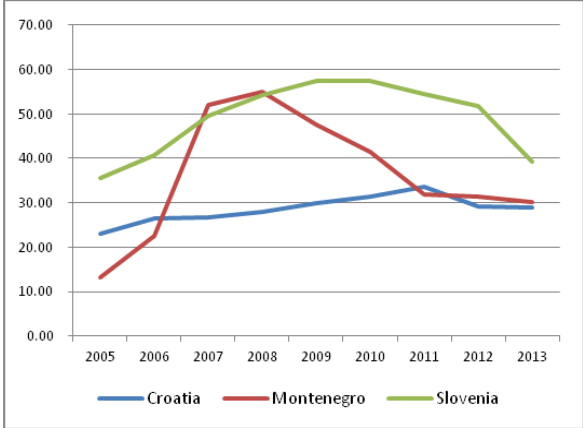
Note: Data for Slovenia (2013) are not corrected for the transfer of claims to DUTB (“bad bank”).

Figure 40: Bank deposits (percentage of GDP)



Source: The World Bank (no date), CBCG (no date), ECB (no date), own work.

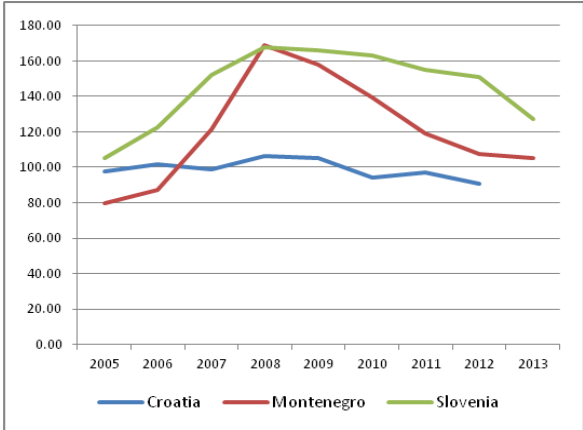
Figure 39: Loans to non-financial corp. (percentage of GDP)



Source: The World Bank (no date), CBCG (no date), ECB (no date), own work.

Note: Data Slovenia (2013) are not corrected for the transfer of claims to DUTB (“bad bank”).

Figure 41: Bank loans to bank deposits (percentage)



Source: The World Bank (no date), CBCG (no date), ECB (no date), own work.

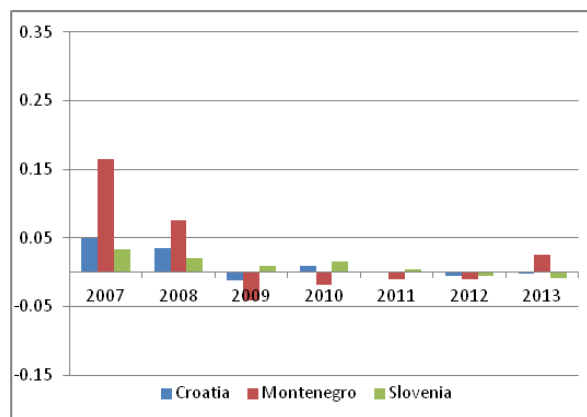
Note: Data Slovenia (2013) are not corrected for the transfer of claims to DUTB (“bad bank”).

To capture the dynamic, Figures 42–45 show increments in the selected indicators as a percentage of total assets of the banking system. In the boom period, the growth in bank activity was the highest in Montenegro. Both a large yearly increase in bank wholesale funding of 15 percent of the balance sheet (predominantly foreign financial inflows documented in Figure 35) and an even larger yearly increase in retail funding (33 percent of the balance sheet) resulted in a considerably more pronounced growth of loans to firms and households as in Slovenia and Croatia. In Slovenia wholesale funding (foreign bank credits) resulted in an almost equal increase in loans to firms and a far lower increase in loans to households. In Croatia, wholesale funding of banks was less intensive (see also much smaller foreign financial inflows in Figure 35), and such was also the increase in loans.

After the bust period, wholesale funding turned in reverse. In Montenegro and Slovenia, a drop in wholesale funding of banks (see foreign financial outflows from banks in Figures 37) systematically cut bank credit potential in the bust and recovery periods by around 5 percent of the balance sheet per year; the effect was especially strong in the recovery period. Croatia faced almost no visible change in wholesale funding after the crisis started. The dynamics of loans to households became negligible in all three countries, while loans to firms dropped considerably in Montenegro and in the recovery period also in Slovenia (in both countries the dynamics of decreasing overshoot 7 percent of balance sheet per year). In Croatia loans to firms did not start to contract until 2012 and even then, the contraction was less intensive. Sudden and strong deceleration of loans (and net foreign financial outflows) in the bust period considerably squeezed deposits in Montenegro (by 5 percent of the balance sheet). In Slovenia and Croatia deposits dropped less than in Montenegro, and only in the recovery period (after 2011).

Based on the presented macroeconomic empirical evidence, several stylized facts could be derived. In the observed period, economic activity was synchronized between the analyzed countries, although the amplitudes of swings differed. Economic activity was also synchronized with swings in the current account and net foreign financial flows, more for flows through debt and other investment instruments than for flows through direct investments and equity instruments; country differences in amplitude were again not negligible. However, for the banking amplification of foreign shocks, swings in the bank wholesale and retail funding were crucial and, therefore, swings in gross (and not net) foreign financial inflows are important. However, swings in gross inflows were several times larger than swings in net inflows; moreover, gross inflows through debt and other investments had incomparably larger amplitude than inflows through direct investments and equity instruments. So, gross inflows through debt and other investment instruments were a crucial factor in bank loans and deposit volatility in all three countries. The difference between the countries was only in the size of endogenous amplification of the above-mentioned exogenous shocks (direct and indirect foreign financial flows) to the banking sector and real economy.

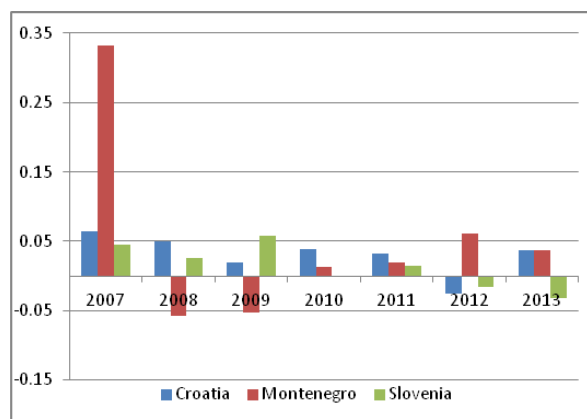
Figure 42: Increment of loans to households (percentage of total assets of the banking system)



Source: BS (no date), CBCG (no date), HBN (no date), own work.

Note: Data are presented as increments (value in year t less value in year t-1) as a percentage of the balance sheet sum (in year t).

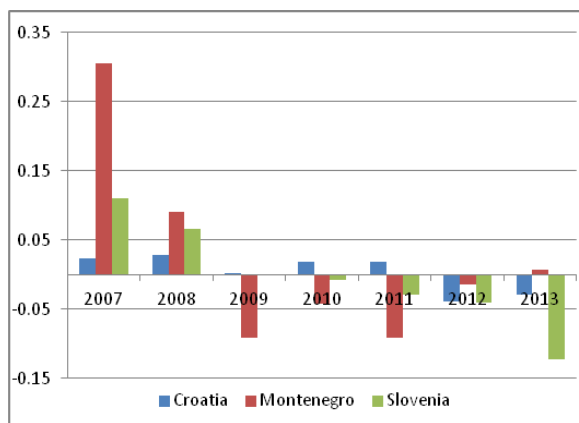
Figure 44: Increment of deposits of the non-financial sector (percentage of total assets of the banking system)



Source: BS (no date), CBCG (no date), HBN (no date), own work.

Note: Data are presented as increments (value in year t less value in year t-1) as a percentage of the balance sheet sum (in year t); deposits of the non-financial sector include deposits of households, firms (non-financial corporations), and government.

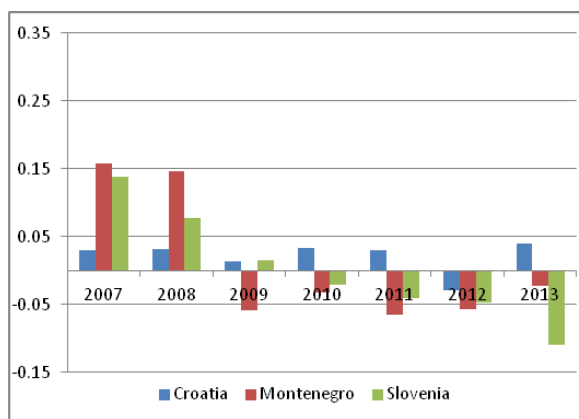
Figure 43: Increment of loans to non-financial corporations (percentage of total assets of the banking system)



Source: BS (no date), CBCG (no date), HBN (no date), own work.

Note: Data are presented as increments (value in year t less value in year t-1) as a percentage of the balance sheet sum (in year t).

Figure 45: Increment of wholesale funding (percentage of total assets of the banking sector)



Source: BS (no date), CBCG (no date), HBN (no date), own work.

Note: Data are presented as increments (value in year t less value in year t-1) as a percentage of the balance sheet sum (in year t); wholesale funding is defined as total liabilities less deposits of the non-financial sector (households, non-financial corporations, and government) and capital.

### 3.3 The credit model of the open economy

This section is devoted to the credit model of the open economy. The model covers three main sectors of interest, banking, household, and non-financial corporations' sector, and allows to separate demand- and supply-side effects on credit supply to households and firms. The model by Prašnikar, Bole, Dominko, Lakićević, and Oblak (2021) is reproduced below:

In an open economy, there are three sectors, namely, banking, household, and business sectors. Credits are extended and redeemed at the end of fixed time intervals (periods). One credit extension-redemption cycle consists of the following phases. At the end of the period (t-1), the banking sector extends credits using retail sources (deposits of the business and household sectors), as well as wholesale sources (credits of the central bank and external loans) available at that time. Extended credits generate deposits of the household and business sectors. In the studied period (t), those deposits could change in structure and size, depending on the economic activity and the current account developments. At the end of the studied period (t), the household and business sectors repay credits using available deposits. When deposits are too low, the unredeemed parts of the credits are revolved (increased credits demanded for the following period); if deposits are larger than the credits due, credits are redeemed in full and the credits demanded for the following period are smaller by the difference (between deposits and credits due). Immediately after credit redemption, banks extend new credits, taking into account the available (retail and wholesale) sources and the credit demand for the next period.

We assume that the demand for credits depends on the interest rate and the expected economic activity, in both cases with constant elasticity. The banking sector maximizes its profit by choosing lending interest rates separately for credits in both the household and business sectors, given the funding constraint balance.

Let us suppose that  $K$  denotes credits,  $D$  deposits,  $Y$  economic activity,  $F$  wholesale financing, and  $r$  the interest rate. Credit demand elasticity on economic activity and interest rate is denoted by parameters  $\beta$  and  $\alpha$ ,  $\kappa$  is the scale parameter,  $\sigma$  the share of household sector deposits, and  $\mu$  the money multiplier. For all variables and parameters, subscripts  $b$  and  $h$  are used to denote business and household sectors, respectively.

We assume that lending interest rate  $R_a$  is given by

$$R_a = R_l + r,$$

where  $R_a$  denotes the lending interest rate,  $r$  the interest margin, and  $R_l$  the bank funding rate. In a small open economy, the costs of bank funding ( $R_l$ ) are determined by interest rates on the world markets, so we will assume (to make computation simpler) that both the deposit rate and the external funding rate are the same.

The model encompasses four relationships, namely, the relationships (1) and (2) present the demand for household and business credits, (3) shows the supply (funding) constraint of the banking sector, and (4) shows (the maximization of) the profit goal function of the banking sector. To make the presentation less cumbersome, we assume in what follows that  $R_i$  is equal to zero.<sup>20</sup>

$$\left( K_{h,t-1} - \sigma(Y_t)D_t(Y_t) + \kappa_h Y_{t+1}^e \beta_h \right) (1 + r_{h,t} + R_{l,t})^{\alpha_h} = K_{h,t}, \quad (1)$$

$$\left( K_{b,t-1} - (1 - \sigma(Y_t))D_t(Y_t) + \kappa_b Y_{t+1}^e \beta_b \right) (1 + r_{b,t} + R_{l,t})^{\alpha_b} = K_{b,t}, \quad (2)$$

$$K_{h,t} + K_{b,t} \leq D_t(Y_t) + \mu F_t(Y_{t+1}^e), \quad (3)$$

$$\max(r_{h,t} + R_{l,t})K_{h,t} + (r_{b,t} + R_{l,t})K_{b,t} - R_{l,t}D_t - R_{l,t}\mu F_t, \quad (4)$$

where  $\sigma > 0$ ;  $1 - \sigma > 0$ ;  $\alpha_h \leq -1$ ;  $\alpha_b \leq -1$ ;  $\beta_h > 0$ ;  $\beta_b > 0$ .

Because of the nonlinearity of the system, both credit variables ( $K_{h,t}$  and  $K_{b,t}$ ) could not be solved from the system as an explicit function of  $Y_t$ ,  $Y_{t+1}^e$ ,  $D_t(Y_t)$ , and  $F_t$  for general values  $\alpha_h$  and  $\alpha_b$ . Linearized functions had to be constructed and solved. Still, it is possible to get the explicit and exact (not only linearized) form of the marginal effects of the impacts of wholesale ( $F_t$ ) and retail ( $D_t$ ) channels and to disentangle supply and demand-side factors for both credit components. The same pertains to the actual and expected impacts of economic activity. To get these effects, it is necessary to perform an optimization (to get interest rates) and then to calculate the corresponding marginal effects. The procedure is described in what follows.

Taking into account the constraint maximization of the goal function of the banking sector, the authors construct

$$\mathcal{L} = r_{h,t}K_{h,t} + r_{b,t}K_{b,t} + \lambda(K_{h,t} + K_{b,t} - D_t - \mu F_t)$$

and solve

$$\frac{\partial \mathcal{L}}{\partial r_{h,t}} = 0,$$

$$\frac{\partial \mathcal{L}}{\partial r_{b,t}} = 0.$$

That gives

---

<sup>20</sup> It is trivial to check that in the case  $R_i \neq 0$ , in relations (8)–(15) only  $r_t$  has to be replaced by  $r_t + R_i$ , while relations (4)–(7) do not change at all.

$$K_{h,t} + \frac{r_{h,t}\alpha_h}{1+r_{h,t}}K_{h,t} + \lambda \left( \frac{\alpha_h}{1+r_{h,t}}K_{h,t} \right) = 0,$$

$$K_{b,t} + \frac{r_{b,t}\alpha_b}{1+r_{b,t}}K_{b,t} + \lambda \left( \frac{\alpha_b}{1+r_{b,t}}K_{b,t} \right) = 0,$$

and

$$\lambda(K_{h,t} + K_{b,t} - D_t - \mu F_t) = 0.$$

The last relation is the Kuhn-Tucker condition, which takes place because the funding constraint is an inequality.

If credit dynamics are driven only by demand factors, the inequality (3) is strict and  $\lambda = 0$  (from the Kuhn-Tucker condition). The corresponding (equilibrium) credit trajectory is therefore given as:

$$K_{h,t} = \left( \frac{\alpha_h}{1+\alpha_h} \right)^{\alpha_h} \left( K_{h,t-1} - \sigma D_t + \kappa_h Y_{t+1}^e \beta_h \right), \quad (4)$$

$$K_{b,t} = \left( \frac{\alpha_b}{1+\alpha_b} \right)^{\alpha_b} \left( K_{b,t-1} - (1 - \sigma) D_t + \kappa_b Y_{t+1}^e \beta_b \right). \quad (5)$$

Calculating the marginal effects of wholesale funding and deposits, we get:

$$\frac{\partial K_{h,t}}{\partial F_t} = 0, \quad \frac{\partial K_{h,t}}{\partial D_t} = -\sigma \left( \frac{\alpha_h}{1+\alpha_h} \right)^{\alpha_h}, \quad (6)$$

$$\frac{\partial K_{b,t}}{\partial F_t} = 0, \quad \frac{\partial K_{b,t}}{\partial D_t} = -(1 - \sigma) \left( \frac{\alpha_b}{1+\alpha_b} \right)^{\alpha_b}. \quad (7)$$

When banking intermediation operates in a demand (unconstrained funding) mood, the marginal effects of wholesale funding are zero, and the marginal effects of deposits are negative, which corresponds to the demand effects. It follows that in the empirical estimation, the insignificant coefficient of the wholesale funding channel and/or the (significant) negative coefficient of the retail channel are the appropriate indicators that credits are driven by demand factors only.

Whenever relation (3) is tight (when demand and supply factors are active which corresponds to the described situation of three Balkan countries in the Great Recession), the Lagrange multiplier  $\lambda$  is free, so it follows that:

$$\frac{1+r_{h,t}}{\alpha_h} + r_{h,t} = \frac{1+r_{b,t}}{\alpha_b} + r_{b,t}. \quad (8)$$

Substituting (1) and (2) in (8) and taking logs gives:



$$\frac{1}{\alpha_h} \log K_{h,t} - \frac{1}{\alpha_h} \log(K_{h,t-1} - \sigma D_t + \kappa_h Y_{t+1}^e \beta_h) = \frac{1}{\alpha_b} \log K_{b,t} - \frac{1}{\alpha_b} \log(K_{b,t-1} - (1 - \sigma)D_t + \kappa_b Y_{t+1}^e \beta_b) + \log \frac{(1+\alpha_b)\alpha_h}{(1+\alpha_h)\alpha_b} \quad (9)$$

Taking the derivatives of (9) and (3) on F, gives the system of equations (10) and (11)

$$\frac{1}{\alpha_h} \frac{1}{K_{h,t}} \frac{\partial K_{h,t}}{\partial F_t} = \frac{1}{\alpha_b} \frac{1}{K_{b,t}} \frac{\partial K_{b,t}}{\partial F_t}, \quad (10)$$

$$\frac{\partial K_{h,t}}{\partial F_t} + \frac{\partial K_{b,t}}{\partial F_t} = \mu. \quad (11)$$

After solving the system, the impact of wholesale financing on credits is as follows:

$$\frac{\partial K_{b,t}}{\partial F_t} = \frac{\mu \alpha_b K_{b,t}}{\alpha_b K_{b,t} + \alpha_h K_{h,t}}, \quad (12)$$

$$\frac{\partial K_{h,t}}{\partial F_t} = \frac{\mu \alpha_h K_{h,t}}{\alpha_b K_{b,t} + \alpha_h K_{h,t}}.$$

Obviously, the size of the impact on (business-relative-to-household) credits depends on the interest rate elasticity of credit demand and, especially, the structure of the credits. Equation (12) shows that in an economy where credits to the business sector (or increments) are larger than credits to the household sector, the impact of wholesale financing could be larger (with the same differences in elasticities). However, differences in interest rate elasticities of credit demand have just the opposite effect,<sup>21</sup> so that actual impact of wholesale financing on firm credits versus the impact on household credits could not be deduced simply by observing only the credit structure, that is without taking into account (modeling) also interest rate structure. Moreover, taking into account equation (1), namely the impact of the current account changes on deposits D and consequently on credit demand, relationship (12) documents a falling impact of the wholesale channel financing in the case of current account improvement.

Taking the derivatives of (9) and (3) on D<sub>t</sub> gives the size and structure of the impact of retail (deposit) channel financing on business and household sector credits:

$$\frac{\partial K_{b,t}}{\partial D_t} = \frac{\alpha_b K_{b,t}}{\alpha_b K_{b,t} + \alpha_h K_{h,t}} + \frac{\sigma(1+r_{h,t})^{\alpha_h} \alpha_b K_{b,t} - (1-\sigma)(1+r_{b,t})^{\alpha_b} \alpha_h K_{h,t}}{\alpha_b K_{b,t} + \alpha_h K_{h,t}}, \quad (13)$$

$$\frac{\partial K_{h,t}}{\partial D_t} = \frac{\alpha_h K_{h,t}}{\alpha_b K_{b,t} + \alpha_h K_{h,t}} + \frac{(1-\sigma)(1+r_{b,t})^{\alpha_b} \alpha_h K_{h,t} - \sigma(1+r_{h,t})^{\alpha_h} \alpha_b K_{b,t}}{\alpha_b K_{b,t} + \alpha_h K_{h,t}}.$$

Comparing the effects on household and business sector credits, it has to be underlined that it is also in the case of retail channel effects that the most important drivers of the difference are interest rate elasticities and the structure of credits since the second item in both relationships

<sup>21</sup> Interest rate elasticity of household credit demand could differ a lot from interest rate elasticity of firm credit demand – could be even much higher, especially for longer term credits. See, for example, Kakes and Sturm (2002) or Hense (2015) from that for firm credits.

(13) is the difference between two similar factors, which are probably small in comparison with the first item if shares of deposits do not differ a lot among the business and the household sector ( $\sigma$  is approximately 0.5).

The retail channel impact on credits could be given in terms of the wholesale impacts as follows:

$$\frac{\partial K_{b,t}}{\partial D_t} = \frac{1}{\mu} \left\{ \frac{\partial K_{b,t}}{\partial F_t} + \left[ \sigma(1 + r_{h,t})^{\alpha_h} \frac{\partial K_{b,t}}{\partial F_t} - (1 - \sigma)(1 + r_{b,t})^{\alpha_b} \frac{\partial K_{h,t}}{\partial F_t} \right] \right\}, \quad (14)$$

$$\frac{\partial K_{h,t}}{\partial D_t} = \frac{1}{\mu} \left\{ \frac{\partial K_{h,t}}{\partial F_t} + \left[ (1 - \sigma)(1 + r_{b,t})^{\alpha_b} \frac{\partial K_{h,t}}{\partial F_t} - \sigma(1 + r_{h,t})^{\alpha_h} \frac{\partial K_{b,t}}{\partial F_t} \right] \right\}.$$

These relationships show very transparently that some important determinants of the relative size of the retail channel impact are the same as those of the relative size of the wholesale channel (interest elasticities and the structure of the credits), especially if the shares of deposits do not differ a lot between both sectors. In addition, relationship (14) reveals the drivers of the difference between wholesale and retail channel impacts. Because variable  $F_t$  affects only the supply of funds (relation (3)), both marginal effects in (12) present theoretical exact values of the wholesale channel supply-side effects, which figure as coefficients in variable  $F_t$  in the corresponding (linearized and estimated) empirical model. The deposit variable affects the demand and supply of credits (see relations (1), (2), and (3)), so a straightforward interpretation of deposit marginal effects is not possible. However, relation (14) enables the theoretical disentangling of the role of deposits (demand or supply) in the estimated model. After rearranging relations in (14), it follows that:

$$\frac{\partial K_{b,t}}{\partial D_t} = \frac{1}{\mu} \left\{ \frac{\partial K_{b,t}}{\partial F_t} + (1 + r_{h,t})^{\alpha_h} \frac{\partial K_{b,t}}{\partial F_t} - (1 - \sigma) \left[ (1 + r_{h,t})^{\alpha_h} \frac{\partial K_{b,t}}{\partial F_t} + (1 + r_{b,t})^{\alpha_b} \frac{\partial K_{h,t}}{\partial F_t} \right] \right\},$$

$$\frac{\partial K_{h,t}}{\partial D_t} = \frac{1}{\mu} \left\{ \frac{\partial K_{h,t}}{\partial F_t} + (1 + r_{b,t})^{\alpha_b} \frac{\partial K_{h,t}}{\partial F_t} - \sigma \left[ (1 + r_{b,t})^{\alpha_b} \frac{\partial K_{h,t}}{\partial F_t} + (1 + r_{h,t})^{\alpha_h} \frac{\partial K_{b,t}}{\partial F_t} \right] \right\}. \quad (15)$$

The marginal effects of deposits on credits can be separated into three effects. The first (positive) is a supply-factor effect, the second (positive) is also a supply-side effect but rescaled by credit rationing intensity, and the third (negative) is a demand-factor effect rescaled by the size of supply-factor effects. For the given structure of deposits, it is possible to calculate, from the estimated coefficients of the empirical model, all three effects separately. For the given  $D_t$  and  $F_t$ , the expected economic activity affects only credit demand, therefore, the corresponding marginal credit effects present demand factor effects. In the empirical model, GDP growth takes on the role of the expected economic activity, presenting demand factor effects.

By a trivial procedure,<sup>22</sup> systems (1), (2), (3), and (8) could, be linearized and solved for

$$\frac{K_{h,t} - K_{h,t-1}}{bil_{t-1}} \text{ and } \frac{K_{b,t} - K_{b,t-1}}{bil_{t-1}} \text{ as a function of } \frac{F_t - F_{t-1}}{bil_{t-1}}, \frac{Y_t - Y_{t-1}}{bil_{t-1}} \text{ and } \frac{D_t - D_{t-1}}{bil_{t-1}}$$

where  $bil_{t-1}$  is the bank balance sheet in the previous period (that is  $bil_{t-1} = K_{h,t-1} + K_{b,t-1}$ ). The corresponding equations are presented as (16) and (17) in Section 3.4.3.

It needs to be emphasized that the priority here is the considerable information available not only on the linearized but also on the exact values of the coefficients  $\beta_2$ ,  $\beta_3$  and  $\beta_5$  in equations (16) and (17). Equation (12) makes it evident that the exact value of the marginal wholesale financing effects on credits, figuring in our empirical equations (16) and (17), has the same form (that is, (8)) because both differentials ( $\partial K$  and  $\partial F$ ) are divided by the same quantity, namely the balance sheet ( $K_{h,t-1} + K_{b,t-1}$ ). The same pertains to the marginal retail financing effects. From equations (13) (or (14)), it follows that the exact form of the marginal effect on credits in our empirical equations (16 and 17) is again identical to the values presented in (13) (or (14)) because both differentials,  $\partial K$  and  $\partial D$ , are normalized by the same quantity, namely, the balance sheet ( $K_{h,t-1} + K_{b,t-1}$ ).

While the same propositions could be made about the marginal effect of economic activity expectations, the corresponding theoretical effects are not presented since they would not be relevant to our operational model. Because of the insufficient degree of freedom in our empirical equations (16) and (17) (economic activity has the same value for all banks in the same country), we have not been able to separate the marginal effects of the expected  $Y_{t+1}^e$  and the actual  $Y_t$  of economic activity; in empirical equations (16) and (17), both effects are merged.

### 3.4 Empirical analysis

#### 3.4.1 Data

The database covers 55 banks from Croatia, Montenegro, and Slovenia. In 2010, it encompasses 30 out of 33 banks in Croatia, 8 out of 11 banks in Montenegro, and 17 out of 22 banks in Slovenia, and accounts for more than 85 percent of the total assets of each banking sector. Foreign-owned banks represent 50 percent of the total number of banks included in the research in Croatia, 75 percent in Montenegro, and 41 percent in Slovenia. The panel is unbalanced and covers the period from 2007 to 2013. Within this period, three distinct phases of the business cycle are identified, namely, boom period (2007–2008), bust period (2009–2010), and recovery period (2011–2013).

---

<sup>22</sup> The procedure has three steps; first, equations (1) to (3) are divided by  $K_{h(-1)} + K_{b(-1)}$ , and (1) and (2) are logarithmized; second, (1), (2), and (3) are expanded in Taylor series (keeping only linear terms) of the (possible lagged) variables  $(K_{h,t} - K_{h,t-1})/Bil_{t-1}$ ,  $(K_{b,t} - K_{b,t-1})/Bil_{t-1}$ ,  $(F_t - F_{t-1})/Bil_{t-1}$ ,  $(Y_t - Y_{t-1})/Y_{t-1}$ ,  $(Y_{t+1}^e - Y_t)/Y_t$  and  $(D_t - D_{t-1})/Bil_{t-1}$ ; and third, linearized systems (1) to (4) are solved for  $(K_{h,t} - K_{h,t-1})/Bil_{t-1}$ ,  $(K_{b,t} - K_{b,t-1})/Bil_{t-1}$ .

The main source of data was the Bankscope database, which was augmented with hand-collected data from the banks' annual reports. Due to missing data or the inability to obtain annual reports from the Bankscope database, 11 banks were not included in the database. The balance sheet data for Montenegrin banks were reported under local GAAP accounting standards in the period 2006–2012 and under IFRS accounting standards in 2013. Since the banks reported their balance sheet data under both standards in 2012, correction factors were used to account for differences between local GAAP and IFRS accounting standards. Being foreign owned, some Montenegrin banks reported in compliance with IFRS in the observed period from 2006 to 2013. For these banks, financial statements reported under IFRS were used.

Instrumental variables used in the model estimation come from different sources. Real estate prices and data on FDI inflows are taken from official statistics of the International Monetary Fund (IMF), the Croatian National Bank (CNB), the Central Bank of Montenegro (CBCG), and the Bank of Slovenia (BS). Data on the number of employees, the number of branches, and the number of ATMs were collected from the bank's annual reports and/or websites. In Montenegro, banks in some countries in our sample switched accounting standards from local GAAP to IFRS (International Financial Reporting Standards) in 2005. As a result, for such banks, the balance sheet data are reported under two accounting standards – local GAAP before 2005 and IFRS after 2005. To account for this change in accounting standards, we include time effects in our model.

The model specification also includes factors extracted by factor analysis from the set of policy indicators. Factors are separately extracted from all three sets of policy indicators. Because indicators of standard macroeconomic policy measures are continuous, but indicators of the structural actions of policymakers and indicators of macroprudential policy are categorical (discrete), standard factor analysis cannot be applied. We therefore calculated a polychoric correlation matrix and applied factor analysis to the generalized correlation matrix.<sup>23</sup> Because the first eigenvalues in the two sets of policy measures (standard macro and structural) are much larger than the rest of the eigenvalues and the only ones greater than 1, we extracted from these sets of policy indicators only the first factor for each policy. They are denoted as *fac\_pol\_struk* and *fac\_macro*. Because the first two eigenvalues are much larger than the rest of the eigenvalues and also the only ones larger than 1 in the set of macroprudential policy measures, we extracted from this set of indicators the two factors denoted by *fac\_prudential1* and *fac\_prudential2*.

---

<sup>23</sup> See, Bartholomew (1980) and J. Ekström (2011) [A generalized definition of the polychoric correlation coefficient](#) for theoretical explanation, and S. Kolenikov, 'Polychoric, by any other 'namelist'', [https://www.stata.com/meeting/chicago16/slides/chicago16\\_kolenikov.pdf](https://www.stata.com/meeting/chicago16/slides/chicago16_kolenikov.pdf), 2016 for code source.

In Table 7, the list of variables is given. In the second column of Table 7, the notation used to denote a particular variable in the estimated equations (see equation (16) and (17)) are given, and in the third column the variables are described.

*Table 7: Definition of variables and calculation of the variables*

Variable used	Notation in the estimated eq.	Description of the variable
Bank loans to households	<i>dloans_to_househ_bil</i>	The yearly change in bank loans to households per unit of the total balance sheet
Bank loans to firms	<i>dloans_to_firms_bil</i>	The yearly change in bank loans to firms per unit of the total balance sheet
Correction factor	<i>b_n1, b_n2</i>	Correction factor to account for differences between banks in the definition of some balance sheet items
Wholesale funding	<i>dbank_fin_bil</i>	The yearly change in due to banks and money market and short-term funding per unit of the total balance sheet
Retail funding	<i>ddeposits_bil</i>	The yearly change in total deposits per unit of the total balance sheet
Impairment cost	<i>cost_impar_bil_1</i>	The lagged yearly costs of impairment per unit of the total balance sheet
Nominal GDP	<i>g_ngdp</i>	The yearly growth rate of nominal GDP
Structural policy variable	<i>fac_pol_struk</i>	Factor extracted from a set of structural policy indicators
Standard macroeconomic policy variable	<i>fac_macro</i>	Factor extracted from a set of standard macroeconomic policy indicators
Macroprudential policy variable 1	<i>fac_prudential1</i>	The lagged value of the first factor extracted from a set of macroprudential policy indicators
Macroprudential policy variable 2	<i>fac_prudential2</i>	The lagged value of the second factor extracted from a set of macroprudential policy indicators
Size of a bank	<i>size</i>	The dummy variable for the size of a bank
A foreign-owned bank	<i>fmo</i>	The dummy variable for the foreign ownership of a bank has a value of one if an observation has a foreign owner, otherwise zero

*Source: own work.*

### 3.4.2 Descriptive statistics

In Table 3, we present mean values of the selected variables in the boom period (2007–2008), bust period (2009–2010) and recovery period (2011–2013) by country. Bank loans to households, bank loans to firms, wholesale funding, and retail funding are documented as the yearly difference per unit of the balance sheet sum. Impairment cost are given per unit of the balance sheet sum. The yearly growth rate of nominal GDP is also given.

Table 8: Mean of selected variables by period and country

	Croatia			Montenegro			Slovenia		
	boom	bust	recovery	boom	bust	recovery	boom	bust	recovery
	2007-2008	2009-2010	2011-2013	2007-2008	2009-2010	2011-2013	2007-2008	2009-2010	2011-2013
N	60	64	88	18	16	27	34	34	51
Share of banks with a foreign parent	0.500	0.469	0.477	0.778	0.750	0.778	0.412	0.412	0.412
Bank loans to households	0.042	0.002	0.006	0.123	-0.019	-0.001	0.039	0.019	0.002
Bank loans to firms	0.048	0.036	0.016	0.189	-0.012	-0.038	0.117	-0.002	-0.015
Impairment cost	0.003	0.009	0.010	0.018	0.032	0.025	0.004	0.010	0.043
Wholesale funding	0.006	0.009	0.001	0.108	0.003	-0.036	0.075	-0.007	-0.052
Retail funding	0.058	0.040	0.035	0.098	0.043	0.049	0.061	0.040	-0.007
Nominal GDP	0.087	-0.028	0.002	0.199	0.007	0.025	0.097	-0.022	-0.003

Source: own work.

Note: Bank loans to households, bank loans to firms, wholesale funding, and retail funding are documented as the yearly difference per unit of the balance sheet sum; impairment cost are in units of the balance sheet sum and nominal GDP in growth rates; boom (2007–2008); bust (2009–2010); recovery (2011–2013).

The sample contains the data for 30 banks located in Croatia, 8 in Montenegro and 17 banks in Slovenia. This accounts for more than 85 percent of the total assets of each banking sector in 2010. Banks in the sample are also classified based on having or not having a foreign parent. In Slovenia approximately 40 percent of banks in the sample are foreign owned, around 50 in Croatia, and around 75 in Montenegro.

Increments in bank loans to households and firms were the highest in the boom period (2007–2008) in all three countries. Montenegrin banks on average increased their loans to households by 12.3 percent of the total balance sheet sum, Croatian by 4.2 and Slovenian by 3.9 percent. Loans to firms grew at a considerably higher rate, especially in Montenegro and Slovenia, at 18.9 percent and 11.7 percent, respectively, but at a more conservative rate of 4.8 percent in Croatia. The bust and recovery periods were noted for a collapse in bank lending to firms (-1.2 percent in the bust period and -3.8 percent in the recovery period) as well as households (-1.9 percent in the bust period) in Montenegro. In Slovenia banks reduced their lending only to firms by 0.2 percent on average in the bust period and by 1.5 percent in the recovery period but not to households.<sup>24</sup> The increment in bank loans to households was 1.9 percent in the bust period and close to zero in the recovery. A yearly change in loans to households and firms alike remained positive in Croatia in the bust and recovery period but a noticeable deceleration was evident after the crisis. Loans to households attained negligible growth in the aforementioned periods, while loans to firms grew at 3.6 percent in the bust and 1.6 percent in the recovery period.

The average yearly difference in wholesale funding per unit of balance sheet sum was positive and less than 1 percent throughout the whole observed period (2007–2013) in Croatia. Wholesale funding was a substantially more important source of funds for an average bank in Montenegro and Slovenia. In the boom period, an average increase in wholesale funding per unit of balance sheet sum accounted for 10.8 percent and 7.5 percent in Montenegro and Slovenia, respectively. In the bust period, the increment was positive and minor at 0.3 percent in Montenegro. It even turned negative (-0.7 percent) in Slovenia. In the recovery period, Slovenian and Montenegrin banks encountered a drain in wholesale funds, Slovenian banks on average by 5.2 percent and Montenegrin banks by 3.6 percent.

Increases in retail funding were relatively high at 9.8 percent in Montenegro, 6.1 in Slovenia, and 5.8 percent in Croatia, on average, in all three countries in the boom period. Increments in retail funding decreased to a lower level and stabilized at around 4–5 percent in Croatian and Montenegrin banks. In Slovenia, the average yearly difference in retail funding first dropped to 4 percent in the bust period and even turned negative in the recovery.

---

<sup>24</sup> It should be noted that a median bank in Slovenia decreased credit to firms by more than the average, namely, by 1.7 percent in the bust, and even more so in the recovery period by 4.7 percent compared to an average of 1.5 percent.

As evident, impairment cost stayed relatively low in Croatia throughout the observed period. On average, impairment cost accounted for 0.3–1.0 percent of total assets. Impairment cost was at a similar level in the boom period and bust period in Slovenia (0.4 percent and 1.0 percent, respectively). In the recovery period there was an upsurge in impairment cost to 4.3 percent of total assets. Montenegrin banks had a higher percentage of impairment, namely, 1.8 percent in the boom period, 3.2 percent in the bust period and 2.5 percent in the recovery period. In the short term, impairment cost could be understood as the main driver of the changes in the capitalization of the banks.

Growth of nominal GDP stood at 8.7 percent in the boom period in Croatia, 19.9 percent in Montenegro and 9.7 percent in Slovenia. In the bust period growth rate of nominal GDP was negative in Croatia (-2.8 percent) and Slovenia (-2.2 percent) but not in Montenegro (0.7 percent). In the recovery period, nominal GDP decreased by 0.3 percent in Slovenia, increased by 0.2 percent in Croatia and even 2.5 percent in Montenegro.

### 3.4.3 Empirical specification

The empirical specification of the model follows our study, namely, Prašnikar, Bole, Dominko, Lakićević, and Oblak (2021). The operational model, which makes it possible to study the aforementioned specificities of the three observed countries during the Great Recession, is shown in equations (16) and (17). Besides supply and demand factors, the model accounts for the role of policy and regulation specificities in bank credit supply to households and firms. The key for this division is the credit model presented in Section 3.3. Two funding variables (wholesale funding and retail funding) represent supply factors, and the growth of nominal GDP demonstrates demand factors. The costs of impairment,<sup>25</sup> the dummy variable for foreign ownership, and the size dummy in the operational model are additionally considered as supply factors. Because of the large set of instruments taken into account, macroprudential policy interventions, standard macroeconomic policy interventions, and structural policies are represented by “amalgam” variables.

$$dloans\_to\_househ\_bil = \gamma_1 b_{n1} + \gamma_2 dbank\_fin\_bil + \gamma_3 ddeposits\_bil + \gamma_4 cost\_impar\_bil\_1 + \gamma_5 g\_ngdp + \gamma_6 fac\_prudent1\_1 + \gamma_7 fac\_prudent2\_1 + \gamma_8 fac\_pol\_struc\_1 + \gamma_9 fac\_macrost\_1 + \gamma_{10} fmo + \gamma_{11} size + const + \varepsilon \quad (16)$$

$$dloans\_to\_firms\_bil = \delta_{11} b_{n1} + \delta_{12} b_{n2} + \delta_2 dbank\_fin\_bil + \delta_3 ddeposits\_bil + \delta_4 cost\_impar\_bil\_1 + \delta_5 g\_ngdp + \delta_6 fac\_prudent1\_1 + \delta_7 fac\_prudent2\_1 + \delta_8 fac\_pol\_struc\_1 + \delta_9 fac\_macrost\_1 + \delta_{10} fmo + \delta_{11} size + const + \varepsilon \quad (17)$$

where *const* is the intercept and  $\varepsilon$  is the error term. For details, see Table 7.

---

<sup>25</sup> In short periods as is the case in our study, changes in capital adequacy are highly dependent on impairment of loans and to a limited degree on increases or decreases in capital. Thus, the cost of impairment (at least in part) reflects the dynamics of bank capitalization. Changes in bank capitalization at a country level are captured also by our analysis of macroprudential policy interventions.



Studies by Gertler and Kiyotaki (2011) and Gertler, Kiyotaki, and Prespitino (2016) represent a starting point in the construction of the hypothesis H19. The authors model demand-side financial frictions simultaneously with the supply-side frictions and assign a key role to the upsurge and collapse of the wholesale market. Considering the analyzed Balkan countries (especially Montenegro and Slovenia), the pre-crisis period was noted for a lack of retail funds (see Section 3.2) compensated for with high inflows of foreign capital into deposit-taking corporations (see Section 3.2). Studies by Hoffman and Schnabl (2016) and Hunya (2009) also provide evidence on the increases in the (foreign) wholesale funding in the boom period in the Balkan countries and a corresponding sudden stop.<sup>26</sup> Theoretically, hypotheses H19 and H20 are backed by the credit model in Prašnikar, Bole, Dominko, Lakićević, and Oblak (2021). See equation (12) and equation (13).

H19. The funding variables were the key drivers of credit supply to households throughout the Great Recession in the three observed countries.

H20. The funding variables were the key drivers of credit supply to firms throughout the Great Recession in the three observed countries.

Following a funding liquidity shock, banks must adjust their assets immediately in terms of size and risk (de Haan, van den End, & Vermeulen, 2017). Since corporate loans usually have shorter maturity and a higher risk profile relative to household loans, adjustment of corporate lending takes place. Further, Huang and Ratnovski (2011) state that, at the refinancing stage, wholesale financiers could suddenly withdraw their funds given a mere hint of negative news, which could, certainly, diminish the credit activity of banks. Hypothesis H21 is also pinned down by our credit model. See equation (12).<sup>27</sup> It follows:

H21. The wholesale funding of banks was more important for credit supply to firms than for credit supply to households.

Studies by de Haan, van den End, and Vermeulen (2017), Jung and Kim (2015), Baskaya, di Giovanni, Kalemli-Özcan, Peydró, and Ulu (2017), and Ivashina and Scharfstein (2010) also found that size and ownership are relevant for credit supply. Foreign-owned banks represent a high share of all banks in the selected countries, namely, 50 percent in Croatia, 75 percent in Montenegro, and 41 percent in Slovenia. A dummy variable for foreign ownership accounts for the effects of foreign ownership not accounted for by the wholesale funding variable.

---

<sup>26</sup> Wholesale funding variable also (in part) tackles the relationship between parent banks in the core Europe and their daughter banks in the Balkan countries. It includes borrowings from a related party (e. g. parent bank). It should, though, be noted that it does not include only borrowings from related parties and thus conclusions on the role of parent banks through the wholesale funding variable can not be made.

<sup>27</sup> In particular, taking the ratio of business credits to all credits as 0.61, as was the case in our observed countries in the period between 2006 and 2013, the ratio of deposits made by households to all deposits in banks as 0.68, and the ratio of interest rate elasticities of credits to firms to interest rate elasticities of credits to households around 0.70, as in Hense (2015), it is shown that wholesale funding is more important for credits given to firms than credits given to households.

H22. Size had a significant effect on the credit supply to firms and households in the three observed countries throughout the Great Recession.

H23. Ownership had a significant effect on the credit supply to firms and households in the three observed countries throughout the Great Recession.

### 3.4.4 Determinants of credit supply to firms and households

In this section, the empirical results are presented for the credits-to-households equation (16) and the credits-to-firms equation (17). The model estimated the contributions of demand, wholesale and retail funding, policy interventions, and impairment cost to credit supply to households and firms in the boom, bust, and recovery phase of the Great Recession are also given. In the study by Prašnikar, Bole, Dominko, Lakićević, and Oblak (2021), we use the panel estimation for the entire period to determine the most persistent effects of the funding channels throughout the whole episode.<sup>28</sup> The equations are estimated with instruments (2GSLs) for key explanatory variables, retail and wholesale bank funding, and impairment costs. The models are of acceptable statistical quality. Sargan-Hansen and Anderson-Rubin statistics also confirm the quality of the instruments used.

*Table 9: Results of the 2GSLs estimation of loans to households and loans to firms*

Variable		Loans to households (Eq.16)		Loans to firms (Eq. 17)
Wholesale funding	$\gamma_2$	0.153** (0.070)	$\delta_2$	0.908*** (0.127)
Retail (deposit) funding	$\gamma_3$	0.042 (0.065)	$\delta_3$	0.363*** (0.120)
Cost of impairment (lag)	$\gamma_4$	-0.469* (0.254)	$\delta_4$	-1.107** (0.440)
Nominal GDP growth	$\gamma_5$	0.189*** (0.023)	$\delta_5$	0.118*** (0.043)
Factor 1 - Macroprudential policy (lag)	$\gamma_6$	0.005* (0.003)	$\delta_6$	0.002 (0.005)
Factor 2 - Macroprudential policy (lag)	$\gamma_7$	0.004** (0.002)	$\delta_7$	0.008** (0.004)
Factor - Structural policy (lag)	$\gamma_8$	0.002 (0.004)	$\delta_8$	-0.005 (0.008)
Factor - Standard macroeconomic policy (lag)	$\gamma_9$	0.006** (0.002)	$\delta_9$	0.004 (0.005)
Foreign banks	$\gamma_{10}$	0.014*** (0.005)	$\delta_{10}$	-0.005 (0.008)

(table continues)

<sup>28</sup> Both models were also estimated for every year separately. Although significance and signs of variables document similar conclusions to those given by the estimated panel models, only the results of the panel models are presented since the yearly variability of the estimated parameters is pretty high due to the relatively small number (55) of degrees of freedom for the given number of explanatory variables (9). However, the results of such yearly models document that our panel regression is very robust.

(continued)

Variable		Loans to households (Eq.16)		Loans to firms (Eq. 17)
Size	$\gamma_{11}$	-0.004 (0.005)	$\delta_{11}$	0.006 (0.009)
Constant		0.008 (0.005)		0.017 (0.011)
Observations		339		339
Overidentification test Sargan-Hansen J statistic (p-value)		0.350		0.480
Under-identification test Anderson-Rubin Wald (p-value)		0.001		0.000

*Source: Prašnikar, Bole, Dominko, Lakićević, and Oblak (2021).*

Note: The IV 2GSLs method is used; the dependent variable is the yearly difference in loans to households per unit of the balance sheet; panel data; standard errors are reported in parentheses; \*\*\*, \*\*, and \* denote statistically significant values at 1, 5, and 10 percent on a two-tailed test, respectively; the effects of correction factors ( $b_{n1}$  and  $b_{n2}$  in the models 16 and 17) for the definition of items are not significant and are not presented; instruments used in the 2GSLs estimation consist of the number of employees, the number of branches, the number of ATMs, FDI flows, house prices, dummies for Croatia and Montenegro, and interactions among the mentioned variables. Robust tests have been used for the verification of instrument quality: the Sargan-Hansen statistics test for over-identifying restrictions and Anderson-Rubin Wald tests for weak instruments.

In the second column of Table 9, the regression results of equation (16) are given. The results indicate that demand had a statistically significant effect on the credit supply to households in the observed period. Relatively, its impact is second most important, yet in absolute terms its impact is modest ( $\gamma_5 = 0.189$ ). A decrease (increase) of 1 percent in nominal GDP results, on average, in a decrease (increase) of credit to households of just less than 0.2 percent of the balance sheet. The effects of macroprudential policy interventions in the previous year and standard macroeconomic policy interventions are minor but with a statistically significant effect on credit supply in the current year.

H19 presumes that the funding variables were the key drivers of credit supply to households (and to firms). The hypothesis cannot be confirmed. While the retail funding variable did not have a statistically significant effect in the observed period, the wholesale funding variable did but it was considerably less sizable than hypothesized. On average, each percentage point of increase (decrease) in wholesale funding per unit of the balance sheet resulted in a 0.15 percent increase (decrease) in credits to households per unit of the balance sheet. The value of the coefficient of impairment costs variable (per unit of the total balance sheet) is negative and significant ( $\gamma_4 = -0.469$ ). Losses from credits or reservations for corresponding expected future losses strongly decreased credits to households in the following year. Table 9 also makes it evident that foreign-owned banks drove credits to households more intensively than domestic banks ( $\gamma_{10} = 0.014$ ).

The third column of Table 9 shows the results for credits to firms in equation (17). Similarly as for credits to households, the demand has a positive and significant ( $\delta_5 = 0.118$ ) effect on credit supply to firms. In relative terms, its effect is even of less importance. The coefficient of the lagged cost of impairment ( $\gamma_4 = -1.107$ ) is far larger than in the case of household credits ( $\gamma_4 = -0.469$ ) and also significant. An increase in impairment costs by 1 percent of the balance sheet in the previous year reduced the credits to firms in the current year by 1.1 percent of the balance sheet. Considering policy, only macroprudential policy had a statistically significant effect.

As hypothesized, beside the cost of impairment, the funding variables were key drivers of credit supply to firms in the observed period. H20 is thus confirmed. The coefficient of retail funding was statistically significant and positive ( $\delta_3 = 0.363$ ). The coefficient of wholesale funding was also statistically significant and particularly high ( $\delta_2 = 0.908$ ) (almost six times higher than for households). This confirms H20. A decrease (increase) of 1 percent in wholesale funding per unit of balance sheet leads, on average, resulted in a decrease (increase) of credit to firms by 0.9 percent per unit of balance sheet leads. Foreign ownership and size were not statistically significant. Based on the discussion above, H22 is not confirmed, while H23 can be only partially confirmed (for credit supply to households).

#### 3.4.5 The model estimated contributions to credit supply to firms and households

Table 10 documents the model estimated contributions of demand, wholesale and retail funding, policy interventions, and impairment to credit supply to households in the boom, bust, and recovery phase of the Great Recession for each analyzed country separately. It allows for comparison and evaluation of the actual credit dynamics in Croatia, Montenegro, and Slovenia. In the boom period, a median bank recorded an increase in credits to households as a share of the balance sheet sum in all three countries. The increase was approximately 12.3 percent of the total balance sheet, 4.2 percent and 3.6 percent in Montenegro, Croatia, and Slovenia, respectively. The household credit dynamics were primarily driven by demand in the boom phase, while the funding effects were considerably lower. The contribution of wholesale funding to credit growth was 1.7 percent per unit of the balance sheet sum for a median bank in Montenegro, 1.3 percent per unit of the balance sheet sum for a median bank in Slovenia, and 0.9 percent per unit of the balance sheet sum for a median bank in Croatia. Retail funding contributed less to actual credit growth in Montenegro and Slovenia but not in Croatia. Policy interventions curbed the growth of credits to households in all three countries, but their effects were small.

In the bust and recovery phase, the growth of credits to households turned negative only in Montenegro. Credit to households increased most in Slovenia, by 1.8 percent of total assets, and by 0.2 percent in Croatia but decreased in Montenegro by 2.4 percent of total assets. In the bust phase, the main determinants of credit supply to households were demand and policy interventions. Their effect is, however, just the opposite. While demand put negative pressure on credit supply, policy intervention helped sustain it. The demand effects were negative in all

three countries (about 1–2 percent of the balance sheet) and in absolute values larger than funding and impairment effects in Croatia and Slovenia but not in Montenegro. In Montenegro, impairment contributed a lion’s share to the negative growth of credit, and policy intervention worked in reverse with the same intensity. The wholesale funding effects in Montenegro and Slovenia were negative (in Slovenia about 0.5 percent of the balance sheet), while retail (deposit) effects were positive but small. In Croatia, both funding effects were positive and small. Policy effects were positive (countercyclical) for all three countries and relative to the size of credit dynamics sizable (around 1 percent of the balance sheet).

Actual credit dynamics were rather anemic in the recovery period of the Great Recession, not exceeding 0.6 percent of the total balance sheet sum. Unlike in Croatia and Slovenia, it was negative in Montenegro. Because of the prolonged period of economic stress, the effects of impairment costs became even larger than in the bust period in all countries. Demand effects vanished in the recovery period. In Slovenia, the contribution of wholesale funding was negative and had the highest effect compared to other effects. It additionally squeezed credits to households. Similar dynamics can be observed for Montenegro. Policy interventions supported the growth of credits to households only in Slovenia, though the overall effect was small. In Montenegro and Croatia, policy interventions curbed credits to households.

*Table 10: Funding and policy effects on credits to households*

	Actual credit dynamics	Impairment	Funding effects		Demand effects	Policy effects
			Wholesale	Retail		
<b>Boom</b>						
Croatia	0.0420	-0.0008	0.0009	0.0024	0.0343	-0.0074
Montenegro	0.1228	-0.0059	0.0166	0.0041	0.0600	-0.0027
Slovenia	0.0364	-0.0013	0.0130	0.0024	0.0350	-0.0069
<b>Bust</b>						
Croatia	0.0019	-0.0028	0.0013	0.0017	-0.0150	0.0084
Montenegro	-0.0236	-0.0104	-0.0019	0.0010	-0.0080	0.0104
Slovenia	0.0179	-0.0028	-0.0047	0.0016	-0.0133	0.0104
<b>Recovery</b>						
Croatia	0.0058	-0.0044	0.0001	0.0014	-0.0018	-0.0043
Montenegro	-0.0012	-0.0167	-0.0055	0.0021	0.0056	-0.0039
Slovenia	0.0022	-0.0071	-0.0091	-0.0003	0.0001	0.0002

*Source: Prašnikar, Bole, Dominko, Lakičević, and Oblak (2021).*

Note: Model estimates of funding and policy effects on credits to households; the effects are evaluated for the median bank and are given in units of balance sheet.

Table 19 documents the model estimated contributions of demand, wholesale and retail funding, policy interventions, and impairment to credit supply firms in the boom, bust, and recovery phase of the Great Recession for the analyzed countries separately. The second column of Table 19 gives the actual credit dynamics for a median bank and makes it evident that increments in credits to firms per unit of the balance sheet are mostly higher when compared to households. There was an increase in credit to firms of 18.2 percent in Montenegro, 13.5 percent in Slovenia, and 3.4 percent in Croatia. While the household credit dynamics were primarily driven by demand in the boom phase, the funding effect was the main driver of credit supply to firms. Demand effects were the most pronounced in the boom phase though still considerably weaker than funding effects. The contribution of wholesale funding to credit growth was especially high at 9.8 percent per unit of the balance sheet for a median bank in Montenegro and 7.8 percent per unit of the balance sheet for a median bank in Slovenia. Retail funding contributed less to actual credit growth in Montenegro (3.6 percent) and Slovenia (2.1 percent) but not in Croatia. It was 2.1 percent, while the wholesale funding effect was 0.5 percent per unit of the balance sheet for a median bank in Croatia. Policy interventions curbed the growth of credits to firms in all three countries. Impairment effects were already relatively high in Montenegro in the boom period and even intensified in the bust and recovery period.

*Table 11: Funding and policy effects on credits to firms*

	Actual credit dynamics	Impairment	Funding effects		Demand effects	Policy effects
			Wholesale	Retail		
<b>Boom</b>						
Croatia	0.0344	-0.0019	0.0051	0.0209	0.0215	-0.0155
Montenegro	0.1815	-0.0139	0.0980	0.0355	0.0351	-0.0004
Slovenia	0.1346	-0.0031	0.0767	0.0208	0.0219	-0.0097
<b>Bust</b>						
Croatia	0.0383	-0.0067	0.0078	0.0145	-0.0094	0.0098
Montenegro	-0.0345	-0.0247	-0.0111	0.0084	-0.0050	0.0083
Slovenia	-0.0172	-0.0066	-0.0280	0.0136	-0.0083	0.0017
<b>Recovery</b>						
Croatia	0.0164	-0.0104	0.0009	0.0126	-0.0011	0.0039
Montenegro	-0.0330	-0.0396	-0.0326	0.0179	0.0004	-0.0042
Slovenia	-0.0470	-0.0168	-0.0540	-0.0023	0.0000	0.0011

*Source: Prašnikar, Bole, Dominko, Lakičević, and Oblak (2021).*

Note: Model estimates of funding and policy effects on credits to firms; the effects are evaluated for the median bank and are given in units of balance sheet.

In the bust and recovery phase, increments in credits to firms remained positive only in Croatia but turned negative in Montenegro and Slovenia. Interestingly, the increments were higher for credit to firms (3.8 percent in the bust and 1.6 percent in the recovery) than credit to households in Croatia (less than 1 percent). Credit to firms decreased by approximately 3.5 percent of total assets in Montenegro. The median bank in Slovenia decreased credit to firms by 1.7 percent in the bust, and even more so in the recovery period (by 4.7 percent). In the bust phase, demand contributed negatively to the actual credit dynamics. Retail funding followed by policy interventions, which were countercyclical yet small, sustained credit supply to firms in all three countries. The contribution of wholesale funding to the growth of credit to firms was positive in Croatia (0.8 percent of the balance sheet) but not in Montenegro (-1.1 percent of the balance sheet) and Slovenia (-2.8 percent of the balance sheet) (capital inflows collapsed after crisis eruption and turned negative).

In the recovery phase, a further drop in capital inflows to deposit-taking corporations put negative pressure on credit supply in Montenegro and especially in Slovenia (-5.4 percent of the balance sheet). For Croatia, wholesale funding effects diminished to 0.1 percent of the balance sheet. The estimated contribution of impairment cost to credit supply to firms was the highest in the recovery in all three countries. Policy interventions systematically supported credit growth in Croatia and (slightly less so) in Slovenia, but not in Montenegro.

### **3.5 Discussion and conclusions**

Stylized facts presented a broader context for the analysis at a micro-level, in particular, at the bank level. It was illustrated that the pre-crisis period was noted for high capital inflows into the region with major differences in main receiving sectors, instruments, and behavior of investors. Unlike in Croatia, gross capital inflows into deposit-taking corporations were shown to strongly influence retail and more importantly wholesale funding channels in Montenegro and Slovenia, and consequently actual credit dynamics to households and firms. It was hypothesized that the funding variables were key drivers of credit supply in the three phases of the Great Recession, but the hypotheses could not be confirmed for credits to households. Interestingly, retail funding does not even have a statistically significant effect on credits to households. It is, however, an important driver of credits to firms, but considerably less sizable than wholesale funding. The effects of the procyclical behavior of wholesale funding (skyrocketing in the boom period and collapsing in the bust and recovery periods) were especially pronounced in credits to firms with a pass-through effect of almost 1. It should be noted that this holds for all three observed countries. Analyzing the model estimated contributions to credit supply to firms and households, it is evident that the household credit dynamics were primarily driven by demand in the boom phase, while the funding effect was the main driver of credit supply to firms. The collapse in capital inflows after the crisis eruption contributed negatively to the growth of credit to firms in Montenegro

(-1.1 percent of the balance sheet) and Slovenia (-2.8 percent of the balance sheet) but not in Croatia. A further drop in capital inflows to deposit-taking corporations put additional pressure on credit supply in Montenegro and especially in Slovenia (-5.4 percent of the balance sheet) in the recovery period. Similar dynamics can be observed for credits to households but less intensive. This is in line with previous empirical findings, which show that lending to non-financial corporations is more sensitive to wholesale funding shocks than lending to households (de Haan, van den End, & Vermeulen, 2017).

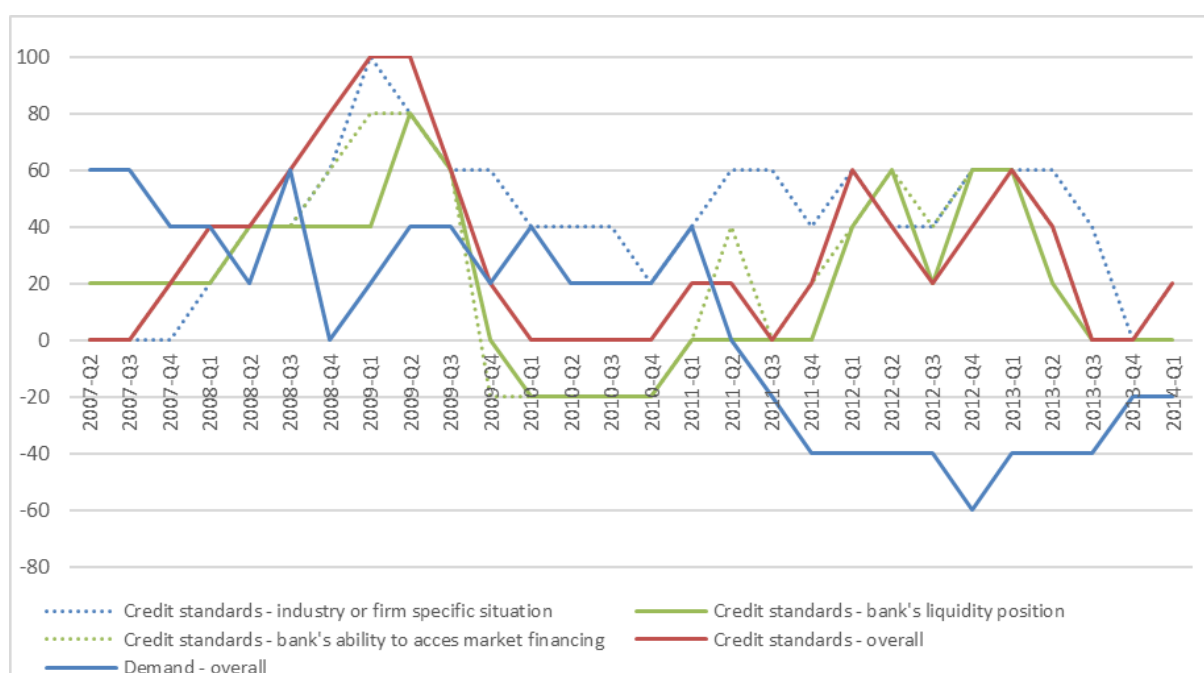
Demand was an important driver of credit supply especially in the boom and bust phases for credit supply to households but only in the boom phase when credits to firms are considered. The estimated contribution of credits to firms was highest for wholesale funding in the boom phase (9.8 percent per unit of the balance sheet for a median bank in Montenegro and 7.8 percent per unit of the balance sheet for a median bank in Slovenia). Impairment costs played an important role in the later phases of the crisis. Contrary to demand factors, they were more important for credits to firms. Considering policy, only macroprudential policy had a statistically significant effect on credits to firms. The effect of macroprudential policy interventions in the previous year and standard macroeconomic policy interventions are minor but with a statistically significant effect on credit supply to households in the current year. Foreign-owned banks are more active than domestic banks in issuing credits to households. Size does not influence credit supply.

In general, the study is a reasonable illustration of simultaneous workings of external factors (such as capital surges and real shocks) and internal policy factors in the context of the financial crisis and its amplification, driven by the scarcity of capital in less-developed economies. It also sheds some light on the relative importance of demand- and supply-side frictions. The findings of our study support a view that credit is supply driven. The wholesale funding variable appears to be the key driver in amplification of swings in credit supply. The results of our study on bank credit supply to firms in Croatia, Montenegro, and Slovenia can also be enriched by the results of the Bank Lending Survey data. Data published by the European Central Bank are, unfortunately, available only for Slovenia. In Figure 46, banks' ability to access market financing (e.g. money or bond market financing, incl. true-sale securitization) and banks' liquidity position are considered supply-side factors. The industry- or firm-specific situation and outlook or borrower's creditworthiness is a demand-side factor.

Figure 46 makes it evident that in the time of the 2008–2009 crisis, demand remained rather stable or even increased (in net terms) and that banks tightened their credit standards (in 2009 all surveyed banks in Slovenia). Banks reported industry- and firm-specific factors to have a greater impact on credit standards than bank costs of funds and balance sheet constraints. In the period 2012–2013 supply-side factors seem to result in the tightening of credit standards in a higher share of Slovenian banks compared to demand-side factors. In the recovery period, banks reported a net decrease in demand for bank credit.



Figure 46: Credit standards and demand



Source: own work.

Note: Net percentages are defined as the difference between the sum of the percentages of banks responding “tightened considerably” and “tightened somewhat” and the sum of the percentages of banks responding “eased somewhat” and “eased considerably”. The net percentages for responses to questions related to contributing factors are defined as the difference between the percentage of banks reporting that the given factor contributed to a tightening and the percentage reporting that it contributed to an easing. Net percentages for the questions on demand for loans are defined as the difference between the sum of the percentages of banks responding “increased considerably” and “increased somewhat” and the sum of the percentages of banks responding “decreased somewhat” and “decreased considerably”.

## 4 HOW CREDIT SUPPLY AND LIQUIDITY ARE RELATED TO POLICY: A COMPARISON ON A COUNTRY LEVEL AND A COMPARISON IN TIME<sup>29</sup>

### 4.1 Introduction

Illustrating crisis transmission from core to periphery through capital inflows and domestic amplification mechanisms during the Great Recession, the role of policy was mostly left out of the story. The questions on whether and how policy was able to contain excessive credit supply to households and firms or whether it was able to sustain credit supply and firms’ liquidity in the recovery remained unanswered. Our approach to studying the role of policy is, as indicated, multidimensional. One perspective is a comparison of credit supply on a country level in one crisis episode and the other is a comparison of firms’ liquidity positions in two crisis episodes but a single country. Exploiting the partial overlap of the study on

<sup>29</sup> This chapter of the dissertation is partially the paper published as Prašnikar, Bole, Dominko, Lakićević, and Oblak (2021) and partially the paper published as Oblak (2021).

macroprudential, standard macroeconomic policy and structural policy actions in Croatia, Montenegro, and Slovenia in the boom (2007–2008), bust (2009–2010), and the recovery periods (2011–2013) of the Great Recession with the analysis of policy response to the Great recession and the pandemic-induced crisis in Slovenia, some parallels between the two crisis episodes could be drawn.

A delay in policy intervention is believed to be one of the main culprits for the worsening of macroeconomic problems caused by the global financial crisis in Slovenia (Verbič, Srakar, Majcen, & Čok, 2016). Bole, Prašnikar, and Trobec (2014) imply that the suboptimal policy response, when timing, sequencing, and calibration are considered, seems to result in high opportunity costs. The authors studied the impact of economic policies on firms' liquidity, in particular on cash flow migration and illiquidity in Slovenia in the bust, boom, and recovery phases. It was shown that the liquidity of non-financial corporations deteriorated sharply in the first years after the crisis and was slow to recover. The inability of banks to refinance foreign loans and the reduction in informational capital ("ability of banks to evaluate future solvency of their clients") because of high uncertainty and procyclical macroprudential policy intervention (most notably in the recovery period) led to increased collateralization and credit rationing. This seemed to hinder the recovery of non-financial corporations due to limited access to needed liquidity.

An appropriate policy response should help sustain firms' liquidity in times of crisis and recovery. In Section 4.2, we study how credit supply to firms and households in the three selected countries (Slovenia, Croatia, and Montenegro) is related to policy. The relation between credit supply and policy from macroprudential to monetary is extensively studied. Let me mention just a few studies. Budnik and Kleibl (2018) analyzed the effects of macroprudential instruments on bank lending using comprehensive data on macroprudential policy changes in 28 member states of the European Union. It was found that instruments such as capital buffers, regulatory lending standards, or liquidity caps "may have an impact on credit growth in the EU member states." De Haan, van den End, and Vermeulen (2017) studied the impact of mostly standard macroeconomic policy interventions, on credit to households and firms. The central bank borrowing was shown to shield "bank lending from shocks in wholesale funding markets to some extent." Using a simulation, Giannone, Lenza, Pill, and Reichlin (2012) also provide evidence that bank loans to households and especially to non-financial corporations are higher with than without the interventions of the central bank. Čehajić and Košak (2021) studied how macroprudential measures affect bank funding costs and found evidence that the activation of macroprudential policy tools is related to lower funding costs but less so in emerging economies.

Unlike in the studies presented, we analyze the effects of macroprudential, standard macroeconomic policy and structural policy simultaneously. The three countries are again a suitable selection since they differ significantly in terms of policy (room for maneuver) and, hence, the focus of policy intervention in all stages of the studied period. Slovenia as a member state of the EU, for example, was required to implement macroeconomic policies

designed by the European Commission and was unable to conduct independent monetary policy. Croatia, at that time a EU candidate country, had more room for independent policy during the boom period (when it partially limited capital inflows) and the bust period but not the recovery period. Croatia also has the most flexible monetary regime. Montenegro was able to “muddle” unmitigated through the whole episode but had no flexibility considering the exchange rate regime.<sup>30</sup> The empirical specification from Chapter 3 is used.

In Section 4.3, a view from the supply side in the three selected countries (Slovenia, Croatia, and Montenegro) is complemented by the demand side view in two time periods (the pandemic and the Great Recession in Slovenia). Namely, liquidity is at the core of the study. A drain of the non-financial corporations’ liquidity was disastrous in the pandemic. Besides a drop in foreign and domestic demand, and uncertain economic, social and political circumstances characteristic, supply chain distortions and containment measures and related costs contributed additionally to an abrupt deterioration of cash flow dynamics in the recent pandemic. Avoiding high social and economic costs of bankruptcies and illiquidity, the policy response to counter the pandemic was exceptional in size and aligned, horizontally (monetary policy, fiscal policy, and macroprudential policy) and vertically (at a national level in Slovenia and at a supranational level in the European Union). Unlike in the Great Recession, immediate liquidity provision was deemed one of the key policy responses to the pandemic-induced crisis.<sup>31</sup>

The ability of such a response to reduce liquidity risk was also a focal point of early literature related to the pandemic. Numerous authors focused on the evaluation of policy interventions and their predicted impact on the liquidity of non-financial corporations and estimated the size of the liquidity gap. Schivardi and Romano (2020), for example, predict illiquidity for the whole population of Italian firms, month-by-month. Around 200,000 companies were projected to be illiquid at the peak which gives rise to a liquidity shortfall of some 72 billion euros. It is assessed that due to government guarantees for bank loans, almost all firms would be able to cover their liquidity gap. According to Demmou, Franc, and Calligaris (2021), up to 38 percent of firms in 14 analyzed countries would face liquidity shortfalls in 10 months after the outbreak of the pandemic without government intervention. Direct payments to cover labor costs and debt moratorium policies seem to be most beneficial. Ebeke, Jovanovic, Valderrama, and Zhou (2021) also find that policy measures would assist in reducing liquidity risk substantially (if implemented as designed). A common message is that the policy interventions are likely to sustain liquidity.

---

<sup>30</sup> The monetary regime seems to present an important dissimilarity in the case of the three countries. Interestingly, the studies on comparison of economic performance in Sweden and Finland, countries with different monetary regimes but similar institutions and (to some extent) common historical background, imply that the monetary regime has only a limited role in driving economic performance (Korkman & Suvanto, 2013; Suni & Vihriälä, 2014).

<sup>31</sup> E.g. direct measures to sustain liquidity accounted for 1.4 billion euros and indirectly, liquidity of firms was maintained through direct grants mostly in the form of employment support (1.8 billion euros) in the period from March 2020 to June 2021 in Slovenia (around 10 percent of GDP). Available fiscal stimulus was at 14.6 percent of GDP in the period from March to September 2020 (IMF, 2020).

But even the “whatever is necessary” approach in the form of “flat” public support observed in the pandemic might lead to suboptimal results, namely, not optimally targeted beneficiaries. Since the shock posed by the pandemic was one with a highly asymmetric impact across sectors, the sectoral view should be accounted for. Demmou, Franc, and Calligaris (2021) predict more than half of firms to be likely to experience liquidity shortages in the contact-intensive sectors such as accommodation and food service activities, transport, and arts, entertainment and recreation, but less than 20 percent in utilities, information and communication, and professional services sector. Ebeke, Jovanovic, Valderrama, and Zhou (2021) document similar, yet more conservative, results in a study of liquidity and solvency of non-financial corporations in 26 European countries.

Ex ante, instruments to measure the shortfall in cash flow due to the pandemic (e.g. an estimate for a firm-level cash flow shortfall could be obtained from value-added tax payments) and a way to reach affected individuals, firms, and banks are stressed as two key concerns for policymakers (Boot et al., 2020). Ex post, the literature indeed tackles the fit between support supplied and support needed, considering size, instruments, and sectors. Cirera et al. (2021) show that firms and sectors which experienced a larger reduction in sales were more likely to receive support, but also that firms not experiencing any shock received support. The recipients were mistargeted, most likely due to barriers to access policy support and the limited capacity of public institutions to target. The probability of receiving support was lower for small firms, which were more susceptible to the shock, but less informed (Apedo-Amah et al., 2020). Bole, Prašnikar, and Rop (forthcoming) also found evidence that support measures were inappropriately targeted considering sectors.

In another policy-related commentary, Boot et al. (2020) highlighted the longer-term consequences of some of the measures employed to counter the pandemic-induced crisis. The key concern raised relates to possibly unsuitable debt instruments (potential), leading to an increase in the leverage of firms, their (potential) overindebtedness, and an increase in default risk. This concern does seem to be in place, especially when we account for the results of the study presented in sections 2.4.4 and 2.4.5. It was shown that the unwinding of debt accumulation resulted in liquidity squeezes and contagion in the previous crisis episode especially in the Balkan region (the transmission mechanism of the crisis was different however). Bircan, De Haas, Schweiger, and Stepanov (2020) analyzed how suitable financial debt instruments are to ease liquidity constraints of small and medium-sized enterprises (SMEs) in 16 emerging markets and three Western European comparator countries. Firms’ debt capacity is considered a crucial factor. According to the study, Slovenian SMEs were not in the most favorable position after the breakout of the pandemic, having limited capacity for additional debt accumulation and low liquidity. Risk-sharing through equity instruments, proposed by Boot et al. (2020), might thus be a more suited form of policy intervention.

The empirical analysis in Section 4.3 draws upon the study of cash flow dynamics and illiquidity contagion of non-financial companies in Slovenia during the Great Recession by Bole, Prašnikar, and Trobec (2014) and the methodology used in the study in Chapter 2 of the

dissertation. First, the effects of the global financial crisis and the pandemic-induced crisis on firms' liquidity and performance are documented. Second, cash flow status with and without policy measures in the year of the outbreak of the pandemic conditional on the cash flow status in the pre-pandemic year is studied. This analysis enables the evaluation of the effectiveness of government (mostly) employment support through direct grants and provides insights on how well targeted support measures were from the sectoral perspective. In short, who the beneficiaries were. The evaluation is, however, partial since the epidemic was prolonged until 15 June 2021 in Slovenia. Third, building upon the study by Bole, Prašnikar, and Trobec (2014) and Bole, Oblak, Prašnikar, and Trobec (2018), parallels are drawn with the Great Recession. The question of policy response and its horizontal and vertical alignment is addressed.

In sections 4.2.1 and 4.3.1, a review of policymakers' responses is provided. In the former section, a comparison of the estimated policy effects for the selected three countries is given, and in the latter, a study employs comparison in time. The methodology in Section 4.2 remains the same as in Chapter 3. Macroprudential, standard macroeconomic, and structural policies are considered.

## **4.2 Comparing the estimated policy effects of the analyzed components in the Great Recession**

### **4.2.1 A review of policymakers' responses: a comparison on a country level**

A review of policymakers' responses in Table 12 covers standard macroeconomic policy indicators (fiscal balance, sales of state firms, government borrowing, central bank credits to banks, effective exchange rate and interest rate), structural policy measures (wages in public sector, privatization, labor market, and capital flows), and macroprudential policies. Central bank credits to banks, the nominal effective exchange rate, and the average loan interest (for private nonfinancial entities) are indicators of monetary policy, which are crucial in describing the impact of monetary policy on financial stability. Changes in policy stance are given in increments for interest rates, in growth rates for the nominal effective exchange rate, and increments per unit of GDP. The cumulative number of loosening actions denoted by (+1) less the number of tightening actions denoted by (-1) is given in the case of structural policy actions and macroprudential policy actions. All other possibilities (no change, tightening, and loosening in the same year, an unclear stance of the action) were denoted by 0. Shifts in macroprudential policy stance are shown by 9 categories, harmonized with the Macroprudential policies evaluation database (MaPPED) (Budnik & Kleibl, 2018). The database is a collection of macroprudential policy actions in EU member states for the years 1995–2014 quantified via a questionnaire that has been completed in cooperation with experts from 28 EU member national central banks and the supervisory authorities of all member states. It tracks the events of introduction, recalibration, and termination of 11 categories and 53 subcategories of instruments. The MaPPED database is the main source of data for Croatia and Slovenia. With the help of experts from the National Bank of Montenegro, a similar

dataset for Montenegro was produced. After excluding all subcategories (instruments) for which there were less than two actions in the entire analyzed period for all three countries taken together, 28 subcategories (9 categories) were used for further analysis.

Considering macroprudential policy in the boom period, it is evident that in all three countries the national macroprudential authorities acted mostly countercyclically. Macroprudential policy tightened and was consistent across all 9 categories analyzed in Montenegro. Also, in Croatia and Slovenia, the number of tightening actions outweighed the number of loosening interventions. In the bust period, the macroprudential policy (mostly) tightened in Slovenia and was thus procyclical, but not in Croatia and Montenegro (with the number of loosening intervention actions being higher). The intervention is, however, highly erratic. Unlike in the bust period, high consistency and countercyclical nature of the interventions could be observed in Croatia in the recovery period, when regulation was loosened five times. In the recovery phase, macroprudential policy actions in Montenegro and Slovenia were biased toward tightening.

Prašnikar, Bole, Dominko, Lakićević, and Oblak (2021) further document fiscal and monetary policy measures and structural (systemic) policy interventions. These policies interact with macroprudential policies and are in part also responsible for the instability of financial systems (Claessens, 2015). It is apparent that, in the boom period, Montenegro had the most restrictive and Croatia the most expansionary orientation of standard macro policy measures. In the bust period, all three countries launched strong, countercyclical standard policy measures. Just the opposite occurred during the recovery period, when the implemented standard policy measures turned procyclical once again, especially in Slovenia and Montenegro. Table 12 shows the procyclical nature of the changes in legislation concerning structural policies in all three countries during the Great Recession. Simplifying the interpretation of the indicated policies, we could heuristically say that the stance of the structural policies in the boom phase was relaxing, mostly unchanged in the bust period, and restrictive (tightening) in the recovery period.

Table 12: Macroprudential interventions, standard macro policy measures, and structural policy

Policies	Categories	Slovenia			Croatia			Montenegro		
		boom	bust	recovery	boom	bust	recovery	boom	bust	recovery
Macroprudential interventions	Capital buffers	0	-2	0	-1	2	0	0	0	0
	Lending standards restrictions	-1	0	0	0	0	0	-1	0	0
	Limits on credit growth and volume	0	0	1	-1	3	1	-1	1	0
	Limits on large exposures and concentration	-1	1	0	0	-2	2	0	0	0
	Liquidity requirements and limits on currency and maturity mismatch	0	0	0	1	0	2	0	0	0
	Loan-loss provisioning	1	-1	-2	0	0	0	-4	3	0
	Minimum capital requirements	-1	0	0	0	-1	0	-1	1	-1
	Other measures	-1	0	-2	0	0	0	0	-2	0
	Risk weights	0	0	0	-1	1	0	0	0	0
Standard macro policy measures; changes in indicators	Fiscal balance	0.26	-2.47	0.07	0.31	-1.75	0.33	-3.31	-1.39	0.13
	Sales of state firms	0.05	0.05	0.23	0.00	0.00	0.07	-1.25	-0.20	-0.17
	Government borrowing	-0.36	2.37	1.36	2.13	3.66	0.62	2.15	-0.55	0.16
	CB credits to banks	1.23	-0.68	2.67	1.09	-1.21	-0.00	-2.62	1.56	-0.15
	Effective exchange rate	-0.31	-0.10	-0.41	-1.46	0.89	0.94	-7.68	10.57	1.41
	Interest	0.94	-0.92	-0.10	0.82	-0.41	-0.36	-0.20	0.09	-0.12
Structural policy measures; changes in legislation	Wages in public sector	1	-1	-3	-1	-2	-3	2	-1	-2
	Privatization	0	0	2	0	2	-1	1	1	1
	Labor market	0	1	-1	1	-1	-1	0	-1	-1
	Capital flows	1	0	1	0	2	2	2	1	-1

Source: Prašnikar, Bole, Dominko, Lakičević, and Oblak (2021), Macroprudential Policies Evaluation Database, yearly IMF Reports (2006-2014), Eurostat (2006-2014), central banks (2006-2014), own work.

Note: Macroprudential interventions and structural policy; the cumulative number of loosening less the number of tightening in the indicated period; indicators of standard policy measures; average changes in the indicated period; changes are increments for interest, growth rates for the exchange rate, and increments per GDP (in percentages) for other variables; boom (2007-2008); bust (2009-2010); recovery (2011-2013).

## 4.2.2 Empirical analysis

### 4.2.2.1 Data

The results presented in this section (Section 4.2.2.1) are an extension of the empirical analysis in Section 3.4. For a description of data and descriptive statistics, see Sections 3.4.1 and 3.4.2.

### 4.2.2.2 Empirical specification

The results presented in this section (Section 4.2.2.2) are an extension of the empirical analysis in Section 3.4. For a description of the empirical specification of the model, see Section 3.4.3. The hypotheses related to the study of policy are as follows:

H24. Because of the erratic (unsystematic) use of macroprudential policy interventions and regulations, macroprudential interventions did not prevent the destabilization of credit activity during the Great Recession.

Since a systematic use of macroprudential policy instruments had only been established after the Great Recession even in advanced economies, it was not unexpected that erratic policy interventions, observed in the use of different instruments of macroprudential regulations (sometimes contradictory), prevailed in the studied countries. Other policies, including standard macroeconomic policies (monetary, fiscal) and structural policies (i.e. public safety net, labor market policies, privatization policies, etc.) could, together with macroprudential policy tools, contribute to procyclicality or work toward the countercyclicality of financial systems. Because the main policy goals of policymakers in developing Balkan countries were not focused on the stability of the financial systems but other performance measures (such as catching up with developed EU countries and accelerating the privatization before the crisis, surviving the collapse of financial flows after the crisis erupted, or targeting the exchange rate), the next hypothesis could be stated as:

H25. Other policy interventions and regulations (standard macroeconomic policies and structural policies) did not mitigate the destabilization of credit growth and so increased the procyclicality of the credit trajectory throughout the Great Recession.

### 4.2.2.3 The estimated policy effects on credit supply

Table 10 in Section 3.4.5 provides a context to explain the policy effects on the credit supply to households. Positive growth of credit to households was mainly driven by demand in the boom period in all three countries and the policy interventions curbed it only to a limited degree. It holds that the total policy effect on credit to households was countercyclical in all three countries in the boom period, but not all the policies were harmonized. Disaggregated policy effects on credits to households are presented in Table 13. Structural policies assisted in the (excessive) expansion of credit, while macroprudential and standard macroeconomic



policies restricted it. The effect of prudential policies is minor in Montenegro, despite consistency and numerous interventions, unlike in Slovenia and Croatia, where prudential policies have (in absolute terms) the highest effect.

Considering the positive contribution to credit dynamics in the bust period, policy interventions became a key determinant in all three countries. Interestingly, the effects of policy interventions were aligned in Slovenia in the bust, namely, all three policy areas analyzed had a positive effect on credit supply to households. Structural policies again acted in just the opposite direction to prudential and standard macroeconomic policies, worsening the bust, in Croatia and Montenegro.

*Table 13: Disaggregated policy effects on credits to households*

	Total policy effects	Prudential	Structural	Standard macro
<b>Boom</b>				
Croatia	-0.0074	-0.0056	0.0008	-0.0026
Montenegro	-0.0027	-0.0003	0.0008	-0.0032
Slovenia	-0.0069	-0.0056	0.0013	-0.0027
<b>Bust</b>				
Croatia	0.0084	0.0050	-0.0009	0.0042
Montenegro	0.0104	0.0012	-0.0005	0.0096
Slovenia	0.0104	0.0004	0.0017	0.0081
<b>Recovery</b>				
Croatia	-0.0043	-0.0009	-0.0009	-0.0024
Montenegro	-0.0039	-0.0014	0.0001	-0.0026
Slovenia	0.0002	0.0030	0.0001	-0.0030

*Source: Prašnikar, Bole, Dominko, Lakičević, and Oblak (2021).*

Note: Model estimates of policy effects on credits to firms; the effects are evaluated for the median bank and are given in units of balance sheet.

In the recovery phase, policy interventions supported credits to households only in Slovenia, although the total effects were trivial. The disaggregated effects, presented in Table 13, show that the effects of macroprudential policy interventions were considerably more favorable than the total policy effect in Slovenia, but the procyclical nature of standard macroeconomic policy interventions balanced out the favorable effects. In Croatia, all three policy areas deepened the bust, while only structural policies had a positive contribution to growth in Montenegro. In the bust and recovery phases, the effects of standard macro policies were (in terms of absolute size) among the largest, while macroprudential effects dominated in the boom phase. Structural effects were among the weakest and the most erratic in all phases.

Evaluating H24 and H25 in the context of credit supply to households, one can confirm both hypotheses. The destabilization of credit was not prevented by the use of macroprudential

policy in any of the three countries analyzed during the Great Recession. Firstly, the effect of prudential policy intervention is small and as such, it could not limit or sustain credit growth. However, the macroprudential policy measures worked countercyclically in the boom and recovery in Slovenia, and in the boom and bust periods in Croatia. Even a highly consistent intervention in Montenegro in the boom period did not result in a significant containment of credit growth. Analyzing the total policy effects on credits to households, one can observe that policy interventions decisively helped to sustain credit supply to households in the bust period in all three countries and (to a limited degree) to curb credit in the boom period. In the recovery period, the total policy effect was procyclical in Montenegro and Croatia but not in Slovenia. The policy effects considered were not systematic and even erratic and thus did not mitigate the destabilization of credit growth.

In Table 14, simulated effects are given for credits to firms. Taking into account the policy intervention effects as a whole, their ability to curb or sustain credit supply to firms is limited (even more so than for credit to households). A notable exception is the policy effect for Croatia in the boom and bust periods, which pushed down the actual growth of credits to firms by almost 50 percent and pushed it up by almost 25 percent, respectively. Also, in the recovery period, the policy effect for Croatia was not negligible in relative terms. Policy interventions had mostly countercyclical effects on credit to firms, apart from Montenegro in the recovery period.

*Table 14: Disaggregated policy effects on credits to firms*

	Total policy effects	Prudential	Structural	Standard macro
<b>Boom</b>				
Croatia	-0.0155	-0.0121	-0.0016	-0.0017
Montenegro	-0.0004	0.0033	-0.0016	-0.0021
Slovenia	-0.0097	-0.0052	-0.0028	-0.0017
<b>Bust</b>				
Croatia	0.0098	0.0052	0.0018	0.0027
Montenegro	0.0083	0.0011	0.0011	0.0062
Slovenia	0.0017	0.0003	-0.0037	0.0052
<b>Recovery</b>				
Croatia	0.0039	0.0036	0.0019	-0.0016
Montenegro	-0.0042	-0.0023	-0.0003	-0.0017
Slovenia	0.0011	0.0032	-0.0002	-0.0019

*Source: Prašnikar, Bole, Dominko, Lakičević, and Oblak (2021).*

Note: Model estimates of funding and policy effects on credits to firms; the effects are evaluated for the median bank and are given in units of balance sheet.

Slovenian and Croatian regulators, unlike Montenegrin, achieved consistency across all policies analyzed in the boom period, which is also reflected in the estimated (negative) contributions to actual credit dynamics. Macroprudential policy actions were especially helpful in limiting the credit growth to firms in Croatia (-1.2 percent of the balance sheet), followed by Slovenia (-1.0 percent of the balance sheet). In Montenegro, they were procyclical. Structural and standard macroeconomic policy interventions also acted countercyclically, yet their effect was small.

In the bust period, policy actions were systematically countercyclical (supporting credit supply to firms) in Croatia and Montenegro. Structural policies additionally suppressed credit growth to firms in Slovenia, while (especially) standard macroeconomic policy's contribution to credit growth to firms was positive (0.5 percent).

The analyzed policies supported credits to firms in Croatia and Slovenia in the recovery period, but not in Montenegro. Yet the actions were non-systematic and even erratic. Considering Montenegro, macroprudential, structural, and standard macroeconomic policy alike hindered the recovery. The same dynamics can be observed in Slovenia except for macroprudential policy measures, which had a countercyclical effect. Also in Croatia, the effects of policies were not aligned since standard macroeconomic policy contributed negatively to credit growth. Consistency proves to play an important role considering the total policy effect in absolute and relative terms. Based on the above discussion, we confirm hypotheses H24 and H25 as set in Section 4.2.2.

### **4.3 How policymakers' responses impact the liquidity of firms: a comparison in time**

#### 4.3.1 A review of policymakers' responses: a comparison in time

Unlike the delayed and erratic policy response to the Great Recession, the policy response to the Covid-19 pandemic at a national and a supranational level was immediate, systematic, and exceptional in its size. In anticipation of an unprecedented economic disaster, the president of the European Commission, Ursula von der Leyen, said in a "Draghi way"<sup>32</sup>: "We will do whatever is necessary to support the Europeans and the European economy (European Commission, 2020a)." The sentiment towards austerity has turned on its head,<sup>33</sup> namely, after the previous crisis episode, many developed countries bet on fiscal consolidation, which resulted in a prolonged and sluggish recovery.

Providing flexibility and financial resources to act, the European Commission relaxed the rules and facilitated the approval process of state aid notifications under the Temporary Framework. A similar framework was adopted following the global financial crisis but this

---

<sup>32</sup> In the face of a sovereign debt crisis in 2012, Mario Draghi said "within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough" (European Central Bank, 2012).

<sup>33</sup> Blanchard and Leigh (2013) proposed that the short-term multipliers in response to the fiscal consolidation during 2010 and 2011 were larger in size than previously believed.

time with considerably more determination. It was adopted in just two days, amended five times, and extended until 31 December 2021. The general escape clause of the Stability and Growth Pact was activated, allowing governments to “depart from the budgetary requirements that would normally apply under the European fiscal framework”. Further, 1,211 billion euros were secured through the 2021–2027 Multiannual Financial Framework and additional 807 billion euros through a temporary recovery instrument NextGenerationEU, financed by borrowing at the EU level. Under the Recovery and Resilience Facility, Slovenia is to receive 1.8 billion euros in grants and 705 million euros in loans (European Commission, 2020b).

Governments could also provide guarantees to banks (to be able to maintain liquidity). In 2009, the Slovenian government also launched guarantees to banks to ensure access to foreign markets and other guarantee schemes for bank loans to companies, which accounted for 6 percent of GDP (Verbič, Srakar, Majcen, & Čok, 2016). Additionally, ample liquidity was made available through a supply of longer-term instruments to counter the global financial by the European Central Bank (Bole, Prašnikar, & Trobec, 2014). Similarly, the Eurosystem expanded purchases of securities and refinancing operations in the pandemic year, which supported extensive fiscal stimulus to counter the crisis. The participation in refinancing operations of Slovenian banks was yet lower than the euro area average. According to the Bank of Slovenia (2020), this might be due to the excess liquidity and ample and growing non-banking sector deposits available (75.5 percent of total liabilities in June 2020) (Bank of Slovenia, 2020).

Being at an early stage of development, a macroprudential policy<sup>34</sup> was not yet properly equipped to identify systemic risks of financial system instability after the eruption of the global financial crisis. In Tables 15 and 16, a non-exhaustive overview of macroprudential policy actions as a response to the Covid-19 pandemic-induced crisis and the Great Recession is given, which was documented by Prašnikar, Bole, Dominko, Lakičević, and Oblak (2021). The cumulative number of macroprudential policy tightening actions denoted by (+1) less the number of macroprudential policy loosening actions denoted by (-1) is given. All other possibilities (no change, tightening and loosening in the same year, unclear stance of the action) were denoted by 0. Shifts in macroprudential policy stance are shown by 10 categories, harmonized with the Macroprudential policies evaluation database (MaPPED) (Budnik and Kleibl, 2018).

Tables 15 and 16 show that the policy response to the previous crisis episode was less harmonized than the policy response to the pandemic-induced crisis. In the boom period (2007–2008), the macroprudential policy actions were mostly countercyclical except for two policy actions in the category of loan-loss provisioning and limits on large exposures. Yet the number of actions with an ambiguous result were strikingly high (9). In the bust (2009–2010) and recovery (2011–2012) periods, the number of ambiguous actions decreased significantly

---

<sup>34</sup> “A subset of a broader financial policy, which includes macro- and microprudential policies with the ultimate goal to achieve stable financial systems (Prašnikar, Bole, Dominko, Lakičević, and Oblak, 2021).”

but the policy actions were mostly procyclical. Namely, policy tightening actions outnumbered the policy easing actions. The macroprudential policy actions focused primarily on tighter requirements in the category capital buffers and loan-loss provisioning. After the first quarter of 2010, the Bank of Slovenia indeed launched a process of accelerated implementation of stricter capital requirements (Bole, Prašnikar, & Trobec, 2014).

In response to a pandemic-induced crisis, the macroprudential policy requirements were eased across seven categories at a supranational level and national macroprudential authorities were expected to act accordingly. The countercyclical capital buffer, which already stood at zero in Slovenia, was lowered or fully released in 11 European countries. The macroprudential authorities in Estonia, Finland, and the Netherlands used additional instruments at their disposal, whereas the macroprudential authorities seem to be more conservative in Slovenia. Restrictions on profit distributions by banks and by leasing companies were introduced in April 2020 (amended in February 2021) and a temporary exclusion of a decline in income caused by the pandemic from the creditworthiness evaluation was allowed for (Bank of Slovenia, 2020; Bank of Slovenia, 2021).

*Table 15: Macroprudential interventions*

	Slovenia			Slovenia	European institutions concerned
	boom	bust	recovery	Covid-19 pandemic	Covid-19 pandemic
	2007-2008	2009-2010	2011-2013	2020-2021	2020-2021
capital buffers	0	2	0	1	-1
lending standards restrictions	1	0	0	-1	0
limits on credit growth and volume	0	0	-1	0	0
limits on large exposures and concentration	2	-2	0	0	0
liquidity requirements and limits on currency and maturity mismatch	0	0	0	0	-1
loan-loss provisioning	-1	1	3	0	-1
minimum capital requirements	2	0	0	0	-2
leverage ratio	0	0	0	0	-1
risk weights	0	0	0	0	-1
other measures	1	0	1	0	-1

*Source: Macroprudential Policies Evaluation Database (MaPPED), Prašnikar, Bole, Dominko, Lakičević, and Oblak (2021), Oblak (2021).*

Note: Macroprudential interventions; a cumulative number of tightening actions less the number of loosening actions in the indicated period.

Table 16: Macroprudential interventions

	Slovenia									Slovenia		European institutions concerned	
	boom			bust			recovery			Covid-19 pandemic		Covid-19 pandemic	
	2007-2008			2009-2010			2011-2013			2020-2021		2020-2021	
	Tightening actions	Loosening actions	Ambiguous actions	Tightening actions	Loosening actions	Ambiguous actions	Tightening actions	Loosening actions	Ambiguous actions	Tightening actions	Loosening actions	Tightening actions	Loosening actions
capital buffers	0	0	0	2	0	0	0	0	0	1	0	0	1
lending standards restrictions	1	0	0	0	0	0	0	0	0	0	1	0	0
limits on credit growth and volume	0	0	1	0	0	0	0	1	0	0	0	0	0
limits on large exposures and concentration	3	1	2	0	2	0	0	0	1	0	0	0	0
liquidity requirements and limits on currency and maturity mismatch	0	0	4	0	0	0	2	2	0	0	0	0	1
loan-loss provisioning	0	1	0	1	0	0	3	0	0	0	0	0	1
minimum capital requirements	2	0	0	0	0	0	0	0	0	0	0	0	2
leverage ratio	0	0	0	0	0	0	0	0	0	0	0	0	1
risk weights	0	0	2	0	0	0	0	0	0	0	0	0	1
other measures	1	0	0	0	0	0	1	0	0	0	0	0	1

Source: own work.

To counter the pandemic, first, the law allowing the deferral of loan payments for at least 12 months for non-financial corporations, sole traders, farmers, and private individuals was adopted in Slovenia. It was followed by nine fiscal stimulus packages, which amounted to almost 5 billion euros in the period until June 2021. Table 17 summarizes support measures and financial resources provided. Though direct subsidies to private companies became an important instrument to support numerous private and public projects in the period 2008–2011, their amount of 876 million euros is lower even when compared to a single set of measures to preserve jobs in the period 2020–2021.

*Table 17: Covid-19 measures adopted by the Slovenian government*

Category	2020 March-December in million EUR	2021 January-June in million EUR
<b>Covid-19 measures</b>	<b>2,910</b>	<b>2,049</b>
Measures to preserve jobs	1,137	639
Measures for the smooth operation of public services	508	728
Measures to maintain consumption and social position	291	50
Other expenditure	67	111
Measures to maintain liquidity	906	466

*Source: Republic of Slovenia Fiscal Council (2021), own work.*

In Table 18, the general government debt and general government surplus/deficit is given. Due to extensive fiscal stimulus, the general government sector returned to a deficit of 7.7 percent of GDP from a surplus of 0.4 percent of GDP in the year 2019. The projected general government deficit in 2021 is 7.9 percent of GDP down from 8.6 percent owing to a more favorable economic outlook. Also, in 2008 and 2009 the government acted countercyclically, increasing the deficit to -5.7 percent of GDP but the intervention was less intensive (Republic of Slovenia Fiscal Council, 2021; Statistical Office of the Republic of Slovenia, 2021).

*Table 18: General government debt and General government surplus (+) / deficit (-)*

	2008	2009	2020	2021
General government surplus (+) / deficit (-)	-1.4% of GDP	-5.8% of GDP	-8.4% of GDP	-8.6% of GDP*
General government surplus (+) / deficit (-)	EUR -529 million	EUR -2,108 million	EUR 3,893 million	
General government debt	21.8% of GDP	34.5% of GDP	80.8% of GDP	80.4% of GDP*
General government debt	EUR 8,263 million	EUR 12,518 million	EUR 37,429 million	

*Source: Statistical Office of the Republic of Slovenia (2021), own work.*

## 4.3.2 Empirical analysis

### 4.3.2.1 Data

Three sources of data are used in the empirical analysis. The first one is a comprehensive database of financial data provided by the Agency of the Republic of Slovenia for Public Legal Records and Related Services (AJPES). The data encompasses the total population of non-financial companies, liable to report under the Companies Act for national statistics purposes. That is 68,125 limited and unlimited liability companies (including listed companies) after the formal reorganization of the status of a company, economic interest groupings, and main offices of foreign business entities<sup>35</sup> in 2020. The database was supplemented (updated) with the data from the list of companies at the beginning of bankruptcy, liquidation<sup>36</sup>, or termination, also provided by AJPES. The data on the state aid to mitigate the effects of the pandemic were retrieved from ERAR, an application for the portrayal of public money use in the Republic of Slovenia.

Since a notable dissimilarity in the causes of both crises exists, the categorization is only partially comparable. It does not change for the manufacturing sector and construction sector, unlike the service sector, which is divided further for the analysis of the pandemic-induced crisis. To categorize companies in segments, we draw on the study by Bol, Prašnikar, and Rop (forthcoming), which evaluates the Covid-19 support measures to alleviate the cost of social distancing at a sectoral level. The authors consider two main characteristics, determining the economic losses of a particular sector and consequently classification, namely essentiality of the sector and the ability to organize work from home. Taking into account non-pharmaceutical mitigation measures, five homogenous segments were identified: manufacturing, construction, utilities, non-vulnerable service segment, and vulnerable service segment.<sup>37</sup> Detailed data are provided in Table 19, which documents definitions and calculation of variables. In the second column of Table 19, with calculations of the variables, we use item names identical to the ones in the original AJPES database.

---

<sup>35</sup> Banks, insurance companies, stock exchange, investment funds and certain other financial and investment companies that do not use the accounting standard for companies are not included.

<sup>36</sup> Companies in insolvency proceedings (bankruptcy, liquidation) are not required to submit annual reports.

<sup>37</sup> The manufacturing segment covers all companies with economic activities in section manufacturing of NACE Rev. 2. The second analyzed segment construction includes companies classified in section construction. Utilities encompass sections electricity, gas, steam and air conditioning supply, as well as water supply, sewerage, waste management and remediation activities of NACE Rev. 2. The non-vulnerable service segment comprises all companies with economic activities classified in sections: financial and insurance activities, real estate activities, professional, scientific and technical activities, and administrative and support service activities. The fifth segment is the vulnerable service segment, and it includes firms from economic activities in section wholesale and retail trade, repair of motor vehicles and motorcycles, transportation and storage, accommodation and food service activities, information and communication, arts, entertainment and recreation, other service activities, and activities of households as employers. Agriculture, forestry and fishing, mining and quarrying, government sectors (O-Q) and activities of extraterritorial organisations and bodies are excluded from the analysis.



Table 19: List of variables and calculation

Variable	Calculation of the variable
Financial debt	(Long-term financial liabilities + Short-term financial liabilities) / Total assets
Operating liabilities	Short-term operating liabilities / Total assets
Operating receivables	Short-term operating receivables / Total assets
Collateral	(Land + Buildings + Other equipment and machinery) / Total assets
Operating cash flow	(Operating profit - Operating loss + Write-offs in value) / Total assets
Operating cash flow without support measures	(Operating profit - Operating loss + Write-offs in value - State aid <sup>38</sup> ) / Total assets
Manufacturing	A dummy variable with the value 1 if a company is categorized in manufacturing segment (section C of NACE Rev.2)
Construction	A dummy variable with the value 1 if a company is categorized in construction segment (section F of NACE Rev.2)
Services	A dummy variable with the value 1 if a company is categorized in services segment (sections D, E, G, H, I, J, and divisions L68 and N79 of NACE Rev 2.)
Utilities	A dummy variable with the value 1 if a company is categorized in utilities segment (sections D, E of NACE Rev. 2.)
Non-vulnerable services	A dummy variable with the value 1 if a company is categorized in a non-vulnerable service segment (sections K, L, M, N of NACE Rev. 2.)
Vulnerable services	A dummy variable with the value 1 if a company is categorized in a vulnerable service segment (sections G, H, I, J, R, S, T of NACE Rev. 2.)
Cash flow status	A categorical variable with the value 0 if a company is inactive <sup>39</sup> , 1 if it has operating cash flow <0, 2 if it has operating cash flow >0
Cash flow without support measures	A categorical variable with the value 0 if a company is inactive, 1 if it has operating cash flow without support measures <0, 2 if it has operating cash flow without support measures >0

Source: Oblak (2021), own work.

<sup>38</sup> The data on state aid was retrieved from ERAR and represents the state aid in the form of direct grants paid to the non-financial corporations in 2020 rather than the state aid approved for the year 2020. The latter is presented in the profit and loss account in the AJPEs database, but after a thorough inspection significant discrepancies were found in the application of the standard 15. According to Note 1 to the Slovenian Accounting Standard 15 (Official Gazette of the Republic of Slovenia, No. 63/20), “organizations that will obtain any state aid ... for the containment or elimination of the consequences of the Covid-19 epidemic, must record the state aid received under other operating revenues (Uradni list RS, 2020)”. This would correspond to the item AOP124 Subsidies, grants, allowances, compensation, and other revenues associated with products and services in our database. Instead of AOP124, the accurate data on state aid paid to the non-financial corporations in 2020 are used as a proxy for Covid-19 support measures. The state aid paid indeed has a direct effect on liquidity in contrast to the state aid approved. It should, however, be noted that, conceptually, this differs from our approach to evaluating cash flow status, where we assume that firms generate their cash inflows (outflows) from their sales (costs) rather than from their short-term operating receivables (short-term operating liabilities) and cash.

<sup>39</sup> Inactive firms are defined as firms at the beginning of bankruptcy, liquidation, or termination in years 2018-2020. Bankrupt companies in the study by Bole et al. (2014) are companies with positive cash flow in year T and not active any more in year T+1.

#### 4.3.2.2 *Descriptive statistics*

Tables 20 and 21 document descriptive statistics for the main variables by segment for the period 2007–2009 and 2018–2020. Financial debt, short-term operating liabilities, short-term operating receivables, collateral, operating cash flow, and operating cash flow without support measures are documented for manufacturing, construction, utilities, and both service segments separately at the first-lower quartile (p25), median (p50), and third-upper quartile (p75). Also, the number of observations is given.

Table 21 and Figures 47 and 48 make it evident that support measures prevented a huge drop in cash flow for all quartiles of firms and all segments in 2020 but failed to prevent its worsening (except for utilities) when only direct grants are considered. A median firm in the vulnerable service sector recorded a decline in cash flow by 29 percent. Without policy intervention, the cash flow would decline by more than 50 percent for the sector mentioned, 42 percent for a median firm in the non-vulnerable service sector, 36 percent in construction, and 27 percent in manufacturing. A drop in cash flow was similar for the service segments in both crises but considerably more disastrous for construction (68 percent) and manufacturing (47 percent) in the previous crisis episode. Ample public support alleviated the consequences of the pandemic. Taking into account the extent to which support measures were able to sustain cash flow, the median firm of the most vulnerable segment benefited the least in relative terms compared to other segments. The firms with stronger cash flow positions (upper-quartile firms) proved to be more resilient to the shock across all segments in both crises. A decline in cash flow was at 13–16 percent without measures and at 6–9 percent with measures in 2020 and at 29–40 percent in 2009. It seems that the global financial crisis had a strong negative impact on the cash flow across the whole distribution of firms.

As already evident, vulnerable service segment firms were indeed hit hardest, even more so when the firms in the lower quartile are considered. Their cash flow from operations was negative (-0.6 percent of the total balance sheet sum) already in the pre-pandemic years and with the pandemic, it additionally deteriorated (-2.8 percent with support measures and -4.9 percent without). A quarter of non-vulnerable service sector firms with the weakest cash flow exhibit a similar pattern, apart from a milder drop in the pandemic year. The solvency of these two subsegments might be endangered. Unlike in the pre-pandemic year, the value of the cash flow for the first quartile was positive in 2007–2008 and only turned negative in the crisis period. Generally, the cash flow position of firms was more favorable in the period 2007–2008 (especially in manufacturing and services) than in the period 2018–2019. In a pre-crisis year, manufacturing firms had stronger cash flow compared to construction and services but did not prove more resilient. Considering a reduction of cash flow in terms of a percentage of balance sheet sum, a lower-quartile manufacturing firm followed a lower-quartile vulnerable service segment firm in the pandemic year. The cash flow was rather stable in 2019 compared to 2018 for all quartiles of firms and all segments.

The financial debt variable is especially relevant when assessing the ability of non-financial corporations, which are not able to sustain positive cash flow from operations, to access debt finance. This includes the instruments made available by the government. According to Bircan, De Haas, Schweiger, and Stepanov (2020), Slovenian SMEs have little room for additional debt. Debt was already on the rise throughout the whole observed period in manufacturing, construction, and services (both non-vulnerable and vulnerable sectors), apart from manufacturing in the pandemic year. The same dynamics of increasing financial debt can be observed in the period 2007–2009. Interestingly, indebtedness was considerably higher for the service and construction segment before the recent crisis, but not in manufacturing. The median and upper quartile levels of financial debt in manufacturing decreased to 11.9 percent and 35.2 percent of the total balance sheet, respectively. Manufacturing firms indeed reported a decrease in demand for bank loans for investments in the first half of 2020 (Bank of Slovenia, 2020). The indebtedness of manufacturing firms in 2008, driven by high investment, was at 14.4 percent and 39.1 percent for the median and upper quartiles. Utilities segment firms, which had the highest level of financial debt, deleveraged in the observed period. The level of financial debt of highly indebted firms (third quartile) in the vulnerable service sector increased most by 3.6 percentage points in the pandemic year to attain 49.5 percent of total assets. Also, the survey data provided by the Bank of Slovenia show that accommodation and food service activities sectors, classified in the vulnerable service segment, increased their indebtedness most. In 2008, financial debt accounted for 38.1 percent of total assets for the most indebted firms in the service segment. A median and an upper quartile construction segment firm increased their indebtedness in 2019 as well as in 2020, most likely due to the favorable real-estate market conditions. The reasons for an increase in indebtedness were likely distinct in 2009 when an increase from 1.4 percent of total assets to 26.8 percent of total assets was documented.

As anticipated, manufacturing and utilities firms have higher available collateral and thus higher capacity to borrow in times of crisis than firms from construction and services. More than a half of the companies from the construction, non-vulnerable service segment, and vulnerable service sector had no collateral available, and only one-quarter of companies had collateral higher than 12.1 percent, 5.2 percent, and 12.0 percent of total assets, respectively.

Almost uniformly across the distribution, short-term operating liabilities declined for firms from all segments in both observed periods. Short-term operating liabilities, which could be understood as an alternative source of finance, rose only for construction firms in the third quartile in 2009 and utilities segment firms in the lower quartile in the pandemic year. With the pandemic, the process of deleveraging slowed down in manufacturing, construction, and for the upper-quartile firms in services. Service sector firms with lower intercompany indebtedness decreased their indebtedness towards suppliers at a higher pace after the outbreak of the pandemic. Across the whole distribution, construction firms depend on the intercompany debt most in both crisis episodes. A rather high level of operating liabilities was evident also for firms from the upper quartile in vulnerable service segment firms. When the

years prior to the global financial crisis are compared to the pre-pandemic years, it is evident that the dependence of firms on the intercompany debt was lower for the latter.

Analyzing short-term receivables, a similar pattern of decreasing level of receivables can be observed in the period 2018–2020. A drop following the outbreak of the pandemic was especially pronounced for the upper-quartile firms in manufacturing and non-vulnerable service segment firms, and the half of the firms with a higher level of short-term receivables in construction. Unlike in 2018–2020, short-term receivables were (mostly) increasing in 2007–2009. Considering net receivables (short-term receivables less short-term operating liabilities), the vulnerable service segment of the first quartile decreased their net borrowing positions, as opposed to an increase in other segments. Except in utilities, net lenders managed to decrease their positions in the pandemic year.

Table 20: Financial and intercompany debt, cash flow and potential collateral in periods 2007–2009 and 2019–2020

Variable	Year	Manufacturing				Construction				Services			
		p25	p50	p75	N	p25	p50	p75	N	p25	p50	p75	N
Cash flow	2007	0.028	0.089	0.171	6,711	0.015	0.076	0.164	6,099	0.007	0.070	0.171	32,650
	2008	0.029	0.094	0.173	6,622	0.009	0.070	0.163	6,685	0.002	0.069	0.168	33,522
	2009	-0.015	0.050	0.119	6,677	-0.047	0.023	0.099	6,767	-0.026	0.036	0.120	35,114
	2019	0.021	0.088	0.162	8,189	0.000	0.076	0.165	7,219	-0.005	0.051	0.139	30,183
	2020	0.002	0.074	0.150	8,328	-0.001	0.063	0.152	7,511	-0.021	0.038	0.128	30,678
Financial debt	2007	0.000	0.110	0.339	6,711	0.000	0.005	0.243	6,099	0.000	0.046	0.341	32,650
	2008	0.000	0.144	0.391	6,622	0.000	0.014	0.275	6,685	0.000	0.060	0.381	33,522
	2009	0.000	0.157	0.413	6,677	0.138	0.268	0.478	6,767	0.000	0.066	0.396	35,114
	2019	0.000	0.127	0.357	8,189	0.000	0.069	0.298	7,219	0.000	0.114	0.464	30,183
	2020	0.000	0.119	0.352	8,328	0.000	0.075	0.315	7,511	0.000	0.124	0.495	30,678
Accounts payable	2007	0.153	0.301	0.512	6,711	0.150	0.373	0.621	6,099	0.114	0.304	0.573	32,650
	2008	0.145	0.281	0.490	6,622	0.148	0.362	0.608	6,685	0.108	0.291	0.558	33,522
	2009	0.138	0.268	0.478	6,677	0.147	0.362	0.649	6,767	0.104	0.285	0.558	35,114
	2019	0.112	0.226	0.430	8,189	0.132	0.312	0.561	7,219	0.079	0.245	0.520	30,183
	2020	0.108	0.219	0.427	8,328	0.126	0.301	0.548	7,511	0.071	0.227	0.508	30,678
Accounts receivable	2007	0.131	0.267	0.458	6,711	0.118	0.353	0.619	6,099	0.066	0.234	0.475	32,650
	2008	0.129	0.265	0.450	6,622	0.118	0.357	0.636	6,685	0.067	0.229	0.481	33,522
	2009	0.125	0.258	0.455	6,677	0.106	0.360	0.645	6,767	0.066	0.234	0.490	35,114
	2019	0.097	0.211	0.398	8,189	0.115	0.330	0.601	7,219	0.040	0.180	0.418	30,183
	2020	0.093	0.202	0.377	8,328	0.107	0.301	0.564	7,511	0.045	0.175	0.397	30,678
Collateral	2007	0.000	0.116	0.416	6,711	0.000	0.000	0.124	6,099	0.000	0.000	0.239	32,650
	2008	0.000	0.136	0.439	6,622	0.000	0.000	0.092	6,685	0.000	0.000	0.223	33,522
	2009	0.000	0.129	0.447	6,677	0.000	0.000	0.103	6,767	0.000	0.000	0.221	35,114
	2019	0.000	0.092	0.390	8,189	0.000	0.000	0.113	7,219	0.000	0.000	0.136	30,183
	2020	0.000	0.090	0.384	8,328	0.000	0.000	0.121	7,511	0.000	0.000	0.142	30,678

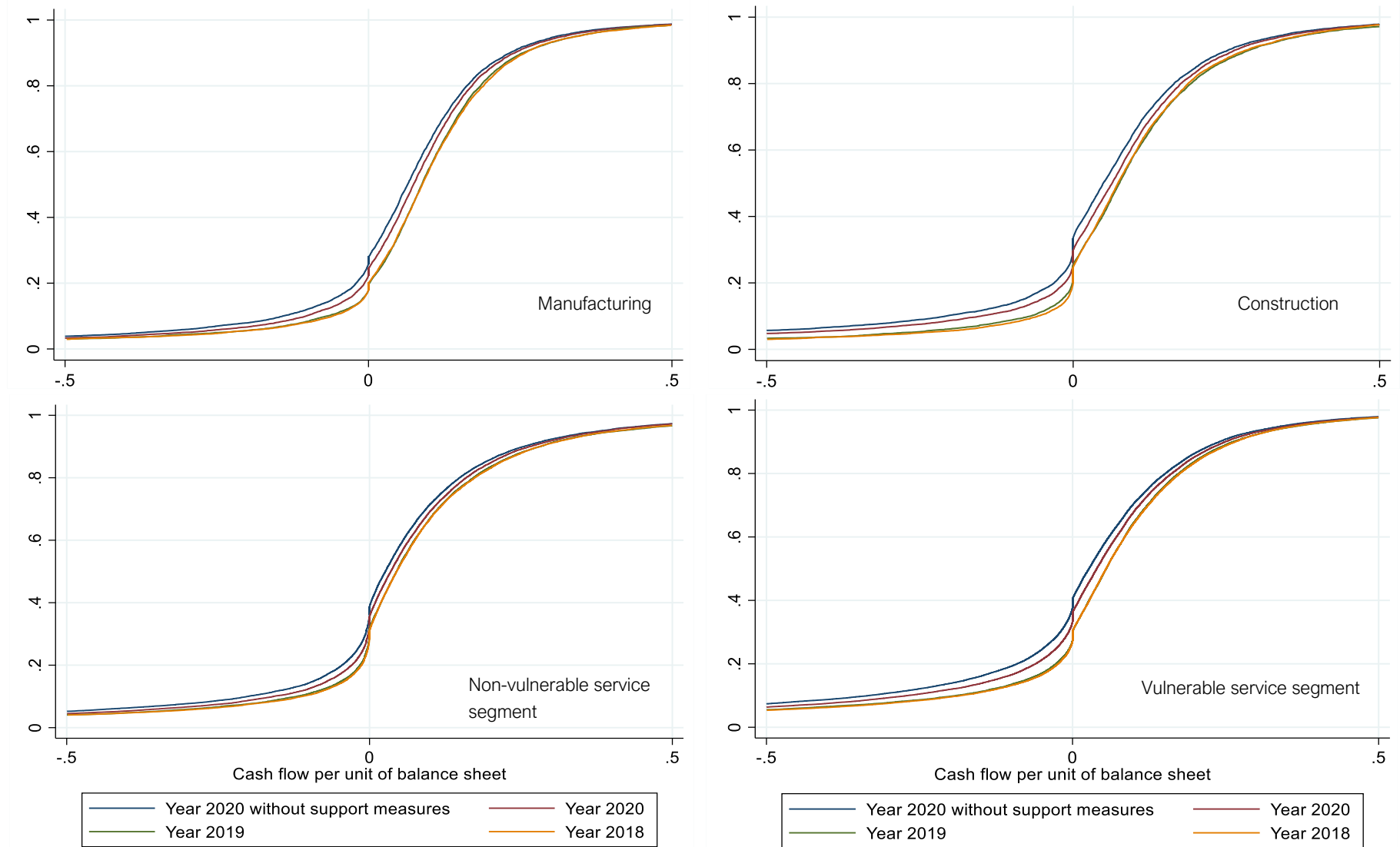
Source: AJPES (2021), own work.

Table 21: Financial and intercompany debt, cash flow with and without state aid and potential collateral in period 2018–2020

Variable	Year	Manufacturing			Construction			Utilities			Non-vulnerable service segment			Vulnerable service segment		
		2018	2019	2020	2018	2019	2020	2018	2019	2020	2018	2019	2020	2018	2019	2020
Total number of companies	N	8,153	8,189	8,328	7,134	7,219	7,511	945	938	928	19,901	20,074	20,226	27,521	27,636	28,003
Cash flow	p25	0.018	0.021	0.002	0.000	0.000	-0.001	0.011	0.009	0.015	-0.003	-0.005	-0.011	-0.005	-0.006	-0.028
	p50	0.089	0.088	0.074	0.073	0.076	0.063	0.086	0.085	0.089	0.045	0.045	0.035	0.055	0.055	0.039
	p75	0.166	0.162	0.150	0.165	0.165	0.152	0.150	0.157	0.167	0.142	0.140	0.131	0.148	0.146	0.133
Cash flow without support measures	p25			-0.002			-0.009			0.012			-0.021			-0.049
	p50			0.064			0.049			0.086			0.026			0.027
	p75			0.141			0.140			0.165			0.120			0.123
Financial debt	p25	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	p50	0.119	0.127	0.119	0.043	0.069	0.075	0.237	0.230	0.185	0.019	0.029	0.033	0.080	0.097	0.109
	p75	0.343	0.357	0.352	0.270	0.298	0.315	0.595	0.569	0.531	0.373	0.392	0.410	0.408	0.422	0.456
Short-term operating receivables	p25	0.107	0.097	0.093	0.131	0.115	0.107	0.020	0.018	0.015	0.031	0.029	0.027	0.054	0.053	0.061
	p50	0.225	0.211	0.202	0.350	0.330	0.301	0.085	0.083	0.086	0.173	0.166	0.149	0.206	0.201	0.196
	p75	0.413	0.398	0.377	0.623	0.601	0.564	0.281	0.280	0.274	0.432	0.429	0.391	0.440	0.433	0.416
Short-term operating liabilities	p25	0.120	0.112	0.108	0.138	0.132	0.126	0.024	0.026	0.028	0.042	0.039	0.035	0.109	0.104	0.094
	p50	0.244	0.226	0.219	0.331	0.312	0.301	0.112	0.109	0.113	0.181	0.175	0.162	0.280	0.270	0.252
	p75	0.458	0.430	0.427	0.586	0.561	0.548	0.328	0.311	0.299	0.442	0.419	0.403	0.563	0.546	0.533
Collateral	p25	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	p50	0.078	0.092	0.090	0.000	0.000	0.000	0.060	0.056	0.069	0.000	0.000	0.000	0.000	0.000	0.000
	p75	0.385	0.390	0.384	0.090	0.113	0.121	0.568	0.540	0.531	0.046	0.051	0.052	0.101	0.115	0.122

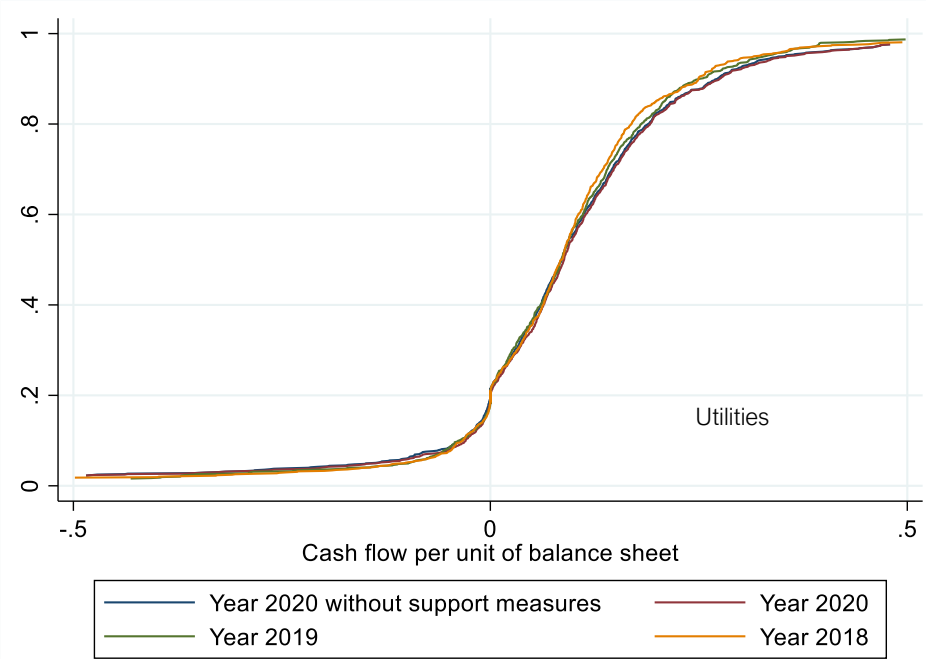
Source: Oblak (2021).

Figure 47: Cumulative distribution of cash flow per unit of the balance sheet with and without support measures in years 2018–2020 by segment



Source: Oblak (2021).

Figure 48: Cumulative distribution of cash flow per unit of the balance sheet with and without support measures in years 2018–2020 for utilities



Source: Oblak (2021).

4.3.2.3 Cash flow dynamics

In Table 22, the cash flow migration of firms in the pre-pandemic years of 2018 and 2019, and in the pandemic year of 2020 is given, drawing on the methodology used by Bole, Prašnikar, and Trobec (2014). It is shown how the cash flow in the (current) year  $t$  is structured conditional on the cash flow in the previous year  $t-1$ . Based on liquidity position, three categories of firms in year  $t$  are recognized. First, firms, which have positive cash flow (greater than zero), second, firms, which have negative cash flow (less than zero), and third, inactive firms. In continuation, we call firms with positive cash flow in year  $t-1$ , which migrate to negative cash flow in year  $t$ , the “collapsing” firms, and firms with negative cash flow in year  $t-1$ , which improve their performance to positive cash flow in  $t$ , the “recovering” firms. The values shown are as a percentage of the total number of companies by segment. Since the methodology is not entirely comparable for the two crisis episodes and only changes in percentages within a particular cash flow status category are comparable, the parallels to the Great Recession are only drawn in Section 4.4.

From Table 22, it is evident that the Covid-19 pandemic deteriorated the liquidity of firms in all segments, but utilities. The segment proved to be resilient to the shock caused by the pandemic with an increase in the share of recovering firms and firms which were able to maintain positive cash flow with policy intervention. There was only a minor increase in the share of collapsing firms. Comparing the proportions of firms by category (e.g. positive to positive) with and without measures for years 2019 and 2020, policy intervention was shown



not to have a statistically significant effect in helping firms from utilities to maintain their pre-pandemic liquidity position. In continuation, the utilities segment as a notable exception is excluded from the analysis.

Table 22: The cash flow migration matrix

Manufacturing							
Year	Negative to inactive	Negative to negative	Negative to positive	Positive to inactive	Positive to negative	Positive to positive	Total number of companies
2018	0.87	10.32	6.23	0.56	6.79	75.24	7,693
2019	0.79	10.51	6.13	0.35	6.68	75.54	7,751
2020	0.53	11.43	5.64	0.27	11.00	71.13	7,867
H <sub>0</sub> : p <sub>19</sub> - p <sub>20</sub> = 0	*	*			***	***	
2020 without support measures	0.53	11.89	5.19	0.27	14.22	67.90	7,867
H <sub>0</sub> : p <sub>20</sub> - p <sub>20w</sub> = 0	-			-	***	***	
Construction							
2018	1.23	12.67	8.77	0.54	7.26	69.53	6,268
2019	0.95	11.80	6.86	0.60	8.89	70.90	6,330
2020	0.56	13.55	6.88	0.38	12.63	66.00	6,618
H <sub>0</sub> : p <sub>19</sub> - p <sub>20</sub> = 0	**	***		*	***	***	
2020 without support measures	0.56	14.12	6.30	0.38	16.15	62.49	6,618
H <sub>0</sub> : p <sub>20</sub> - p <sub>20w</sub> = 0					***	***	
Non-vulnerable service segment							
2018	1.02	19.25	9.42	0.55	8.22	61.54	18,482
2019	1.12	18.85	8.48	0.69	9.41	61.46	18,742
2020	0.90	20.26	8.29	0.49	12.35	57.70	19,084
H <sub>0</sub> : p <sub>19</sub> - p <sub>20</sub> = 0	**	***		**	***	***	
2020 without support measures	0.90	20.86	7.69	0.49	15.23	54.83	19,084
H <sub>0</sub> : p <sub>20</sub> - p <sub>20w</sub> = 0	-		**	-	***	***	
Vulnerable service segment							
2018	1.19	17.66	8.97	0.55	8.44	63.19	25,293
2019	1.15	17.46	8.46	0.53	8.97	63.43	25,454
2020	0.86	18.95	7.89	0.41	14.10	57.78	25,949
H <sub>0</sub> : p <sub>19</sub> - p <sub>20</sub> = 0	***	***	**	**	***	***	
2020 without support measures	0.86	19.66	7.18	0.41	18.01	53.89	25,949
H <sub>0</sub> : p <sub>20</sub> - p <sub>20w</sub> = 0	-	**	***	-	***	***	

(table continues)

(continued)

Utilities							
Year	Negative to inactive	Negative to negative	Negative to positive	Positive to inactive	Positive to negative	Positive to positive	Total number of companies
2018	0.79	13.80	4.26	0.22	3.25	77.67	891
2019	0.56	13.23	4.60	0.22	4.82	76.57	892
2020	0.23	12.59	5.22	0.23	4.99	76.76	882
H <sub>0</sub> : p <sub>19</sub> - p <sub>20</sub> = 0							
2020 without support measures	0.23	12.70	5.10	0.23	5.90	75.85	882
H <sub>0</sub> : p <sub>20</sub> - p <sub>20w</sub> = 0	-			-			

Source: Oblak (2021).

Note: A two-sample proportions test is used; \*\*\*, \*\*, and \* denote statistically significant values at 1, 5, and 10% on a two-tailed test, respectively.

The share of firms (overall) migrating to negative cash flow increased by 5.5 percentage points ( $z=21.17$ ,  $p=0.000$ ) to more than 30 percent in the pandemic year of 2020. Absent measures, the share of firms with negative cash flow would surge by more than 9 percentage points to almost 35 percent. Already in the pre-pandemic year firms with negative cash flow accounted for more than one-quarter of both service segment firms and even strengthened to 32.6 percent of the non-vulnerable service sector and 33.1 percent of the vulnerable service sector in 2020. Without policy intervention, an additional 3–5 percent of companies in each segment would migrate to negative cash flow. This represents around 2,400 firms, 1,200 from the vulnerable service sector. Despite minor differences across segments, the policy intervention seems to be targeted properly for the highest share of firms from the vulnerable service segment (4.6 percent,  $z=10.90$ ,  $p=0.000$ ), prevented from migrating to negative cash flow. Strikingly, the share of inactive firms did not increase in the year of pandemic. There was a decrease in the share of firms migrating to inactive from positive cash flow and negative cash flow alike. This could indicate that the policy measures sustained also de facto dead companies. The number of companies migrating from negative cash flow to inactive dropped by 37 percent in construction (-0.4 percentage points,  $z=2.56$ ,  $p=0.010$ ), 28 percent in manufacturing (-0.3 percentage points,  $z=1.95$ ,  $p=0.050$ ), 23 percent (-0.3 percentage points,  $z=3.23$ ,  $p=0.001$ ) in vulnerable and 22 (-0.2 percentage points,  $z=2.08$ ,  $p=0.037$ ) in non-vulnerable service sector.

After the outbreak of the pandemic, around 60 percent of firms (down from 65 percent) in the analyzed segments were able to sustain positive cash flow. Positive to positive cash flow firms accounted for the lowest part of firms in both service segments (58 percent), followed by construction (66 percent) and manufacturing (70 percent) in 2020. Along the same lines,

the share of firms migrating from positive to negative (the so-called “collapsing firms”) was the lowest in manufacturing at 11 percent despite a marked increase in 2020. Collapsing firms accounted for 12.4 percent of the non-vulnerable service segment, 12.6 percent of the construction segment, and 14.1 percent of all firms in the vulnerable service segment. Without policy intervention, an additional 2–4 percent (see the sixth column in Table 22) of companies from each sector would migrate from positive to negative cash flow or (potentially) to inactivity, and around one-sixth of firms would be collapsing. Again, the highest share of firms from the vulnerable service sector was able to sustain positive cash flow due to policy intervention. However, when the number of firms that were not able to sustain positive cash flow with measures is compared to the number of firms that were not able to sustain positive cash flow without measures, the lowest share of firms benefited.

In the pre-pandemic years, the percentage of collapsing firms in manufacturing was rather stable, but not in construction and services. Worsening of liquidity position was evident already in 2019 with an increase in the share of collapsing firms. The share of recovering firms, which migrate from negative cash flow in year  $t-1$  to positive cash flow in year  $t$ , decreased in the observed period in all four segments, most notably in construction (see the third column in Table 22). The recovery was further depressed by the pandemic in the manufacturing and both service segments, though, negligibly for the non-vulnerable service segment firms. Policy intervention enabled at most 0.7 percent of firms ( $z=-2.05$ ,  $p=0.040$ ) in the vulnerable service segment to migrate from negative to positive cash flow in the pandemic year.<sup>40</sup>

#### **4.4 Conclusion**

As discussed in the introduction, Bole, Prašnikar, and Trobec (2014) analyzed cash flow migration and illiquidity contagion of firms in Slovenia during the Great Recession. It was shown that the liquidity of non-financial corporations deteriorated sharply in the first years after the crisis and was slow to recover. Although the cash flow position of firms was more favorable than in the pre-pandemic years, a drop in cash flow was considerably more disastrous even when the policy intervention in the pandemic is not accounted for. Unlike in the pandemic, the service sector was hit the least by the crisis in 2009. The consequences of the shock were evidently more unfavorable for the manufacturing and construction segments. This implies the distinct nature of both crisis episodes. The share of firms able to sustain positive cash flow in 2009 plummeted by more than 8 percent and the decrease is comparable to the shock posed by the pandemic to the non-financial corporations’ cash flows absent measures. The cash flow of non-financial companies continued to deteriorate for two years after the previous crisis emerged and the level of firms able to sustain positive cash flow had not yet reached the pre-crisis level in 2012, the last year included in the study. The policy response to the pandemic was considerably more decisive and ensured an additional 3.4

---

<sup>40</sup> The rules prohibit state aid to firms in financial distress on 31<sup>st</sup> of December 2019.

percent of firms to sustain positive cash flow, 0.6 percent of firms to recover, and a decrease in the share of inactive firms. As mainly companies with positive cash flow in the pre-pandemic year received support, this indicates a well targeted intervention but with a probable malfunction, i.e. sustaining de facto dead companies, which do not migrate to inactivity due to support received.

Accounting for (only) directly paid out grants, a huge drop in cash flow for all quartiles of firms and all segments was avoided, but not worsening. Strengthening their cash flow position without and even more so with public support, firms from the utilities segment were a notable exception. The result is not statistically significant, but it still raises the question of mistargeting the beneficiaries. Cirera et al. (2021) find that firms not experiencing any shock received support. Another result of our study is equivalent, namely that sectors with a large reduction in sales or cash flow were more likely to receive support. Table 22 makes it evident that when we consider the proportion of firms, prevented from migrating to negative cash flow, the highest share (number) of recipients in absolute terms was from the most vulnerable service segment. Also, the highest share (number) of firms from the vulnerable service segment (4 percent) sustained positive cash flow due to support measures. However, when the number of firms able to sustain positive cash flow with measures is compared to the number of firms, not able to sustain positive cash flow without measures, the lowest share benefited. A median firm in the vulnerable service segment also recorded the highest decline in cash flow by 29 percent. Without policy intervention, the cash flow would decline by more than 50 percent and would be disastrous. The support measures compensated for a considerable part of a reduction in cash flow but compared to other sectors for the lowest when a median firm is considered. The approach “whatever is necessary” in form of “flat” public support might thus lead to suboptimally targeted beneficiaries.

With hindsight to the Great Recession, a question of disturbances in the provision of bank credit to the non-financial corporations to cover the estimated liquidity gap of 0.6 billion euros (cash flow from operations) remains. In the recovery period of the Great recession, adverse developments in the non-financial corporations’ sector liquidity could be in part attributed to erratic policy response (Bole, Prašnikar, & Trobec 2014). The process of collateralization and credit rationing intensified and thus limited the access to needed liquidity and hindered the recovery of the non-financial corporations. Interestingly, the estimated contribution of policy to actual credit dynamic was positive in the recovery period in Slovenia, despite not being aligned horizontally. Only macroprudential policy seems to have had a positive contribution to the credit supply to households and firms for a median bank in Slovenia. The macroeconomic costs of procyclical policy orientation were the highest in the recovery phase when policy interventions through standard macro and structural policy measures in Slovenia and Montenegro even amplified credit decreases driven by the collapse of wholesale funding. In the boom and bust periods, the total policy effects in all three observed countries were countercyclical but weak in comparison with the other variables of interest. This is probably due to erratic specific policy intervention through the crisis cycle. Only in Croatia during the boom phase did the policy effect on credits to firms exceeded 1

percent of the balance sheet. The policy interventions were systematic. The contribution of macroprudential policy interventions was especially significant.

So far, it seems that the lesson has been learned. The governments and the European Union institutions concerned acted in concert to prevent massive illiquidity and bankruptcies. The policies were aligned and exceptional in size (intensity). For instance, macroprudential requirements across seven categories were eased at a supranational level and national macroprudential authorities were expected to act accordingly. The countercyclical capital buffer, which already stood at zero in Slovenia, was lowered or fully released in 11 European countries. The macroprudential authorities in Estonia, Finland, and the Netherlands used additional instruments at their disposal, whereas the macroprudential authorities seem to be more conservative in Slovenia. The restrictions to profit distributions were introduced in April 2020 and a temporary exclusion of a decline in income caused by the pandemic from the creditworthiness evaluation was allowed for, but otherwise, the policy toolkit remained unchanged.

In the second quarter of 2020, banks reported, on balance, broadly unchanged credit standards in the euro area, but not in Slovenia. A tightening of credit standards and credit terms and conditions for loans or credit lines to enterprises at most banks followed the outbreak of the pandemic. According to the Bank of Slovenia (2021), reasons cited by banks were “the increased uncertainty brought by the pronounced downturn in the economy and the economic outlook caused by the Covid-19 pandemic, the worsening situation in certain sectors, and the change in the acceptable level of risk at the banks.” Another tightening of credit standards by domestic banks followed in the third and fourth quarters of 2020. The reaction of Slovenian banks compares to the one in the previous crisis when all the banks tightened their credit standards in the fourth quarter of 2008 and the first quarter of 2009 just milder.

## **CONCLUSION**

The severe consequences of the 2007–2009 global financial crisis posed two main questions. One question “how such major consequences can flow from such a seemingly minor event” (Williamson in Miller & Stiglitz, 2010, p. 1), is related to macrofinancial linkages. At the core, there are interactions between the real economy and the financial sector with financial market imperfections playing a key role in crisis transmission and amplification (Claessens & Kose, 2018). In the dissertation, two main transmission channels, the borrower balance sheet channel, operating through the demand side of finance, and the liquidity channel, which analyzes the importance of liquidity on banks’ ability to extend credit and thereby on economic activity, are extensively studied. The second question is “why particular regions (countries) were distressed more than others during the Great Recession and for longer.” It opens the debate on the core (Europe) and the periphery, and related policy issues.

Political and economic consolidation enabled the countries of the Balkan region to integrate into the international financial markets at the onset of the global financial crisis. This, besides

the accession of Slovenia to the European Union and its “success story”, heightened the levels of optimism among agents (households, firms, banks...) and resulted in a marked economic expansion. Favorable economic conditions positively influenced the strength of non-financial corporations’ balance sheets and the financial accelerator endogenously drove the amplification and propagation of the debt accumulation process through firms’ investments. As hypothesized, the financial accelerator in the Balkan countries was several times stronger (twice as strong for core investments) than in the Mediterranean and especially Central European countries in the boom period of the Great Recession. Following the crisis eruption, a similar dynamic of debt decumulation process could be observed in all three regions but its effect on liquidity squeezes and contagion was still much larger (at least 50 percent) in the Balkan countries. The liquidity position of non-financial corporations was additionally weakened by intercompany indebtedness.

Gertler, Kiyotaki, and Prestipino (2016) proposed that the wholesale markets were the culprit in the crisis transmission, “when the (global financial) crisis hit, the epicenter featured malfunctioning of the wholesale banking sector.” Arising from distortions in the wholesale funding market, the liquidity channel of financial transmission is activated when a shock to banks’ liquidity leads to adjustments in credit supply to households and firms and is thus transmitted to the real economy. Focusing on the liability side of the bank balance sheet and the crucial role that capital inflows had directly or indirectly on its dynamics, the wholesale funding channel is of particular importance for the capital-constrained developing economies. It was hypothesized that the funding variables (wholesale and retail funding) are key drivers of credit supply in the boom, bust, and recovery phases of the Great Recession in the observed countries, but the hypotheses could only be confirmed for credits to firms. The effects were especially sizable for wholesale funding and its contribution to the propagation of a shock (procyclicality) was significant in all three countries, namely, Slovenia, Croatia, and Montenegro. An increase in wholesale funding of 1 percent of the balance sheet increased credits to firms by 0.9 percent of the balance sheet in the observed period 2007–2013. Analyzing the model estimated contributions to credit supply to firms and households, it is evident that the household credit dynamics were primarily driven by demand in the boom and bust phases. A sudden stop in capital inflows to deposit-taking corporations after the crisis eruption contributed negatively to the growth of credit to firms in Montenegro and Slovenia in the bust and the recovery periods. A similar dynamic can be observed for credits to households but less intensive. This is in line with previous empirical findings, which show that lending to non-financial corporations is more sensitive to wholesale funding shocks than lending to households (de Haan, van den End, & Vermeulen 2017).

Based on the results of the studies by Bole, Oblak, Prašnikar in Trobec (2018) and Prašnikar, Bole, Dominko, Lakićević, and Oblak (2021) two main pillars of economic policy could be proposed. By focusing on foreign capital inflows, macroprudential policy in the periphery could be the most effective in the boom phase. Since banks are crucial in the intermediation of financial inflows and thus amplification of a shock, an automatic increase of banking capital to cover the enlarged overheating risks would probably be effective. Obviously, country-

specific macroprudential policy alone would be too weak to mitigate the effects of endogenously amplified (common) policy-driven capital flows from the core to the periphery in the boom and vice versa in the bust period. The fiscal policy on the national level is, therefore, seen as a necessary second pillar for mitigating the spillover and amplification of symmetric shock effects. There is a role for country-specific fiscal policy especially in the bust and recovery phases when opportunity costs of amplified capital outflows are by far the largest. Countercyclical fiscal spending and curbing outflow (withdrawal) of banking funds by government guarantees to banks would probably be the most common policies at hand.

As evidenced, the indebtedness, both to banks and intercompany indebtedness, had disastrous effects on the liquidity of non-financial corporations in the Balkan region in the bust and recovery phases of the Great Recession. Leaving aside the question of how to prevent rapid debt accumulation in the expansionary phase of the business cycle and resolve the problem of amplification of symmetric shock from core to periphery, the key policy dilemma becomes how to sustain the liquidity of firms. In 2009, the share of firms able to sustain positive cash flow plummeted by more than 8 percent and the decrease is comparable to the shock posed by the pandemic to the non-financial corporations' cash flows absent measures. The cash flow of non-financial companies continued to deteriorate for two years after the previous crisis emerged and the level of firms able to sustain positive cash flow had not yet reached the pre-crisis level in 2012 (Bole, Prašnikar, & Trobec, 2014). A huge drop in cash flow for all quartiles of firms and all segments in Slovenia, but not worsening (accounting only for directly paid-out grants) was prevented by an immediate, considerably more decisive, and aligned response following the outbreak of the pandemic. The public support measures ensured an additional 3.4 percent of firms to sustain positive cash flow and 0.6 percent of firms to recover. Strikingly, the share of inactive firms decreased in 2020 compared to 2019, which might indicate that measures also supported de facto dead companies.

The policy response during the Great Recession was anemic. The recovery period of the Great Recession in Slovenia, for example, was noted for the process of collateralization and credit rationing, which intensified and limited access to needed liquidity and hindered the recovery of non-financial corporations (Bole, Prašnikar, & Trobec, 2014). The analysis of the underlying determinants of credit supply to firms (and households) interestingly implies that the estimated contribution of policy effects to actual credit dynamics to households and firms was actually positive in the recovery period in Slovenia. However, the effect is minor and importantly not aligned horizontally. Namely, standard macroeconomic policy actions (and to a limited degree structural policy action) seem to depress the credit supply to firms in the recovery, while macroprudential policy had a countercyclical effect on the credit supply of a median bank in Slovenia to households and firms in the recovery. Similarly, standard macroeconomic and structural policy measures amplified the credit crunch driven by the collapse of wholesale funding in Montenegro. Aiming to achieve a significant contribution to the supply of credit to firms and households, the horizontal alignment of policies appears to be crucial. Systematic standard macroeconomic policy, structural policy, and macroprudential policy interventions resulted in a sizable and significant policy contribution to the actual

dynamics of credits to firms in Croatia during the boom phase. It exceeded 1 percent of the balance sheet. The total policy effects in all three observed countries were countercyclical in the boom and bust periods but weak in comparison with the other variables of interest. This is probably due to inconsistent specific policy interventions.

In response to the pandemic, the governments and the European Union institutions concerned acted in concert to prevent massive illiquidity and bankruptcies. Immediate liquidity provision was one of the key policy responses. So far, it thus seems that the policymakers learned the lesson but not without new lessons to be learned. Firstly, with hindsight to the Great Recession, a question of disturbances in the provision of bank credit to non-financial corporations to cover the estimated liquidity gap of 0.6 billion euros (cash flow from operations) remains. Even a systematic policy response failed to alter the behavior of banks (at least in Slovenia). Their reaction to a shock was similar just less decisive in both crisis episodes. The tightening of credit standards by Slovenian banks in the second quarter of 2020, was followed by a tightening of credit standards in the third and fourth quarters of 2020.

Secondly, the policy intervention raised new concerns, which are primarily related to (1) the longer-term consequences of some of the measures employed to counter the pandemic-induced crisis, and (2) the beneficiaries of the “whatever is necessary” approach in the form of “flat” public support and the justification of an unprecedented fiscal stimulus. Boot et al. (2020b) emphasized the longer-term consequences of some of the measures employed to counter the pandemic-induced crisis. The key concern raised relates to possibly unfitting debt instruments leading to an increase in the leverage of firms, their (potential) overindebtedness, and an increase in default risk. An ingenious solution to risk sharing through equity instruments is proposed. Bircan, De Haas, Schweiger, and Stepanov (2020) also provide support for such a view and an insight into firms’ debt capacity. Slovenian small and medium-sized enterprises were, for example, not in the most favorable position, having limited capacity for additional debt accumulation and low liquidity.

As shown, sectoral distribution of state aid (at least in Slovenia) was suboptimal. For example, the support measures compensated for a considerable part of a reduction in cash flow of a median firm in the most vulnerable segment, the vulnerable service segment, but compared to other sectors for the least. Also, the number of firms not able to sustain positive cash flow with measures relative to the number of firms not able to sustain positive cash flow without measures is the lowest for the vulnerable service segment and thus the lowest share of firms benefited. In contrast, the utilities segment was able to strengthen its cash flow position without and even more so with the public support received. Furthermore, a decrease in the share of inactive firms in 2020 compared to 2019 even reinforces the issues related to the question of how taxpayers’ money was spent.



## REFERENCE LIST

1. Adrian, T., & Shin, H. S. (2010). Liquidity and leverage. *Journal of Financial Intermediation*, 19(3), 418–437.
2. AJPES (Agency of the Republic of Slovenia for Public Legal Records and Related Services), *Financial data for Slovenian companies*, Proprietary database (2012).
3. Amadeus, *Amadeus database of comparable financial information for public and private companies across Europe*, Bureau van Dijk (2012).
4. Apedo-Amah, M.C., Avdiu, B., Cirera, X., Cruz, M., Davies, E., Grover, A., Iacovone, L., Kilinc, U., Medvedev, D., Maduko, F.O., Poupakis, S., Torres, J. & Tran, T.T. (2020). Unmasking the Impact of COVID-19 on Businesses: Firm Level Evidence from across the World. In *Unmasking the Impact of COVID-19 on Businesses: Firm Level Evidence from across the World*. World Bank, Washington, DC. Available at: <https://doi.org/10.1596/1813-9450-9434>.
5. Bakker, B., & Gulde, A. (2010). The Credit Boom in the EU New Member States: Bad Luck or Bad Policies? *International Monetary Fund Working Paper*, 130.
6. Baldwin, R., & Giavazzi, F. (2015). The Eurozone Crisis A Consensus View of the Causes and a Few Possible Solutions. In *The Eurozone crisis: A consensus view of the causes and a few possible solutions*. <https://voxeu.org/article/eurozone-crisis-consensus-view-causes-and-few-possible-solutions>
7. Bank of Slovenia (2007-2015). *Financial Stability Reports*. Bank of Slovenia.
8. Bank of Slovenia. (2020). *Financial Stability Review*. Available at: [https://bankaslovenije.blob.core.windows.net/publication-files/fsr-oktober-2020\\_ang.pdf](https://bankaslovenije.blob.core.windows.net/publication-files/fsr-oktober-2020_ang.pdf).
9. Bank of Slovenia. (2021). *Financial Stability Review*. Available at: [https://bankaslovenije.blob.core.windows.net/publication-files/fsr\\_april\\_2021\\_en.pdf](https://bankaslovenije.blob.core.windows.net/publication-files/fsr_april_2021_en.pdf).
10. Bartholomew, D. J. (1980). Factor analysis for categorical data. *Journal of the Royal Statistical Society B: Methodological*, 42(3).
11. Baskaya, Y. S., di Giovanni, J., Kalemli-Özcan, Ş., Peydró, J. L., & Ulu, M. F. (2017). Capital flows and the international credit channel. *Journal of International Economics*, 108, S15–S22. <https://doi.org/10.1016/J.JINTECO.2016.12.003>
12. BCBS, Basel Committee on Banking Supervision. (2011). The transmission channels between the financial and real sectors: a critical survey of the literature. *Basel Committee on Banking Supervision Working paper*, 18
13. Bernanke, B. S., Gertler, M., & Gilchrist, S. (1999). The financial accelerator in a quantitative business cycle framework. In John Taylor & Woodford Michael (Eds.), *Handbook of Macroeconomics* (Vol. 1, pp. 1341–1393.)
14. Bircan, C., De Haas, R., Schweiger, H. & Stepanov, A. (2020). *Coronavirus credit support: Don't let liquidity lifelines become a golden noose*. VOX CEPR Policy Portal. Available at: <https://voxeu.org/article/coronavirus-credit-support-don-t-let-liquidity-lifelines-become-golden-noose>.
15. Blanchard, O. J. & Leigh, D. (2013). Growth Forecast Errors and Fiscal Multipliers. *American Economic Review*, 103(3), 117–120. Available at: <https://doi.org/10.1257/AER.103.3.117>.
16. Bole, V., Oblak, A., Prašnikar, J., & Trobec, D. (2018). Financial frictions and indebtedness of Balkan firms: A comparison with Mediterranean and Central European countries. *Journal of Policy Modeling*, 40(4). <https://doi.org/10.1016/j.jpolmod.2018.02.013>
17. Bole, V., Prašnikar, J. & Rop, A. (forthcoming). Support for the non-affected: How macroeconomic policies shaped the COVID-impact on sectoral activity.

18. Bole, V., Prašnikar, J., & Trobec, D. (2014). Policy measures in the deleveraging process: A macroprudential evaluation. *Journal of Policy Modeling*, 36(2), 410–432.
19. Bonin, J. P. (2004). Banking in the Balkans: the structure of the banking sectors in Southeast Europe, *Economic Systems* 28, 141–153.
20. Boot, A. W. A., Carletti, E., Haselmann, R., Kotz, H.-H., Krahen, J. P., Pelizzon, L., Schaefer, S. M., & Subrahmanyam, M. G. (2020a). The Coronavirus and financial stability. *SAFE Policy Letters*, 78. Available at: <https://ideas.repec.org/p/zbw/safepl/78.html>.
21. Boot, A. W. A., Carletti, E., Kotz, H.-H., Krahen, J. P., Pelizzon, L., & Subrahmanyam, M. G. (2020b). Corona and financial stability 3.0: Try equity - risk sharing for companies, large and small. *SAFE Policy Letter*, 81. <https://www.econstor.eu/handle/10419/215544>
22. Brunnermeier, M. K., & Pedersen, L. H. (2009). Market Liquidity and Funding Liquidity. *The Review of Financial Studies*, 22(6), 2201–2238. <https://doi.org/hhn098>
23. Brunnermeier, M. K., & Sannikov, Y. (2014). A Macroeconomic Model with a Financial Sector. *American Economic Review*, 104(2), 379–421. <https://doi.org/10.1257/AER.104.2.379>
24. Budnik, K. & Kleibl, J. (2018). Macroprudential regulation in the European Union in 1995-2014: Introducing a new data set on policy actions of a macroprudential nature. *ECB Working Paper*, 2123.
25. Burlon, L., Fantino, D., Nobili, A., & Sene, G. (2016). The quantity of corporate credit rationing with matched bank-firm data. *Economic working papers*, 1058. Bank of Italy, Economic Research and International Relations Area.
26. Campos-Martins, S., & Amado, C. (2022). Financial market linkages and the sovereign debt crisis. *Journal of International Money and Finance*, 123, 102596
27. Central Bank of Bosnia and Herzegovina. *Annual Report*.
28. Central Bank of Bosnia and Herzegovina. Croatian National Bank (1997-2013). *Annual Report*. Croatian National Bank.
29. Central Bank of Montenegro (2002-2013). *CBCG Annual Report*. Central Bank of Montenegro.
30. Chen, N., & Wang, H. (2008). Identifying the Demand and Supply Effects of Financial Crises on Bank Credit—Evidence from Taiwan. *Southern Economic Journal*, 75(1), 26–49.
31. Cirera, X., Cruz, M., Davies, E., Grover, A., Iacovone, L., Cordova, J.E.L., Medvedev, D., Maduko, F.O., Nayyar, G., Reyes Ortega, S. & Torres, J. (2021). Policies to Support Businesses through the COVID-19 Shock: A Firm Level Perspective. *World Bank Research Observer*, 36 (1), 41–66.
32. Claessens, S. (2015). An Overview of Macroprudential Policy Tools. *Annual Review of Financial Economics*, 7, 397–422.
33. Claessens, S., & Ghosh, S. R. (2013). Capital Flow Volatility and Systemic Risk in Emerging Markets: The Policy Toolkit. In Otaviano Canuto & Ghosh Swati (Eds.), *Dealing with the Challenges of Macro Financial Linkages in Emerging Markets* (pp. 91–116). The World Bank. <https://doi.org/10.1596/978-1-4648-0002-3>
34. Claessens, S., & Kose, M. A. (2013). Financial Crises: Explanations, Types, and Implications. *IMF Working Paper*, 13(28).
35. Claessens, S., & Kose, M. A. (2018). Frontiers of macrofinancial linkages. *BIS Papers*, 95(95).

36. Cornett, M. M., McNutt, J. J., Strahan, P. E., & Tehranian, H. (2011). Liquidity risk management and credit supply in the financial crisis. *Journal of Financial Economics*, *101*(2), 297–312. <https://doi.org/10.1016/j.jfineco.2011.03.001>
37. Cottarelli, C., Ariccia, G. D., & Vladkova-Hollar, I. (2005). Early birds, late risers, and sleeping beauties: Bank credit growth to the private sector in Central and Eastern Europe and in the Balkans. *Journal of Banking & Finance*, *29*, 83–104.
38. CRM (Central Register of the Republic of Macedonia). 2012. Financial data for Macedonian companies.
39. Čehajić, A., & Košak, M. (2021). Macroprudential measures and developments in bank funding costs. *International Review of Financial Analysis*, *78*, 101943. <https://doi.org/10.1016/J.IRFA.2021.101943>
40. de Haan, L., van den End, J. W., & Vermeulen, P. (2017). Lenders on the storm of wholesale funding shocks: saved by the central bank? *Applied Economics*, *49*(46), 4679–4703. <https://doi.org/10.1080/00036846.2017.1287868>
41. Demmou, L., Franco, G. & Calligaris, S. (2021). Liquidity shortfalls during the COVID-19 outbreak: Assessment and policy responses. *OECD Economics Department Working Papers*, *1647*, 6–7.
42. Diamond, D. W., & Dybvig, P. H. (1983). Bank Runs, Deposit Insurance, and Liquidity. *Journal of Political Economy*, *91*(3), 401–419.
43. Diamond, D. W., & Rajan, R. G. (2001). Banks and Liquidity. *American Economic Review*, *91*(2), 422–425. <https://doi.org/10.1257/aer.91.2.422>
44. Diamond, D. W., & Rajan, R. G. (2005). Liquidity Shortages and Banking Crises. *The Journal of Finance*, *60*(2), 615–647.
45. Ebeke, C., Jovanovic, N., Valderrama, L. & Zhou, J. (2021). Corporate Liquidity and Solvency in Europe during COVID-19. *IMF Working Papers*, *21*(278). Available at: <https://doi.org/10.5089/9781513570914.001>.
46. Ekström, J. (2011). A generalized definition of the polychoric correlation coefficient. *UCLA Department of Statistics*.
47. European Central Bank. (2012). *Speech by Mario Draghi, President of the European Central Bank at the Global Investment Conference in London*. Available at: <https://www.ecb.europa.eu/press/key/date/2012/html/sp120726.en.html>.
48. European Central Bank. (2020). *ECB Banking Supervision provides temporary capital and operational relief in reaction to coronavirus*. Available at: <https://www.bankingsupervision.europa.eu/press/pr/date/2020/html/ssm.pr200312~43351ac3ac.en.html>.
49. European Commission. (2020a). *COVID-19: Commission sets out European coordinated response*. Available at: [https://ec.europa.eu/commission/presscorner/detail/en/IP\\_20\\_459](https://ec.europa.eu/commission/presscorner/detail/en/IP_20_459).
50. European Commission. (2020b). *Timeline of EU action*. Available at: [https://ec.europa.eu/info/live-work-travel-eu/coronavirus-response/timeline-eu-action\\_en](https://ec.europa.eu/info/live-work-travel-eu/coronavirus-response/timeline-eu-action_en).
51. Everaert, G., Che, N., Geng, N., Gruss, B., Impavido, G., Lu, Y., Saborowski, C., Vandenbussche, J., & Zeng, L. (2015). Does Supply or Demand Drive the Credit Cycle? Evidence from Central, Eastern, and Southeastern Europe. *IMF Working Papers*, *15*(15).
52. Firmen-Compass database, *Financial data for Austrian companies*, Compass-Gruppe (2012).
53. Firmen-Compass database. 2012. Compass-Gruppe. Financial data for Austrian companies
54. Fisher, I. (1933). The Debt-Deflation Theory of Great Depressions. *Econometrica*, *1*(4), 337. <https://doi.org/10.2307/1907327>

55. Gertler, M., & Kiyotaki, N. (2010). Financial Intermediation and Credit Policy in Business Cycle Analysis. In Benjamin M. Friedman & Woodford Michael (Eds.), *Handbook of Monetary Economic* (Vol. 3, pp. 547–599).
56. Gertler, M., Kiyotaki, N., & Prestipino, A. (2016). Wholesale Banking and Bank Runs in Macroeconomic Modeling of Financial Crises. In John Taylor & Uhlig Harald (Eds.), *Handbook of Macroeconomics* (Vol. 2, pp. 1345–1425). <https://doi.org/10.1016/bs.hesmac.2016.03.009>
57. Giannone, D., Lenza, M., Pill, H., & Reichlin, L. (2012). The ECB and the Interbank Market. *The Economic Journal*, 122(564), F467–F486. <https://doi.org/10.1111/J.1468-0297.2012.02553.X>
58. Gräbner, J., & Hafele, C. (2020). The emergence of core-periphery structures in the European Union: A complexity perspective. *ICAE Working Paper Series*, 113.
59. Hense, F. (2015). Interest Rate Elasticity of Bank Loans: The Case for Sector-Specific Capital Requirements. *CFS Working Paper*, 504.
60. Hoffmann, A., & Schnabl, G. (2016). Monetary policies of industrial countries, emerging market credit cycles and feedback effects. *Journal of Policy Modeling*, 38(5), 855–873. <https://doi.org/10.1016/J.JPOLMOD.2016.08.002>
61. Holmstrom, B., & Tirole, J. (1997). Financial intermediation, loanable funds, and the real sector. *Quarterly Journal of Economics*, 112(3), 663–691. <https://doi.org/10.1162/003355397555316>
62. Huang, R., & Ratnovski, L. (2011). The dark side of bank wholesale funding. *Journal of Financial Intermediation*, 20(2), 248–263. <https://doi.org/10.1016/j.jfi.2010.06.003>
63. Hunya, G. (2009). *FDI in the CEECs Under the Impact of the Global Crisis: Sharp Declines*. Vienna: The Vienna Institute for International Economic Studies Database on Foreign Direct Investment in Central, East and Southeast Europe.
64. IMF Fiscal Monitor Database of Country Fiscal Measures in Response to the COVID-19 Pandemic. <https://www.imf.org/en/Topics/imf-and-covid19/Fiscal-Policies-Database-in-Response-to-COVID-19>
65. Ivashina, V., & Scharfstein, D. S. (2010). Bank Lending During the Financial Crisis of 2008. *Journal of Financial Economics*, 97(3), 319–338.
66. Iyer, R., Peydró, J. L., Da-Rocha-Lopes, S., & Schoar, A. (2020). Interbank Liquidity Crunch and the Firm Credit Crunch: Evidence from the 2007-2009 Crisis. *Review of Financial Studies*, 27(1), 347–372. <https://doi.org/10.1093/RFS/HHT056>
67. Jiménez, G., Ongena, S., Peydró, J.-L., & Saurina, J. (2012). Credit Supply and Monetary Policy: Identifying the Bank Balance-Sheet Channel with Loan Applications. *American Economic Review*, 102(5), 2301–2326. <https://doi.org/10.1257/aer.102.5.2301>
68. Jiménez, G., Ongena, S., Peydró, J.-L., & Saurina, J. (2011). Credit Supply versus Demand: Bank and Firm Balance-Sheet Channels in Good and Crisis Times. *Discussion Paper, 005*. Tilburg University, Center for Economic Research.
69. Jovančević, R. (2000). Macroeconomic conditions and the banking reform in Croatia, *MOST: Economic Policy in Transitional Economies*, 10, 325–345.
70. Juvan, J. (2011). The Role of Slovenia in Stabilization, Integration and Security of Southeastern European Countries: Opportunities Missed. *Sicherheit Und Frieden (S+F) / Security and Peace*, 29(3), 202–207. <http://www.jstor.org/stable/24233180>
71. Kakes, J., & Sturm, J. (2002). Monetary policy and bank lending: Evidence from German banking groups. *Journal of Banking & Finance*, 26(11), 2077–2092, or Hense, op. cit., 2015 from that for firm credits,
72. Kindleberger, C. P., & Aliber, R. Z. (2005). *Manias, panics and crashes: A history of financial crises, fifth edition*. *Manias, Panics and Crashes: A History of Financial Crises* (pp. 1–309). Palgrave Macmillan. <https://doi.org/10.1057/9780230628045>

73. Kiyotaki, N., & Moore, J. (1997). Credit Cycles. *Journal of Political Economy*, 105(2), 211–248.
74. Koman, M., Lakicević, M., Prašnikar, J. & Svejnar, J. (2015). Asset stripping, rule of law and firm survival: the Hoff-Stiglitz model and mass privatization in Montenegro, *Journal of Comparative Economics*, 43, 274–289
75. Koo, R. (2008). *The Holy Grail of Macroeconomics: Lessons from Japan's Great Recession*. Singapore: J. Wiley.
76. Korkman, S., & Suvanto, A. (2015). Finland and Sweden in a Cross-Country Comparison. *Reform Capacity and Macroeconomic Performance in the Nordic Countries*, 278–305. <https://doi.org/10.1093/ACPROF/OSO/9780198717102.003.0020>
77. Krishnamurthy, A. (2010). Amplification Mechanisms in Liquidity Crisis, *American Economic Journal: Macroeconomics*, 2(3), 1-30.
78. Magud, N. E., & Vesperoni, E. R. (2015). Exchange rate flexibility and credit during capital inflow reversals: Purgatory ... not paradise. *Journal of International Money and Finance*, 55, 88–110.
79. Magud, N. E., Reinhart, C. M., & Vesperoni, E. R. (2014). Capital inflows, exchange rate flexibility and credit booms. *Review of Development Economics*, 18(3), 415–430.
80. Mendoza, E. G., & Terrones, M. E. (2008). An Anatomy of Credit Booms: Evidence From Macro Aggregates and Micro Data. *IMF Working Paper*, 226.
81. Miller, M. & Stiglitz, J. (2010). Leverage and Asset Bubbles: Averting Armageddon with Chapter 11. *Economic Journal*, 120(544), 500-518.
82. Minsky, H.P. 1986. *Stabilizing an Unstable Economy*. Yale University Press, New Haven and London (2008).
83. National Bank of Serbia. Available at: <http://www.nbs.rs/internet/latinica/> (accessed March 5, 2014 , 2021).
84. National Bank of the Republic of Macedonia. Available at: <http://www.nbrm.mk/default-en.asp> (accessed March 2, 2014).
85. Oblak, A. (2021). A First Peek at Firms' Cash Flow Dynamics in the Pandemic Year: A Lesson Learned? *Economic and Business Review*, 23(4).
86. Ongena, S., Peydró, J. L., & Van Horen, N. (2015). Shocks Abroad, Pain at Home? Bank-Firm-Level Evidence on the International Transmission of Financial Shocks. *IMF Economic Review*, 63(4), 698–750. <https://doi.org/10.1057/IMFER.2015.34>
87. *Pojasnilo 1 k Slovenskemu računovodskemu standardu 15, stran 2364*. (2020). Uradni list RS. Available at: <https://www.uradni-list.si/glasilo-uradni-list-rs/vsebina/2020-01-0955?sop=2020-01-0955>.
88. Prašnikar, J., Bole, V., Dominko, M., Lakićević, M. & Oblak, A. (2021). Disentangling External Flows (External Shocks) and Policy Effects on the Credit Activities of Banks in Three Emerging Countries during the Great Recession. *Journal of Balkan and Near Eastern Studies*, 23(1), 78–100.
89. Prašnikar, J., Bole, V., Dominko, M., Lakićević, M., & Oblak, A. (2021). Disentangling External Flows (External Shocks) and Policy Effects on the Credit Activities of Banks in Three Emerging Countries during the Great Recession. *Journal of Balkan and Near Eastern Studies*, 23(1), 78–100. <https://doi.org/10.1080/19448953.2020.1818026>
90. Republic of Slovenia Fiscal Council. (2021). *Public finance and macroeconomic developments*. Available at: [https://www.fs-rs.si/wp-content/uploads/2021/07/Public-Finance-and-Macroeconomic-Developments\\_July-2021.pdf](https://www.fs-rs.si/wp-content/uploads/2021/07/Public-Finance-and-Macroeconomic-Developments_July-2021.pdf).
91. Sanfey, P. (2011). South East Europe: lessons from the global economic crisis. In Othon Anastasakis, Jens Bastian and Watson Max (Eds.): *From Crisis to Recovery: Sustainable Growth in South East Europe* (pp. 13–36).. Oxford: South East European Studies at Oxford (SEESOX).

92. Schadler, S. 2011. Rethinking the South East European convergence model. In Othon Anastasakis, Jens Bastian and Watson Max (Eds.): *From Crisis to Recovery, Sustainable Growth in South East Europe* (pp. 37–52). Oxford: South East European Studies at Oxford (SEESOX).
93. Schivardi, F. & Romano, G. (2020). *Liquidity crisis: Keeping firms afloat during Covid-19*. VOX EU CEPR Policy Portal. Available at: <https://voxeu.org/article/liquidity-crisis-keeping-firms-afloat-during-covid-19>.
94. Šević, Ž. (2000). Banking Reform in South East European Transitional Economies: An Overview. *MOST: Economic Policy in Transitional Economies*, 10, 271–283.
95. Statistical Office of the Republic of Slovenia. (2021). *Net lending (+) / net borrowing (-) and consolidated gross debt of general government, Slovenia, annually*. Available at: <https://pxweb.stat.si/SiStatData/pxweb/sl/Data/-/0314905S.px/> (accessed September 22, 2021).
96. Stein, Jermey C (1998). An Adverse-Selection Model of Bank Asset and Liability Management with Implications for the Transmission of Monetary Policy. *RAND Journal of Economics*, 29 (3), 466-486.
97. Suni, P., & Vihriälä, V. (2014). Euro – How big a difference. Finland and Sweden in search of macro stability. *Revue de l'OFCE*, N° 132(1).
98. Sutherland, D., Hoeller, P., Merola, R., & Ziemann, V. (2012). Debt and macroeconomic stability. *OECD economics department Working Paper*, 1003.
99. Taylor, A. M (2015). Credit, Financial Stability, and the Macroeconomy. *NBER Working Papers*, 21039.
100. Van den Heuvel, S. J., Heuvel, V. den, & Skander. (2002). Does bank capital matter for monetary transmission? *Economic Policy Review*, 8(May), 259–265.
101. Verbič, M., Srakar, A., Majcen, B., & Čok, M. (2016). Slovenian public finances through the financial crisis. *Teorija in praksa*, 1(53), 203–227.
102. Vienna initiative, CESEE deleveraging monitor (July 2013).
103. Wiener Institut für Internationale Wirtschaftsvergleiche 2014, WIIW Database on Foreign Direct Investment in Central, East, and Southeast Europe.

## **APPENDIX**





## **Appendix 1: Summary in Slovenian language**

### **DALJŠI POVZETEK DISERTACIJE V SLOVENSKEM JEZIKU**

#### **Motivacija**

Svetovna gospodarska in finančna kriza v letih 2007–2009 ostaja predmet znanstvene obravnave tudi po več kot desetletju. Razprava se na eni strani osredotoča na vzroke nastanka finančne krize, dejavnike, ki vplivajo na njen razvoj (in globino), ter posledice finančnih kriz, na drugi strani pa se vprašuje osnovne predpostavke obstoječih ekonomskih modelov. Krizi je sledilo spoznanje oziroma prizadevanje k razvoju ekonomskih modelov, ki bolj odslikavajo dogajanje v realnem in finančnem sektorju, in bi s tem ustrezno podpirali oblikovanje ekonomskih politik, vključno z odzivom na pandemijo. Razlika v mehanizmu nastanka obeh kriz je izrazita, le-to pa ne zmanjšuje vrednosti znanstvenih spoznanj, povezanih s krizo v letih 2007–2009.

Raziskovanju makrofinančnih povezav (angl. macrofinancial linkages) tako empiričnemu kot teoretičnemu se v letih po finančni krizi pripisuje vedno večjo vrednost. Osrednji element makrofinančnih povezav je povezanost realnega sektorja s finančnim sektorjem preko nepopolnih finančnih trgov (angl. financial market imperfections). »Finančni sektor je lahko izvor šokov, ki se krepijo preko realnega sektorja, in realni sektor je lahko izvor šokov, le-ti pa se krepijo preko finančnega sektorja (Claessens & Kose, 2018).« Stična točka transmisijskih mehanizmov (angl. transmission mechanism) je bilanca stanja in z njo povezana zmožnost zadolževanja nefinančnih družb in gospodinjstev ter tudi sposobnost bank za kreditiranje gospodarstva.

Ideje avtorjev, kot so Fisher (1933), Minsky (1986) in Kindleberger (1978), o z dolgom pogojeni krizi so ponovno relevantne. Kindleberger in Aliber (2005) v svoji knjigi analizirata finančne balone (angl. financial bubbles) od sedemnajstega stoletja dalje, svoje razumevanje finančne krize pa gradita na modelu Hymana Minskega. Teza knjige je: »Cikel manije in panike je rezultat procikličnih sprememb v ponudbi kreditov; ponudba kreditov raste hitro v dobrih časih, ko pa se gospodarska rast umiri, rast kreditov navadno močno upade.« Tudi razumevanje svetovne gospodarske in finančne krize bi lahko osnovali na predstavljeni tezi.

Z naraščanjem zadolženosti nefinančnih podjetij in gospodinjstev, ki je značilna za večino evropskih držav v obdobju pred finančno in gospodarsko krizo (ECB, 2012), se je povečevala njihova ranljivost na neugodne zunanje šoke in zmanjševala sposobnost za absorpcijo le-teh (Sutherland, Hoeller, Merola, & Ziemann, 2012). Zadolženost lahko upočasni dinamiko okrevanja po krizi (Taylor, 2015), ki pa je poleg zadolženosti odvisna tudi od institucionalnega okolja (npr. bančne in makrobonitetne regulacije).

Razsežnosti svetovne finančne in gospodarske krize tako postavljajo številna vprašanja. Disertacija je motivirana z dvema ključnima vprašanjema in posledično naslavlja dve vprašanji: "Kako navidezno nepomemben dogodek lahko povzroči tako nezanemarljive

posledice (Williamson v Miller & Stiglitz, 2010)?" ter "Zakaj so bile določene regije (države) bolj prizadete in so v času t.i. Velike recesije potrebovale več časa za okrevanje kot druge?"

### **Raziskovalno področje in raziskovalna vprašanja**

Desetletje trajajoča rast aktivnosti na nepremičninskem trgu se je razvila v finančni balon na omenjenem trgu v Združenih državah Amerike. Pok balona je sprožil krizo, ki ni razgalila le neravnovesij v državi izvora, temveč tudi na svetovni ravni. »Vsaka kriza ima svoje edinstvene značilnosti, kot so narava šoka, predmet špekulacij, obliko rasti kreditne aktivnosti, iznajdljivost goljufov in dogodek, ki krizo sproži (Kindleberger & Aliber, 2005).« Kljub omenjenim razlikam se pojavljajo podobni vzorci in Velika recesija (angl. the Great Recession) ni izjema.

Finančna kriza je navadno večdimenzionalna, povezana z več kot enim destabilizacijskim dejavnikom. Povezana je lahko s kreditnim razmahom (angl. credit boom), znatnim povečanjem cen premoženja, najpogosteje nepremičnin in delnic, motnjami v finančnem posredništvu, dostopu do zunanjega financiranja, s poslabšanjem bilanc stanja podjetij, gospodinjestev, finančnih posrednikov ali držav (Claessens & Kose, 2018). Taylor (2015) omenjeno krizo opredeli kot finančno krizo, kot nenormalen in redek pojav. V primerjavi z normalnimi recesijami so ekonomske in socialne posledice finančnih kriz večjih razsežnosti tako kratkoročno kot srednjeročno, vzroke za njihov nastanek pa v prvi vrsti povezujemo z (nevzdržnim) naraščanjem zadolženosti.

Izvori kreditnih razmahov (angl. credit boom) so številni, od pozitivnih šokov v produktivnosti, ekonomskih politik do kapitalskih (pri)tokov (angl. capital (in)flows). Pritoki tujega kapitala v državo gostiteljico lahko privedejo do povečanja razpoložljivosti dolžniških sredstev na domačih finančnih trgih (Claessens & Kose, 2018). Kreditni standardi tako za nefinančne družbe kot za gospodinjstva se sprostijo, dostop do kreditov je posledično lažji. Veliki prilivi kapitala v obdobju pred krizo sovpadajo s prekomerno rastjo kreditov in porastom cen premoženja v številnih državah, vključno z državami balkanske regije. Hoffman in Schnabl (2016) in Hunya (2009) dokumentirajo povečanje tujih grosističnih virov financiranja v financiranju bank v balkanski regiji v obdobju razcveta ter pripadajoč problem nenadne ustavitve kapitalskih tokov (angl. sudden stop). Prilivi kapitala iz razvitih držav v omenjena gospodarstva so nesorazmerno veliki, njihova narava pa destabilizirajoča.

Razsežnosti svetovne finančne krize in njene posledice so bile izjemne. Nepopolni finančni trgi, preko katerih se prenašajo in stopnjujejo šoki iz realnega gospodarstva v finančni sektor in iz finančnega sektorja v realno gospodarstvo, lahko delno pojasnijo krizno dinamiko. V disertaciji je poudarek na transmisijem mehanizmu iz finančnega sektorja v realni sektor. Basel Committee on Banking Supervision (2011) ter Claessens in Kose (2018) so opredelili tri glavne transmisijske kanale (angl. transmission channel). Prvi bilančni kanal (angl. borrowers balance sheet channel) deluje na strani povpraševanja in opisuje, kako lahko spremembe v bilanci stanja oziroma premoženjski bilanci posojilojemalcev krepijo

makroekonomska nihanja. Najbolj razširjen model je model finančnega akceleratorja. Drugi kanal, tj. posojilni kanal (angl. bank lending channel), povezan s ponudbeno stranjo, poudarja pomen bilanc stanja bank in drugih finančnih institucij pri kreditiranju in zagotavljanju likvidnosti realnemu sektorju. Tretji, likvidnostni kanal (angl. liquidity channel), obravnava vpliv likvidnosti na kreditno ponudbo bank, in s tem na gospodarsko aktivnost. Poudarja rigidnost, ki je lahko prisotna pri upravljanju bilančnih postavk bank. Zadolženost tako lahko proučujemo z dveh različnih vidikov, in sicer z vidika povpraševanja oziroma podjetij (gospodinjstev) in z vidika ponudbe oziroma bank. V zadnjem času so bili razviti modeli, ki upoštevajo oba vidika. Gertler in Kiyotaki (2011) ter Gertler, Kiyotaki in Prestipino (2016) so razvili model, ki razlaga mehanizem (nevzdržnega) zadolževanja nefinančnih podjetij kot posledico finančnih trenj (angl. financial frictions), ter hkratnega povečanja zadolženosti bank. Le-to je povezano z izboljšano dostopnostjo grosističnih virov financiranja.

Drugo poglavje disertacije raziskuje vplive pritokov tujega kapitala na stopnjevanje krize (angl. crisis amplification) in posledično odnos med jedrnimi (evropskimi) državami in perifernimi državami, ter vlogo prvih pri prenosu in poglobljanju krize v perifernih državah. Ključno je tudi vprašanje o mehanizmih znotraj države, kot so na primer institucionalno okolje ali razvitost finančnih trgov, ki v času razcveta pospešujejo gospodarsko aktivnost v času upada pa le-tega dodatno poglobljajo. Raziskava temelji na modelu finančnega akceleratorja (angl. financial accelerator), ki endogeno stopnjuje učinke zunanjih šokov na rast zadolženosti. Ugodne ekonomske razmere, vključno z razmerami na finančnih trgih, pozitivno vplivajo na stanje bilanc stanja nefinančnih družb in gospodinjstev ter tudi finančnih institucij. Z rastjo premoženja (angl. net worth) omenjenih ekonomskih akterjev se njihova kreditna sposobnost izboljšuje, pribitek na zunanje financiranje (angl. external finance premium), ki je posledica t.i. agencijskega problema, pa se zmanjšuje. Le-to vodi v nižje stroške kapitala, kar povzroči rast investicij in potrošnje ter posledično agregatnega povpraševanja. Po izbruhu krize negativni makroekonomski učinki slabijo bilance stanja kreditojemalcev preko nižjih dobičkov in nižjega dohodka ter tudi preko nižjih cen premoženja, kar povečuje pribitek na zunanje financiranje in lahko zatre investicije in potrošnjo (Bernanke, Gertler, & Gilchrist, 1999). V disertaciji je uporabljena razširjena različica osnovnega modela finančnega akceleratorja (Bole, Oblak, Prašnikar, & Trobec 2018), ki omogoča primerjavo velikosti finančnih akceleratorjev v treh regijah, v različnih obdobjih gospodarskega cikla (razcvet, upad in okrevanje) ter za različne tipe investicij (investicije v produktivni kapital in finančne investicije). Model denarnega toka je osnovan na idejah prispevkov: Miller in Stiglitz (2010), Krishnamurthy (2010).

Raziskovalni vprašanji:

**V1.** Kako se velikost akceleratorjev razlikuje v treh regijah (ob upoštevanju makroekonomskega stanja, optimizma na Balkanu in velikih pritokih kapitala) glede na različna obdobja (razcveta, upada in okrevanja) in glede na različne vrste investicij?

**V2.** Kakšen je vpliv finančnega in nefinančnega dolga, poslovnih terjatev in premoženja, ki lahko služi za zavarovanje finančnega dolga (angl. collateral), na denarni tok podjetij v različnih obdobjih in v različnih skupinah držav?

Tretje poglavje je namenjeno študiji kreditne ponudbe in dejavnikov vpliva nanjo s poudarkom na likvidnostnem kanalu. Banke motnjam na medbančnih trgih (ali motnjam v dostopnosti vlog nefinančnih sektorjev) prilagodijo svojo kreditno ponudbo gospodinjstvom in podjetjem ter preko aktivacije likvidnostnega kanala prenesejo šok iz finančnega sektorja v realni sektor. V disertaciji gradimo na kreditnem modelu, ki je bil razvit v študiji Prašnikar, Bole, Dominko, Lakičević, in Oblak (2021), modelu v teoretičnem prispevku Gertler in Kiyotaki (2011) ter Gertler, Kiyotaki in Prespitino (2016). Eden pomembnejših vidikov je ponovno vloga prilivov kapitala na prekomerno zadolževanje gospodinjstev in podjetij v obdobju pred krizo in kreditni krč, ki je sledil. V treh izbranih državah večino grosističnih virov financiranja predstavljajo prilivi tujega kapitala v banke. Zanimivo je, da Huang in Ratnovski (2011) v svoji študiji pokažeta, da v fazi refinanciranja lahko grosistični viri financiranja presahnejo že ob najmanjši negativni novici, kar lahko vodi v nižjo kreditno aktivnost bank. Tako preučujemo, kako različna narava prilivov kapitala v analiziranih treh državah vpliva na ponudbo kreditov v Črni gori, na Hrvaškem in v Sloveniji v času Velike recesije.

Raziskovalni vprašanji:

**V3.** Kako grosistični viri financiranja in vloge nefinančnih sektorjev vplivajo na ponudbo bančnih kreditov v treh državah glede na fazo gospodarskega cikla (razcvet, upad in okrevanje) in vrsto posojilojemalca (gospodinjstva in podjetja)?

**V4.** Kako oslabitve in povpraševanje vplivajo na ponudbo bančnih kreditov v treh državah glede na fazo gospodarskega cikla (razcvetenje, oprsje in okrevanje) in vrsto posojilojemalca (gospodinjstva in podjetja)?

Četrto poglavje je osnovano na idejah in metodologiji, uporabljeni v drugem in tretjem poglavju, ter je razširjeno tako, da omogoča analizo vpliva ekonomskih politik. Ključno raziskovalno vprašanje je, kako ukrepi ekonomskih politik (sistematični oziroma nesistematični) vplivajo na ponudbo bančnih kreditov in likvidnost podjetij. Prvič, analiziramo makrobonitetne politike, standardne makroekonomske politike ter strukturne politike ter njihov vpliv na kreditno ponudbo bank podjetjem in gospodinjstvom. Večinoma se empirične študije ukvarjajo z vprašanjem vpliva politik na kreditno ponudbo parcialno. De Haan, van den End in Vermeulen (2017), Giannone, Lenza, Pill in Reichlin (2012) na primer ocenjujejo učinek monetarne politike, Budnik in Kleibl (2018), Čehajić in Košak (2021) pa učinke makrobonitetne politike. Disertacija obravnava ukrepe ekonomske politike celovito.

Drugič, preučujemo likvidnost podjetij v dveh časovnih obdobjih in v nadaljevanju tudi vpliv ukrepov za omilitev posledic pandemije. Primerjava v času delno omogoča primerjavo vplivov usklajenih ekonomskih politik v času pandemije ter vplivov nesistematičnih ukrepov

ekonomskih politik v času svetovne gospodarske in finančne krize. Empirična analiza temelji na metodologiji, ki je uporabljena v študiji v drugem poglavju disertacije ter študiji, v kateri avtorji obravnavajo spremembe v denarnih tokovih in nelikvidnost nefinančnih podjetij v Sloveniji v času Velike recesije (Bole, Prašnikar & Trobec, 2014).

Raziskovalno vprašanje:

**V3.** Kako ukrepi ekonomskih politik (sistematični oziroma nesistematični) vplivajo na ponudbo bančnih kreditov in likvidnost podjetij?

### **Podatki in metodologija**

Disertacija je hierarhična po strukturi; od jedrnih do perifernih držav, od primerjave med regijami do primerjave med državami in ene države v dveh kriznih obdobjih. Na najvišji ravni so države razvrščene v tri skupine glede na geografsko bližino, naravo kapitalskih tokov in sektorsko zadolženost. Med balkanske države sodijo Bolgarija, Bosna in Hercegovina, Hrvaška, Severna Makedonija, Črna gora, Srbija in Slovenija. Omenjenim balkanskim državam je skupen močan pritek kapitala v predkriznem obdobju. Sredozemske države so Italija, Grčija, Španija in Portugalska. Jedrna (centralna) Evropa vključuje Avstrijo, Češko, Francijo, Nemčijo, Madžarsko in Slovaško. Ta delitev je uporabljena v drugem poglavju. V tretjem in delno v četrtem poglavju je primerjava na ravni držav. Ponudbo bančnih kreditov in odziv ekonomskih politik v obdobju Velike recesije preučujemo za Hrvaško, Črno goro in Slovenijo. Dodana je še ena dimenzija primerjave, časovna. Ukrepe ekonomskih politik v Sloveniji med Veliko recesijo primerjamo z ukrepi med pandemijo Covida-19.

Empirična analiza temelji na številnih virih podatkov. V začetku drugega poglavja je prikazana dinamika izbranih makroekonomski kazalcev, ki temeljijo na sekundarnih virih podatkov. Le-ti vključujejo nacionalne statistične urade in nacionalne centralne banke ter mednarodne institucije (ponudnike podatkov), kot so Eurostat, Evropska centralna banka (ECB), Svetovna banka (WB), Mednarodni denarni sklad (MDS) in Banka za mednarodne poravnave (BIS). Zadolževanje podjetij in zadolževanje gospodinjstev je analizirano na ravni individualne banke. Glavni viri podatkov so finančni podatki podjetij in bank ponudnika Bureau van Dijk, in sicer bazi podatkov Amadeus in Bankscope. Podatki za spremenljivke, ki so ključne za analizo dejavnikov vpliva na kreditno ponudbo podjetjem in gospodinjstvom, so zbrani naknadno s pomočjo letnih poročil. Dopolnjeni so bili tudi finančni podatki podjetij. Dodatni viri podatkov so Centralna banka Črne gore, Centralni register Makedonije, avstrijski Firmen-Compass in celovita zbirka finančnih podatkov Agencija Republike Slovenije za javnopravne evidence in storitve (AJPES). Podatki o državni pomoči so bili pridobljeni iz ERAR, portala za spremljanje porabe javnega denarja v Republiki Sloveniji. Končne zbirke podatkov vključujejo podatke za več kot 11.000 podjetij v obdobju 2006–2010 za 17 analiziranih držav, finančne podatke hrvaških, slovenskih in črnogorskih bank z več kot 85 pokritostjo bilančne vsote posameznega bančnega sektorja v obdobju 2006–2013, ter podatke za celotno populacijo slovenskih gospodarskih družb za obdobje 2007–2020 (68.125 in 2020).

V drugem poglavju je razširjeni model finančnega akceleratorja, ki temelji na modelu Bernanke, Gertler in Gilchrist (1999), in predstavlja podlago za empirično specifikacijo modela, ocenjen s pomočjo posplošene metode momentov (angl. general method of moments, GMM). V tretjem poglavju so enačbe kreditov gospodinjstvom in krediti podjetjem ocenjene z instrumenti, kjer predpostavljamo, da so ključne spremenljivke endogene. Na grosistične vire financiranja in vloge nebančnega sektorja lahko vplivajo isti dejavniki. Enako velja za oslabitve. Da bi izkoristili naravo podatkov (panel), za oceno uporabimo fiksne učinke instrumentalnega 2GSLs. V tretjem poglavju so dodatno ocenjeni prispevki posameznih spremenljivk k dejanski kreditni ponudbi podjetjem in gospodinjstvom za mediano. Enaka metodologija je uporabljena pri obravnavi vloge ukrepov ekonomskih politik na ponudbo kreditov v četrtem poglavju. V primerjalni študiji vpliva ukrepov ekonomskih politik na likvidnost podjetij v dveh časovnih obdobjih uporabimo preprosto opisno statistiko.

### **Prispevek k znanosti**

Področje raziskovanja, ki se ukvarja z makrofinančnimi povezavami, je obsežno, njegova konsolidacija pa je vse bolj zanimiva tako za raziskovalce kot za oblikovalce ekonomskih politik. To nazorno kaže članek *Frontiers of macrofinancial linkages* avtorjev Claessens in Kose (2018), ki poskuša povzeti obstoječo literaturo in vključuje več kot 60 strani literature in virov. Disertacija prispeva k razpravi o vlogi makrofinančnih povezav pri prenosu, širjenju in krepitvi krize z vidika povpraševanja (vidik posojilojemalcev, in sicer podjetij in gospodinjstev) in vidika ponudbe (vidik posojilodajalcev, zlasti bank). Jedro predstavljajo povezave med realnim gospodarstvom in finančnim sektorjem, ki nastajajo zaradi nepopolnih finančnih trgov. Medtem ko v okviru obstoječih teoretičnih modelov (glej na primer Koo (2008)) lahko pojasnimo vzroke nastanka finančne krize ali mehanizem upadanja gospodarske aktivnosti, dejanska krizna dinamika ostaja nejasna. K boljšem razumevanju le-te v regijah na različnih stopnjah razvoja pa ključno prispeva primerjava na regionalni ravni (v drugem poglavju).

Drugič, disertacija omogoča vpogled v odnos med jedro Evrope in periferijo. V obdobju pred krizo je bil eden od pomembnih ciljev politike konvergenca med razvitim jedrom in manj razvitimi obrobni evropskimi državami, ki bi jo dosegli s pritoki tujega kapitala v manj razvita gospodarstva in v sektorje z visoko mejno produktivnostjo (Praet, 2014). Cilj ni bil dosežen, so pa nesorazmerno veliki prilivi tujega kapitala v periferna gospodarstva balkanske regije (in deloma tudi sredozemske) v predkriznem obdobju ter njihova nenadna ustavitve ob izbruhu krize dodatno destabilizirali ekonomije držav gostiteljic. Omenjen mehanizem prenosa in krepitve istega (simetričnega) šoka (od jedra proti periferiji) je slabo raziskan.

Preučevanje mehanizma asimetrične krepitve simetričnega šoka od jedra proti periferiji omogoča razširjeni model finančnega akceleratorja (Bole, Oblak, Prašnikar & Trobec, 2018). Le-to je tudi eden pomembnih prispevkov disertacije. Osnovna predpostavka modela je, da se velikost finančnega akceleratorja spreminja skupaj s fazo gospodarskega cikla (razcvet, upad

in okrevanje), vrsto investicij (investicije v produktivni kapital, finančne investicije ali investicije v nepremičnine), panogo, regijo (balkanska regija, sredozemska regija ali srednjeevropska regija) in glede na solventnost podjetij (velikost kapitala in premoženja, ki lahko služi za zavarovanje finančnega dolga). Tudi kreditni model odprtega gospodarstva (Prašnikar, Bole, Dominko, Lakićević in Oblak, 2021) ponudi teoretično podlago za empirično analizo ponudbe kreditov bank ter omogoči razmejevanje vpliva dejavnikov ponudbe in povpraševanja na ponudbo kreditov gospodinjstvo in podjetje. Na podlagi modela je bilo tako mogoče proučiti učinke dveh glavnih spremenljivk, povezanih s prilivi tujega kapitala (grosističnih virov financiranja in vlog nefinančnih družb), na kreditno aktivnost bank. Ustrezna teoretična podlaga in številni viri podatkov so omogočili obsežno empirično analizo.

Nenazadnje so rezultati, predstavljeni v doktorski disertaciji, relevantni tudi z vidika oblikovalcev ekonomskih politik. Skladno z dejansko dinamiko procesa kopičenja dolga in njegovega vpliva na likvidnost lahko predlagamo dva glavna stebra ekonomske politike. Kot najučinkovitejša kombinacija politik za periferne države se v času gospodarskega razcveta nakazuje makrobonitetna politika, osredotočena na omejevanje prilivov tujega kapitala iz jedra na periferijo, skupaj z ekspanzivno fiskalno politiko (specifično za posamezno državo) v fazi upada in okrevanja. Analiza ukrepov makrobonitetne, standardne makroekonomske in strukturne politike ter njihovih učinkov nadalje osvetljuje pomen horizontalnega usklajevanja. Rezultati nakazujejo, da pomemben učinek ukrepov ekonomskih politik na bančno ponudbo kreditov podjetjem in gospodinjstvom lahko dosežemo le z usklajenostjo vseh treh analiziranih politik (npr. zaježitev nevzdržne rasti kreditov v obdobju razcveta). Učinki neusklajenih ukrepov ekonomskih politik na bančno ponudbo kreditov podjetjem in gospodinjstvom so zanemarljivi. Primerjava ukrepov v dveh kriznih obdobjih, in sicer v času Velike recesije v letih 2007–2009 in krizi, ki jo je povzročila pandemija v letih 2020–2021, podpira omenjeni rezultat. Zdi se, da so oblikovalci ekonomskih politik z ukrepi, ki so bili usklajeni tako horizontalno (monetarna politika, fiskalna politika in makrobonitetna politika) kot vertikalno (na nacionalni in nadvacionalni ravni), preprečili katastrofalno poslabšanje likvidnostnega položaja podjetij med pandemijo. Omenjena študija sicer odpira tudi vprašanje neoptimalne sektorske porazdelitve državnih pomoči.

## **Omejitve**

Kljub izdatnemu številu ur, namenjenih zbiranju podatkov, je razpoložljivost podatkov še vedno omejena. Neagregirani podatki o posojilih podjetjem in gospodinjstvom ter o vlogah niso na voljo v podatkovni zbirki Bankscope in so bili za celoten vzorec bank zbrani ročno skladno z razpoložljivostjo podatkov v letnih poročilih. Kljub relevantnosti kapitalске ustreznosti bank in njene dinamike v analizi kreditne ponudbe le-ta v model ni vključena kot neodvisna spremenljivka. Kapitalске ustreznosti v letnih poročilih ne razkrivajo vse banke. Spremembe kapitalizacije bank so zajete s spremenljivko stroški oslabitev. Poleg omenjenih omejitev povezanih s podatki na ravni spremenljivk, lahko dodamo še omejitve na ravni podatkovnih baz, in sicer nekatere raziskave izkoriščajo za analizo dejavnikov vpliva na

kreditno aktivnost bank bolj kakovostne podatke, ki povezujejo npr. podjetja z individualnimi bankami.

Pokritost celotne aktive bančnega sistema primerjalno s celotno aktivo bank v vzorcu je zadovoljiva in primerljiva za izbrane države. V tretjem in delno v četrtem poglavju tako analiziramo Črno goro, Hrvaško in Slovenijo. Tudi razpoložljivost podatkov za druge balkanske države in nekatere države jedrne Evrope je sprejemljiva, pri drugih državah jedrne Evrope in državah sredozemske regije pa vzorec (trenutno) zajema le omejeno število bank in ne pokriva celotne porazdelitve bank glede na celotno aktivo. Razlike med državami so precejšnje, kar je tudi ključni razlog za omejitev na omenjeni izbor držav.

Kakovost in razpoložljivost podatkov sta bili problematični tudi pri ocenjevanju učinkov ukrepov ekonomskih politik na likvidnost podjetij v letu pandemije v primerjavi z Veliko recesijo. Natančni podatki so na voljo za nepovratna sredstva (večinoma podpora zaposlovanju), za ostale oblike državnih pomoči pa podatki niso javno dostopni. Glede na to, da metodološki pristop temelji na izplačani in ne odobreni državni pomoči, ocenjujemo, da bodo ukrepi ekonomskih politik pozitivno prispevali k likvidnosti podjetij tudi v letu 2021. Učinki ukrepov ekonomskih politik so tako v letu 2020 podcenjeni. Druga omejitev študije o likvidnosti je povezana z uporabljenimi metodologijo. Preprosta opisna analiza ne omogoča vpogleda v transmisijski mehanizem.

V petem poglavju disertacije je ena od osrednjih točk vpliv ekonomskih politik na kreditno ponudbo bank. Analizirani in upoštevani so standardni kazalniki makroekonomske politike (javnofinančni saldo, prodaja državnih podjetij, zadolževanje države, krediti centralne banke bankam, efektivni devizni tečaj in obrestna mera), ukrepi strukturne politike (plače v javnem sektorju, privatizacija, trg dela in kapitalski tokovi) ter makrobonitetne politike. Učinkov sprememb ekonomskih politik na spremembe kreditne ponudbe z razpoložljivimi podatki ni bilo mogoče analizirati za posamezen ukrep oziroma inštrument ločeno.

## **Rezultati in diskusija**

Disertacija naslavlja dve ključni vprašanji: "Kako navidezno nepomemben (manjši) dogodek lahko povzroči tako nezanemarljive posledice (Williamson v Miller & Stiglitz, 2010)?" ter "Zakaj so bile določene regije (države) bolj prizadete in so v času t.i. Velike recesije potrebovale več časa za okrevanje kot druge?" Prvo vprašanje je povezano makrofinančnimi povezavami, katerih osrednji element je povezanost realnega sektorja s finančnim sektorjem preko nepopolnih finančnih trgov (Claessens & Kose, 2018). V disertaciji sta obširno preučena dva glavna transmisijska kanala, in sicer bilančni kanal, ki deluje na strani povpraševanja, in likvidnostni kanal, ki obravnava vpliv likvidnosti na kreditno ponudbo bank, in s tem na gospodarsko aktivnost. Drugo vprašanje izpostavlja odnos jedrnih (evropskih držav) in perifernih držav.

Politično umirjanje in gospodarski napredek sta državam balkanske regije ob začetku globalne finančne krize omogočila vključitev v mednarodne finančne trge. To je poleg vstopa Slovenije



v Evropsko unijo in njene "zgodbe o uspehu" povečalo stopnjo optimizma med ekonomskimi agenti (gospodinjstvi, podjetji, bankami ...) in povzročilo nadpovprečno gospodarsko rast. Ugodne gospodarske razmere so pozitivno vplivale na stanje bilanc stanja nefinančnih družb, finančni akcelerator pa je z endogenim delovanjem krepil zadolževanje podjetij za investicije. Kot smo predpostavili, je bil finančni akcelerator v balkanskih državah v obdobju razcveta Velike recesije nekajkrat močnejši (dvakrat močnejši za investicije v produktivni kapital) kot v sredozemskih in zlasti centralnoevropskih državah. Po izbruhu krize je bilo v vseh treh regijah mogoče opaziti primerljivo dinamiko procesa razdolževanja finančnega dolga, vendar pa je bil negativen učinek razdolževanja na likvidnost v balkanskih državah neprimerljivo večji (vsaj za 50 odstotkov). Likvidnostni položaj nefinančnih družb je dodatno oslabila zadolženost do ostalih nefinančnih družb.

Gertler, Kiyotaki in Prestipino (2016) kot glavnega krivca za prenos krize vidijo grosistične trge in z njimi povezane vire financiranja: "po izbruhu globalne finančne krize je bilo v središču nepravilno delovanje medbančnih trgov". Zaradi zloma medbančnega trga je bil bankam otežen dostop do likvidnosti. V odgovor na likvidnostni šok pa banke zmanjšajo kreditno aktivnost, kar prinaša širše makroekonomske posledice preko t.i. likvidnostnega kanala.

Grosistični viri financiranja v perifernih državah balkanske regije predstavljajo predvsem prilive kapitala iz tujine. Posledično so kapitalski tokovi, ki so posebej pomembni za kapitalsko omejena gospodarstva v razvoju, in vpliv, ki so ga le-ti imeli neposredno ali posredno na dinamiko pasivne strani bančne bilance stanja, ponovno osrednja tema analize. Ena izmed hipotez predpostavlja, da so spremenljivke financiranja (grosistični viri financiranja in vloge nebančnega sektorja) ključni dejavniki ponudbe bančnih kreditov v fazi razcveta, upada in okrevanja Velike recesije v opazovanih državah. Hipoteza je bila delno potrjena, in sicer za kredite podjetjem. Učinki so bili še posebej veliki pri grosističnih virih financiranja, njihov prispevek k širjenju šoka (procikličnost) pa je bil statistično značilen in visok v vseh treh državah (v Sloveniji, na Hrvaškem in v Črni gori). Povečanje (zmanjšanje) grosističnega financiranja za 1 odstotek bilančne vsote je v opazovanem obdobju 2007–2013 povečalo (zmanjšalo) kredite podjetjem za 0,9 odstotka bilančne vsote. Kreditno ponudbo gospodinjstvom v obdobju razcveta in upada so spodbujali predvsem dejavniki na strani povpraševanja, upoštevajoč modelsko ocenjene prispevke k ponudbi kreditov podjetjem in gospodinjstvom. V obdobju upada in okrevanja pa je nenadna ustavitev pritokov tujega kapitala v depozitne finančne institucije negativno prispevala k rasti kreditov podjetjem v Črni gori in Sloveniji. Podobno, a manj intenzivno, dinamiko je mogoče opaziti pri kreditih gospodinjstvom. To je skladno s prejšnjimi empiričnimi ugotovitvami, ki kažejo, da so posojila nefinančnim družbam bolj občutljiva na šoke povezane z grosističnimi viri financiranja kot posojila gospodinjstvom (de Haan, van den End in Vermeulen 2017).

Rezultati študij Bole, Oblak, Prašnikar in Trobec (2018) ter Prašnikar, Bole, Dominko, Lakićević in Oblak (2021) nakazujejo na potencialno dva ključna stebra ekonomskih politik v perifernih državah. V obdobju gospodarskega razcveta bi lahko bili najučinkovitejši ukrepi

makrobonitetne politike, ki se osredotočajo na pritoke tujega kapitala oziroma njihovo omejevanje. Glede na to, da so banke ključni posrednik pri zagotavljanju zunanjih virov financiranja za podjetja in gospodinjstva ter s tem pri prenosu zunanjih šokov, bi najverjetneje bilo učinkovito že samodejno povečanje kapitala, namenjenega za pokrivanje tveganj, povezanih s pregrevanjem gospodarstva. Je pa očitno, da so izključno ukrepi makrobonitetne politike prešibki, da bi ublažili učinke kapitalskih tokov iz jedra na periferijo v obdobju razcveta in obratno v obdobju upada. Fiskalna politika na nacionalni ravni je tako drugi predlagani steber za blažitev simetričnih šokov. Vloga fiskalne politike, specifične za posamezno državo, je pomembna zlasti v obdobju upada in okrevanja, ko so oportunitetni stroški povečanega odliva kapitala največji.

Kot je razvidno, je imela zadolženost tako pri bankah kot podjetjih, katastrofalne učinke na likvidnost nefinančnih družb v balkanski regiji v obdobju upada in okrevanja Velike recesije. Če zanemarimo vprašanje, kako preprečiti nevzdržno zadolževanje v obdobju razcveta in kako rešiti problem stopnjevanja simetričnega šoka iz jedra na periferijo, postane ključna dilema ekonomskih politik, kako ohraniti likvidnost podjetij. Leta 2009 se je delež podjetij, ki so bila sposobna vzdrževati pozitiven denarni tok, zmanjšal za več kot 8 odstotkov, zmanjšanje pa je primerljivo s tistim med pandemijo brez upoštevanja ukrepov ekonomskih politik. Denarni tok nefinančnih družb se je po nastanku prejšnje krize poslabševal še dve leti. Tako delež podjetij, ki so bila sposobna vzdrževati pozitiven denarni tok, ob zaključku študije leta 2012 še ni dosegel predkrizne ravni (Bole, Prašnikar in Trobec, 2014). Odziv na pandemijo je bil takojšen, usklajen in odločen. Denarnega toka nefinančnih družb sicer ni uspel ohraniti na ravni pred pandemijo, je pa preprečil ogromen upad denarnih tokov. Upoštevajoč državno pomoč je dodatnih 3,4 odstotka podjetij ohranilo pozitivni denarni tok. 0,6 odstotka podjetjem iz vseh analiziranih sektorjev je državna pomoč omogočila prehod iz negativnega denarnega toka v letu pred pandemijo k pozitivnem denarnem toku. Delež neaktivnih podjetij se je v Sloveniji v letu 2020 presenetljivo zmanjšal v primerjavi z letom 2019, kar lahko nakazuje, da so ukrepi podpirali tudi *de facto* mrtva podjetja.

V nasprotju s pandemijo je bil odziv politike v času Velike recesije nezadosten. V Sloveniji je bilo obdobje okrevanja po Veliki recesiji zaznamovano s procesom povečevanja zahtevanega premoženja za zavarovanje finančnega dolga in omejevanje kreditiranja (angl. credit rationing), ki je poslabšal dostop do potrebne likvidnosti ter oviral okrevanje nefinančnih družb (Bole, Prašnikar in Trobec, 2014). Zanimivo, analiza dejavnikov kreditne ponudbe bank podjetjem (in gospodinjstvom) kaže, da je bil ocenjeni prispevek učinkov ekonomskih politik k dejanski dinamiki kreditiranja gospodinjstev in podjetij v obdobju okrevanja v Sloveniji sicer pozitiven. Ta učinek je majhen in je rezultat horizontalno neusklajenih ekonomskih politik. Standardni ukrepi makroekonomske politike (in v omejenem obsegu strukturne politike) so namreč v obdobju okrevanja vplivali na zmanjšanje ponudbe kreditov podjetjem, medtem ko je imela makrobonitetna politika proticiklični učinek. Podobno so standardni ukrepi makroekonomske in strukturne politike okrepili kreditni krč v Črni gori, ki ga je povzročil zlom medbančnih trgov. Rezultati nakazujejo, da nezanemarljiv učinek ukrepov ekonomskih politik lahko dosežemo le s horizontalno usklajenostjo. Usklajenost ukrepov

standardne makroekonomske politike, strukturne politike in makrobonitetne politike je na Hrvaškem v obdobju razcveta pomembno prispevala k omejevanju zadolževanja podjetij. Učinek je presegel 1 odstotek bilančne vsote. Skupni učinki ukrepov ekonomskih politik v vseh treh opazovanih državah so bili v obdobju razcveta in upada proticiklični, vendar šibki v primerjavi z drugimi analiziranimi spremenljivkami. To je verjetno posledica njihove nekonsistentnosti.

Z usklajenim odgovorom na pandemijo je vladam in zadevnim institucijam Evropske unije uspelo preprečiti množično nelikvidnost in stečaje. V nasprotju s prejšnjo krizo je bil eden ključnih ukrepov takojšnje zagotavljanje likvidnosti in zdi se, da se učimo. Je pa pristop "karkoli je potrebno" v obliki državnih pomoči, ki niso ciljno oziroma sektorsko usmerjene, deležen tudi številnih kritik. Prvič, z obzirom na Veliko recesijo ostaja odprto vprašanje zagotavljanja bančnih virov financiranja nefinančnim družbam za pokritje ocenjene likvidnostne vrzeli v višini 0,6 milijarde EUR (denarni tok iz poslovanja). Kljub usklajenemu delovanju ekonomskih politik je namreč vedenje bank ostalo razmeroma nespremenjeno (vsaj v Sloveniji). Njihov odziv na šok je bil v obeh kriznih obdobjih podoben. Po zaostitvi kreditnih standardov slovenskih bank v drugem četrtletju leta 2020 je sledila zaostritev kreditnih standardov še v tretjem in četrtem četrtletju leta 2020.

Drugič, kritike ekonomskih politik v odziv na pandemijo so povezane predvsem z (1) dolgoročnimi posledicami nekaterih protikriznih ukrepov, in (2) prejemniki državnih pomoči. Boot in drugi (2020b) so izpostavili (ne)ustreznost dolžniških instrumentov, ki na dolgi rok vodijo k povečanju finančnega vzvoda podjetij, njihovi (potencialni) prezadolženosti in povečanju plačilnega tveganja. Lastniški instrumenti bi lahko po mnenju avtorjev bili ustreznejša oblika pomoči. Bircan, De Haas, Schweiger in Stepanov (2020) prav tako izpostavijo problematičnost dolžniških instrumentov in omogočijo vpogled v sposobnost dodatnega zadolževanja podjetij. Slovenska mala in srednje velika podjetja na primer že pred pandemijo niso bila v najbolj ugodnem položaju, saj so imela omejene možnosti za dodatno zadolževanje in nizko likvidnost.

Rezultati analize učinkovitosti podpornih ukrepov v času pandemije tudi nakazujejo na neoptimalno sektorska porazdelitev državne pomoči (vsaj v Sloveniji). Npr. državna pomoč je nadomestila znaten del zmanjšanja denarnega toka za podjetja v najbolj ranljivem storitvenem segmentu (upoštevajoč mediano), vendar v primerjavi z drugimi sektorji najmanjši del upada denarnega toka. Prav tako je število podjetij, ki niso uspela ohraniti pozitivnega denarnega toka upoštevajoč neposredna nepovratna sredstva, v primerjavi s številom podjetij, ki niso bila zmožna ohraniti pozitivnega denarnega toka brez neposrednih nepovratnih sredstev, najnižje v najranljivejšem storitvenem segmentu. Nasprotno pa so podjetja v sektorjih gospodarskih javnih služb prejela državno pomoč in tako le še dodatno okrepila svoj denarni tok. Poleg omenjenega manjši delež neaktivnih podjetij v letu 2020 v primerjavi z letom 2019 krepi kritike, povezane s smotrnostjo porabe davkoplačevalskega denarja.