

CORVINUS UNIVERSITY OF BUDAPEST
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ESSAYS ON
ECONOMIC IMPLICATIONS OF COVID-19

Doctoral dissertation – Thesis booklet

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Introduction

This thesis focuses on the economic implications of the COVID-19 pandemic, which started in 2020 and induced both a health and an economic crisis in the world. The thesis is comprised of four chapters (articles), each chapter being a study on its own. This is the format of the article-base' dissertation where the overall thesis is comprised of at least three published papers, which are linked together through a common topic, methodology or underlying framework. This inevitably means that the published articles - and feedback received in the process of publishing them - shape the resulting dissertation.

Three of the studies presented have been published in peer-reviewed journals, while the fourth one is a working paper, that I presented in conferences. My goal with the thesis is to provide a rather broad view of how the COVID-19 induced crises has impacted the economy. The first two studies focus on the microeconomic level, they use primary data collection to ask questions about the situation of individual employees and of firms during the pandemic, these studies focus solely on Hungary. Meanwhile, the latter two studies focus on the macroeconomic level. The first study investigates the relationship between national competitiveness and government policies, while the second - the only study with a forward-looking perspective - presents possible recovery scenarios for the countries of the Visegrad region.

The thesis integrates these studies into a framework, based on the work of Chikán et al. (2018) and Chikán (2008). It uses the framework to show that those examples of economic shock and resilience that it uncovers and presents are interlinked through the complex system of the economy. Through this approach I intend not just to present a broad view of the economic impacts at various levels, but also to shed some light on the common patterns across varying layers and the interlinkages across the entities in different spaces.

Through the individual studies presented in the thesis I put forward the hypothesis that actors who were not focusing solely on maximizing efficiency, but also have built resilience through various ways, have benefited from this during the pandemic shock.

Chapter in the thesis	Original title	Description	Author contribution (CRediT)	Methodology	Publication status
2. Employees	Working from home in the midst of COVID-19: occupations and performance Evidence from Hungary	Analyses factors influencing working from home (WFH) possibility and performance in WFH	Conceptualization, Methodology, Formal analysis, Investigation, Writing - Original Draft, Visualization	Primary data collection (survey) analysed with quantitative methods	Working paper, presented at multiple conferences
3. Firms	Management practices and changes in turnover of domestic firms during the Covid-19 economic shock	Analyses factors influencing firm revenue resilience during the pandemic, including managerial practices and firm characteristics	Conceptualization, Methodology, Formal analysis, Writing - Original Draft, Visualization	Primary data collection (survey) based database analysed with quantitative methods	Published in Economic Review / Közgazdasági Szemle (MTA A)
4. Nations	Government influence on national competitiveness (evidence from the COVID era)	Clusters nations based on the perception of their government policies and analyses whether certain long-term policies have provided better resilience during COVID-19	Conceptualization, Methodology, Formal analysis, Writing - Original Draft, Visualization	Secondary global database analysed with quantitative methods	Published in Competitive-ness Review (Q1)
5. Recovery	Macroeconomic assessment of possible Green Recovery scenarios in Visegrad countries	Assesses ex ante recovery scenarios through macroeconomic modelling, that can contribute to recovering from the current shock and building resilience towards future shocks	Conceptualization, Methodology, Software, Writing - Original Draft, Visualization	Forward looking macroeconomic scenario modelling, based on international data	Published in Society and Economy (Q3)

Figure 1 – Summary of papers included in the thesis

This is important, because pursuing efficiency and building resilience can be conflicting goals. This, actually is observed across various systems from biology (Inouye et al. 2021) to network theory and to business. As Inouye et al. (2021) writes:

In general, keeping resources in reserves may increase robustness or resilience to future perturbations, but prevent current performance from being maximized - (Inouye et al. 2021, p.2183)

While in view of this a balanced approach - both considering efficiency and other goals, that helps build resilience - would be beneficial, it is observed that the focus, especially in the economy, has shifted towards efficiency in this century. This is highlighted by the spread of practices that focus on efficiency, while framing resilience and especially redundancies and buffer strategies as “unnecessary costs” and inefficiencies (Martin 2019; Ruiz-Benítez et al. 2018; Landau 1969).

In a world without high risk events, without uncertainty, with reasonable stability redundancies and resilience building can truly be an unnecessary cost (Martin 2019; Landau 1969). However, if we accept that there are unknown unknowns, true uncertainty, that can effect the economic system then resilience building becomes a precautionary necessity. Through this thesis I explore, how

ways of resilience building and focusing on goals that are different from efficiency have created better outcomes during a shock period. These thoughts can be summarised as general research questions that are examined in this thesis through the chapters focusing on the separate levels, but also on commonalities across the discussed layers of the economy:

- **R1** What are characteristics and behaviours that support resilience at the level of employees, firms and national economies? Both pre- and post- crisis.
- **R2** Are there more general commonalities in these behaviours?
- **R3** How to these behaviours relate to performance in a non-shock environment?
- **R4** How recovering from shocks relate to this resilience and how recovery can enable future resilience?

The COVID-19 context

The dissertation describes the context of the COVID-19 pandemic, both globally and specifically for Hungary. The COVID-19 pandemic was a defining moment of the years 2020-2021. Initial reports of an unknown respiratory virus in China as early as the beginning of the year 2020 were followed by the rapid spread of the virus. Nevertheless, it took until January 20 for the Chinese public health officials to acknowledge that the world is facing a new communicable disease. While this was followed by an eventual quarantine of about 650 million people, the virus has already been transferred outside of China, therefore beginning its rapid global spread.

The pandemic also meant practically 'shutting-down' large parts of national economies in countries applying these measures, resulting in a reduction of economic activity not seen since the 1930s Great Depression. Estimated effects of the crisis on global economic activity were between -2.7% to -2.9%. Meanwhile about 18% of global working hours were lost in the second quarter of 2020, with annual losses amounting to about 8.8% in the same year. This translates to about 255 million full-time jobs, or four times as many jobs as were lost during the GFC.

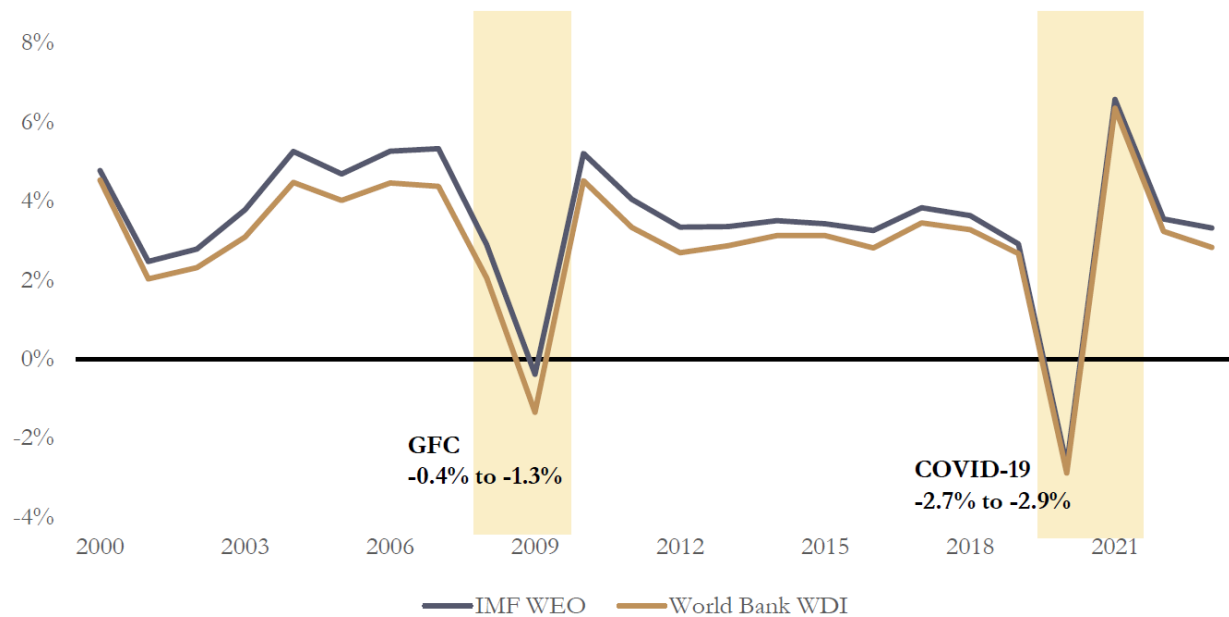


Figure 2 – Economic (GDP) impacts of COVID-19

Defining resilience

In this dissertation what I am interested in is what different entities - people, firms, governments - have done in order to reduce the burden of this initial economic shock. I am largely focusing on characteristics of these entities, that enabled them to withstand the economic shock better than others did.

Brunnermeier (2021), in his book *The Resilient society*, defines **resilience** multiple ways: we can think of resilience as the *"ability to rebound"* (p.8) or more formally it can be thought as an ability for *"reversion back to the mean"* (p.16). Resilience is dependent on the ability to adapt and change (Brunnermeier 2021).

There are common elements across the definitions, regardless of the unit of analysis and the context: (1) resilience is generally defined as an ability, (2) first to absorb impacts and (3) second to recover from (4) an unknown / unexpected shock. Importantly, as Brunnermeier (2021) or Chikán et al. (2022) highlights, production systems in the last few decades have increasingly moved towards "just in time" principles: minimizing stocks, implementing lean practices, relying on the ever-available transnational stock flows. Resilience, in these production systems, but also in general, in contrast to this encourages redundancies and safety buffers (Brunnermeier 2021). And indeed, for example in Hungary, during the COVID-19 induced supply chain disruptions firms

started to leverage inventories as a buffer to mitigate shocks (Chikán et al. 2022b). Inevitably, building resilience diverts the focus from cost-efficiency and efficiency to stability and safety, which - ironically - can prove to be more cost-efficient if a shock actually strikes. In conclusion, the definition that I adapt through this dissertation focuses both on *withstanding* and *adapting to* shocks and makes no distinction between the two. It focuses on an ability, but given the empirical nature of the work, which works with outcomes, it proxies ability with ‘realised ability’. And importantly, I consider resilience of the different entities in the context of COVID-19, which is - as I have discussed it earlier - a largely unexpected and rapidly evolving shock, with origins outside of the economic and business systems. Therefore, I can summarise my adapted definition of *economic resilience* as ***the ability of various entities to adapt to and/or withstand shocks and maintain and/or increase their performance.***

A framework of the economy and competitiveness based on Chikan’s concept

To connect the different layers of the impacts in a comprehensive system of the economy I adapt a framework building on Chikan’s work (2008, 2018). Figure 3 presents how the individual articles can be positioned in the framework that links micro and macro levels of the economy.

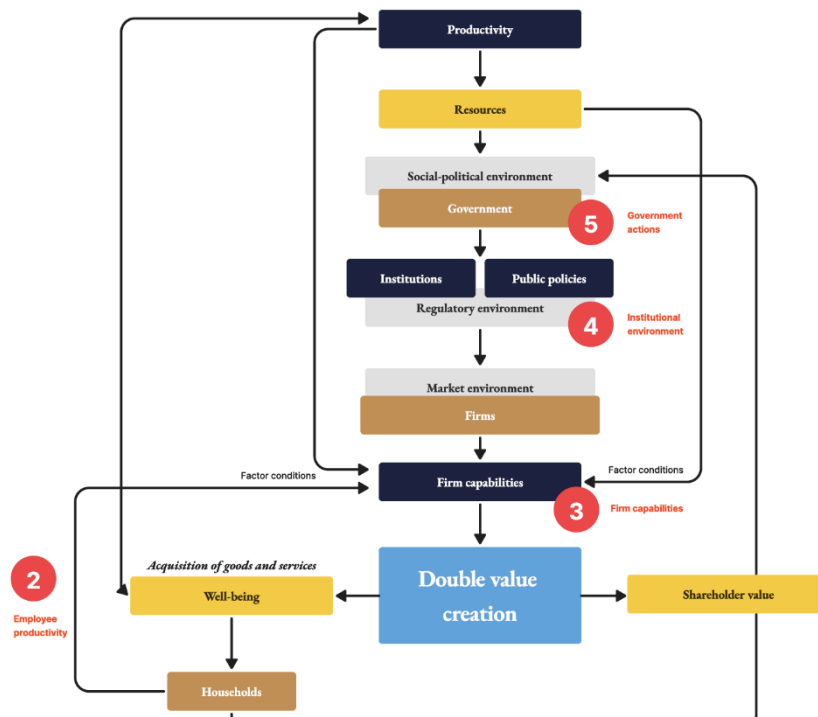


Figure 3 – Framework of economic value creation and the articles

Crucially, as I discuss in the conclusion of the thesis, these areas are linked together through various channels, as indicated by the framework. Furthermore, they also share bits of logic and methods of operation that are common between these layers. Through the channels these logics can easily spread up and downwards, shifting the economic-societal system towards certain behaviours. Accordingly, it is important to see these separate layers in a common framework (such as the one presented above) and to be able to understand the commonalities that transcend across these levels of the economic system.

Now, after setting the scene, describing the context and the overarching framework I turn to discuss the contributions of the individual chapters/articles of the thesis in the next sections.

1. Within a Firm: Employees and Management Issues in the Pandemic

The chapter introduces how the COVID-19 pandemic has disrupted normal work processes in the early days of 2020 March. Importantly, this chapter starts our investigation from as close to the micro level of the economy as possible - on the level of the actual employees and people. The chapter discusses what were the instant and most crucial effects of COVID-19 and related government measures on how people were working. It builds on primary research carried out during the earliest periods of the pandemic (starting March 2020), the background of the research will be discussed in the next section. Material presented in the chapter has been published as a working paper: *Kiss-Dobronyi, B. and Szekeres, M. (2021), "Working from home in the midst of COVID-19: occupations and performance Evidence from Hungary"*.

Building on primary, survey-based, data collection in Hungary that asked respondents about remote working, management behaviour as well as performance in the early months of the pandemic, this paper analyses factors that have contributed to performance losses or gains. First, the paper constructs and tests a working-from-home (WFH) potential index, based on the skills profiles of occupations. Later it uses this index, as well as other recorded characteristics to study the relationship between the potential for working from home against observed rates of working from home. Followed by an analysis of other factors that can contribute to both working from home in the crisis period and to lower (or maintained) performance in the crisis period.

Methodologically the research employs multivariate analysis (probit regressions) on the survey data, using 407 observations from the sample.

Results indicate that whether people were able to work from home in the crisis period were largely correlated with whether they had previous experience with remote work or not (see Figure 4 above). Furthermore, the analysis has shown that WFH potential score were negatively correlated with performance loss, just as prior WFH experience and management support were. Meaning that lower performance were more often observed in cases, where employees did not have prior WFH experience, were in jobs that were generally less suitable for WFH or received little to no management support. Crucially, if tasks had to change significantly as employees moved to WFH a loss in performance were also likely.

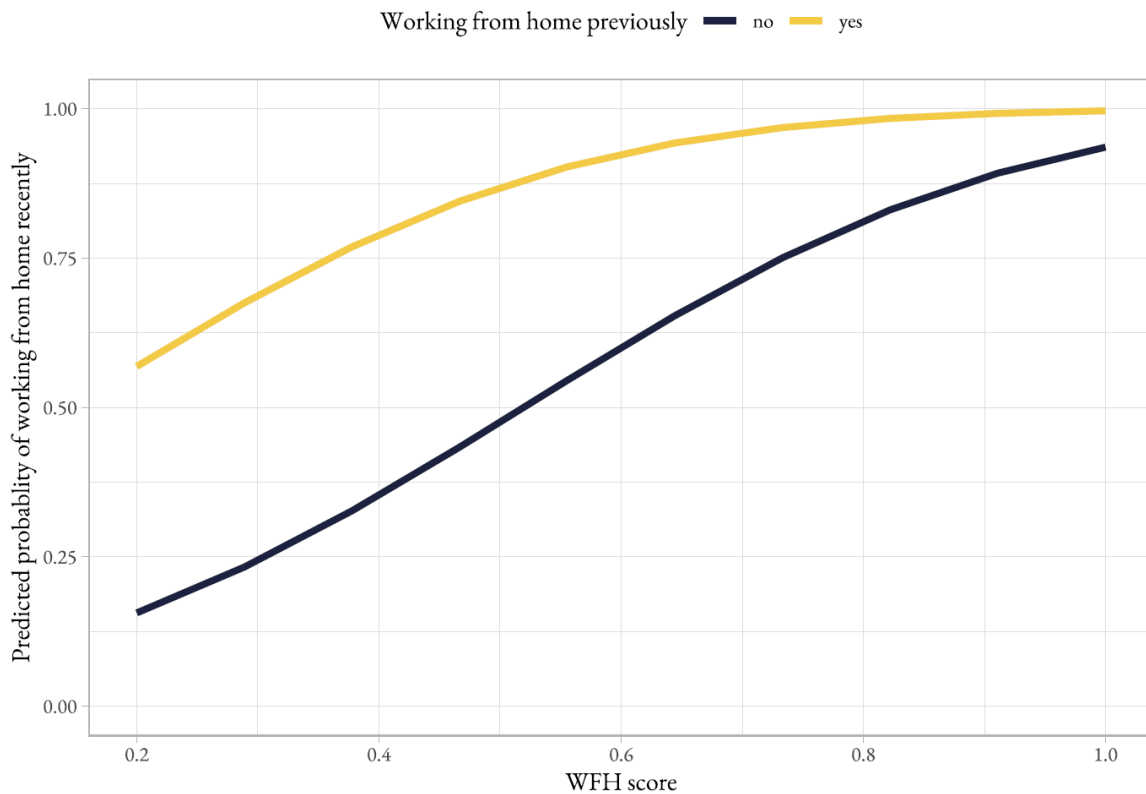


Figure 4 - Predicted probability of working from home recently conditional on WFH score, by previous WFH experience

The paper has further studied management responses, focusing on communication and found that those respondents who received more frequent communication and software-aided collaboration from their management were less likely to suffer a loss of performance.

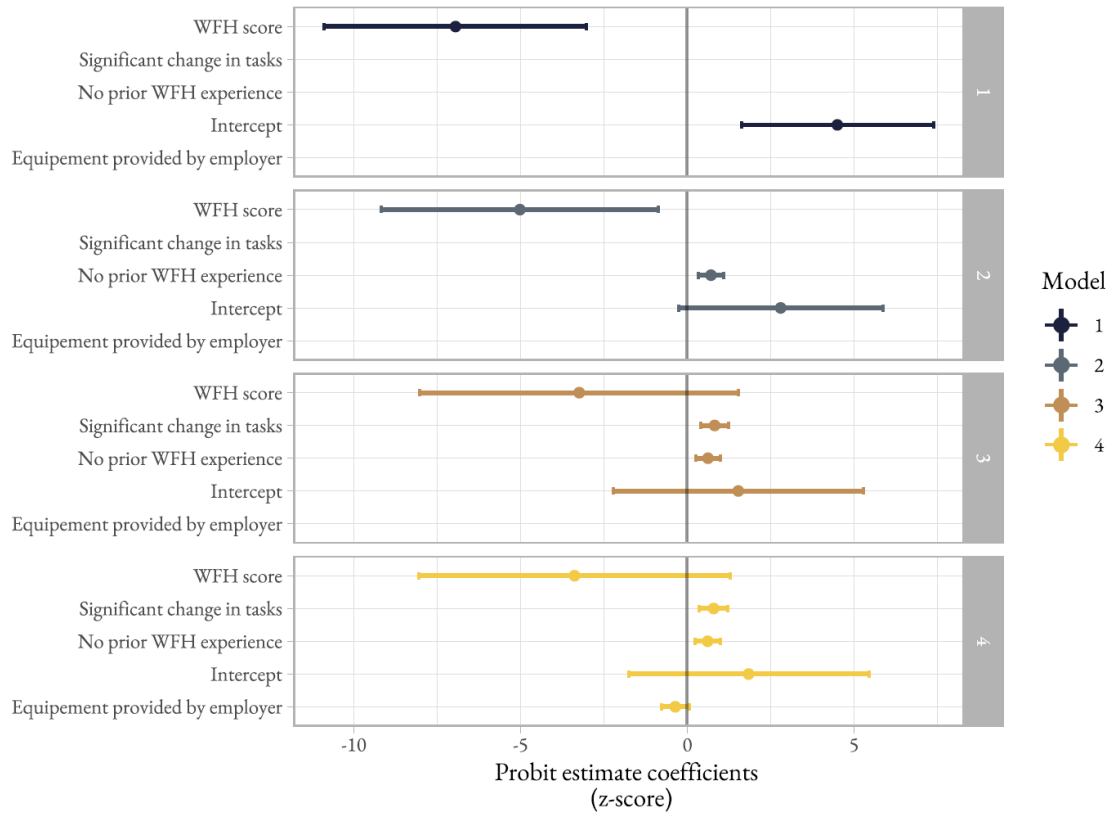


Figure 5 – Factors effecting observed performance of employees switching to WFH

Overall results of the analysis suggest that not all WFH experiences are the same. Those who had previous experience with WFH are taking this obstacle easier as well as those who are supported, technically and through more frequent communication, by their employer. Which brings us to a point that should be important for employers even in “normal times”: those employers who allowed their employees to try out working from home before the pandemic seen a lesser drop of productivity now. Meanwhile, the findings suggest that if a reorganizing of work tasks is necessary increased communication can help to align expectations and maintain job performance.

2. Firm Behavior and Performance in the Pandemic

The chapter discusses how the COVID-19 pandemic has impacted firms' performance in the two years that we can consider the height of the pandemic: 2020 and 2021. The chapter builds on research that has started before the pandemic: the data collection on firm characteristics by the Competitiveness Research Centre (CRC) at Corvinus University, which was later extended by financial data of the surveyed firms, reaching into the years after the pandemic. This is the setup that has enabled us to study the effects of the pandemic on a sample of Hungarian and to investigate how different firm characteristics, including management directions have influenced resilience during and after the pandemic. Material presented in the chapter has been published in Hungarian in *Közgazdasági Szemle* (Economic Review - monthly of the Hungarian Academy of Sciences) as *Kiss-Dobronyi, B., Czakó, E., and Losonci, D. (2024), "Menedzsmentgyakorlatok és a hazai vállalatok árbevétel-változása a Covid-19 jelentette gazdasági sokk idején [Management practices and changes in turnover of domestic firms during the Covid-19 economic shock]", *Közgazdasági Szemle* (Economic Review - Monthly of the Hungarian Academy of Sciences), Vol. LXXI No. 3, pp. 229–254.*

The article exploits the CRC survey on Hungarian firm characteristics that has been collected just before the pandemic in 2018-2019 and financial data both on the firm- and on sectoral level to evaluate whether certain firm characteristics and/or behaviours have contributed to firms performing beyond or below expectations. The research connects two databases (HCSO/KSH and Orbis) to the firm-level data to derive sectoral measures of firm performance (focusing on sales revenues) and uses ARIMAX forecasting methods to predict an expected firm revenue growth conditional on the sectoral growth and the firm's historical performance relative to its sector in the past (illustrated in Figure 6).

Using this method we classify firms based on whether they have performed during the pandemic within or below expectations. The research then focuses on those firms who did not meet expectations and explores their common characteristics. Using the Fisher's exact test and the Cochran-Armitage test we find no significant group differences between 'normal' performers and weaker performers in 274 variables, however we find areas where there a significant common differences.

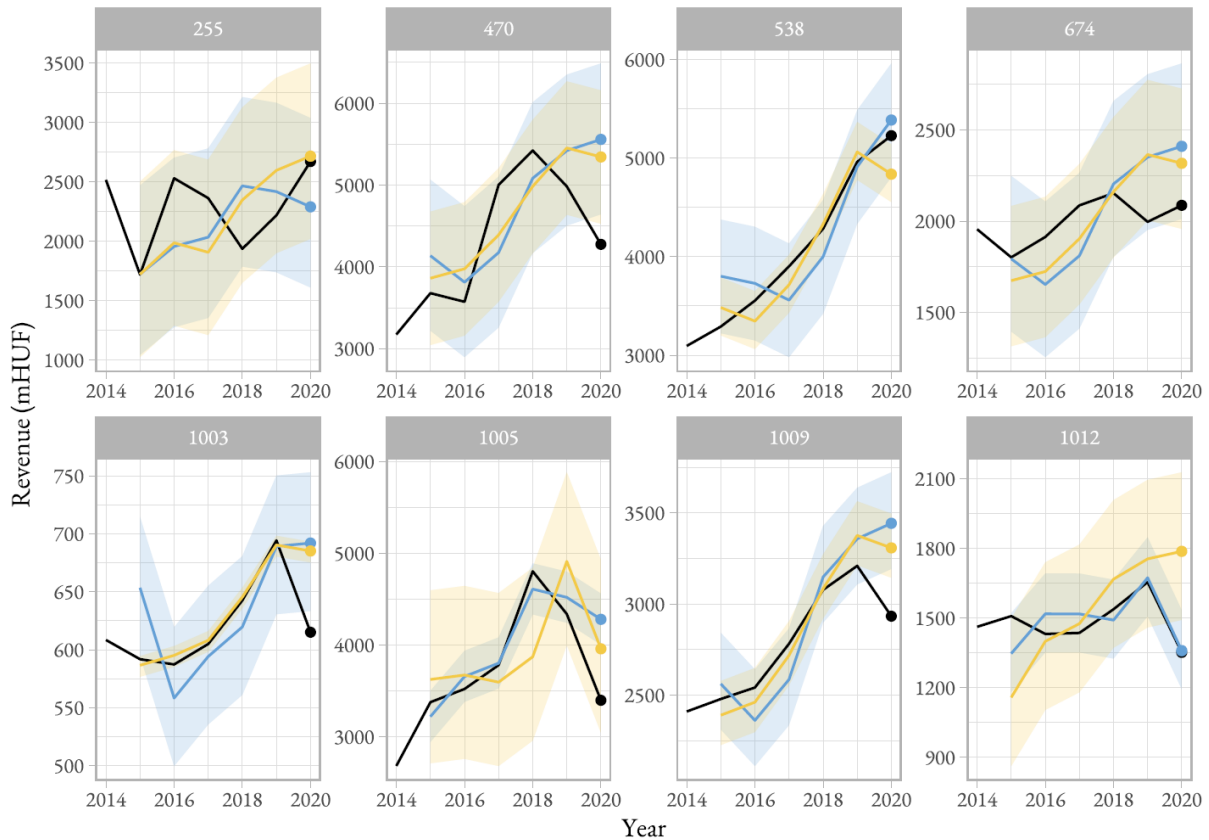


Figure 6 - Predicted and observed revenue in a sample of firms. The observed revenues are shown as a solid black line, while the predicted revenues are shown with colored lines. The HCSO data based predictions are shown with blue, while the Orbis data based predictions are shown with yellow. A "confidence interval" of probable revenue outcomes has been defined for both estimations based on error terms derived from the historical data. This is shown with a semi-transparent area around the colored lines. Numbers above the figures show a randomized ID for the individual firms

Substantial differences are identified in four areas (1) general firm characteristics, (2) environmental protection, (3) employees and (4) management practices. The dissertation discusses results in these areas separately, here we highlight the area where the research uncovered the most consistent results: management practices and its connection to leadership styles. The analysis finds that lower performing firms display management behaviours that are consistent with leadership style differences as described by Dióssy et al. (2023, p. 10).

Firms with managers who followed a more 'relationship-oriented' style were less likely to observe a lower-than-expected performance during the first year of the pandemic according to the results.

The research goes on to note that this is largely in line with anecdotal evidence presented by other literature, e.g. P. Juhász et al. (2021, p139):

“During the crisis managers need to manage not only tasks, but also emotions.”

This analysis is exploratory in nature, thus it does not aim to establish how these presented correlations emerge through specific mechanisms. Therefore, it do not attempt to decipher whether the greater-than-expected decrease in revenues results from supply-side, supplier-related, or demand-side, customer-related factors. However, the identified factors describe and illustrate a management style and firm characteristics that, we posit, are related to and may have contributed to the *worse* than-expected performance. The assumption of a causal relationship is supported by the temporal precedence utilized in the research: the data on management practices and firm characteristics were collected well before the onset of the pandemic, thus we can assert that a reverse causality is unlikely: the reactions and weaker performance could not have caused the management responses.

From the previously described management practices, a picture emerges of a company and management that views employees more as production factors rather than as empowered and retained human resources (colleagues). Those firms that were unable to maintain their performance, as the rest of their industries, characterized by owner interference, yet they do not engage deeply in professional work and place the achievement of higher profits above other corporate goals. In this group, relationship-oriented management style traits are marginalized.

3. National Competitiveness Patterns and the Pandemic

In this chapter, after exploring how the pandemic has impacted people (Chapter 2) and firms (Chapter 3) in Hungary, we take another step back and look at the macro view. We investigate how the pandemic has impacted the competitiveness of nations and how different institutional systems in those nations have resulted in significantly different competitiveness outcomes. This chapter builds on ideas that have been developed over the years in the Competitiveness Research Centre (CRC) at Corvinus University, with the main framework of how people, firm and national competitiveness are linked in a single system conceptualised by Attila Chikan, Erzsebet Czako and their colleagues (Chikán et al. 2018; Chikán et al. 2009; Chikán et al. 2019).

This framework posits that national institutions, which often are represented in government policies and directions, are major drivers of competitiveness: mostly through shaping the environment that businesses operate in, but also through direct means. This is an idea that we aim to test and explore in the context of the COVID pandemic. Material presented in the chapter has been published in *Competitiveness Review* as *Chikán, A., Kiss-Dobronyi, B., Homoki-Szabó, E., and Molnár, B. (2024), “Government influence on national competitiveness (evidence from the COVID era)”, Competitiveness Review, 35 (6).*

In the chapter we first create clusters of countries, based on the type of policies (and the evaluation of those policies) that they have historically implemented. This analysis uses K-Means clustering based on time-series of IMD competitiveness scores of all countries ranked in the IMD global ranking. This yields five groups, which we classify all countries in the sample into. We further consider the overall competitiveness of the countries in the groups (see Figure 7). Our interest is focused on groups who display similar competitiveness scores, but different government policy ‘configurations’ (i.e., H1 vs H2 and M1 vs M2 in the figure). The defined clusters correspond to a simplified market liberal state (1) – welfare state (2) and high (H) or medium (M) competitiveness classification.

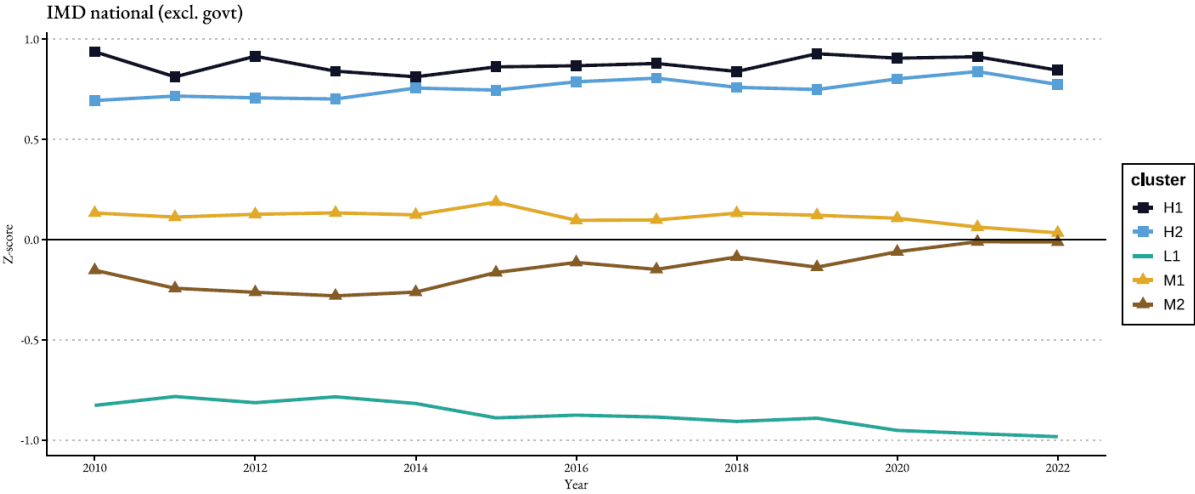


Figure 7 - Average IMD scores through the period by country clusters

Once we established that these groups have shown similar scores in the past we test how these differences have changed during the pandemic years. This is done with a modified difference-in-differences logic, where both of our groups are ‘treated’ during the pandemic period – thus what

we are interested in is whether the post-treatment difference is significantly different from the pre-treatment difference between the groups.

The research tests and decomposes these differences. Figure 8 summarises the observed differences. The analysis finds a significant difference (in differences) in overall competitiveness between M1 and M2 groups (these are middle-competitiveness groups) during the pandemic, while the same is not present for the high-competitiveness groups. Furthermore, in the middle-competitiveness groups the difference can be traced back to a divergence in ‘economic performance’ scores.

	IMD overall national competitiveness*	IMD infrastructure	IMD business efficiency	IMD economic performance	IMD government performance
H1 vs H2	X Pre-treatment	X Pre-treatment	X Pre-treatment	X Pre-treatment	✓ Pre-treatment
	X Post-treatment	✓ Post-treatment	X Post-treatment	✓ Post-treatment	X Post-treatment
M1 vs M2	X Pre-treatment	X Pre-treatment	X Pre-treatment	X Pre-treatment	✓ Pre-treatment
	✓ Post-treatment	X Post-treatment	X Post-treatment	✓ Post-treatment	X Post-treatment

Figure 8 - Pre-treatment and post-treatment test results. Note: for pre-treatment lack of significant difference is indicated with an x (X) while significant difference in the pre-treatment period is indicated with a tick; for the post-treatment period a significant difference is indicated with a tick, * excludes government performance

Based on the results of the article we conclude that government policy directions – ‘configurations’ – did have an effect on observed competitiveness in the crisis period. While the changes were not substantial in the high-competitiveness groups in the case of the medium-competitiveness groups the more welfare-oriented group seems to have fared better when faced with a crisis.

In this group (medium competitiveness) states that focused on supporting society and had strong social systems in place have been more resilient at handling the economic / competitiveness problems caused by COVID. But generally, having a strong social framework and investing in public services is costly and might mean substantial redistribution. Therefore, we cannot suggest that in “normal times” these policies would also lead to higher competitiveness than their market liberal counterparts, but we do show that in times of crisis they might induce higher resilience.

4. Green and Sustainability Issues: Recovery from the pandemic

This chapter is somewhat removed from the topics that the other three chapters have touched upon so far. We are still considering economic developments around COVID-19 and still have a strong regional focus around Hungary, however, this chapter looks beyond of *what has happened* and asks the question *what could happen?* The chapter builds on work that spans multiple studies and was part of an initiative to investigate recovery from COVID-19 shocks through sustainable development.

The author of this thesis has been part of many of these studies including but not limited to Pollitt et al. (2021), Hummelen et al. (2021), Kiss-Dobronyi et al. (2023), Kiss-Dobronyi et al. (2021), and Dafnomilis et al. (2022). Ideas explored in this chapter and in these broader works posit that government policy-led recovery efforts responding to the pandemic can simultaneously advance economic recovery and sustainable growth, responding to climate risks.

Crucially, the chapter does not try to analyse impacts of EU initiatives *actually implemented*, such as the ‘Green New Deal’ or the ‘Recovery and Resilience Facility’ (RRF). However, given that the RRF has required substantial green spending European Commission 2025 the hypothetical recovery that we model does have some resemblance to this large-scale initiative. In fact many ‘green’ projects in Visegrad countries have been financed since 2021 from this instrument.

Material presented in the chapter has been published in *Society & Economy* as Kiss-Dobronyi, B., Fazekas, D., and Pollitt, H. (2021), “Macroeconomic assessment of possible Green Recovery scenarios in Visegrad countries”, *Society and Economy*, 43 (2021) 3, pp 227–252.

The paper employs *ex ante* modelling, using the E3ME macroeconomic model, to simulate effects of a possible ‘green’ recovery scenario in four countries of the Visegrad region: Czechia, Hungary, Slovak Republic and Poland. The paper highlights that a government spending driven recovery, focusing on green measures, can boost economic activity and employment, substantially quickening the pace of the economic recovery. Green measures considered include subsidizing renewable power installations, providing car scrappage schemes as well as energy efficiency improvements.

The paper simulates both the COVID-19 economic impacts themselves, which was a novel contribution at the time of writing, and the recovery scenarios and then discusses what drives the differences in achieved recovery trajectories across the countries of interest.

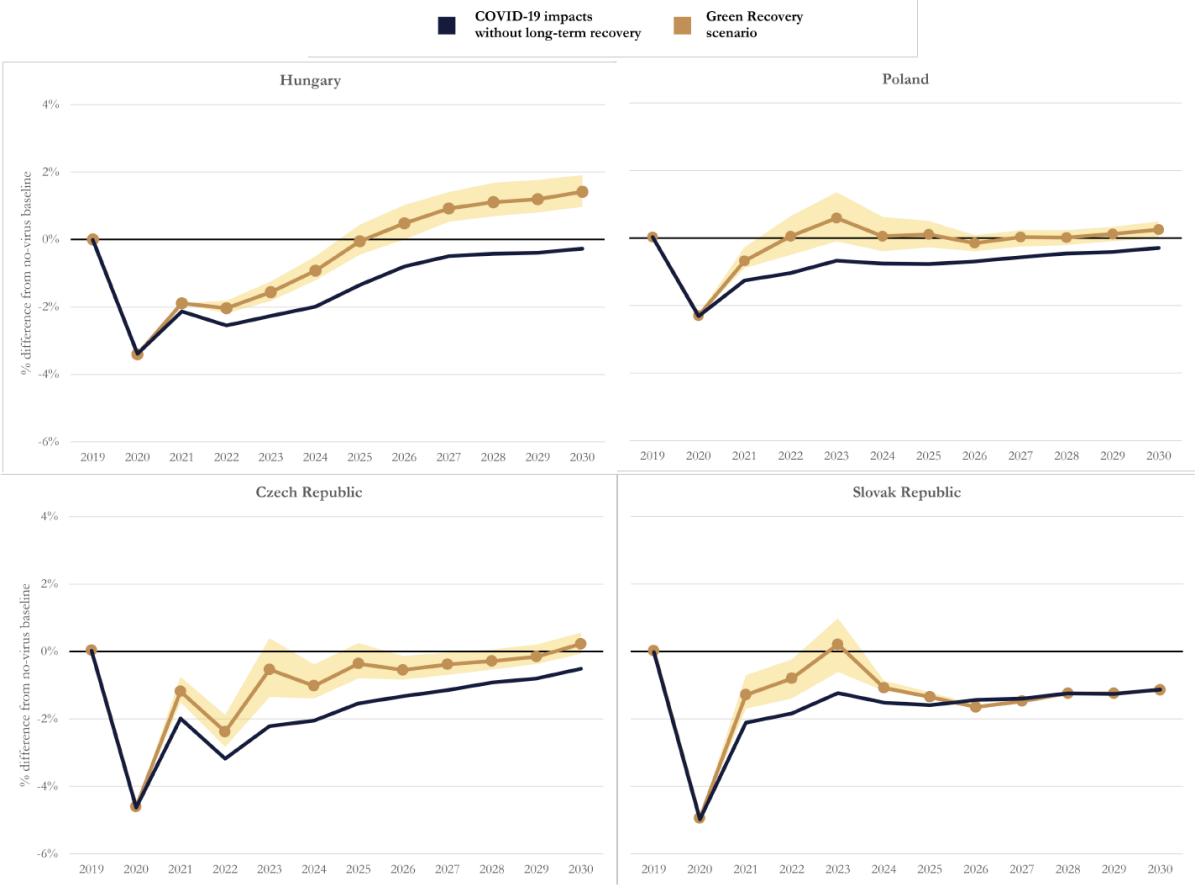


Figure 9 - **Employment** impacts in the modelled scenarios, % difference from no-virus baseline, Visegrad countries. The light-green area shows the results of the sensitivities, with the “light” sensitivity being the lower bound, while the “strong” sensitivity being the upper. Based on E3ME model simulations

Results highlight the importance of initial resilience as well as the possibilities of the countries in terms of being able to accommodate these policies. E.g., in the Slovak Republic take-up of subsidized renewable energy is limited mostly because of a strong and increasing nuclear-based power generation share. At the same time the results in e.g. Poland in Hungary show a permanent effect, boosting employment through increasing renewable based power generation and related investments and increasing the countries’ participation through automotive supply-chains.

All-in-all, however the main result of the research is showing that these recovery actions can contribute economically to the recovery, while yield environmental co-benefits, however they are

not one-size-fits-all type measures. The initial country context largely determines their simulated outcomes. Finally, we highlight in the paper that the ‘green’ recovery angle is particularly important for these countries due to energy security concerns. In order to improve their resilience against future shocks that are related to this issue transitioning to domestically produced energy is a resilience boosting solution.

Conclusions

This thesis integrates four studies which start at the micro, employee level and stretch from there all to the macroeconomic, national level. In the Introduction I described a framework based on Chikán (2008) and Chikán et al. (2018) which establishes a linkage between the different layers of the economic system that I present in the chapters.

The outcomes discussed can be classified into two categories: (1) a discussion of the various impact channels presented through the chapters that align with the framework based on Chikán (2008) and Chikán et al. (2018), (2) a discussion of general implications on the understanding of economic resilience and resilience building.

First, let us discuss the various *impact channels* of resilience that are demonstrated in the chapters of the thesis and describe how they can be positioned in the overarching framework that I use. These examples show varying levels and processes of the economic system, where resilience and reaction to shocks of the various entities can have effects on other actors as well through interlinkages. The framework helps uncover some of these interlinkages. Chikán et al. (2018) and Chikán (2008) highlights the role of institutions in enabling competitiveness of firms and eventually leading to national competitiveness. Reflecting on this, I demonstrate in **Article 3** how the overall competitiveness of nations with more focus on welfare-orientation proved to be more resilient. At the level of the firm, the model adapts ideas of the resource-based view, including how the heterogeneity of accessible resource, including human resources, can lead to differences competitiveness. In relation to this, in **Article 1** and **Article 2** I demonstrated that these type of ‘resource’ differences and differences in managerial capabilities does lead to different resilience and - facing the shock - performance outcomes. Finally, in **Article 4** we see how existing systems and structures determine impacts of both shocks and certain recovery actions. This links to the long-term, institutional view of Chikán et al. (2018).

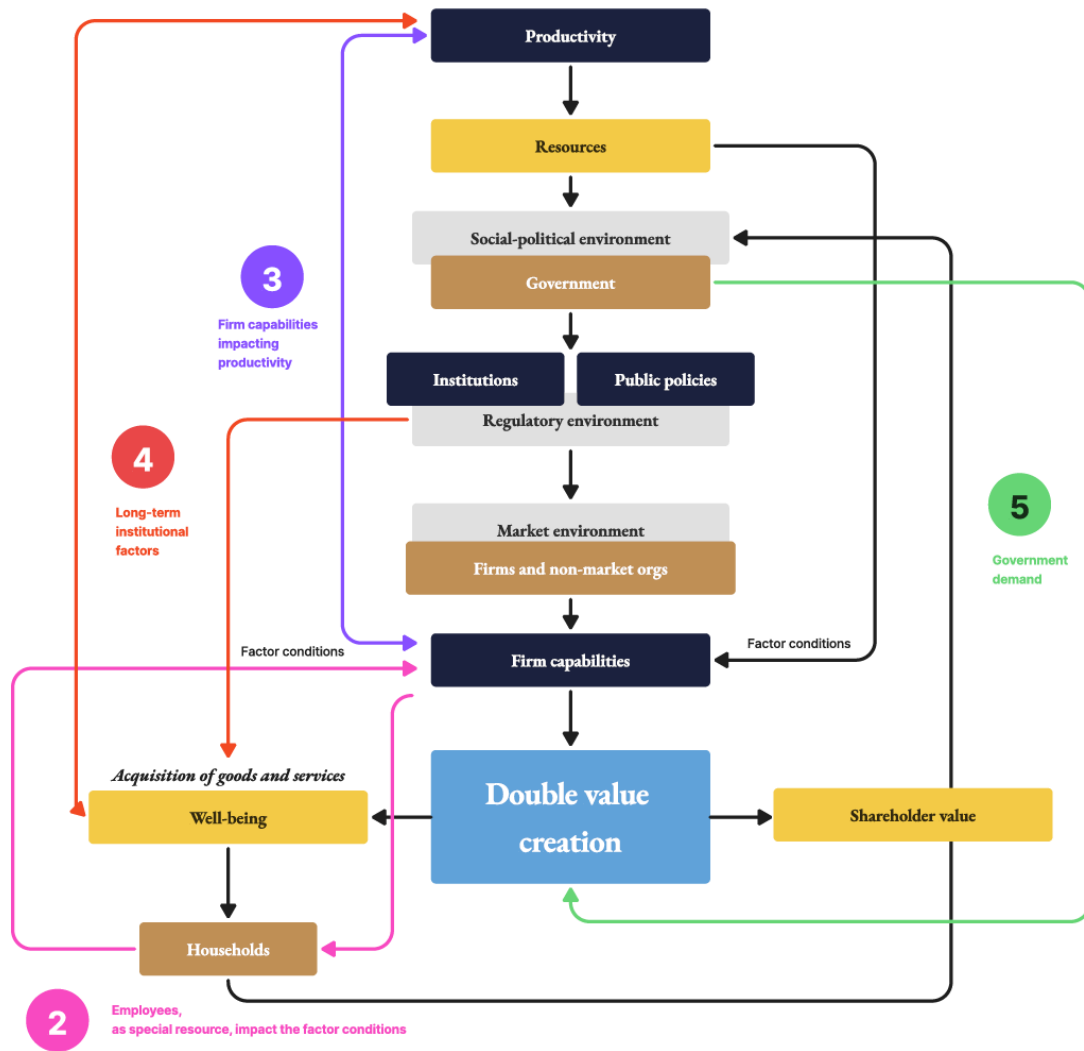


Figure 10 - Framework of economic value creation and the proposed impact channels

Commonalities – resilience in general

While there are various "level-specific" implications of the studies we can also identify common characteristics and patterns linking together responses in these various layers of the economic system, linking back to the general research questions. Especially, **R1** "What are characteristics and behaviours that support resilience at the level of employees, firms and national economies?" and **R2** "Are there more general commonalities in these behaviours?".

First, **pre-existing conditions**, which are linked to *proactive resilience*, are in all contexts prove to be important. In the case of employees already existing experience with remote work, in the case of firms an existing direction towards digital solutions and in the case of nations a welfare focused government policy all contribute to stronger resilience.

Second, **adaptation and flexibility** is the basis of *reactive resilience*. However, adaptation can be difficult, and it needs to be supported to work. We see examples for this at the employee level - adaptation *can* happen (i.e., switching to new tasks if necessary), but without strong managerial support it might also lead to subpar employee performance. Similarly, at the national level we see how countries with established welfare policies fare better, e.g., in employment terms during the pandemic - welfare policies that enable adaptability and flexibility of the workforce. Finally, we too see this idea influence our recovery projections: it is a Keynesian tenet that during an economic downturn government spending can and should support demand in the economy, my results show here that if this is done through adapting to a new economic-energy structure then several co-benefits can also be reaped.

And third, while I mostly discussed resilience in a positive light so far, the topic of **trade-off between resilience and efficiency** in the short term is inevitable. The classical idea is to say that we only need redundancies and resilience building if the expected disruption from shocks multiplied by the probability of those shocks is higher than the cost of building resilience.

In an efficient system resilience building is thought to be costly and only maintained in order to avoid damages, that are higher magnitude than the cost of resilience building (e.g., Martin (2019), Landau (1969)). However, as this thesis illustrates through the chapters, **resilience building is not necessarily costly, in contrast, it can have economic value, not just through avoiding damages, but through other means (we can call them co-benefits) as well**. Resilience building that responds to well articulated risks can create new economic opportunities (Mercure et al. 2021), as well as they can lead to various co-benefits, that go beyond increasing resilience and therefore reducing damages from shocks. Figure 11 presents examples of these from the articles for various levels of the economic system. My findings here relate to the *R3 and R4* research question defined in the beginning (see page 5): "*How to these behaviours [i.e., building resilience] relate to performance in anon-shock environment?*".

	RESILIENCE BUILDING	AVOIDED DAMAGES	COSTS	CO-BENEFITS
Ch 1 - Employees	Enabling employees to gain WFH experience; managerial communication and support during adaptation	Task switching performance losses	Managerial time spent on building trust and communication	Loyalty, mental health of employees (P. Juhász et al. 2021; Sass et al. 2022)
Ch 2 - Firms	Relationship-oriented leadership, trust building; exploring digital solutions	Performance loss during shock	Managerial time spent on building trust and communication; time spent on exploring digital solutions	As above; potential yields from digital transformation (Dióssy et al. 2023)
Ch 3 - Nations	Welfare-oriented government policies	Competitiveness loss during shock	(in medium competitiveness) trade-off between general competitiveness and welfare	Competitiveness is on similar levels with both approaches
Ch 4 - Recovery	Reactive adaptation, using shock for systematic change	Long-term implications of COVID economic shock	Increasing debt, due to government spending	Forward looking; avoiding climate and energy security risks (Hartvig et al. 2024)

Figure 11 - Examples of avoided damages, costs and co-benefits based on the chapters, references are provided, when the article does not directly make the co-benefit cases.

This pandemic has shown us that building resilience is valuable and as we live in an increasingly uncertain world it will be even more valuable tomorrow. Building resilience, however, starts with building trust and *treating employees well*, because, as it is shown, adaptability and flexibility, the components of *reactive resilience* are dependent on communication and trust among co-workers at the firm level and welfare policy and a social safety net at the national level. Building resilience, as I show through these examples, also does not have to be *“costly”*. In organisations adaptation can be supported just by talking clearly in frequently in stressful situations. While at the national level focusing on welfare and social policy, does not mean compromising competitiveness. Finally, when it comes to reactive resilience, as I have investigated, re-building and recovery can mean that we are *“building back better”*, enhancing our resilience towards other risks such as energy security or climate change, while repairing impacts of a shock.

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