

THE RESILIENT SOCIETY

The Resilient Society

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MARKUS K. BRUNNERMEIER



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Contents

Foreword	I
Acknowledgements	III
Introduction	1
<i>Implementing a Social Contract</i>	4
<i>Long-Run Forces and Tensions</i>	6
<i>Global Resilience</i>	8
Part I: Resilience and Society	11
1. Resilience and Its Cousins	13
<i>A Definition of Resilience</i>	13
<i>Robustness and Redundancies</i>	18
<i>Resilience and Sustainability</i>	19
<i>Growth with Resilience</i>	20
2. Resilience and the Social Contract	29
<i>Externalities and the Social Contract</i>	31
<i>Insurance and the Social Contract</i>	38
<i>Approaches to Implementing a Social Contract</i>	42
<i>Implementation through Social Norms and Conventions</i>	44

	<i>Implementation through the Government</i>	48
	<i>Implementation through Markets</i>	53
	<i>A Responsive Social Contract for Resilience</i>	55
Part II: Containing the Shock: The Case of Covid-19		59
3.	Behavioral Responses to Waves and Resilience Illusions	63
	<i>SIR Models with Behavioral Response</i>	64
	<i>Tale 1: Covid-19 Fear</i>	66
	<i>Tale 2: Covid Fatigue and the Resilience Illusion</i>	70
	<i>Tale 3: The Last Covid-19 Mile</i>	72
	<i>Regional Differences</i>	73
4.	Information, Testing, and Tracing	75
	<i>General Lockdowns versus Targeted Lockdowns</i>	76
	<i>Types of Information for Targeted Lockdowns</i>	79
	<i>Tracing, Efficient Testing, and Targeted Enforcement</i>	81
	<i>Privacy and Stigma</i>	83
5.	Communication: Managing People's Worries	85
	<i>Fostering a Sense of Community</i>	86
	<i>The Role of Credibility in Communication</i>	87
	<i>Gaining Credibility by Offering the Counterfactual</i>	90
	<i>Vision and Narratives</i>	93
6.	The Role of Vaccines in Designing a New Normal	95
	<i>The Cost-Benefit of Vaccines</i>	97
	<i>Vaccine Development: Redundancies, Diversification, and Resilience</i>	98

Part III: Macroeconomic Resilience	109
7. Innovation Boosts Long-Lasting Growth	117
<i>Speeding Up Preexisting Trends</i>	119
<i>Principles of Innovation: Cannibalization and QWERTY</i>	120
<i>Shaking Off Regulatory Shackles</i>	123
<i>Examples of Innovation</i>	123
8. Scarring	139
<i>Shifts in Optimism, Preferences, and Risk Attitude</i>	140
<i>Labor Scarring</i>	143
<i>Firm Scarring</i>	147
9. The Financial Market Whipsaw: Central Banks as Guardians of Financial Resilience	157
<i>The Stock Market and Large Firms: K-Recession</i>	158
<i>Debt Markets</i>	164
10. High Government Debt and Low Interest Rates	179
<i>Enhancing Resilience with Fiscal Stimulus</i>	179
<i>High Public Debt</i>	181
<i>Why Are Interest Rates So Low?</i>	182
<i>Safe Asset Status of Government Bonds</i>	185
<i>High Debt and Vulnerability to Interest Rate Spikes</i>	187
<i>Additional Implicit Government Debt</i>	189
11. The “Inflation Whipsaw”	191
<i>The Inflation Whipsaw: A Dynamic Perspective</i>	192
<i>Short-Term Effects</i>	198
<i>Central Banks and Unconventional Monetary Policy</i>	201

<i>Long-Term Effects</i>	209
<i>Monetary, Fiscal, and Financial Dominance</i>	214
<i>Redistributive Monetary Policy</i>	223
12. Inequality	225
<i>Inequality in Individual Resilience</i>	226
<i>Different Forms of Inequality</i>	227
<i>Inequality and the Resilience of the Social Contract</i>	236
<i>Outlook and Lessons from History</i>	241
Part IV: Global Resilience	243
13. Resilience Challenges of Emerging Economies	245
<i>How Poverty and Middle-Income Traps Inhibit Resilience</i>	246
<i>Health Resilience</i>	250
<i>Resilience through Fiscal Policy Space</i>	253
<i>Policy Space and the IMF's Special Drawing Rights</i>	259
<i>Debt Restructuring</i>	261
14. New Global World Order	269
<i>Geopolitics and Global Order</i>	270
<i>Global Finance</i>	279
<i>Global Trade</i>	291
15. Climate Change and Resilience	303
<i>Less Consumption versus More Innovation</i>	304
<i>Resilience and Proximity to Tipping Points</i>	309
<i>Ex-ante and Ex-post Resilience: Planning Security versus Flexibility</i>	312

Conclusion and Outlook	315
Endnotes	321
Bibliography	361
Index	393

Foreword

As a result of the Covid-19 crisis, the world must address a critical question: How can societies be reshaped so that we can face inevitable, severe shocks with resilience? To answer that question, this book proposes a shift in our mindset and our social interactions. Rather than lethargically avoiding risks, we should proactively develop societies that are resilient to adverse shocks.

The Covid-19 pandemic has provided us with an opportunity to learn how to be better prepared for future crises, on a national and international scale. This book is my take on those lessons, specifically related to the economic challenges that societies around the globe now face and how we can prepare for the next shock. It presents an analysis of the immediate and long-term pandemic impacts on societies.

The aim of the book is to present the concept and principles of resilience in a structured way, and to make them available to a broader public. However, the book makes no attempt to be all inclusive, comprehensive, or fully rigorous. Rather it raises intriguing perspectives designed to encourage readers to think. Hopefully, the book will stimulate discussions among politically interested citizens

THE RESILIENT SOCIETY

who are keen to build a more resilient society.

Part I of the book outlines the concept of resilience and how our social contracts could be redesigned to make societies more resilient to unexpected shocks. Part II outlines four core elements of resilience management using the Covid-19 pandemic as the primary example. Part III addresses future macroeconomic challenges, such as scarring effects, high debt levels, and inflation. Part IV emphasizes global challenges. Each chapter stands on its own and can be read without reading the earlier chapters.

I draw from the insights of others, but the book presents my own analytical summary of the main tradeoffs and should not implicate others. In fact, this is a work in progress. Events are still unfolding. Hence, the book should be read as an interim synthesis.

Markus Brunnermeier
Princeton, June 2021

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Introduction

The Covid-19 pandemic has made us feel fragile. As individuals, we discovered that we could suddenly be hit by a rapidly spreading, unknown disease. It upended our perception that medical progress would prevent such events. Societies around the world faced disruptions on an unprecedented scale. The pandemic paralyzed recreational activities, stretched public services to the limit, left the poorest and most vulnerable unattended, turned our homes into workplaces, stopped our kids from going to school, disrupted our family lives, and forced us to connect with friends through screens. And we lost many lives.

The pandemic has also given us reason to be confident in the power of medicine and technology. Indeed, we can only marvel at the speed and efficiency of vaccine discovery, which occurred less than a year after the virus was identified. But what about social fragility and vulnerabilities? Will our societies quickly recover, or will they bear permanent scars? Most importantly, will they be able to overcome similar shocks in the future? This book seeks to address that question.

The key concept in this book is **resilience**. The term refers to an *ability to rebound*, which is different than the idea of **robustness**,

THE RESILIENT SOCIETY

which is an ability to resist. Sometimes robustness is not the best way forward. Resilience is about being able to weather a storm and recover, as described in the famous poem by Jean de La Fontaine titled *The Oak and the Reed*.²¹ The oak is robust. It is mighty and looks indestructible in the face of normal winds. By contrast, the reed is resilient. Even light breezes bend the reed. But when a strong storm erupts, the reed declares: “I bend but do not break.”

That phrase incorporates the essence of resilience. The reed bounces back when the storm is over. It fully recovers. The robust oak can withstand strong winds, but it breaks when the storm becomes too severe. Once it has fallen, no recovery is possible. Its lack of resilience prevents restoration. The reed, always in motion, might look vulnerable, but it is much more resilient than the oak.

This is a nice metaphor from nature, but it does not fully describe the challenges we face. There are, of course, purely “physical” pillars of resilience. For instance, in daily life we depend on the proper functioning of numerous networks and infrastructures. Just imagine life without telecoms, the internet, and roads. So, if we want those elements of our physical infrastructure to rebound after a shock, we might need to build them with redundancies, buffer stocks, duplications of structures, and added capacities. Doing so implies a possible need to sacrifice efficiency in exchange for greater resilience.

So far, societies have sought to manage production systems according to a “just in time” principle; that is, to maximize flows and minimize stocks, which is the objective of global value chains. By contrast, the concept of resilience leads us to emphasize a “just in case” approach, which would give us the ability to recover speedily after a shock. For that to occur, we must give priority to

resilience, which turns redundancies into a virtue rather than a vice. Safety buffers are useful because they allow us to absorb shocks. A mindset of resilience provides a new way of looking at cost-benefit calculations.

Another way to understand the difference between resilience and robustness is to consider an electric circuit with numerous light bulbs. The most cost-efficient way to set this up would be a series circuit like those used in old-style Christmas tree lights. In this case, if one light bulb failed, the entire Christmas tree would turn dark. A more resilient alternative is a parallel circuit. In this case, each light bulb is connected to a main circuit, which is the norm for lighting a staircase. If the second-floor light bulb fails, the lights on the first and third floors stay on. The total cost of the wiring is higher because more wire is needed, but the parallel circuit is more resilient.

Resilience is also different than **risk**, which refers to the frequency and size of shocks. Resilience is about the *ability to react* after a shock hits—the ability to bounce back or, in formal terms, to “mean-revert.” This ability to rebound implies the need to facilitate adaptation. If we are able to adapt and change, we will strengthen our resilience. With improved resilience, we will be able to take more chances and embrace more opportunities—because the shocks will be less detrimental.

Resilience is also an essential component of **sustainability**. In the absence of resilience, a society can become unsustainable. Severe shocks might push society over the cliff, leading to detrimental adverse feedback loops.

The Covid-19 pandemic has taught us that resilience requires more than individualistic thinking. A society relies on healthy collective functions, which are created (or not) by the quality of

our **social contract**. This contract emerges from the recognition that our individual conduct will impact others. Economists call these impacts “externalities.” Without a social contract, people often impose negative externalities on each other. As a result, some citizens become trapped or pushed close to tipping points. Taken as a whole, negative externalities increase social fragility and undermine resilience, particularly when a shock like the recent pandemic hits.

In this book, I argue that resilience can serve as the guiding North Star for designing a post-Covid-19 society.² This overarching principle can help us think about how to prepare society and foster cohesion that enables us to better react to future shocks. Throughout, I apply an economist’s perspective on health and the social contract.

Granting to people the personal freedom they need to dream, experiment, strategize, plan, and possibly fail is essential for societal progress. It is my view that that this freedom is also essential for human dignity. However, people should not be trapped or fall into poverty. They should have the ability to rebound and try again after they have learned from their failures. Personal bankruptcy protection serves precisely that purpose. Hence, rather than shielding people from possible failure, society should encourage experimentation and curiosity while also making individuals resilient.

Implementing a Social Contract

This book addresses how a resilient social contract can be implemented, either by governments or via social norms. Authoritarian **governments** use outright force to limit externalities.

In open societies, governments have to rely more on the power of persuasion. Due to the Covid-19 pandemic, the pendulum might swing toward increased government intervention that could limit individual freedom. **Social norms** are another way to enforce the social contract and to internalize externalities. An example can be seen in Japan where, without government pressure, citizens have generally adhered to mask-wearing guidelines and social distancing recommendations because they fear social stigma.

Markets can also play an important role in aggregating the information that is dispersed in a society. If many people like a product, they will demand more of it and thereby push up its price, which signals firms to supply more.

All of these factors—social norms, government mandates, and the market—can play a role in implementing a social contract. That said, it is important to recognize that a society and its social contract will be more resilient if the contract's implementation can *flexibly respond* to shocks. Depending on the nature of the crisis, implementing the mix of social norms, government mandates, and the market will need to be adjusted. Making these adjustments will require careful discernment. Too much flexibility can be detrimental. People need to rely on a clear, consistent social framework in order to make predictions and plans with at least a modicum of certainty.

Therefore, it is paramount for us to understand how human behaviors change when shocks occur in waves, as has occurred during this pandemic. Managing a crisis requires information. To understand new situations, we need experimentation. Accurate communication is also essential, in part because it has such a powerful influence on human behavior. However, conveying factual information about public health guidelines during a pandemic,

for example, is challenging. People struggle to grasp unobserved counterfactuals, such as the estimated number of Covid-19 deaths in the absence of certain public health measures.

Finally, any resilient response to a crisis needs to include a vision for the new normal. The book is designed to help readers think about the future. What will society look like at the end of a crisis? Where will we go next?

Long-Run Forces and Tensions

From a macroeconomic and financial perspective, we should recognize the reality of volatility while also developing the capacity to rebound (resilience). In other words, for us to attain long-run growth we will need to flexibly adapt and embrace disruptive technologies. Paradoxically, this resilient approach to shocks will be *less risky* than maintaining the status quo, which can lead to long-term stagnation.

Shocks like the recent pandemic can trigger two long-run forces during the post-shock recovery phase. On the one hand, the Covid-19 pandemic has induced technological progress and **innovations** in several areas of life. These new technologies might foster resilience and therefore provide additional capacity to adjust to future shocks.

On the other hand, there is a risk of long-term **scarring** that could undermine resilience. Workers who lost jobs might lose skills and struggle to return to the labor market. Disruptions within education systems might lead to human capital scarring. And finally,

firms might suffer from debt overhang. If large debt burdens hold firms back from investing, the economy might suffer in the long run.

To remain resilient, we must avoid **financial market** havoc. Financial markets remained resilient in 2020 and early 2021. After an initial shiver in March 2020, central bank interventions rapidly removed the tail risk in markets and stabilized asset prices, resulting in a drop-and-rebound pattern similar to a whipsaw. As central banks contained the risk of widespread negative outcomes, firms benefited from lower interest rates as they raised much needed liquidity. In the future, this type of scenario might make the economy more resilient, but it might also lead to financial instability in the medium term.

Public debt typically soars in times of crisis, just as it has during the Covid-19 pandemic. The large fiscal stimulus programs have so far averted an outcome like the Great Recession, even though the pandemic has caused a much larger fundamental shock than what we experienced in 2008. Nonetheless, there are worries about debt sustainability and the long-term economic outlook. A society is only resilient if government debt is sustainable over the long run. Otherwise, the society will face a sizable risk of inflation and also a risk of deflation due to debt overhang. Until now, the US government debt burden has been bearable because of low interest rates and the safe asset status of government bonds. However, governments that are vulnerable to interest rate hikes might experience skyrocketing interest burdens. Remaining vigilant to these potential adverse jumps in debt markets is critical.

There is also a risk that **inflation** will display whipsaw dynamics over the medium term. In 2020, depressed demand lowered inflation rates; however, inflationary forces could be unleashed in the future. To foster resilience, central banks must remain alert to the danger of

deflation traps and inflation traps. Like a high-speed race car with strong brakes, an independent central bank can boost the economic recovery while the economy remains in recession, or it can step on the brakes and tighten policy in times of rapid economic growth. However, at any time, a conflict of interest between the central bank and the government might emerge if tighter monetary policy increases the government's debt servicing costs.

A social contract is only resilient if society is fair and if **inequalities** are kept in check. In the case of the United States (at least), the Covid-19 pandemic has revealed the ways that inequality impacts all parts of society. Racial inequalities have become more apparent. We have seen the problem of unequal healthcare access and how that problem has heterogeneously affected different communities. The Covid-19 pandemic has worked like an X-ray machine, revealing the hidden challenges under the surface of many societies.

Global Resilience

Finally, this book will discuss how the world as a whole can enhance resilience. The Covid-19 pandemic has reminded us that we live in a global society and that we need global resilience. We have seen again how a contagious disease can rapidly spread throughout the world. Perhaps surprisingly, it is common for viruses to transmit from animals to humans. This happens on a weekly basis. But human-to-human transmission is much rarer for zoonotic viruses. Hence, banning wet markets, establishing early warning systems,

and promoting early responses to outbreaks are critical to improve global resilience.³ Such interventions might also be useful to detect mutations of SARS-CoV-2, such as the ones discovered in Southeast England and in South Africa in late 2020, or the Delta variant in India in the spring of 2021.

This need raises broader questions about the **international order**. As in previous health crises, or in the battle against climate change, all humans have recently faced one common enemy: Covid-19. However, international coordination has been a low priority since the early days of the pandemic. At the time of this writing, many countries are still working unilaterally to secure vaccine commitments.

Emerging and **developing countries** face particular challenges in retaining resilience while escaping poverty and middle-income traps. *Policy space* to respond to shocks is more limited in developing nations. For instance, lockdown measures during the Covid-19 crisis triggered starvation and other invisible deaths from missed immunizations for other diseases. Moreover, developing nations have limited *fiscal space* and that restricts their ability to foster resilience. Strained public finances leave little room for further stimulus should another crisis appear.

Looking ahead, international relations will play a crucial role in shaping the post-Covid-19 world. The latent power struggle between the US and China is likely to drag on in several areas, including digitization, cybersecurity, spheres of influence, and trade. At the same time, Europe will have to decide whether to align more closely with the US or play a more independent role relative to both China and the US. The pandemic has also highlighted the vulnerability of deeply integrated global value chains. In the future, supply chains

might need to be more diversified to improve resilience despite slightly higher costs.

Last but not least, the principle of resilience is important in the context of climate change and environmental sustainability. We will face shocks and setbacks, but we need innovation to reduce emissions. Without that, society will be propelled toward irreversible, dangerous tipping points that make us more vulnerable. A single shock or unexpected event could push society over the edge to a point of no return, or into a state of ongoing deterioration.

Shocks can be caused by many factors, of which pandemics are just one. The Covid-19 crisis has clearly revealed that a failure to prepare for risks can have a devastating global impact, especially in societies that lack the resilience needed to face unforeseen circumstances. This highlights the necessity to consider the main theme of this book. When the next unforeseen crisis strikes—a large-scale internet failure, a cyberattack, a bioengineering experiment failure, a superbug, a catastrophic climate event—all of humanity will benefit if the social contract is designed to enable us to bounce back after we have been knocked off our feet.

PART I

RESILIENCE AND SOCIETY

How should resilience and a social contract guide our societies and the way we live together? We will dive into the details of that question in this section. Chapter 1 defines the concept of resilience and compares it with the related concepts of robustness, sustainability, and risk. Next, chapter 2 explores the implications of resilience for the social contract, especially how it can enable us to live together as a peaceful society, and how to make the social contract itself more resilient.

CHAPTER 1

Resilience and Its Cousins

A resilient society is able to react to and respond after a shock. Resilience even opens new doors to enhanced growth and sustainability.

A Definition of Resilience

A society can drift and change, but it will usually follow a trend—a smooth procession over time. Occasionally a society faces shocks that lead to deviations from the normal trend and expected outcomes. A shock can trigger abrupt changes in, for example, stock prices or the wellbeing of individuals.

Prior to a shock, we are typically aware that something could suddenly change, and we foresee possible future paths. Of course, the *ex-ante* view is blind to whether the shock will materialize.

We can only assign a probability to that event. Some shocks are extremely rare and improbable. Others are more likely. Some shocks are good and others are bad. Some future scenarios are dangerous, as we have seen during the Covid-19 shock. Others are completely unforeseen, or even unimaginable.

Shocks have two important features: amplitude and frequency. An ample shock causes more damage than a small one. The difference is shown in figure 1-1, where the shock is amplified in the right-hand panel.

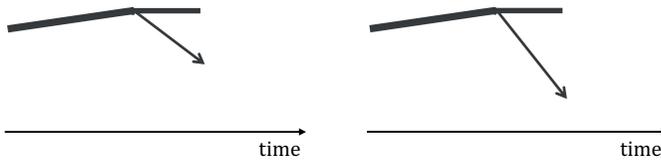


Figure 1-1: Each panel depicts the impact of a negative shock. The impact of the shock on the left-hand panel is smaller than the impact of the shock on the right-hand panel.

Resilience pertains to what happens after a shock has occurred. A long-lasting impact is known as a persistent shock, as shown in the left panel of figure 1-2. In contrast, a resilient process occurs when a society bounces back like a trampoline, as depicted at the right panel of figure 1-2. Resilience is, in formal mathematical language, a reversion back to the mean, back to the original conditions. In fact, the concept of resilience originated in the field of materials science. For example, a metal is resilient if, after it deforms under stress (the shock), it returns to its original state.

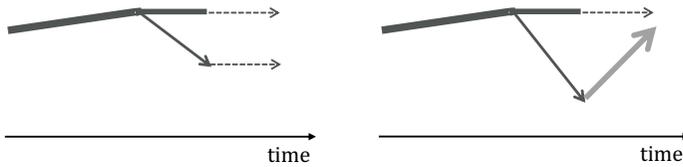


Figure 1-2: Both panels show the process extending after the shock. In the left panel, the shock is persistent. The right panel depicts a resilient process that bounces back.

The left panel shows a less ample shock, but the shock has a persistent impact. In contrast, the right panel depicts a larger shock, but with a more resilient outcome. The impact of the shock is only temporary, and the system partially bounces back. Stated in statistical terms, the parameter reverts back to its mean.

A more troubling scenario occurs when the impact of a shock becomes worse and worse, perhaps spiraling out of control. This is the opposite of resilience and is not depicted in figure 1-2.

Individual and Societal Resilience

The concept of resilience can be applied at an individual, societal, or even global level. Individuals are resilient if, after falling down during a crisis, they can make the right moves and bounce back to their feet. Whether a person recovers often depends on how she or he reacts after the shock's impact. This idea is also found in the social sciences, in which resilience pertains to the ability to adapt and react rather than panic. Importantly, resilient people are

able to reinvent themselves, to be actively engaged in the rebound. Developing ex-ante contingency plans to adapt in the face of shocks enhances resilience.

A society is resilient if all, or at least most, individuals have the option to react in order to bounce back. In a non-resilient society, some people might never recover from a severe crisis. Temporary job losses might lead to permanent unemployment, firms might close forever, or large debts might hold back households for years. These people do not bounce back even if insurance cushions the fall. Societal resilience might also depend on interactions among individuals and on a society's preparedness for severe events, such as pandemics. Using simulations and stress tests to evaluate various responses to shocks can increase the preparedness and resilience of society. Overall, resilient societies are able to react in a coordinated way and institutions can be reinvented.

Small and Big Risks

Perhaps paradoxically, enduring a small crisis from time to time can be preferable to avoiding them at any cost. A crisis is an opportunity to make needed adjustments. Without adjustments, imbalances can build up over time. As large imbalances accumulate, the inevitable crisis will be more severe and the system will be less able to rebound. In contrast, a system with a higher frequency of smaller crises, each followed by a rebound, is more resilient and therefore less prone to risks than a seemingly stable system. This phenomenon is sometimes referred to as a volatility paradox. We should be most cautious when volatility is very low.

Risk Exposure Teaches Resilience

How does a society or individual obtain the capability and knowledge to adjust swiftly in order to bounce back? How can we foster resilience and strengthen people's capacity to flexibly adapt and react to shocks? One possibility is to learn to react during occasional smaller shocks. The human immune system is a good example. To develop antibodies and resistance against germs, the immune system needs to be exposed to them. If the immune system is isolated in a hyper-sterile environment, the body will not develop resilience. Upon leaving the sterile environment, the body will not be trained to fight germs, leaving it more vulnerable to infection. Similarly, many entrepreneurs have experienced failures, but those failures have led them to develop immensely successful unicorn business models. If there is resilience, setbacks can lead to improved insights and practices.

The same is true for whole societies. Experiencing a smaller shock can help a society better handle subsequent shocks. Taiwan has successfully managed its Covid-19 outbreaks because the nation learned how to implement contingency plans during the SARS outbreak in 2003.⁴

When individuals or societies are exposed to some risks, they gain an opportunity to develop resilience by learning how to adapt plans and then deal with similar risks in the future.

Robustness and Redundancies

Robustness

Robustness, unlike resilience, is about the ability to resist shocks without adapting. A robust system performs well and continues to operate as normal—in most circumstances. Like the oak, a robust system can withstand the impact of most shocks, but it breaks in extreme circumstances. The more robust a system is, the costlier it is to operate because more safety buffers are needed. Total robustness that covers all contingencies (i.e., zero fault-tolerance) is typically nonviable.

In contrast, resilience is the capacity to withstand shocks in a dynamic way. Like a reed, it gives in, adapts, adjusts, and then bounces back. Resilience can cover more contingencies and therefore survive shocks that break through the “robustness barrier.”⁵ Resilience involves “giving in” slightly so as to lower the costs—a core premise of resilience. Therefore, developing resilience can be economically more efficient. The choice is between a costly, sufficiently robust solution and a less expensive resilient approach that constantly adjusts to each situation.

Another analogy illustrates the difference between the two concepts. A robust skyscraper that can unwaveringly withstand any storm would need a massive quantity of materials, which would make it expensive to build and potentially so heavy that it could not hold its own weight. A resilient skyscraper, instead, sways a little in the wind. The Willis Tower in Chicago can sway up to three feet from side to side on a windy day.⁶ This type of resilient construction enables higher and lighter constructions with modern glass facades.⁷

Redundancies and Buffers

Redundancies are safety buffers. They are crucial for both robustness and resilience. However, the types of safety buffers needed for each are distinct. Robustness requires redundant backups for each unit and each task that might face a shock. If one fails, an immediate replacement is necessary. In contrast, a resilient system handles shocks by regrouping resources after temporary withdrawals. Agility, flexibility, liquidity, and general education are key to a resilient system's redeployment after a shock.

An optimal approach is to integrate resilience and robustness. For example, if a shock forces a person into a trap or makes it difficult to rebound, redundancies that foster robustness are the right answer. For shocks from which a person can regroup and adjust, it is economically wiser to have re-deployable redundancies at hand. Finally, societies and individuals should have generic redundancies that prepare them for unforeseen shocks, the so-called "unknown unknowns." Flexibility and agility are paramount in order to cover a broad range of unforeseen threats.

Resilience and Sustainability

The concept of resilience can also be linked to the concept of sustainability, which is the focus of this book's chapter on climate change. A development is sustainable if it can be maintained in the long run.

Resilience is essential for sustainability. It prevents a person or

society from falling off a cliff after being hit by a shock. However, resilience alone is insufficient for sustaining development. If a society has underlying factors that cause slow and constant deterioration, the future will be dire and unsustainable.

Paradoxically, taking on some risks with resilience might be the only way to make the path sustainable. Imagine a room that is flooding as water pours in through the backdoor. If nothing is done, the whole room will soon be completely filled. One option would be to allow water to escape by opening another door. However, there could also be even more water outside that door. Although there is complete uncertainty in this situation, doing nothing would be unsustainable. Some risk-taking is needed.

In many cases, the only way to make a process sustainable is to embrace technological disruptions. These disruptions could lead to temporary shocks, but with clever and creative reactions the process could become resilient enough to bounce back after each shock. Progressing through these disruptions might be the only way to achieve ultimate sustainability and its necessary ingredient, resilience.

Growth with Resilience

At first sight, it might seem that resilience can only be achieved at the expense of growth. Intuition tells us that the faster a society grows the more fragile it could become. Growth creates tensions in “just in time” supply chains, it necessitates many quick adjustments in the workforce, and it puts strain on capacity utilization.

That intuition is misleading. To the contrary, a resilient society will enjoy stronger growth over the long run because it will better absorb shocks. For that reason, a resilient society is better equipped to take risks. And risk-taking is an essential driver of growth. A prominent explanation is “Schumpeterian creative destruction.” Promoting innovation, which possibly disrupts whole economic sectors, leads to higher growth on average. However, it also makes the economy more volatile as new entrants displace incumbent firms. As long as the economy is resilient, it will bounce back from temporary disruptions. If, however, resilience is lacking (e.g., after a financial crisis) and a recession leads to a permanently lower growth path, then risk considerations deserve much more attention.

Investment, innovation, entrepreneurship, and R&D all involve risk-taking—and society often benefits. Think of the risks embraced by the CEOs of the German startup BioNTech, Ugur Sahin and Özlem Türeci. They reconfigured their entire company to search for a new mRNA vaccine against Covid-19 in January 2020.⁸

This type of innovation can subsequently boost economic growth, which, in turn, provides more resilience. As the economic bicycle moves faster, it becomes more resilient to dangerous side winds. However, in many circumstances, risks materialize and heavy losses ensue. If those losses cause irreversible damage, if risk-taking puts the survival of the economic entity in danger, then it is better to take fewer risks and potentially accept slower growth in the long run.

Risk versus Resilience

Before a shock occurs, society faces risk. Referring back to figure 1-1, the ex-ante risk depicted in the left panel is smaller than the one in the right panel because the possible shock is smaller. This assumes that the shock for both panels is equally probable. In reality, shocks can be more or less likely, or more or less frequent. For instance, the temperature or a stock price can remain stable for some time and then suddenly move up or down. In the language of statistics, amplitude and probability distribution can be combined into a single measure called the “variance.”⁹

Thus, we face a fundamental choice in relation to managing risk. The first is **risk avoidance**. In this case, the society organizes itself with the primary objective of reducing the frequency and size of shocks. Social rules and norms are built to reduce the risk exposure of individuals and groups. One might refrain from certain activities or insist on exclusion of liability in order to minimize risk exposure.

There are two problems with the risk avoidance strategy. First, it could discourage intrinsically risky activities that might yield great societal and economic benefits. In fact, a society should desire such risk-taking. Otherwise, companies might not reap the full benefit of R&D investment. If underinvestment in risky R&D is the norm, individual firms might not have sufficient incentives to innovate, which might reduce societal benefits. A second problem with the risk avoidance strategy is that it could fail. However hard we work to limit exposure to risk, some risks could materialize in totally unexpected ways. The Covid-19 pandemic, of course, is a case in point.

An alternative might be preferable in the long run. This second approach is based on the **acceptance of risk** but in a framework of institutions, rules, and social processes **that ensure resilience**. If successful, it would foster risk-taking and growth while protecting the society if potential dangers materialize. Strong resilience yields major benefits when the shocks are exceptionally strong. A striking example is the cohesion that the Japanese society sustained after the Fukushima disaster in 2015, which proved to be a terrible combination of a natural disaster—the tsunami—and a human-caused catastrophe.

The point is this: As economic activity becomes increasingly complex and inherently risky, resilience can and should become a key growth factor.

Resilient Risk-Taking through Limited Liability

If a society is able to rebound after failure, then it will continue to encourage risk-taking. This simple insight has many public policy implications. One important policy approach is limited liability, which is often presented as the innovation that started capitalism. Limited liability is a means of sharing downside risks across a society, providing a form of resilience. Limited liability incentivizes risk-taking by limiting downside risks. With limited liability, the maximum loss for an entrepreneur is capped. As a consequence, an entrepreneur will have enough resources to rebound even if she fails.¹⁰ When the downside risk is restricted to the size of an initial investment, the entrepreneur might as well engage in a project that offers more upside.

On the private level, personal bankruptcy usually allows households to discharge parts of their debts. The remainder is paid back until they emerge debt-free, usually after a couple of years. This provides people with a ladder to climb out of personal bankruptcy in the medium run. Limited liability mechanisms insure individuals against negative tail risks while ensuring individual resilience.

Of course, to fine-tune limited liability is a balancing act. On the one hand, it should stimulate R&D investments; on the other hand, it should avoid excess risk-taking, especially in the realm of financial speculation.

Figure 1-3 illustrates two growth paths. Each line could represent the possible cumulative returns of a mutual fund, or long-run growth in an economy, or the growth trajectory of a start-up. (At this point, the discussion will generally apply to all these examples.) If decision-makers focus only on avoiding risks, resulting in a low-volatility scenario, then the straight-line trajectory would be appealing. It has no volatility, but fairly substantial growth. The other line presents a scenario of higher growth, but at the cost of significant volatility. People who are very risk-averse would pick the straight line.¹¹

However, it's important to recognize that the more volatile path remains highly resilient. After every decline, the path fully bounces back and grows. A resilient strategy would focus on strengthening the underlying factors that support resilience *in the midst of volatility*. Over the longer term, the higher growth rate will accumulate and an exponential gap between the two processes will emerge. Thus, figure 1-3 succinctly captures how risk minimization can forego large gains, whereas resilience management might lead to superior outcomes.

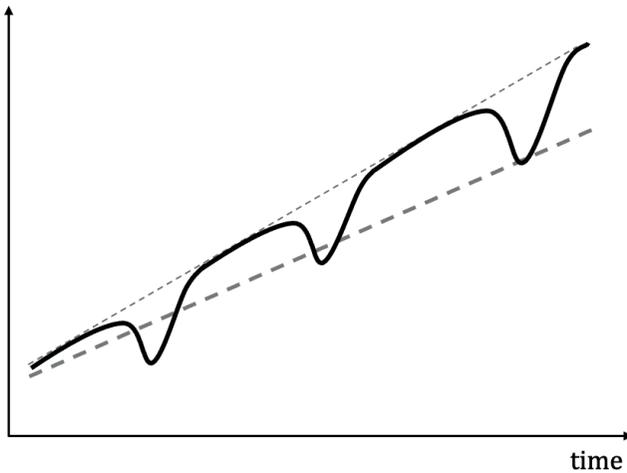


Figure 1-3: Risk avoidance path (straight line) vs. a volatile but resilient path.

A concrete example of this distinction is the economic analysis of business cycle costs. How much should we be willing to pay to eliminate business cycle fluctuations? An analysis by Nobel Laureate Robert Lucas suggests that we should pay very little. Stated differently, sacrificing some long-run growth to eliminate business cycles would prove costly. Of course, Lucas's analysis takes the rebound for granted, and he does not address the topic of how to design a resilient economy. In contrast, a risk-minimizing person would be willing to pay a substantial cost and to incur lower long-run growth to eliminate fluctuations (see the straight line in figure 1-3). But this approach completely neglects resilience. For many years, the US economy steadily bounced back from every recession. It was very resilient until 2007, at least.

Aggregate numbers obviously obscure significant heterogeneity. Occupational groups in disrupted industries can be hit hard by

recessions. Therefore, decision-makers in these industries often have a much higher willingness to pay for business cycle smoothing than noncyclical occupations. This demonstrates that macroeconomic resilience is often not sufficient; there is a need for individual micro-resilience. In a resilient society that is inclusive, every citizen has the ability to bounce back after personal shocks.

For the volatile path shown in figure 1-3 to dominate the straight path, the former has to rebound. Limited liability is one approach to helping people react and bounce back after an adverse financial shock. On the other hand, if **traps** are prominent along the volatile path, then disruptions could be very costly. In that case, adopting the straight path (less volatile) will seem more reasonable.

Exogenous growth models all simply assume resilient paths. In many endogenous growth models, constant innovations can lead to a higher growth path. There are also endogenous growth models that exhibit traps where resilience fails, such as when the economy falls into a poverty trap or middle-income trap. More generally, as shown in part 3 of the book, we will see that financial crises often lead to non-resilient outcomes; they push the economy toward a permanently lower growth path. Recessions caused by external shocks, such as the Fukushima nuclear catastrophe in Japan, often have more resilient outcomes (at least from a purely economic perspective).

Mutual Reinforcement between Resilience and Growth

A society is more resilient if the *pace* of change does not outstrip the *capacity* to change. Consider an analogy of a cyclist riding into crosswinds. If the cyclist is riding at a healthy speed, the bike can

resist sudden crosswinds; it is resilient. Likewise, disruptive changes that put certain parts of society under stress are more difficult to master if the economy fails to grow. Ultimately, a society that boosts inclusive growth stabilizes the social contract itself, culminating in a virtuous cycle.

There is also a danger. If a cyclist rides too fast, his or her vulnerability will increase. Riding at high speeds will diminish the cyclist's ability to avoid a pothole, potentially leading to a crash. Once a biker falls and incurs an injury, it will be more difficult to ride again. And so, change and technological progress must avoid leaving people behind. We will come back to these thoughts in the chapters that discuss innovation and inequality.

To achieve growth, societies must be able to take risks in order to innovate. However, risks could materialize. If they do, those negative situations should not be allowed to destroy individuals or the society. That is why resilience matters. It enables individuals, groups, and societies to take risks and yet rebound when risk-taking does not work out.

Societies have other ways to deal with risk. For instance, they can try to mitigate risks by opting for slower growth. They can also insure people. Insurance is a process by which risks are pooled and/or transferred to others. But insurance raises difficult issues of moral hazard. It can lead to excessive risk-taking or a bad allocation of risk in the economy. A resilient society naturally finds the optimal level of risk to achieve its objectives. It does not protect its members from every risk, nor does it seek to fully eliminate risk. Rather, it explicitly aims to endow its members with the *ability to rebound* if and when risks materialize. This leads to a totally different approach to welfare and public policy.

CHAPTER 2

Resilience and the Social Contract

Imagine a group of people who act only on the basis of their immediate needs and self-interest, without ever considering the effects of their actions on others. Such a group would be violent and unstable. It would be the law of the jungle. Any shock or hazard would be amplified, often irreversibly, by those who try to pass the impact of the shock to others. The law of the jungle can improve life for a few people, but it can ruin life for society as a whole. In fact, we would not call such a group a “society.”

Moreover, the law of the jungle exposes a society to permanent danger. Societies subsist because they have mechanisms—collectively called a “social contract”—that prevent shocks from spiraling into self-destruction. A social contract should encompass all the forces and mechanisms that contribute to a society’s resilience.

Philosophers of the Enlightenment, such as Thomas Hobbes, John Locke, and Jean-Jacques Rousseau, reasoned about the emergence of social contracts. Hobbes postulated that if people were

to live in a pre-social “state of nature,” or a world without social order or laws, then they might not shy away from violating the wellbeing of others. For example, nothing would stop them from stealing someone else’s belongings or taking advantage of them. For this reason, the basic assumption of behavior in economics, encompassed in the *homo economicus*, is based on Hobbes’s view that humans are egoistic and will do whatever they can get away with. In contrast to the Hobbesian assumption, which also underlies classical economics, Locke and Rousseau were more optimistic about humans. They emphasized that humans are fundamentally good but might be corrupted by society. More recently, behavioral economics has studied altruism and attitudes about fairness.

To overcome the bad outcome of the pre-social “state of nature,” humans can come together and agree on an implicit **social contract**. These contracts can be at the family, community, firm, national, or global level. They can assign people’s individual rights and enable them to better react to shocks. In short, a social contract defines levels of individual freedom. It can dramatically change the playing field.

Along which dimension of wellbeing—economic, societal, or individual—should the social contract exhibit resilience? All of these dimensions are important. Above all, the social contract itself needs to be resilient. A social contract is of little use if it cannot sustain an external shock. Indeed, a society is not resilient if its social contract easily disintegrates.

To better grasp the links between social contracts and resilience, it is useful to first refer to “externalities,” a concept familiar to economists that can be used in a broader social context.

Externalities and the Social Contract

Externalities designate spillover effects. They arise when actions by one individual indirectly affect other people. A classic example in economics is a firm that pollutes a river thereby imposing a negative externality on people living downstream. Besides the externality, an additional consideration is important: How can the person on the receiving end of an externality react to the hardship? For example, she could react by using a water filter, or she could do something that passes the danger on to others.

In the Covid-19 world, three striking examples of externalities immediately come to mind. First, masks have protected the health of those who wear them and those around them: a positive externality to others. Moreover, everyone can see who is not wearing a mask, which allows others to react and stay away from non-wearers.

Another example is social distancing. When people choose to reject social distancing recommendations, they put others at risk of infection. This negative externality can be mitigated in many circumstances by taking protective, though often costly, countermeasures.

A third example—refusing to be vaccinated—limits the benefits of vaccines and puts others at risk, causing yet another negative health externality. In this case, it is difficult to know whether someone has been vaccinated; thus, it is difficult to react in situations that involve many strangers.

In addition to these individual-level externalities, countries can also create externalities that spill over to other countries. Since January 2021, with Covid-19 spreading out of control in many countries, the number of virus variants has increased. There is a

risk that the virus could evolve to a point at which current vaccines become less effective or even ineffective. Countries that do not contain the virus might therefore impose negative externalities by providing a breeding ground for new variants that might spread around the world.

Contagion as a Form of Spreading Externalities

Virus contagion illustrates how negative externalities can start with one person and then impact many others. In epidemiology, virus spread is often measured by using the reproduction rate R_0 , which relates to how many new people an infected person will infect. If R_0 exceeds 1, then on average each infected person would infect more than one person and the virus would spread across the population.

The implications of exponential virus spread are treacherous. As sometimes occurred in this pandemic, Covid-19 incidence numbers started to rise slowly, which might have appeared to be linear growth. But after a couple of weeks, the exponential growth became apparent and the case numbers exploded.¹² In such cases, resilience only kicks in when the externality slows down and when those who incur the externalities have a better defense mechanism, such as social distancing or vaccination. Importantly, virus spread might not be uniform across a population. It might spread from one age group that is less careful to other age groups, for example.

Figure 2-1 provides a striking illustration of these externalities during the summer and fall of 2020 in Germany. In July 2020, the virus was largely contained. It then started to rise again, driven by

the behavior of people in their twenties. During calendar weeks thirty-five to forty, the virus spread slowly but clearly through all age groups up to the nonagenarians. This pattern clearly illustrates how young people spread externalities to older populations over time. Infection rates remained very high for the elderly, who also had a substantially higher death rate.

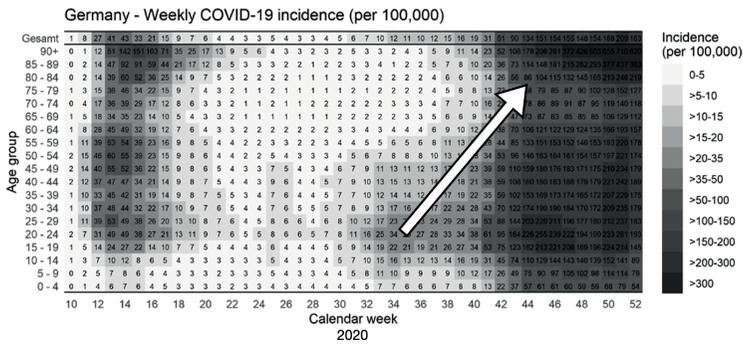


Figure 2-1: The spread of Covid in Germany in 2020 across age groups. Source: Robert Koch Institute 2020

Externalities also exist across population groups and can even be induced by politics. In India, migrant workers in larger cities who contracted Covid-19 from rich travelers were forced by the lockdown to give up their employment. To avoid starvation, they had to return to their home villages. This migration spread the virus around the countryside.¹³

With these examples in mind, we can see that resilience kicks in when externalities are contained, for example through immunity. In basic SIR contagion models, resilience comes from herd immunity—assuming that recovery from the sickness leads to permanent immunity. The predominant barebones epidemiological model, the SIR model, demonstrates how a virus can spread among

a susceptible population (S) and gradually infect (I) most of the population before those people recover (R). The key parameter in this model is the reproduction rate of the virus, the R_0 , which measures how many new people an infected person will infect. If each infected person infects more than one person, the outcome would be an exponential spread of the virus. As the fraction of recovered people rises over time, the fraction of susceptible people declines. As a result, the sick people cause fewer externalities. The spread of the virus slows down. Herd immunity kicks in, which drives resilience. When each infected person infects fewer than one person on average ($R_0 < 1$), the virus dies out slowly and society bounces back.

Feedback, Trap Externalities, and Tipping Points

Resilience, or the lack thereof, is often about how people react or are able to react to shocks. “**Trap externalities**” rob people of their resilience—their ability to bounce back after a shock. For example, if an employer fires a worker who subsequently cannot afford to send her children to school, her children’s potential will be severely compromised. The children will have almost no way to react to the shock. Such outcomes resemble the oak tree in Lafontaine’s fable. Once the oak tree has been uprooted by a storm, it dies.

The reaction of someone who has been exposed to an externality can lead to destabilizing feedback loops and to weaker overall resilience. In other words, people might cumulatively inflict externalities onto each other and therefore cause a deterioration in the society’s equilibrium and resilience. We call those situations “**feedback**”

externalities.” A classic example is a bank run. If many bank customers withdraw their money on one day, they destabilize the bank and cause a negative externality. If the actions of those people incentivize others to withdraw money as well, more “feedback externalities” would ensue. Ultimately, this process could result in a full-blown bank run, which would force the bank to suspend withdrawals because banks typically would not have sufficient deposits.

From an abstract perspective, the hoarding of face masks is like a bank run. A store might have enough face masks to supply one for each potential customer, but hoarding would cause the store to become illiquid in relation to face masks.

Both types of runs illustrate the large effects of feedback externalities. The few individuals who cause a bank run or hoard masks can induce negative externalities on many other people. Economists attribute these types of feedbacks to so-called “strategic complementarities.” Hoarding behavior is illustrated graphically in figure 2-2. Suppose that some people, including person A, purchase more toilet paper than typically needed. As a result, there will be less toilet paper available for others, including person B in the figure below. Person B suffers from a negative externality. Observing this, others might infer that toilet paper is scarce, so they also purchase more toilet paper. Now person A suffers from an externality that he or she caused. As toilet paper becomes quite scarce, person A will hoard more and person B, in reaction, might also acquire more toilet paper. At some point, when all toilet paper has been purchased, the loop stops. Externalities combined with feedback loops are the real “resilience killers.”

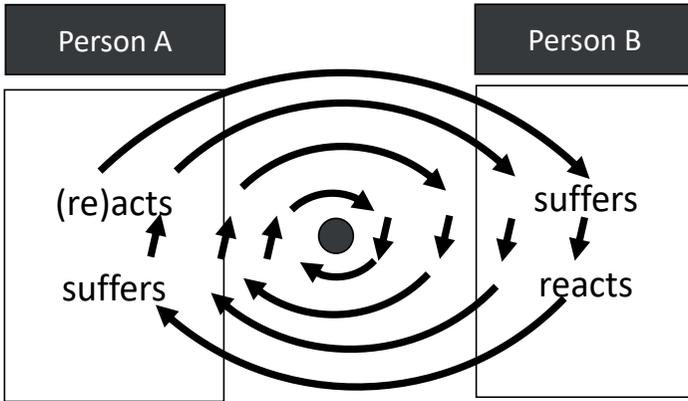


Figure 2-2: Feedback Externality Loop.

The opposite of a destabilizing feedback loop is known as “stabilizing dynamics.” These dynamics arise when a person who has been exposed to a negative externality reacts like a **maverick**. She either does not buy toilet paper, despite her fears, or she returns the extra she has purchased. However, once a feedback loop gets going, a few mavericks alone will not be able to stop it. A government intervention will be needed.

More profoundly, the potentially devastating effects of adverse feedback loops have been recognized for millennia. Ancient societies implemented “eye for eye, tooth for tooth” laws of retaliation precisely to contain violent adverse feedback loops. Without such laws, one incident might trigger another retaliatory incident of even larger proportions, and that might trigger even more retaliation. A “tooth for tooth” stops this loop after the first two steps. However, a better approach would be to compensate the other person with livestock (or money) for the lost tooth.

Tipping points occur when feedback externalities kick in. Tipping points are serious “threats to resilience.” Societies should identify and avoid them. Once a tipping point is crossed, resilience is lost. For example, a small trigger could push a society suffering from latent discontent beyond the brink. The society could disintegrate and end up in civil unrest. Once violence breaks out, returning to peaceful coexistence is a difficult process.¹⁴

In many cases, it is difficult to know when a tipping point might be crossed. Everything might look stable until the tipping point is reached, leading to rapid deterioration. Tipping points make social dynamics highly nonlinear.

Paradoxically, the social contract itself will become more resilient if *some* decline in individual or aggregate wellbeing—perhaps caused by an externality or shock—is absorbed and those individuals are able to bounce back. In other words, if individuals and societies can remain far from tipping points, the outcome will be more stability and less disintegration.

Social Contract and Containing Externalities

The resilience of societies is anchored in social contracts, which serve at least two purposes: containing externalities that members of society impose on one another and insuring against natural shocks. Without a social contract, people are free to impose negative **externalities** on each other.

In the absence of any social contract, externalities will abound. Because a social contract sets limits to admissible individual behaviors, it helps people avoid trap externalities and it stops

feedback externalities. However, social contracts could be perceived as restricting individual freedoms. To address externalities caused by others, a social contract might limit people's actions. During a global pandemic, for example, externalities abound and raise intense questions about personal freedoms. Should individuals have the freedom to infect others? What should limit this freedom and why? Should we have the freedom to go to a political rally even if this action might spread a deadly disease? Or should we limit personal freedoms to protect the vulnerable? In relation to resilience, externalities that influence how people react to spillovers deserve special attention.

Insurance and the Social Contract

Shocks from Mother Nature

There is a second rationale for a social contract besides containing externalities and enabling positive reactions: to uphold people who are exposed to natural shocks and the externalities caused by mother nature.

Adverse shocks come in many forms. To the extent that these shocks are idiosyncratic—that is, different from person to person—the lucky ones can insure the unlucky. Every year some people get sick while others do not. We cannot know exactly who will get sick, but we know that the individual cost of sickness will be quite high because treatments are expensive. However, because few people