International Studies in Entrepreneurship

Pontus Braunerhjelm
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Unleashing Society's Innovative Capacity

An Integrated Policy Framework

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Volume 55

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ISSN 1572-1922 ISSN 2197-5884 (electronic)
International Studies in Entrepreneurship
ISBN 978-3-031-42755-8 ISBN 978-3-031-42756-5 (eBook)
https://doi.org/10.1007/978-3-031-42756-5

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The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

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"Building an innovative economy requires policies that address both knowledge accumulation and knowledge diffusion. While the emphasis has predominantly been on knowledge enrichment through measures such as R&D subsidies and tax incentives, as highlighted by the authors, the diffusion of knowledge is equally vital. This entails policies to promote entrepreneurship, occupational mobility, low levels of red tape, and implementing tax systems that do not deter individuals from advancing their skills or embarking on ventures fraught with uncertainty and risk. This illuminating tome equips leaders from the corporate world, policy circles, and academia with the insights to understand and shape policies that catalyze enduring innovations of great social value."

—Zoltan Acs, *Professor Emeritus at the Schar School of Policy and Government, George Mason University, and founder of Small Business Economics*

"Innovation and entrepreneurship are at the core of economic growth. While many pay lip service to this statement, only a few understand what it really means. This new book is a must read for anyone interested in innovation and entrepreneurship. In the volume, Braunerhjelm and Henrekson dive deep into Sweden's economic successes and failures alike to come up with important lessons. These lessons matter for any country wishing to not only avert calamity, but also promote innovation and consequent growth. Notably, a key contribution of the book rests on the authors' holistic approach to innovation strategy: There must be a suite of policies spanning all policy domains coherently. Tax policy matters, but so do labor laws, housing regulations, and so on. If the pieces don't fit, the system is fragile and liable to eventually collapse. Thus, innovation policy must not be a separate compartmentalized policy domain. Good innovation policy is good policy, full stop. It is to be hoped that policymakers everywhere will pay particular attention."

—Maria Minniti, *Louis A. Bantle Chair in Entrepreneurship and Public Policy, Director of the Institute for an Entrepreneurial Society, Whitman School of Management, Syracuse University*

"Knowledge in all its forms is crucial for innovation and economic growth in developed economies. Conventional wisdom prioritizes government support for knowledge accumulation, such as increasing connectivity, government seed funding and subsidies to R&D spending. In this important and insightful new book, Pontus Braunerhjelm and Magnus Henrekson convincingly show that measures related to the incentive structure of the entrepreneurial process, access to markets, and an open internationally competitive knowledge base are just as important. A detailed and careful account is given of how all these policies are complementary and can be balanced to creation of a strong innovative environment."

—Roy Thurik, *Professor of entrepreneurship and economics, Montpellier Business School, and Research Fellow, Tinbergen Institute*

Preface

Over the last several decades, most of Europe has experienced low growth characterized by poor firm-level productivity growth, fewer breakthrough innovations, a small number of rapidly growing firms, and continued obstacles to integrated and competitive markets. These problems have gradually been exacerbated through a series of crises. However, there are a few countries that deviate from that path, and Sweden is one of them. Even though this country is currently struggling with a number of problems related to faltering integration policies, an underperforming judiciary system, and lagging industrial dynamism, we argue that there are lessons to be learned from the transformative policy changes instituted there since the mid-1990s.

The deep crisis in the early years of that decade sparked a host of timely and radical reforms, particularly on the macrolevel, but some key microeconomic reforms were also implemented. These reforms halted and reversed a vicious circle of declining growth rates, rising unemployment, and rapidly increasing government debt, problems other countries are faced with today. This success can be attributed partly to a well-designed reform package, partly to a good measure of luck as Swedish industry was well positioned to meet rising demand in new sectors (telecommunications) and emerging markets (heavy manufacturing industry). During the subsequent crises that followed in 2001–2003 (the IT-crisis), 2008–2009 (the financial market crisis), and 2020–2021 (the pandemic), Sweden also managed rather well from an international perspective. The reforms set in place before these events occurred constituted a platform for continued modernization of the welfare state that had served Sweden well up to the 1990s.

However, there has been a marked slowdown in such reform ambitions in recent years. Hence, even though the Swedish economy experienced V-shaped downturns during both the financial market and COVID-19 crises, economic growth and dynamism have not returned to the levels achieved prior to 2008. Still, with few exceptions, most of the EU member countries report even weaker development. While stable government finances and credible inflation policies are necessary conditions for continuous dynamism and increased prosperity, they are not sufficient. To keep up with intensified competition in some markets, as well as protectionist measures

in other markets, innovation is becoming an increasingly important factor in successful penetration of markets and the surmounting of entry barriers. There is a chorus of demands to strengthen innovation policy, not least from the European Union, but these calls are rarely coordinated across policy areas.

In this book, we argue that a holistic perspective is essential. Without such a comprehensive approach, measures implemented in one area risk becoming ineffective or even counteracting efforts in others, thereby weakening the overall conditions for innovation. The task is to create long-term institutions that are favorable to innovation and economic dynamism that partly build on previous reforms in Sweden, mostly implemented at the macrolevel, while concomitantly emphasizing the conditions for dynamism at the microlevel, i.e., promoting the forces of creative destruction. We propose to build on insights generated by recent research. Enabling a framework for innovative enterprise should make economies, irrespective of origin and traditions, better equipped to promote creativity and inventiveness and to cope with contemporary challenges.

It goes without saying that we do not claim to have all the answers, and we welcome suggestions to further concretize and strengthen our proposed framework.

Pontus Braunerhjelm is grateful for financial support from the Blekinge Institute of Technology and Vinnova. Magnus Henrekson acknowledges financial support from the Jan Wallander and Tom Hedelius Foundation and the Kamprad Family Foundation for Entrepreneurship, Research & Charity. We are also indebted to Klas Eklund for his contributions to our joint book published in Swedish in 2012, which has in part inspired our work in this book. Finally, we would like to thank David Crouch, Kathy Saranpa, Per Thulin, and Mikael Arvidsson Martins for comments and suggestions on earlier drafts of the manuscript.

Stockholm, Sweden
August 2023

Pontus Braunerhjelm
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Acknowledgements

The authors acknowledge the Kamprad Family Foundation for Entrepreneurship, Research & Charity and the Swedish Innovation Agency (Vinnova) for funding this Open Access publication.

About This Book

This book examines policy measures that foster the creation of innovations with high inherent potential and that simultaneously provide the right incentives for individuals to create and expand firms that disseminate such innovations in the form of highly valued products. In so doing, we suggest an innovation policy framework based on two pillars: (1) the accumulation, investment, and upgrading of knowledge, and (2) the implementation of mechanisms that enable knowledge to be exploited so that growth and societal prosperity are encouraged. Knowledge is a necessary but far from sufficient condition for growth. To secure industrial dynamics and growth in the long term, institutions must be designed both to encourage sophisticated knowledge investments *and* to stimulate the creation, diffusion, and productive use of knowledge in *all* sectors of the economy. We argue that the latter area has been overlooked in policy discussions and that a coherent innovation policy framework must include tax policy, labor market regulations, channeling of savings, competition policy, housing market regulation, and infrastructure to foster growth and future prosperity.

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Pontus serves, and has served, on several boards, including the Royal Swedish Academy of Engineering Sciences (IVA), research organizations, and start-up firms. He is a senior advisor to both early-stage financiers and entrepreneurs. Pontus has also been engaged in several policy-oriented projects. In 2007–2009, he was appointed Executive Secretary of the government's Globalization Council, and in 2014 he chaired the governmental committee on Swedish entrepreneurship policies.

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He received his PhD in 1990 from Gothenburg University with his dissertation *An Economic Analysis of Swedish Government Expenditure*. Throughout the 1990s, he conducted several projects that aimed to explain cross-country growth differences. Since the turn of the new millennium, his primary research focus has been on entrepreneurship economics and the institutional determinants of the business cli-

mate. In this area, he has published extensively in scientific journals and contributed several research surveys to *Handbooks* in the entrepreneurship field.

In addition to his academic qualifications, he has extensive experience as an advisor, board member and lecturer in many different contexts, both in the business sector and in the public sector.

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Chapter 1
The Challenge

During recent years, challenges have emerged on an unprecedented scale, affecting nearly all countries of the globe: climate change, energy supply, geopolitical tensions, protectionist measures, demographic changes, and a seemingly infinite demand for human capital, to mention but a few. Until recently, the most compelling challenge seemed to be increased globalization and intensified competition at all stages of the value chain. This threatened the privileged position of industrialized economies and their businesses, prompting measures to enhance efficiency and competitiveness at both the policy and firm levels, while, at the same time, creating opportunities for developing countries. Even though the world economy currently seems to be in a phase of decoupling, deglobalization, and increased state intervention, we believe that in the medium to long term, the global economy will continue to embrace openness. Hence, fortune favors the well-prepared, and both countries and businesses are likely to benefit by positioning themselves for a return to the prospect of increasingly competitive markets.

Coming to grips with the present challenges requires well-reasoned and substantiated policies, and here, innovation is a key factor. To express the matter differently, creative and fresh thinking will help develop policies that incentivize individuals and businesses to envision new products, services, and business models. Such creativity and innovation will also help transform these ideas into dynamic businesses that will succeed in attaining a size at which significant economies of scale can be realized. This requires entrepreneurship.

Our point of departure will be our native country, Sweden, which experienced dwindling growth rates and lackluster industrial dynamism between the 1970s and the mid-1990s. The country managed to realize an impressive economic turnaround through an ambitious reform package implemented in the aftermath of the deep economic crisis of 1991–1994. The first reform wave strengthened the macroeconomic side of the economy by making the country more resilient in the face of financial and debt crises. Subsequent reforms had a more microeconomic profile by targeting areas decisive for essential creative destruction processes, notably taxation, social security, entrepreneurship, labor markets, innovation, and venture

P. Braunerhjelm, M. Henrekson, *Unleashing Society's Innovative Capacity*,
International Studies in Entrepreneurship 55,
https://doi.org/10.1007/978-3-031-42756-5_1

capital. More recently, new problems have emerged that need to be solved. Unemployment, particularly among the young, remains at a high level; an aging population puts pressure on the welfare state; certain key competencies are in short supply; uniquely rapid net immigration has caused massive integration problems; educational standards have deteriorated; and the judicial system is increasingly troubled and overburdened—phenomena that fuel populist tendencies in the political landscape. Yet, we believe that there are lessons to be learned from the turnaround of the Swedish economy which provide valuable insights for other economies as well.

Economies need to be equipped with adequate instruments to cope with these current challenges. In fact, economic growth is a prerequisite for resolving many of these issues. But growth in the sense of "more of the same" is not the solution. Increased production with current technology would exacerbate environmental problems. The export sector will rapidly become obsolete if it continues to manufacture the same products it always has. In sectors such as education and health and social care, quality is more important than volume. Continued renewal and transformation of the economy are therefore the keys to prosperity and sustainable growth. New technology, new knowledge, new working methods, and new organizational forms are needed to make economies competitive, lower the thresholds to the labor market, create new resources and further prosperity without compromising the environment. In other words, the dynamics of the business sector must be strengthened, with a particular focus on the conditions for innovation.

Innovation does not simply concern new high-tech goods, but rather all manner of changes—in production methods and organizational forms—which ultimately lead to increased value for society. Such innovations require carriers; entrepreneurs who drive change, confront tradition, and experiment with new ideas are essential in this respect. They can be lone wolves or work in teams; they can serve as the engine for large projects; they can be small business owners or enthusiastic intrapreneurs who renew and improve the functioning of incumbent firms; and they can work in the private or public sector. Entrepreneurs are driven by different goals: some are passionate about an idea, some want to launch a new product, some wish for financial gains and still others may be entrepreneurs by necessity in a tough labor market where they cannot find permanent employment.

Economists distinguish between different kinds of innovations: process innovations (which improve the production process) and product innovations (which lead to new products), as well as between gradual improvements (incremental innovation) and radically and disruptive new products and services. Our purpose here is not to delve into the taxonomy of innovation, but rather to discuss how innovation activities in general can be stimulated and how a policy for innovation in the broadest sense should be formulated. The task is obviously not simple. By definition, innovations concern the creation of something new. This means moving past old and established patterns, exercising creativity, and breaking with tradition, activities often attributed to the entrepreneur. Mapping the factors that promote such creativity is complex. It is even more difficult to formulate a policy that makes new ways

of thinking easier and more widespread; in a certain sense, we are seeking to create a "routine" for something that is, *de facto*, about the very breaking of routines.

We maintain that the policy debate on innovation is often too narrow. It tends to concentrate on research and development, R&D, for the development of new, high-tech products and how these products can be successfully marketed. Therefore, policy recommendations are often about how support for R&D should be organized and financed, and how to raise capital in the early stages of the life cycle of a business. In the political debate, the question is often formulated in terms of how to boost skills and then turn them into new high-tech products.

These measures are important, but far from sufficient—a broader approach is required. Innovation is about significantly more than creating the knowledge to develop new products. Innovation can also mean that existing knowledge is diffused throughout an economy and used in new areas, new organizations, and in new ways. To support innovation in this broad sense, policies must create structures that facilitate the dissemination of knowledge and promote entrepreneurship in both large and small organizations. The goal is not only to develop new breakthrough products with a high technology content, but also to stimulate many small steps in the improvement of "ordinary" products and services, regardless of their technology content, and to make organizational forms and production processes more efficient throughout the economy.

Neither the creation of new knowledge nor its application takes place in isolation, i.e., exogenously, nor does it automatically benefit society. For this to happen, society as a whole—and not least of all economic policy—must value, support, promote, and stimulate knowledge accumulation, education, entrepreneurship, and competition. Our policy recommendations are therefore more comprehensive and all-embracing than is usually the case in discussions surrounding innovation and entrepreneurship. They cannot be limited to simple volume targets for R&D investment or the supply of early-stage financing. They must extend much further.

We therefore argue that innovation policy rests on two pillars:

1. Building and strengthening the knowledge base and
2. Creating conditions for the dissemination, application, and commercialization of knowledge

The purpose of this book is to describe this approach and identify which policy tools can and should be used to stimulate innovation in this broad sense. We believe that systemic weaknesses must first and foremost be remedied by an innovation policy that promotes continued renewal by strengthening incentives for experimentation, innovation, and entrepreneurship. In this respect, our proposal differs from the traditional "innovation system" approach, which is more focused on the structure of innovation than on the forces that drive it.

This introductory chapter explores some of the challenges outlined above and explains why innovations are so important for Western welfare societies, using Sweden as an example. Chapter 2 describes the dominant theoretical growth models and the model that we advocate, while Chap. 3 provides a general overview of the conditions for entrepreneurship. In Chaps. 4 and 5, we present a detailed analysis of

the conditions in which Swedish entrepreneurship is embedded. This analysis then provides the basis for our policy recommendations. These are generalized and summarized in the form of an innovation policy framework in Chap. 6—in other words, in clear rules to be used in policymaking.

1.1 The Swedish Example

Since the mid-1990s, Sweden has enjoyed quite positive economic development, both compared to most small countries with similar conditions and to itself during the two preceding decades. Up until the 2008–2009 financial crisis, the Swedish economy had grown more rapidly than the economies of both the United States and Europe. Nevertheless, between 2010 and 2021, the United States has grown at a faster pace whereas Swedish growth is essentially on a par with the EU average. At the same time, the domestic financial situation has become significantly more robust due to the reforms implemented in the 1990s, and Sweden has shown healthy surpluses in the current account and the public sector, while at the same time having a stronger banking system. For several years, in fact, Sweden has enjoyed one of the strongest financial positions within the EU and has also been far more resilient to crises, as clearly manifested during both the IT and financial market crises as well as during the pandemic.

There are several reasons for this positive turn in the Swedish economy. Most important is arguably the deep crisis of the early 1990s, which eliminated the least productive parts of industry and sparked a series of structural reforms that marked a radical break with much of the economic policy of the 1970s and 1980s. Stricter budget rules, tax reform, deregulation, stricter competition legislation, EU membership, an independent central bank with inflation targets, a floating exchange rate, and pension reform—within a mere few years' time, radical economic policies came into effect. The new frameworks established for monetary policy (inflation targets with guidelines for interest-rate setting) and fiscal policy (notably surplus targets and expenditure ceilings) were particularly important. At the same time, Sweden was—at least in the short term—helped by a weaker currency, strong growth in the global economy, and favorable positioning regarding new information technology. Both government expenditure and taxes as a share of GDP have declined since then, and in recent years, tax rates on labor have been significantly lowered.[1]

Due to the far-reaching reform agenda successively implemented since the mid-1990s, Sweden was able to cope with the ensuing crises from a position of strength. Today Sweden has significantly better financial buffers than virtually all other European countries. The Swedish economy has also climbed in international rankings of competitiveness, attractiveness to business and innovativeness—characteristics that are important for the maintenance of a strong position in the globalized

[1] For an analysis of this development, see Bergh (2014) and Heyman et al. (2019).

world economy. However, to sustain such a position requires continual policy reforms adapted to the ever-changing circumstances in the global economy, and here we fear that Sweden is losing ground even though the state of affairs is still strong, see Table 1.1.

The rankings in this table depict the top 20 countries according to the most commonly used measures of competitiveness and innovativeness. Sweden is ranked number one among EU countries in three of the five measures. Switzerland, a small open economy albeit not part of the EU, is also ranked highly according to all five measures. The Asian powerhouses Singapore and Hong Kong are at or near the top based on several measures. Nonetheless, half of the top 20 countries in all rankings are European Union members; in particular, the Nordic and Western European

Table 1.1 Country ranking according to the five most common measures of national innovativeness, top 20 countries for the latest available year

Rank	IMD World Competitiveness Ranking 2022	WEF Global Competitiveness Index 2019	Global Innovation Index 2020	No. of triadic patents per capita 2022#	R&D spending as a share of GDP 2021
1	Denmark	Singapore	Switzerland	Switzerland	Israel
2	Switzerland	USA	USA	Japan	South Korea
3	Singapore	Hong Kong	Sweden	Sweden	Taiwan
4	Sweden	Netherlands	UK	Israel	USA
5	Hong Kong	Switzerland	Netherlands	South Korea	Sweden
6	Netherlands	Japan	South Korea	Denmark	Japan
7	Taiwan	Germany	Singapore	Finland	Belgium
8	Finland	Sweden	Germany	Germany	Switzerland**
9	Norway	UK	Finland	Luxembourg	Austria
10	USA	Denmark	Denmark	Netherlands	Germany
11	Ireland	Finland	China	Austria	Finland
12	UAE	Taiwan	France	USA	UK*
13	Luxembourg	South Korea	Japan	Belgium	Denmark
14	Canada	Canada	Hong Kong	Singapore	Iceland
15	Germany	France	Canada	France	Netherlands
16	Iceland	Australia	Israel	UK	Singapore*
17	China	Norway	Austria	Ireland	France
18	Qatar	Luxembourg	Estonia	Norway	Slovenia
19	Australia	New Zealand	Luxembourg	Canada	Czechia
20	Austria	Israel	Iceland	Italy	Norway

Note: *2020; **2019; #Triadic patent families are a set of patents filed at three of the major patent offices: the European Patent Office (EPO), the Japan Patent Office (JPO), and the United States Patent and Trademark Office (USPTO). Patents included in the triadic family are typically of higher economic value

Source: *IMD World Competitiveness Yearbook 2022*; *WEF Global Competitiveness Report 2019*; *The Global Innovation Index 2020—What is the Future of Innovation Driven Growth?*; Triadic patents (https://data.oecd.org/rd/triadic-patent-families.htm) and population from the OECD; R&D spending/GDP from the World Bank (https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?end=2016&start=2016)

countries continue to do well. By contrast, southern and eastern EU member states are absent in the rankings, which bears witness to Europe's well-known core/periphery pattern. Thus, the EU's alleged "innovation emergency" (European Commission 2015) is far from uniform, and if this stark inequality is allowed to persist, it is likely to result in increased tension between countries and regions within the Union. Currently, internal tensions within the EU risk being aggravated by its larger members calling for more interventionistic industrial policies and more generous possibilities to use state aid and subsidies granted at the EU level. That is likely to favor the larger and northern EU countries. Hence, a lessening of these tensions and a strengthening of innovativeness in countries and regions that are experiencing less economic success cannot be achieved without an improved understanding of what policies and framework conditions are necessary for innovation and commercialization.

The fact that Sweden has done so well in the aftermath of the 1990s crisis is partly due to the reforms that paved the way for continued structural transformation during subsequent decades, and partly due to the fact that the specialization of Swedish industry happened to fit well with increased global demand (notably IT/telecom, machine tools, and pharmaceuticals). This has delivered export successes and boosted domestic purchasing power. The Swedish labor market has also succeeded relatively well in terms of rehiring or retraining workers who have been laid off without the government needing to provide extensive industrial subsidies or other public support programs, apart from the measures taken during the pandemic.

1.2 The Challenges Ahead

1.2.1 Globalization or Deglobalization?

In 2009, Sweden's Globalization Council—an inter-ministerial unit working for the Swedish government—presented its concluding report on reforms required for Sweden to retain its position as an innovative knowledge economy.[2] The work was commenced in 2007, when globalization was at its peak. A large number of high-quality commissioned reports, conducted by renowned European and U.S. scholars, constituted the core of the analysis. The concluding report stressed microeconomic reforms to improve framework conditions for a dynamic, experimental, and innovative business sector. Such reforms would help in coping with both accelerating global competition for capital investments and the risk of a potential brain drain. Low-cost competition implied continued pressure on companies in which jobs could be moved abroad, while at the same time the competition for talent, entrepreneurs, technology, and investment from more mature industrialized countries was expected to intensify. Approximately 50% of the 118 policy recommendations in

[2] Braunerhjelm et al. (2009).

the concluding report had been instituted ten years later (Braunerhjelm 2020), roughly half of them fully and the rest partially.

Overall, the dip in global trade in 2008–2009 was viewed as a temporary phenomenon, and as the crisis diminished, a return to business as usual was expected. However, that did not occur. Instead, world trade levelled out and then began to decline (Fig. 1.1). This decline coincided with the United States entering a more protectionist phase during Donald Trump's presidency, which was maintained by the Biden administration. National security concerns and the increasing role of digitization and digitized devices in surveying and generating information across borders have accelerated protectionism and led to the characterization of "strategic sectors." This term reflects claims that such fields should be shielded from foreign ownership and influence. In addition, it involves export restrictions on goods and components considered strategically important. According to Global Trade Alert, protectionist interventions (both tariffs and other measures) have increased since 2008.[3]

To focus now on goods and services, the former has decreased whereas the opposite is true for the latter, even though service trade is more difficult to trace in the statistics. It has been argued that the falling trade in goods simply reflects lower global growth, which is associated with a few countries, especially China and the United States. Hence, the fall in trade from 61% of global GDP in 2008 to 56% in 2021 is claimed to mirror a move back to normal after the hyper-globalization of the mid-1980s through 2008.

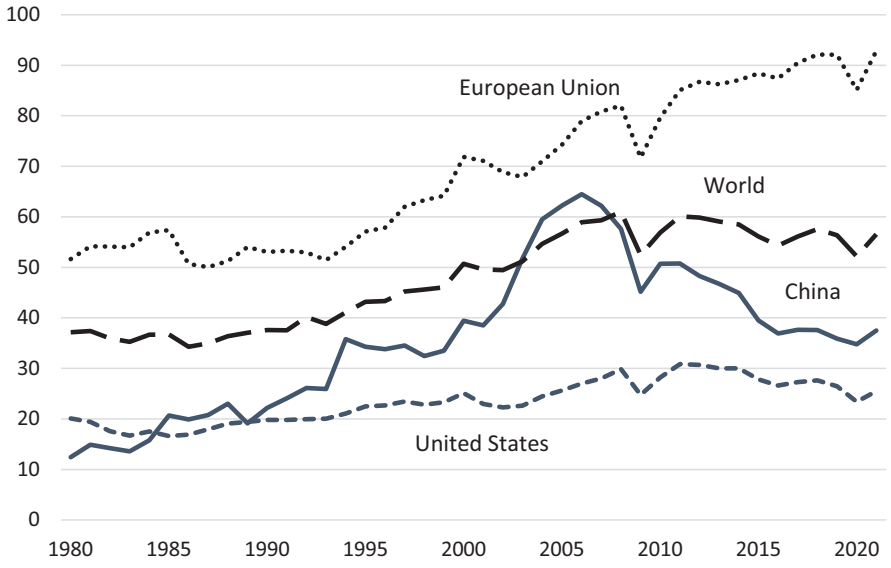

Fig. 1.1 Trade (export plus import) as a share of GDP, 1980–2021 (%). *Note*: Data for the European Union include intra-EU trade. *Source*: OECD

[3] See https://www.globaltradealert.org/.

On the other hand, rising incomes and a rapidly growing middle class in developing countries should boost the demand for imports and induce more trade. At the same time, technological advances, digitization, and (previously) increased globalization intensified competition and resulted in a fragmentation of supply chains. When economists previously spoke of "comparative advantages" in foreign trade, they typically referred to entire industries or countries. In recent decades, the meaning has shifted to specific tasks within an industry—even within a firm or within an individual department of that business: crucial tasks necessary to produce a final product could be performed on the other side of the globe as part of a fully integrated production system. The increased partitioning of the value chain risks being halted due to escalating trade barriers and geopolitical tensions. To reorganize production will take time. Companies are also urged or incentivized to resume production domestically or at least in countries that are geographically closer. Overall, the strong trend towards outsourcing has been stopped in the last few years and the development of the so-called kaleidoscopic comparative advantages has been stalled, at least temporarily.

Interestingly, even though trade in final goods has regressed to some extent, no similar pattern can be found for trade in intermediate goods. As Fig. 1.2 shows, trade in intermediate goods has grown rapidly following the sharp downturn caused by the onset of the pandemic in the first half of 2020. This suggests that production is still dependent on the supply of intermediate goods through global distribution channels.

In the case of Sweden, which is still dependent on a relatively small number of large multinational firms (e.g., Ericsson, ABB, Atlas Copco, Sandvik, SKF, Hexagon, IKEA, and H&M), the intensification of international competition can have rapid and direct effects. Disturbances in the flow of intermediate products would be detrimental to these companies. Similarly, should some of these national "crown jewels" relocate production or lose their competitive edge, the ecosystems built around these firms, and therefore the Swedish economy, could experience significant negative impacts. The situation is exacerbated by the fact that over the last decades, the aggregate share of sales in the domestic market of Swedish multinational companies has decreased considerably. The same is true for foreign-owned companies with a high volume of manufacturing located in Sweden.

Hence, the decision about relocating manufacturing or R&D is not a particularly difficult one. Domestic companies so important to Sweden are being challenged by new competitors, increasingly so by businesses from China and India. The pattern of competition is changing rapidly, and the competitive advantages enjoyed by mature industrialized countries in advanced production have been challenged for some time.

To conclude, the benefits or disadvantages of globalization have not yet been assessed adequately. First, globalization takes several forms, and trade in goods is merely one aspect. Migration, foreign direct investment, and capital flows are other components of globalization that have arguably remained at the same level or even increased (Baldwin 2022; Dadush 2022). Hence, despite a possible slowdown in global exchanges, we argue that global competition can be expected to continue even though it may take on a different guise. Nations and businesses consequently need to prepare for continued competitive pressure and restructuring.

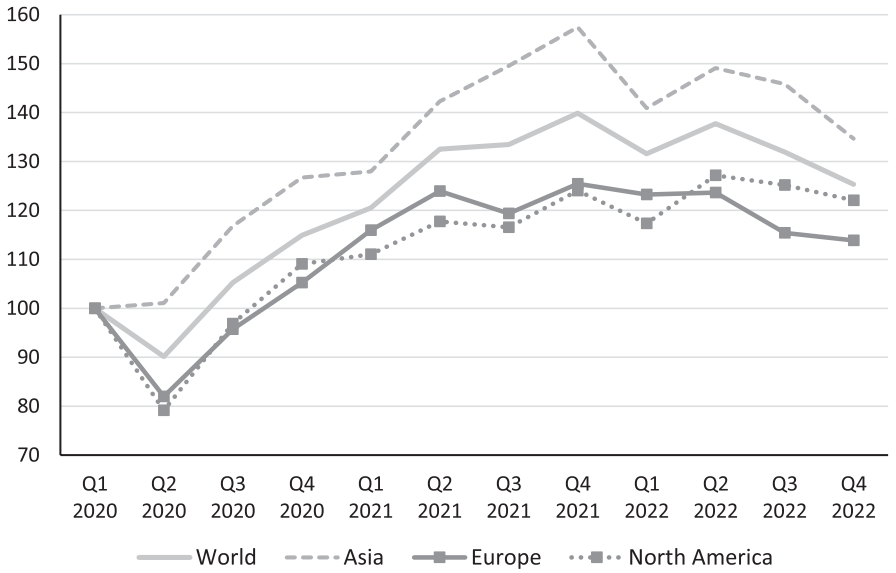

Fig. 1.2 Trade in intermediate goods (excl. fuel) for the world and regionally, Q2 2019–Q4 2022 (2019 = 100). *Source*: WTO information note on trade in intermediate goods: fourth quarter 2022 (https://www.wto.org/english/res_e/statis_e/miwi_e/info_note_2022q4_e.pdf)

1.2.2 The Growing Service Sector and the Labor Market

The service sector is increasingly exposed to forces of competition, and this calls for capacities to adapt and restructure in order for companies to survive. Since the service sector has been shielded from competition to a greater extent than goods production, the potential for improvement tends to be greater. Sweden's service sector is significantly larger than its goods-producing sector, and, on average, service sector productivity is lower. However, there are also highly productive service industries that are well-positioned to meet fiercer competition, especially in business-related services.

The service sector includes both private and public providers, sometimes operating on the so-called quasi-markets defined by a public agency acting as a link (in the capacity of client and/or financier) between customer and producer (Le Grand 2009). Among the latter are services such as education, health, and social care, which are in need of renewal, quality improvements, and greater efficiency in order to meet future challenges. These service sectors are central to a nation's knowledge base, and, despite consuming considerable resources, they suffer from significant quality problems. Such problems in the educational system are particularly serious, as they are likely to induce path dependency leading to a deterioration in subsequent links of the nation's knowledge base (Henrekson and Wennström 2022; Heller Sahlgren and Jordahl 2023).

As the population ages, it requires more of several different types of care, including healthcare, meal services, and cleaning. This means a demand for more resources—both in terms of hours worked and financial resources—and greater efficiency. In this area, demand is growing much faster than the aggregate economy; one reason for this is that technological advances in medicine and medical technology are creating the possibility of new treatment methods. Since it is generally more difficult to increase productivity in care services than in manufacturing, relative costs tend to increase in line with the so-called Baumol's Cost Disease (Baumol 1967).[4] Here too, innovation, especially organizational innovation, is required to increase quality and efficiency.

A better functioning service sector is also necessary to reduce unemployment and the exclusion of marginalized groups, thereby enabling more individuals to become self-sufficient. The service sector accounts for 75–80% of employment in most developed countries, and its employment share is expected to increase further in the future. If unemployment is to fall—not least among young people—more service jobs are needed. In manufacturing, most unqualified entry-level jobs have been phased out as starting wages have risen, and production processes have become increasingly mechanized, digitized, and sophisticated. Meanwhile, jobs requiring little training have been transferred to low-wage countries. The same is partly true in the service sector, where many simple jobs—which previously served as entry-level positions—have disappeared. This is the case although demand is high (not least of all in health and social care) and there are a plethora of basic tasks to be performed. Many service jobs simply cannot be outsourced; a nurse in Sweden, or for that matter a police officer, cannot perform their duties from Guangdong or Phnom Penh.

A growing problem in several developed countries, and particularly in Sweden, is the increasing share of working-age individuals (20–64 years old) who are not students, not self-sufficient, and dependent on social transfers. In Sweden, the estimated number of such individuals is about 1.4 million out of a working-age population of 5.6 million and a total population of ten million, of which roughly 700,000 are immigrants (Eklund and Larsson 2023). One reason is the incompatible combination of (previously) generous rules for immigration,[5] a failing integration policy and a universal welfare state. At present, most European economies have introduced stricter immigration rules and made access to welfare services increasingly conditional. But the problems will linger for quite some time and at a considerable societal cost if integration policies continue to function poorly.

All in all, we believe that in order to create more entry-level jobs and stimulate competition and new forms of organization, there is a pressing need for a restructuring of service production and increased labor-market flexibility. The important

[4] The literature on this issue is extensive. For Sweden, see Borg (2009) and Elert and Henrekson (2023).

[5] Although rules for asylum seekers became stricter following the refugee crisis in 2015, total immigration is still very high. On average, immigration has exceeded one percent of the total population during the 2018–2022 period (https://www.scb.se/hitta-statistik/sverige-i-siffror/mannis-korna-i-sverige/invandring-till-sverige/).

point in this context is that innovation does not simply apply to the export industry or high-tech goods and services. Conversely, the service sector may benefit from experience gained in manufacturing, an area that has been exposed to competition for a considerably longer time.

1.3 Competition, Innovation, and Institutions

Some of the fundamental factors associated with the commercialization of inventions and the entry of new businesses in the market relate to a country's openness, intellectual curiosity, and the rule of law—all necessary conditions for enabling entrepreneurial endeavors and innovations. Heterogeneity is crucial where different ideas and knowledge bases compete and experiment in the marketplace. Hence, discrimination—whether based on ethnicity, religion, age, or gender—is not only morally reprehensible but also economically inefficient, as it excludes potential entrepreneurs from exploiting opportunities and contributing to social advancement. Similarly, the capacity of an economy to develop depends not only on the organization and financing of the education system, how it equips future entrepreneurs, the flow of knowledge and entrepreneurs' ability to modify or invent new processes and products, but also on how laws, regulations, taxes, fees, and subsidies affect entrepreneur behavior and motivation. Consequently, a society's overall innovative capacity originates in a well-designed institutional framework where different policy areas are synchronized and interlaced in a manner that promotes competition and efficiently functioning markets.

Joseph Schumpeter—the Austrian economist who became the father of modern entrepreneurship theory through his 1934 book *The Theory of Economic Development,* first published in 1911—claimed that the entrepreneur was the central figure in "creative destruction," the process by which the new incessantly drives out the old. However, towards the end of his scholarly career, he became increasingly convinced that innovation would be most efficiently conducted in rival large businesses. He believed that these companies had the skills and resources to drive new technology and new organizations. This thesis has been endlessly studied and debated, but the issue is far from settled. The current consensus is that innovation activities are most intense in a mixed environment in which medium-sized companies predominate, particularly if they reside in clusters and information-dense environments. Perfect competition among small businesses does not provide sufficient resources for expensive, high-tech research, while oligopolies and monopolies tend to become too rigid, focusing on measures to preserve the value of their current technology rather than sustaining their competitiveness by means of an innovation that risks making their current products and production methods obsolete.

Large firms have impressive R&D resources and should be able to exploit economies of scale, but technological development in recent decades also seems to be advantageous for smaller units. Whereas firms, particularly large ones, seem to be focusing on development rather than research, there is no aggregate discernible

trend towards smaller firms undertaking a larger share of overall R&D (Becker et al. 2022). In some industries however, e.g., pharmaceuticals, smaller firms have increased their share of R&D (Anderson and Kindlon 2019). There are also indications that universities and research institutes are performing more research than previously (Arora et al. 2021). However, young, fast-growing firms contribute the most to growth and new employment. These firms are often referred to in the media as "gazelles," even though there are industry-specific differences.[6] A recent phenomenon among fast-growing firms is the emergence of platform companies; concerns have been raised regarding their long-term effect on competition and innovation.

1.3.1 The Emerging Platform Economy

Ongoing digitalization has implications for market structure and efficient functioning, not least when it comes to market entry and innovation. Essentially, it has profound implications for the organization of economic activity by altering supply chains, giving rise to new business models, and changing market structure.

On the consumer side, digitalization has doubtlessly yielded benefits in terms of improved accessibility, lower prices, or free products and services as well as increased variety paired with improved quality. The reverse side of this development is a strong concentration of market power in a small number of firms in several markets. This is due to the combination of low or non-existent marginal costs for an additional user/customer, huge network externalities and data that are monopolized by platform owners. Most of the concentrated markets can be found in the technology sector. According to Philippon (2019), almost all markets in the United States have experienced decreased dynamism due to faltering competition, which in turn stems from an aggressive use of non-compete clauses that compromise labor mobility, but also due to the emergence of platform companies. This has generated concerns regarding entry possibilities and future innovation.

Antitrust proceedings have also been initiated in the United States as well as in the European Union; this has been accompanied by a parallel updating of tools available in competition law. For instance, the Digital Markets Act (DMA) was introduced in the EU in 2022, the first comprehensive regulation of digital platforms aimed at improving the conditions for competition. In the United States, there is lively discussion on how to interpret existing competition laws given the way digitalization affects business behavior and market dynamism. The challenges facing competition policy have recently been addressed in a number of expert reports containing extensive discussions on how platform companies impact entrepreneurship and innovation (Mandorff and Nyberg 2023). This includes practices that affect

[6] Carlsson (2011) and Haltiwanger (2022). This perspective will be discussed at some length in Chap. 4.

bargaining power and potential abuse of dominant market positions, use of data, interoperability, and different modes of the so-called self-preferencing. In the United States, there is a clear shift in the interpretation and application of current competition laws in order to reduce the market power of platform firms.

1.4 Climate Change

Climate change, which arguably constitutes the most important challenge facing mankind, stems primarily from the emissions associated with burning fossil fuels (IPCC 2023). Currently, fossil fuel accounts for 80% of global energy production. To avoid detrimental environmental, social, and economic consequences, fossil fuel must be replaced by renewable energy. In the EU, a net zero emission target by the year 2045 has recently been prescribed by law.

Carbon pricing has long been favored by economists as the primary instrument to address climate change. This proposes that Pigouvian taxes be used to eliminate the difference between the marginal private and social costs of using fossil fuels (Pigou 1920). Through carbon pricing, the negative externality is internalized by the emitter. Yet, despite a strong theoretical basis for carbon pricing/taxes, the level of implementation, and the effects, of such instruments are still modest. A mere 22–24% of global emissions were covered by some kind of carbon pricing in 2021, in too many cases with questionable effects due to the low level of those taxes (Grubb et al. 2023).

More recent research has produced a more nuanced view of what is required to combat climate change. Specifically, this involves a simultaneous and rapid overhaul of the energy systems affecting a range of different technologies, industries, and ways of life, i.e., a more holistic approach (Braunerhjelm and Hepburn 2023). The energy transition also needs to be accomplished much faster than previous large-scale changes, which typically took roughly one century to fully unfold (Edquist and Henrekson 2006). Hence, technological change, innovation dynamics, and entrepreneurship can be expected to play a vital role in this transformation. In turn, this transition requires more extensive policies than those induced by an imposition of carbon taxes. In the last decades, the energy sector has also been characterized by innovation, resulting in falling costs for alternative energy sources.

1.5 Innovation Is Key

The list of challenges outlined above could be extended, but it is sufficient to illustrate that economies are facing complex problems including climate change, demography-related issues, competitiveness, digitalization, the labor market, and the welfare sector. If these are to be tackled successfully, extensive innovations are required, both large and small.

A common misconception is that an innovation is the same as an invention—typically created by a single ingenious inventor—which entails a new, preferably high-tech and revolutionary, industrial product. We still carry with us the images of Thomas Edison and his light bulb, Gustaf Dalén and his revolving lighthouse, Gustaf de Laval and his milk separator, Alexander Graham Bell and his telephone. Such inventions are certainly important, but they are only a small part of the flow of innovations, which often consist of small changes to existing products to make them more functional, more economical, more user-friendly, and less harmful to the environment.[7] And innovations apply to services as well—and to forms of production, sourcing, marketing, transport, and logistics.

1.5.1 The Flow of Knowledge

Based on this broader view of innovation in a mature service economy such as Sweden, we argue that innovation policy must stand on two pillars[8]:

- First, *knowledge building* through schools, universities, and R&D institutions, in addition to upgrading and extension of the knowledge base—for example, through a sensible policy regarding cutting-edge research.
- Second, *knowledge dissemination* throughout the economic system and society at large. Knowledge must flow freely and be exploitable by entrepreneurs starting their own businesses or by intrapreneurs working in incumbents to develop and augment their operations. Hence, knowledge is commercialized in the form of innovations—that is, transformed into goods, services, and organizational changes that can survive and thrive in the marketplace.

The first of these tasks is central to innovation capacity. But to fully leverage knowledge investments, they must be complemented by policies that create favorable conditions for knowledge to be applied and commercialized. We perceive an imbalance between these policy areas.

For smaller countries such as Sweden, dissemination of knowledge, combined with cutting-edge knowledge in a few key areas, is a more effective instrument for the promotion of innovations than the accumulation of completely new knowledge. Dissemination of knowledge requires a high absorptive capacity to comprehend and convert research developed by others into innovations.[9] The knowledge required to

[7] Steve Jobs and Elon Musk are contemporary examples of individually-oriented entrepreneurs, even though there is always a context in which inventions are developed before taken to the market. Even Edison worked with teams, the so-called Edison's muckers.

[8] Acs et al. (2009) and Braunerhjelm et al. (2010) present models and provide some empirical evidence on this.

[9] Eliasson (1991) shows how large Swedish companies have functioned as global acquirers of technology. Carlsson (1979) claims that the big Swedish businesses that emerged during the decades before the First World War often relied on knowledge and ideas drawn from other countries.

generate successful innovations does not solely relate to goods and services, but also involves understanding consumer preferences, markets, and financial opportunities. Such knowledge is fragmentary and dispersed. Various parts of it reside in the minds of diverse individuals in different organizations and in different places. Often, the average local business leader or politician (not to mention the most knowledgeable of economists!) has access to no more than a fraction of the knowledge required to make the right decisions. In addition, human error permeates all links of the chain. For this reason, the flow of knowledge is important.

Dissemination takes place most efficiently and most rapidly in "knowledge-intensive environments," often in the form of the so-called clusters of companies and networks that are closely linked within one or a few related industries. Innovations seem to thrive in the type of environments where businesses can simultaneously act as competitors, customers, and subcontractors. Supporting and developing such skill clusters or blocks through various policy measures are therefore important ingredients in an innovation policy (Braunerhjelm and Feldman 2006). Cities in particular are important engines of innovation (Acs 2002; Moretti and Thulin 2013; Florida et al. 2017).

1.6 The Importance of the Entrepreneur

We disagree with the perspective that knowledge should be seen as the engine of the economy rather than the fuel. Other mechanisms are required to convert knowledge into something of societal value. One mechanism is entrepreneurship, a quality residing in specific individuals who can absorb disseminated knowledge and transform it into new or improved goods and services, better organization, higher efficiency, or other aspects that generate consumer value.

The entrepreneur has a dual role. As we have noted, he or she translates new knowledge into actual change. Entrepreneurs also deal with uncertainty, i.e., non-calculable risk. It is never known in advance how much new knowledge, or combinations of knowledge from different points in time, is worth or how its value can be realized. In the case of a product innovation, for example, it is virtually impossible to predict how it will be received by the market. In practice, some measure of genuine uncertainty is always present. As entrepreneurs engage in innovative activities, knowledge is further refined and diffused. Hence, it is the entrepreneur who experiments, investigates, and innovates, i.e., identifies new business opportunities and takes them to market to see if they can be successfully commercialized.

1.6.1 Diverse Types of Entrepreneurs

Entrepreneurs work in different ways and in different constellations. They may work on their own, either as an innovator or self-employed, but also in networks and organizations—a business, government agency, or educational institution. In such

organizations, the search for new knowledge is often organized according to fixed routines. Specific persons are assigned to conduct R&D and to monitor knowledge development elsewhere, deciding what may be relevant to their own organization.

Sometimes this type of entrepreneurial person will leave a large organization to start their own business and pursue their dreams, thus creating a spin-off company. Sometimes an entrepreneur is forced by necessity to start anew, in a situation where permanent jobs are scarce. Another may strive to exploit a business opportunity they believe they have identified. Even if acting as an entrepreneur may simply be a way of making a living, this can sometimes develop into a genuinely entrepreneurial business. Entrepreneurs can thus appear in several shapes and sizes.[10]

The entrepreneur can be found in every industry. It is striking how Swedish innovators in recent decades have contributed not only to the development of new industrial products such as ulcer medication, cell phones, digitized devices or markets, or specialized steel products. They have also been successful in providing services in fields such as logistics, communication, and social welfare. Thus, Ingvar Kamprad, the founder (and until his death sole owner) of IKEA, should be numbered among the great Swedish innovators and entrepreneurs, revolutionizing the furnishing business through flat-pack delivery and constant improvement of the logistics chain during the course of six decades. Similarly, Sweden can boast of Niklas Zennström, who with Skype transformed our way of communicating via the Internet, and Spotify founders Daniel Ek and Martin Lorentzon, who have done the same for the music industry.

The fact that the entrepreneurial person can function in so many different roles and places also means that the innovation process can vary widely. Entrepreneurs who work in large firms (often known as intrapreneurs) can, via their R&D departments, personnel, HR departments, and so on, develop new products or processes that the firm itself can commercialize and where financing takes place internally, via bank loans, retained earnings, or the bond market.

Entrepreneurs in start-ups or small businesses often lack the necessary financial strength. In that case, the solution is either for the entrepreneurs to sell their knowledge (product, process, etc.) to other incumbent firms, or to receive financial support from the state, venture capital or private loans during the period preceding commercialization. Some results indicate that the second model—where the entrepreneur develops the innovation and then sells or licenses it to an incumbent—has been the most successful path to commercialization and diffusion of knowledge in Sweden (Braunerhjelm and Svensson 2023). However, this may indicate that conditions for expanding on promising activities are unfavorable. For example, there may be a shortage of competent venture capital, i.e., external investors who contribute management skills, networks, and industry expertise in addition to financial backing. Nevertheless, there seems to be a consensus that new, young, and small firms

[10] For a more detailed overview of the entrepreneur's role and function, see Hébert and Link (2007), Henrekson and Stenkula (2016), and Braunerhjelm (2011).

account for a disproportionately large share of radical and groundbreaking innovations (Baumol 2010; Haltiwanger 2022).

1.7 The Crucial Role of Government

Even though the government may provide the basis for a functioning market economy by establishing an institutional framework that guarantees that property rights are not violated, entry barriers are low, and competition is fair, this is not sufficient to foster innovation activities in an optimal way. Given that the basic pillars of innovation are knowledge creation and knowledge dissemination, other complementary measures are required. The classic example is the provision of education services. Education also generates positive external effects. This means that education provides greater socio-economic benefits than "merely" raising the individual's level of education and income-earning capacity—it also raises the competence of society as a whole and, indirectly, its capacity for innovation and cultural and technological development. Moreover, it endows individuals with absorptive capacities to comprehend and process flows of knowledge. Therefore, it is economically effective for the government to support education. Thus, in almost all countries, compulsory schooling is more or less free, while various forms of scholarships and student loans assist the less fortunate to further their studies (at least in wealthier countries).

Correspondingly, R&D expenditure not only benefits the private investors in question, but it also gives rise to knowledge spillovers that benefit society at large. Consequently, there is a rationale for governments to fund and undertake R&D, particularly basic research that contributes to the accumulation of a larger knowledge stock for which any commercial applications are not yet known. A similar argument could be used for the training of researchers, i.e., PhD programs. This is also the rationale for government co-funding of private R&D investments through tax deductions or grants.

In the same way, infrastructure—both physical and virtual—has positive external effects. In addition to the purely economic benefits of trade and transport, people are exposed to travel, receive an education, enjoy new experiences, and learn about other parts of the world far away from their native countries. Infrastructure and communication networks are thus critical for the flow of knowledge and innovations, and the government fulfills an important role in these areas.

A financial market strongly focused on short-term returns is not the best tool for financing investments where uncertainties abound but potential societal benefits are significant. However, long-term returns, as the name implies, do not appear immediately—a circumstance apt to dissuade private investors. This is why governments frequently initiate support schemes for start-ups in the form of seed funding and access to certain services as well as for investment and the development of technology. Different forms of support exist depending on where in the development chain the company and its innovations are positioned. It is a delicate task to design such policies, since overly generous support risks wasting resources, leading to excessive

risk-taking and reduced personal effort. The best option seems to be a balanced collaboration between private and public venture capital (Lerner 2020), where the entry conditions for both sides are clearly spelled out in a contract that also stipulates when and under what conditions one party can withdraw or take over the enterprise in its entirety.

In addition to these initiatives, which are primarily aimed at financing new products in young firms, there are many more factors that affect the inclination to innovate. A successful innovation policy must therefore infuse a broad policy spectrum. We will elaborate at length on this issue in the following chapters. The fact is that most governmental measures in the form of taxes and regulations affect people's willingness to absorb new knowledge, take risks, and think afresh in one way or another—often more effectively than systems of subsidies can, as these easily become opaque and vulnerable to rent seeking.

1.8 Sweden in an International Perspective: Some Country-Level Comparisons

As already noted, Sweden has had positive development since the mid-1990s, especially in terms of macroeconomic stability. In general, Sweden has moved upwards in a number of international rankings of economic development as shown above in Table 1.1. These rankings are based on a mix of subjective valuations and actual statistics. We conclude this chapter by providing some key development indicators and compare Sweden with a selected number of other wealthy countries over a somewhat longer period according to our two pillars, knowledge building and knowledge dissemination. We start by looking at the development of GDP per capita and conclude by presenting the distribution of the Swedish labor force across industries.

Figure 1.3 shows that most countries have enjoyed encouraging GDP-per-capita growth rates since the late 1990s, although the trend stalled somewhat after the 2008–2009 financial market crisis. Sweden recovered fairly quickly from this financial turbulence and was among the top economic performers until 2020. As a result, the increase in Swedish GDP growth has been strong but not exceptional compared to similar countries.

1.8.1 Knowledge Accumulation

Turning to the most prominent measure of knowledge accumulation, Fig. 1.4 depicts how R&D expenditure has evolved in relation to GDP. Sweden has long been characterized by high expenditures for R&D, predominantly by its large, technology-based multinational companies. For the last 40 years, Sweden has held a top position

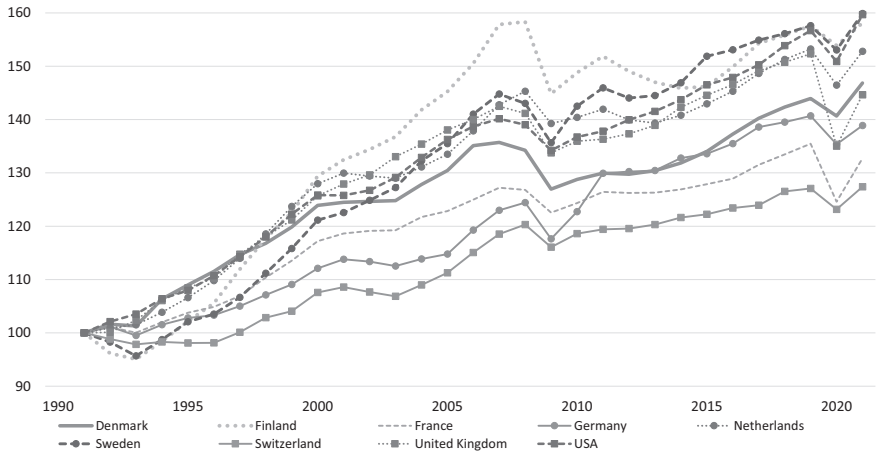

Fig. 1.3 GDP per capita in selected wealthy countries, 1991–2021 (index 1991 = 100). *Source*: World Bank National Accounts data and OECD National Accounts data

when countries are ranked according to R&D spending relative to GDP (Fig. 1.5). Denmark, Finland, Germany, Switzerland, and the United States have also invested heavily in R&D, whereas the EU average is about one percentage point lower. The United Kingdom trails behind the other countries in this group.

R&D investment dominates in the business sector, where approximately 75% of R&D spending is private while the remainder is attributed to the government, other public sources, and the European Union. R&D spending is obviously an important precursor to innovation (we return to this issue in Chap. 2). However, there are some slightly ominous signs. From an R&D investment peak in Sweden of approximately 4% of GDP in 2001, the share is now down to 3.5%. A limited number of industries and businesses account for the bulk of private R&D expenditure: pharmaceuticals, ICT, automobiles, trucks, and instruments. Thus, if the leaders among these industries decide to outsource or relocate, Sweden's aggregate R&D intensity will surely suffer. AstraZeneca's decision several years ago to relocate part of its R&D from Sweden to other countries is a cause for concern. Ericsson's restructuring and Nokia's weakened position led to a sizable downward shift in R&D spending in Sweden and Finland in 2001 and 2010, respectively.

If the comparison is limited to 2019, although the group of countries is extended, it is obvious that Israel and South Korea play in a league of their own (Fig. 1.5). Sweden is ranked just after Taiwan in fourth place and ahead of all other EU countries. Applying the alternative measure of R&D per capita, some shifts in the rankings can be observed. In particular, the United States improves its position while China sinks to the bottom together with Turkey. Germany, Norway, and Luxembourg also climb the ladder, while Sweden drops to fifth place. Nevertheless, the Swedish position remains strong in an international comparison.

When we disaggregate R&D spending to different sectors and compare multiple outcomes, Sweden still retains a leading position (Fig. 1.6) compared with the

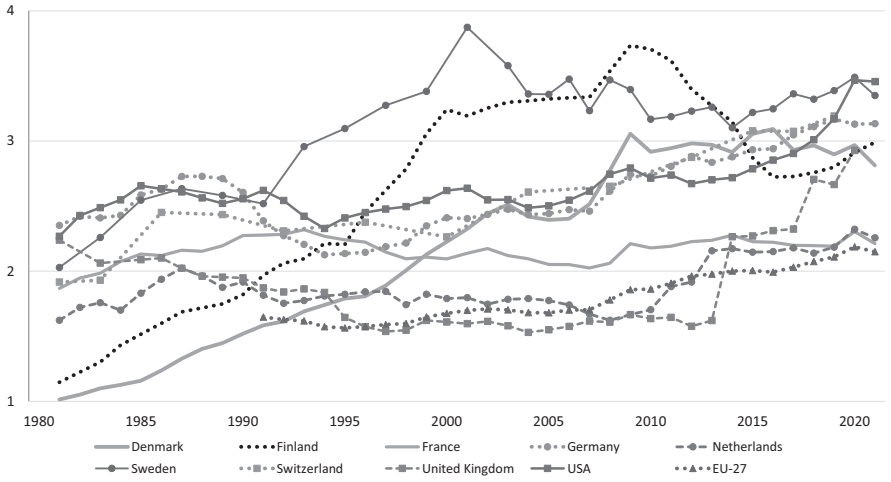

Fig. 1.4 R&D expenditure as a share of GDP in selected wealthy countries, 1981–2021 (%). *Source*: OECD

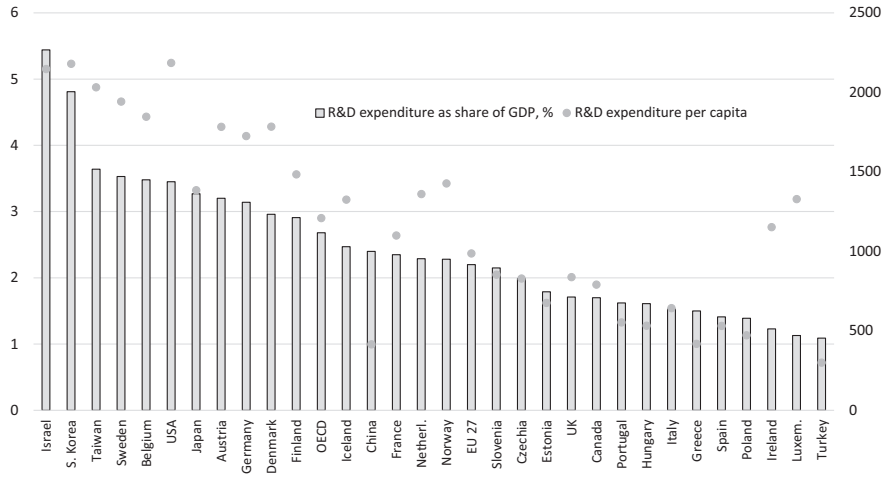

Fig. 1.5 R&D expenditure as a share of GDP (%) and per capita (PPP$), 2019. *Source*: OECD, *Main Science and Technology Indicators*, Volume 2021/2, Table 2 and 4

OECD median and the median of the top five countries. Regarding the latter category, Sweden belongs to this group for five out of six indicators: total R&D spending as a percentage of GDP, business sector R&D spending as a percentage of GDP, higher education sector expenditure on R&D as a percentage of GDP, number of researchers per thousand inhabitants, and number of scientific publications per thousand inhabitants.

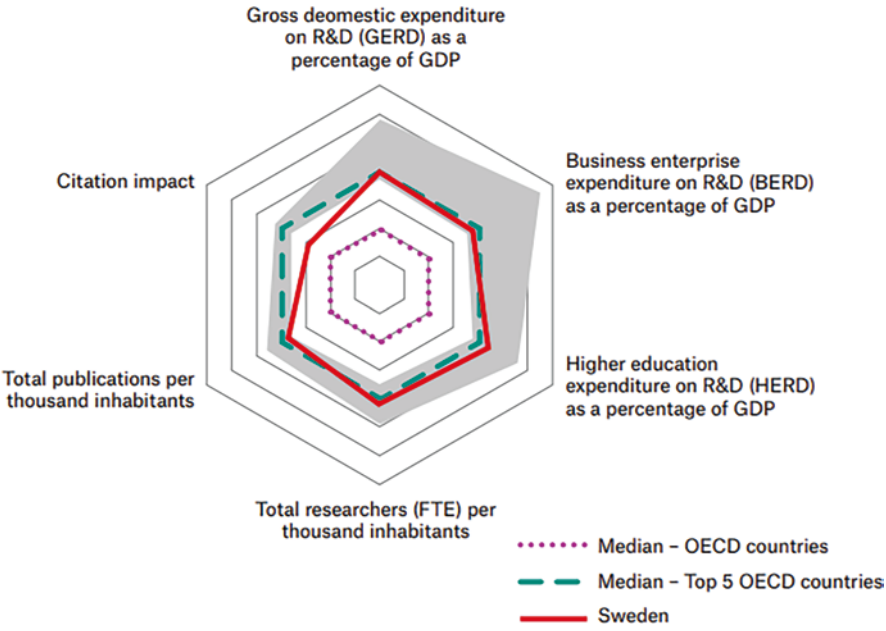

Fig. 1.6 The Swedish research system in international comparison, 2020. *Note*: Sweden's position is shown in relation to the median value for all OECD countries and the median value for the top five OECD countries. The figure also contains a gray area, which shows minimum and maximum values for the top five countries. *Source*: GERD, BERD, HERD from OECD. Publications per thousand inhabitants and citation impact from Scimago

Another measure of accrued knowledge is the share of population enrolled in tertiary education. Figure 1.7 shows that Sweden is in an intermediate position compared to the other countries. The Swedish trajectory turned downwards in the early 2000s, unlike most other countries where the share of population enrolled in tertiary education continued upwards or remained stagnant. However, since 2013, the trend has again been moving upwards and by 2019, Sweden had caught up with Germany. It should be noted that the level of education not only captures knowledge accumulation but is also a prerequisite for absorption of new knowledge.

1.8.2 Knowledge Diffusion

We now turn our attention to the second pillar required for innovation, knowledge diffusion. Total factor productivity (TFP)—that is, the increase in productivity that cannot be attributed to increased investment or employment—is often used as a (rough) measure of technological change, innovation, organizational change, and restructuring. Hence, it is an indicator of knowledge being applied for commercial purposes which in turn leads to structural change.

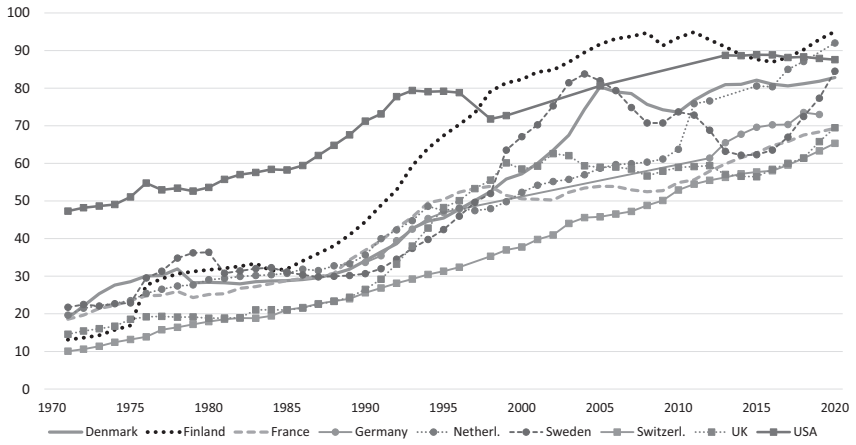

Fig. 1.7 Gross enrollment in tertiary education in a number of wealthy countries, 1971–2020 (%). *Note*: Gross enrollment rate is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. Tertiary education, whether or not to an advanced research qualification, normally requires, as a minimum condition of admission, the successful completion of education at the secondary level. *Source*: UNESCO Institute for Statistics (UIS). UIS.Stat Bulk Data Download Service, https://apiportal.uis.unesco.org/bdds

Sweden shares the experience of faltering TFP growth with most other countries, even though there has been a modest increase since 2009 (Fig. 1.8). But it is not comparable to the trend prior to the financial market crisis. The pattern here among countries is considerably more heterogenous than in the previous graphs, where some countries have experienced no or very modest increases in TFP since the early 1990s (Switzerland), while others have enjoyed a fairly robust growth since the financial crisis (United States). Finland's very strong performance between 1991 and 2007 has not recurred since the financial crisis.

Entrepreneurship has been identified as another important diffusion mechanism (Acs et al. 2009). Initially dominated by large businesses and an expansionary government sector, Sweden has developed a more dynamic entrepreneurial environment in the last three decades (Fig. 1.9). The seeds for this trend were sown in the latter part of the 1990s, but when the IT bubble burst in early 2000, the result was a backlash for the entire entrepreneurial ecosystem. However, a new wave of entrepreneurs emerged around 2004, more experienced and better suited to handle the challenges that start-ups face. Since then, Sweden has been the breeding ground for many of Europe's Unicorns (young companies valued at more than one billion USD). Still, entrepreneurial activity has also increased in other countries, and Sweden's position is intermediate when compared to similar countries.

Finally, Fig. 1.10 presents the evolution of total manufacturing employment and by R&D intensity as a share of total employment. The more R&D-intensive manufacturing industries (high- and medium-tech production) have almost halved their employment share over the longer term, from 7.9% in 1980 to 4.2% in 2021. This

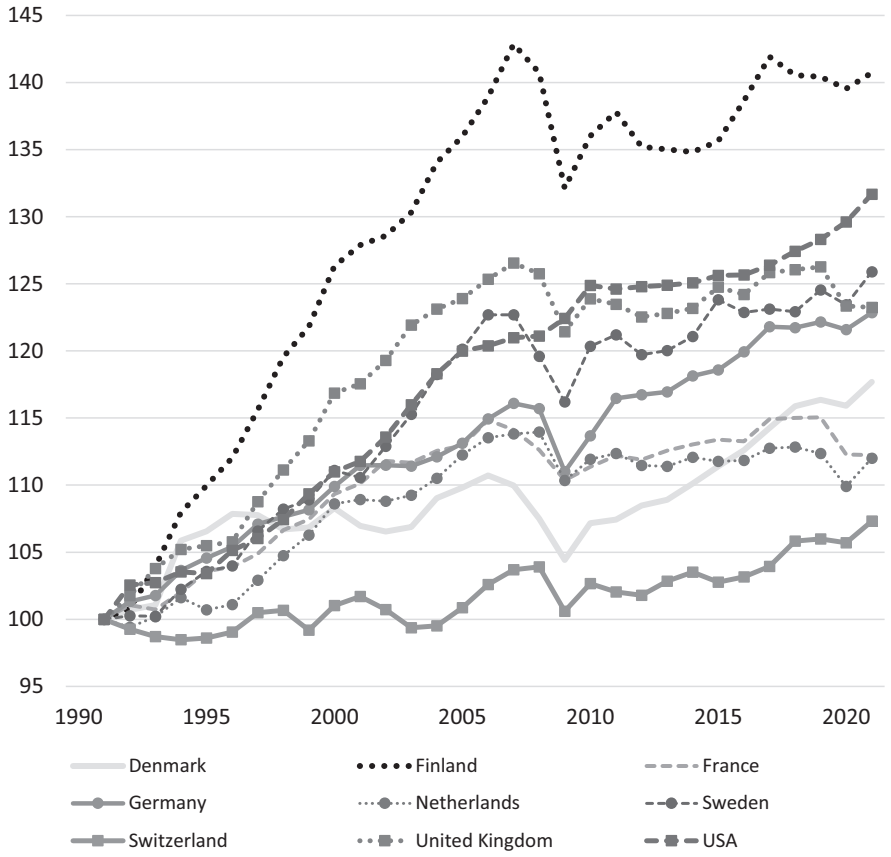

Fig. 1.8 Total factor productivity (TFP) in a number of wealthy countries, 1991–2021 (index 1991 = 100). *Source*: OECD

decline coincides with a general pattern of a shrinking production share for manufacturing while the service sector grew from 56% in 1980 to 78% in 2019. Part of this increase is related to the strong growth in the employment share of knowledge-intensive business services (KIBS), which increased by 33% between 1990 and 2019. Distributed value chains and firm-level strategies that focus on core production and procure components and services, which has led to outsourcing, are some of the explanations for the altered production structure. It is obvious that services that used to be kept within manufacturing firms have migrated to other branches and firms. Previous studies on the knowledge base of the Swedish industry claim that the level has not decreased, rather the opposite, albeit there has been a change in the composition where the service sector, particularly business-related services, has increased

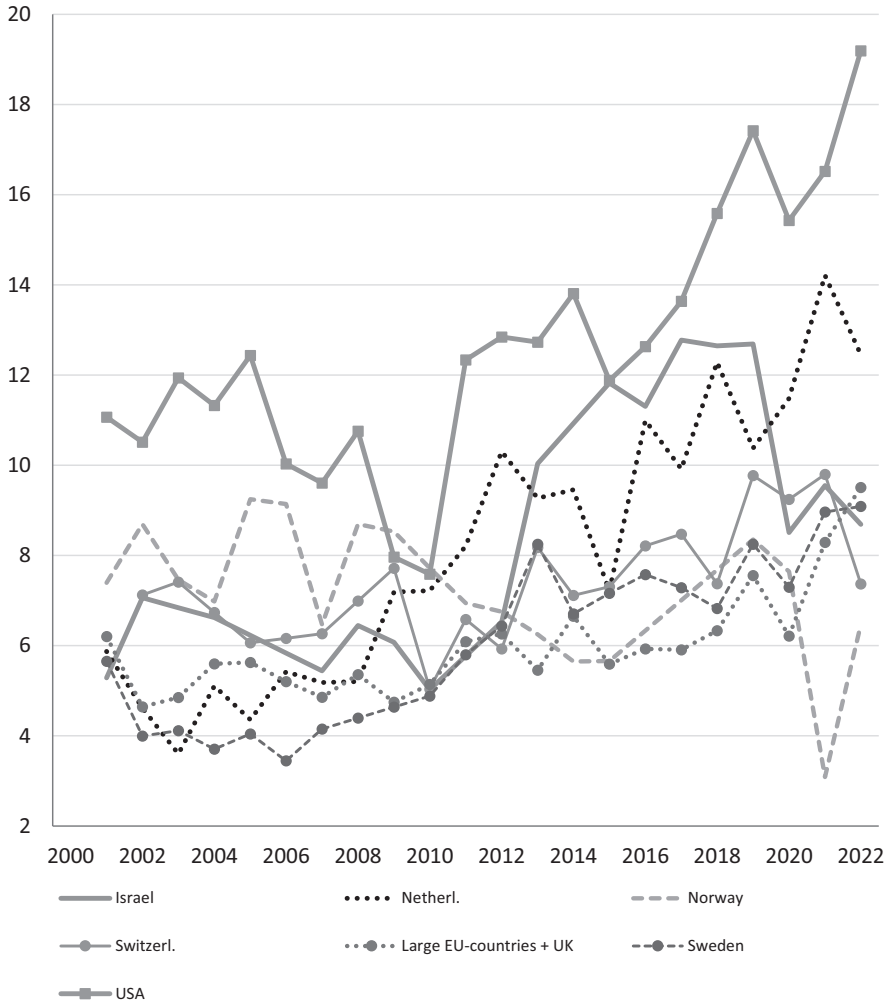

Fig. 1.9 Total early-stage entrepreneurial activity (TEA), 2001–2022 (%). *Note*: Defined as the percentage of 18–64-year-olds who are either nascent entrepreneurs (0–3 months) or owner-manager of new businesses (3–42 months). *Source*: Thulin (2023)

its share considerably in the last decades (Hagman et al. 2015).[11] The increase in the share of employees in the knowledge-intensive sectors seems like an inevitable development given the rapid automation and outsourcing of non-core activities in manufacturing.

[11] According to Eurostat, employment in Swedish knowledge-intensive sectors amounts to almost 57%, the highest level among EU countries (https://tradingeconomics.com/sweden/employment-in-total-knowledge-intensive-services-eurostat-data.html).

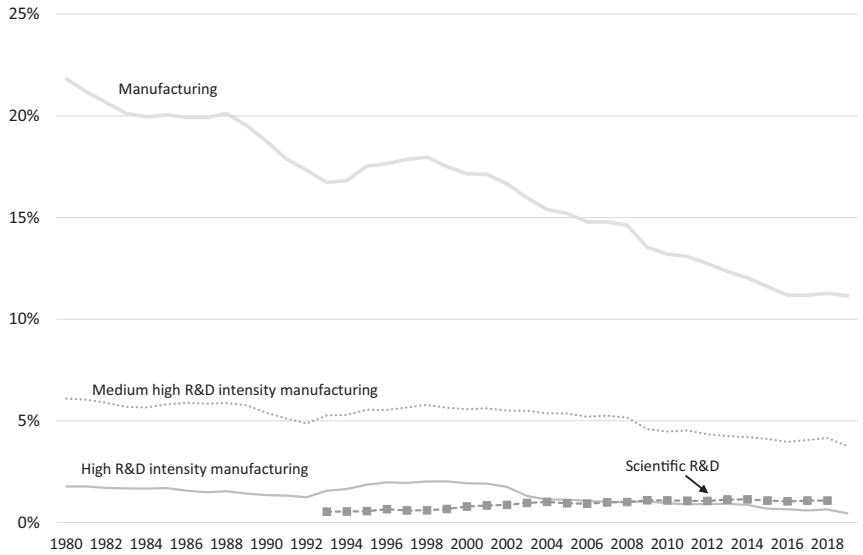

Fig. 1.10 Total manufacturing employment and by R&D intensity as a share of total employment, 1980–2019 (%). *Note*: Data on scientific R&D are only available between 1993 and 2018. *Source*: OECD STAN Database

Thus, there has been a pronounced shift towards service production in Swedish industry. On the other hand, the base for advanced manufacturing production is relatively thin in terms of employment. The employment share in manufacturing has been decreasing more or less continuously since the 1980s. However, this trend is counterbalanced by the increase in advanced service production. In general, Swedish industry specializes in the mid-tech segments, where future competition can be expected to be particularly fierce. However, it should be emphasized that the boundaries between industry and services is becoming increasingly blurred as activities are moved out of "pure" industrial manufacturing into industry-related services. A large proportion of the activities now carried out in the service sector previously took place within industrial enterprises.

This introduction has provided rather general outlines; in the following chapters, we will examine in more detail what theory and empirical data indicate on the topics of innovation and entrepreneurship. Then we will return to our policy recommendations.

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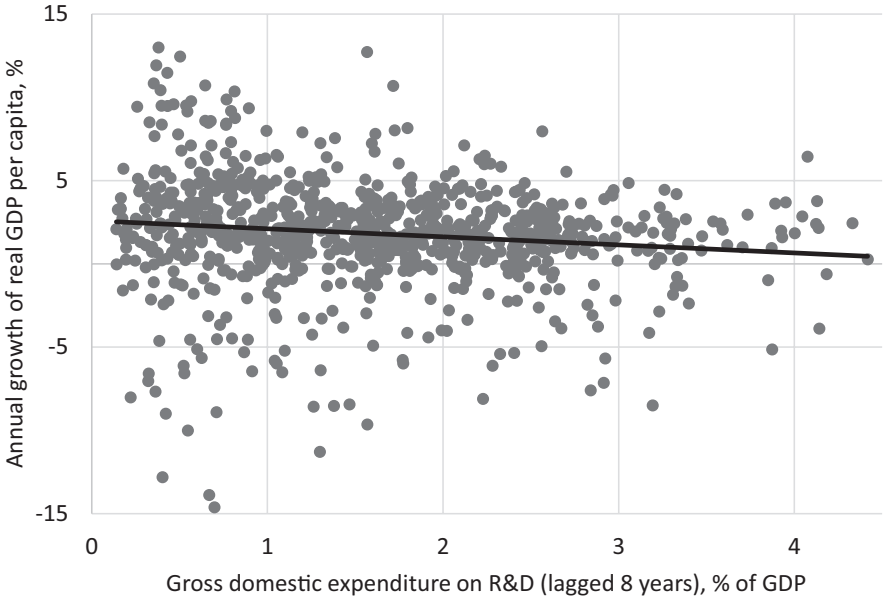
Chapter 2
Theories of Growth, Innovation, and Entrepreneurship

One of the most important—and most difficult—areas of research in economics concerns the mechanisms that cause higher growth and increased prosperity. Economists base their work on theoretical models that are expected to capture the complex relationships of real-world behavior. Policy conclusions are then derived from these simplified models. However, if a model is based on incorrect or oversimplified assumptions, these conclusions will likely prove to be just as flawed.

This is clear in the analysis of growth and transformation. The current growth paradigm is based on theories developed in the late 1980s and beginning of the 1990s, notably by Robert Lucas, Paul Romer, Philippe Aghion, and Peter Howitt. These models highlight investment in knowledge—measured as education and R&D—as the main source of growth and have had profound implications for economic policy. Among other things, the early ambition that three percent of the EU's total budget should go to R&D can be linked to this theory, as well as Sweden's "knowledge boost"—a government investment program for adult education in 1997–2002—and the massive expansion of regional universities and colleges.

Knowledge is undoubtedly crucial for economic growth. The great leaps forward in the material development of mankind—such as the first Industrial Revolution in the late 1700s and the second one a century later—were based on new knowledge, new technology, and transformative innovations. The same is true for the IT revolution, followed by the digitized technology of our own time. Nevertheless, econometric analyses of the effects that knowledge investments have on growth, measured in terms of R&D or education, do not show unambiguously positive results (Gordon 2012). A simple correlation between R&D investment and growth for OECD countries during the 2000s rather indicates a weakly negative covariation (see Fig. 2.1). However, at finer levels of disaggregation, such as the industry or firm level, the results are more robust and generally positive, especially for private sector R&D. It is more difficult to demonstrate positive effects of publicly funded R&D initiatives

P. Braunerhjelm, M. Henrekson, *Unleashing Society's Innovative Capacity*,
International Studies in Entrepreneurship 55,
https://doi.org/10.1007/978-3-031-42756-5_2



Source: Updated from Acs et al. (2009), OECD.

Fig. 2.1 The relationship between annual GDP growth and R&D investment in OECD countries, 1981–2021, R&D lagged eight years. *Source*: Updated from Acs et al. (2009), OECD

aimed at the business sector (Bergman 2012), although publicly funded basic research seems to have positive effects, even if the time lag can be sizeable.[1]

One explanation for this relatively weak connection is that knowledge-based growth models primarily look at how knowledge is acquired and how much knowledge (measured in various ways) is produced, but they do not explain how it is disseminated and transformed into economically valuable goods and services. What is measured and included as explanatory factors in these models—R&D as a share of GDP serving as a typical example—are therefore not necessarily the most relevant factors for the questions we are trying to answer regarding forces that promote innovations. This has led to the emergence of empirical research which shows that investment in knowledge and research should be supplemented by, for example, entrepreneurship, competition, knowledge sourcing, and mobility between and within industries and firms in order for economic growth to ensue.[2] The

[1] Sala-i-Martin (2002) and Jones (2021).

[2] For example, Holcombe (1998), who asserts that "entrepreneurship is the engine of economic growth," and Baumol (2002), who stresses the role of new, small, and young firms in the innovation process. For an account of the development of effects attributed to entrepreneurship, see Braunerhjelm et al. (2022). Other mechanisms are the mobility of human capital (Møen 2005;

institutions—laws, regulations, and norms—that are relevant for the transformation of knowledge into societal benefits are thus central to growth. These represent different mechanisms and policy areas than those that are emphasized in today's dominant but narrow growth models, namely quantitative measures of R&D and education.

In this chapter, we discuss how research on economic growth has evolved since Schumpeter's pioneering work in the early twentieth century, emphasizing the microeconomic foundations of growth. Significant progress has been made in recent decades, but a number of "unknowns" remain. We compare the knowledge-driven growth models with the evolutionary growth models that have been developed in parallel. The impact of the latter models in guiding economic policy varies, but knowledge-driven models are arguably the most influential. To a greater extent, the Schumpeterian and evolutionary models highlight the importance of institutions that influence competition, search costs, and industry-level routines, which in turn create the conditions for entrepreneurs and firms to engage in innovation. However, countries with similar formal institutions show large differences in growth. This indicates both that there may be substantial differences between *de jure* and *de facto* institutions and that informal institutions (norms) are important, but also that the design of institutions at a more detailed level affects incentive structures and growth.[3] In Chap. 3, we will devote additional space to discussing the importance of both formal and informal institutions for innovation and entrepreneurship.

2.1 Development of Growth Models

What are the factors that drive economic growth? At a general level, there is consensus that credible institutions that promote property rights, transparency, and basic education are necessary—but not sufficient—conditions. The effect of other variables is even more uncertain. Some countries in Asia show strong growth but under different institutional conditions than many mature industrialized countries feature, often based on imitating technology from the leading economies. More generally, growth rates can also differ significantly among countries with comparable institutions.

Before we begin our examination of the various growth models, we begin by defining two key concepts—innovation and entrepreneurship—to which we will devote a great deal of attention hereafter[4]:

Kaiser et al. 2015; Braunerhjelm et al. 2020), and the economy's competence regarding commercialization (Eliasson et al. 2004).

[3] Merely copying institutions that function well in one country does not guarantee that they will function equally well in another country (North 1990; Easterly 2001).

[4] The link between the entrepreneur and innovation was described by Schumpeter (1947, p. 151) in the following way: "The entrepreneur and his function are not difficult to conceptualize: the defin-

- Our definition of "innovation" is based on the widely implemented version presented in the *Oslo Manual* (OECD 2018), although we emphasize the market perspective. Hence, we define "innovation" as *a new or improved product or service, a new form of organization, new inputs or new markets, or a combination of these aspects*. Inventions, scientific findings, or technical discoveries do not necessarily have a market value—as a rule, an entrepreneur, who can identify a market opportunity, is required in order for these to attain a specific market value. Innovation spans most sectors, industries, and economic activities. At the same time, the difficulties of measuring innovation are obvious: R&D expenditure and patents are the most commonly used measures, but they are obviously difficult to apply, for example, to organizational changes, to the identification of new markets, and in the service sector (Nagaoka et al. 2010). In addition, R&D expenditure is an input measure, while we are interested in the return it provides in the form of innovation output. Novelty is not sufficient to "earn" the designation of an innovation; it must also be economically valuable.
- "Entrepreneur" and "entrepreneurship" can be defined on the basis of various characteristics and functions (Braunerhjelm et al. 2022; Hébert and Link 2007). The more well-known definitions include Joseph Schumpeter's (an agent that disturbs the equilibrium state of the economy), Frank Knight's (a bearer of uncertainty), and Israel Kirzner's (one who drives the economy towards equilibrium). To these classic definitions, additional ones have been added that are based on the entrepreneur's function/area of activity, for example intrapreneurs, social entrepreneurs, and gig economy entrepreneurs. All definitions emphasize the entrepreneur as an agent of change, a force that drives development. This view returns to Schumpeter's original definition of the entrepreneur as a disrupter of economic equilibrium. We will use the following general definition: entrepreneurs are the *agents of change in the economy* whose actions result in restructuring, market experimentation, and dynamism.[5]

Entrepreneurship and innovation have undoubtedly played a crucial role in previous leaps in growth and economic development. This is illustrated by the second industrial revolution of the late nineteenth century, which was marked by major technological breakthroughs, including electricity and the internal combustion engine,[6] paralleled by the emergence of new firms and industries based on these achievements. Characteristic for this period were reforms that included both knowledge upgrading (such as compulsory schooling) and improved opportunities for the transformation and dissemination of knowledge into public goods (for example,

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ing characteristic is simply the doing of new things or the doing of things that are already being done in a new way (innovation)."

[5] See also OECD (2008) and Mokyr (2010), who also emphasize the importance of entrepreneurship for innovation and growth. Henrekson and Stenkula (2016, p. 71) also add that to qualify as an entrepreneur, the individual must strive "to create value, which often, though not always, means that the entrepreneur aims to expand the firm to its full potential."

[6] See Edquist and Henrekson (2006) for details regarding these new general purpose technologies and how long it took for them to fully penetrate and transform the production system.

increased competition and limited risk-taking through incorporated businesses).[7] Then, as now, this was preceded by increasing internationalization as trade volumes increased and cross-border investment grew, as did the cross-country mobility of labor. This was the environment that inspired Schumpeter (1934 [1911]) to launch his pioneering work on the entrepreneur as the *primus motor* of industrial transformation, dynamism, and growth. Much later, Baumol (2002, 2010) even claims that radical entrepreneurial innovations explain at least 90% of economic development since the onset of the Industrial Revolution. It is therefore self-evident, he argues, that entrepreneurship and innovation should be as much a part of economic theory and economics education as the role of markets and price mechanisms.

2.1.1 The Neoclassical School

During the 1930s and 1940s, Schumpeter's entrepreneurial vision of growth was supplanted by more macro-oriented analyses. In the aftermath of extreme economic fluctuations and the disastrous depression of the early 1930s, Swedish economists of the Stockholm School (notably Gunnar Myrdal, Erik Lindahl, Erik Lundberg, and Bertil Ohlin) and John Maynard Keynes began to emphasize the role of the demand side. By using fiscal policy (taxes and public expenditure), monetary policy (interest rates), and foreign exchange policy (changes in the exchange rate), the government was able to influence overall demand in the economy and thereby temper cyclical fluctuations. The importance of entrepreneurship, business ownership, and other supply-related factors (such as technological progress) did not attract the same interest. For a long time, these Keynesian models also worked relatively well, especially when there were untapped resources—mainly labor—that could be employed in productive activities.

During the 1950s and 60s, growth models based on this thinking were further developed and formalized. Growth occurred as an interplay between investment, population growth, and consumers' willingness to save. Consumers were prepared to refrain from consuming for a period—that is, to save—provided that the interest rate (defined by the marginal productivity of investing an additional unit of capital) at least corresponded to their rate of time preference (the discount rate). If the interest rate was higher, savings and investment would increase until the marginal productivity of capital returned to the level of the discount rate. Analogously, if the consumers' discount rate exceeded the interest rate, consumption would increase while savings and investment would decrease. The growth rate stabilized when the net productivity of investment reached a certain level, i.e., when a steady state had been achieved. Given stable population growth, economies grew at a steady pace. In

[7] Sweden's strong growth from 1870 to 1950 (the highest in the world during this period) was preceded by many important institutional changes: compulsory schooling was introduced in 1842, the guild system was abolished in 1846, limited liability for juridical persons was introduced in 1848, and domestic freedom of trade was initiated in 1864.

line with this model, growth policy was designed primarily to promote investment by lowering the cost of capital (possibilities for deductions, tax relief for internal investment funds, etc.) and to increase labor supply.

However, despite its elegance, this theory did not reflect actual development. Robert Solow (1956, 1957) demonstrated that the bulk of economic growth—perhaps as much as 80%—remained unexplained after the effects of increased investment and employment had been accounted for.[8] The explanation was attributed to technological advances and knowledge enhancements, popularly known as the Solow residual, or as "the measure of our ignorance" (Abramovitz 1956, p. 11). But the mechanisms behind technological progress and knowledge growth remained a mystery. This was unsatisfactory, not least because the residual was often larger than what could be explained by the theory, i.e., growth became exogenous and not something captured or determined within the framework of the model.

The residual was assumed to contain primarily new and improved technology and better trained staff as well as innovations. Recent research has pointed out that organizational changes, changes in industry composition and markets, start-ups and the closure/exit of firms should also be included[9]—that is, much of what Schumpeter called "creative destruction." Many of the variables omitted from the standard growth model of the 1950s and 1960s also have clear policy relevance, but since it was not possible to identify which ones that primarily affected growth, no definitive policy conclusions could be drawn.

A decade later, Jorgenson and Griliches (1967) proposed a model in which the factors of production were quality-adjusted (labor with respect to human capital and physical capital with respect to its level of technology), thereby eliminating large portions of the Solow residual. However, to be able to do this, they were forced to make some bold assumptions, notably that the stock market accurately values firm equity. The Jorgenson–Griliches model can be seen as a stepping stone towards the endogenous or knowledge-based growth models of the 1980s.

2.1.2 Endogenous, Knowledge-Based Growth Models

The next foundational step in the modeling of economic growth was pioneered by Paul Romer (1986, 1990) and Robert Lucas (1988), who developed the first knowledge-based growth models. These are referred to as endogenous growth models since knowledge and knowledge investment, which in the earlier models were

[8] See also Swan (1956), Kaldor (1961), Uzawa (1965), and Denison (1967). Rostow (1990) provides an overview of contributions to neoclassical growth theory. Other problematic assumptions also characterized the model, notably that markets are characterized by perfect competition, which implies that there are no incentives for innovation!

[9] Baumol (1968) pointed out early on that there was no room for entrepreneurs or innovations in these models. For an evaluation of the newer models from the same perspective, see Bianchi and Henrekson (2005), and Henrekson et al. (2023).

treated as exogenous and part of the Solow residual, now become determined within the model.

Romer's first model was built on three factors of production: capital, labor, and knowledge. Knowledge was assumed to be accumulated partly through R&D investments of firms, and partly as a result of spillovers from the aggregate stock of knowledge in the economy. Companies' R&D investments were thus internal, but at the same time some of the new knowledge spilled over into the aggregate stock of knowledge. Goods production used knowledge, capital, and labor. Knowledge was assumed to be non-rival and thus gave rise to economies of scale. Even if labor and capital were kept constant, increases in the knowledge base would lead to increased production, higher productivity, and growth. Consequently, all firms would benefit from increased R&D investments. Asymmetric information and the risk that some firms could become "free riders" may then keep R&D investment at too low a level from a societal point of view, which opens the door for government policy to stimulate investment in R&D. In other respects, the model remains faithful to the original neoclassical growth model: firms are assumed to be price takers and make zero profits in the steady-state equilibrium.

In a subsequent article, Romer (1990) extended his model by positing a more realistic market structure. This model is based on four factors of production—labor, human capital, physical capital, and new knowledge (technology)—which are employed with different intensities in three sectors. In the production of new knowledge (i.e., R&D), only human capital is employed, which also utilizes the aggregate stock of knowledge, i.e., previously accumulated knowledge. The output is a new technology or design that is used together with capital to produce new capital goods (semi-finished products and other inputs). Finally, these differentiated capital goods are combined with labor and human capital to manufacture consumer goods. Production of the three types of goods—new productive knowledge, capital goods, and consumer goods—can take place within a single firm or be distributed across several firms.

Romer makes a number of strong assumptions to keep his model analytically tractable. Population is constant, as is the proportion that is highly educated; capital is assumed to be produced with the same technology as consumer goods; and knowledge is immediately available to all actors in the economy. New capital goods never become obsolete and are protected by perpetual patents. The development costs that businesses incur lead to a market structure of monopolistic competition. Companies cover these costs through a surcharge on the (given) price that a new product or quality makes possible. In equilibrium, the entry of new firms/products means that costs can be precisely covered. As a result, no profits are made.

The R&D sector is thus central to this framework. Not only does this sector determine the growth rate; it also produces both firm-specific and generally available knowledge. The volume of new knowledge that is produced is assumed to be determined by the quantity of human capital in the R&D sector, the size of the aggregate stock of knowledge, and the productivity of R&D personnel. The size of the aggregate stock of knowledge will in turn affect productivity. To avoid an explosive increase in the growth rate, Romer also assumes that the growth effect of more

research results is linear: If the number of researchers increases, the quantity of new knowledge also increases in the same proportion. Thus, given that the human capital share is constant in the R&D sector, the output of the R&D sector is assumed to be directly proportional to the aggregate stock of knowledge. This assumption has been questioned by Jones (1995a, b) among others, and this will be discussed later. The relationship between the size of the aggregate stock of knowledge and the productivity of R&D workers also means that the difference in growth and prosperity between industrialized and developing countries can be expected to increase, as the industrialized countries have a significantly larger aggregate stock of knowledge. Given these far-reaching and sometimes extreme assumptions, Romer argues that there exists a long-term stable growth path and that economic policy can be used to increase the steady-state rate of growth.

Far-reaching simplifications and strong assumptions notwithstanding, these knowledge-based models provided important insights into the role of knowledge in the growth process. First, investments in human capital and R&D are explained in terms of profit-seeking firms and individuals competing by means of a stronger knowledge base, higher quality products, and new goods and services. Second, investments in knowledge lead to large and sustained spillover effects that benefit other firms. Firms that invest in the creation and discovery of new knowledge will not be able to keep it entirely to themselves—some of it will "spill over" to other firms, thus increasing the aggregate stock of knowledge, which in turn boosts productivity and growth in all firms.

This argumentation led to an important policy conclusion. Since knowledge production (R&D) in the model is assumed to be privately financed, firms will underinvest in new knowledge because their own investment will partly benefit other firms including their competitors. At the same time, knowledge investments benefit society at large as they lead to a higher growth rate and rising incomes. Consequently, this version of Romer's endogenous growth model also provides arguments for subsidies and tax incentives to stimulate investment in R&D.

2.1.3 Neo-Schumpeterian Growth Models

A new generation of knowledge-based growth models appeared in the early 1990s. Pioneers among these so-called neo-Schumpeterian model builders include Segerstrom (1991), Aghion and Howitt (1992, 1998) and Cheng and Dinopoulos (1992).[10] Here, innovations are perceived as resulting from "competitions," where the winner gains a temporary monopoly. At the same time, the innovation makes existing knowledge obsolete, and firms based on obsolete knowledge are eliminated. Innovation thus becomes a competitive tool that creates a willingness to pay for new, improved products.

[10] See Aghion et al. (2021) for an extensive overview of this class of models.

These models claim to capture Schumpeter's concept of creative destruction, which is partly correct. But at the same time, they focus on very specific and limited types of innovation and entrepreneurship originating in R&D that can most closely be likened to the activity of researchers at a large pharmaceutical firm. In these models, the entrepreneur appears exclusively as an agent who pursues R&D investments where it is assumed that returns on innovation investments follow an *ex ante* and objectively known probability distribution. The expected costs and returns of innovations are thus objectively calculable, and the value and economic uses of innovations are known once a new product or technology has been developed.

The entrepreneur is thus conceptualized as a decision-making agent who is responsible for allocating resources between two activities: goods production and R&D. As such, this model fails to capture the role of the entrepreneur within the firm, i.e., whether the role can be filled by a manager or whether "entrepreneur" refers to the owner(s). Hence, his or her activities differ substantially from entrepreneurship and innovation as construed by Schumpeter, Knight, and Kirzner. Consequently, the models' policy conclusions are questionable. They not only underestimate the role of small firms and start-ups, but they are also unable to capture growth made possible through improved organizational forms and more rigorous competition.

2.1.4 Critique of Endogenous Growth Models

Knowledge-based growth models represented a significant step forward in the understanding of growth, insofar as Solow's residual could—at least in part—be explained and integrated into the model (i.e., endogenized). Early on, however, several weaknesses were identified related to the assumptions that form the basis for these models. Some of the criticism was directed at the lack of realism in the assumptions regarding knowledge investment and knowledge development:

- Previous research showed that opportunities to assimilate knowledge appeared to be cumulative, i.e., existing levels of knowledge affected the development of new knowledge. The endogenous growth models partially account for this, but they subsequently imply that path dependence is prevalent. This may lead to lock-in effects that limit the spread of new knowledge as do varying levels of absorption capacities (Cohen and Levinthal 1990) and costs of absorbing new knowledge (Mansfield et al. 1981).
- Understanding economic growth implies considering the historical time path of economic development, which tends to be punctuated by "eras" when general purpose technologies emerge or techno-economic paradigm shifts occur (Bresnahan and Trajtenberg 1995; Freeman and Louça 2002). Similarly, processes of economic growth are embedded in and dependent on the institutional setup (Lundvall 1992; Nelson 1993; Braunerhjelm and Henrekson 2016). These

aspects loom considerably larger in evolutionary approaches to economic growth (see below).

- Although knowledge can be spread across regions and countries (Coe and Helpman 1995), in principle there is agreement that the dissemination of knowledge is geographically limited. Even though technological advances in transmitting and sharing knowledge have facilitated its diffusion, the concentration of knowledge-dense areas is still a prevalent phenomenon (Andersson and Larsson 2022). In addition, the more advanced the new knowledge, the more difficult it is to interpret, codify, and apply commercially, and the more importance proximity assumes in assimilating such knowledge (Polanyi 1958). Innovation has proven to be even more geographically concentrated than both R&D and production (Ejermo 2009). This (as well as path dependence and lock-in effects) contrasts strongly with the typical model of endogenous growth in which the dissemination of knowledge takes place automatically and without cost.
- Weak incentive structures and low potential for organizational learning generally limit a company's capacity for dynamism, i.e., its R&D development and the application of results in production. Larger companies are more risk averse in their respective technology and product areas (Christensen 1997), while radical innovations can be attributed to newer firms (Casson 2003; Baumol 2004).
- Smaller firms are generally more oriented towards the service sector and more focused on innovations that do not originate in R&D, while most knowledge-driven growth models have endogenized innovation solely through R&D investments. The dominant growth models lack the Schumpeterian entrepreneur who assimilates and exploits knowledge in ways that are not visible in the R&D statistics, but which still spills over to other firms. IKEA, Starbucks, and Ryanair are examples of innovative firms with little or no research in the narrow sense, although many of them invest significant resources in development and design.
- The somewhat weak connection between R&D and increases in growth/productivity may reflect the fact that chance and coincidence also play a role in producing successful innovations, that there is a high degree of imitation, and that R&D investment and innovation initiatives take place irregularly and even in firms on the verge of financial collapse. Previous research also shows the importance of continuity and sustainability in innovation initiatives; empirical studies need to span lengthy periods (Roper and Hewitt-Dundas 2008). In addition, and as mentioned earlier, innovation is associated with significant measurement problems where gradual (incremental) innovations rooted in learning by doing are seldom or never captured in the statistics. Finally, the rate of disruptive innovation seems to have slowed down, which may reflect the reliance on a narrower set of existing knowledge (Park et al. 2023).
- Another aspect of the critique is more model oriented. Jones (1995a, b) observed that early endogenous growth models included a scale factor, which implied that technological change and innovations were proportional to R&D investments and that population was assumed to be constant. The proportion of researchers (and the proportion employed in manufacturing) was also assumed to be constant. All other things equal, this means that if R&D costs (researchers) are dou-

bled, growth will also double. However, Jones pointed out that this is inconsistent with observable facts: the number of researchers has increased sharply in recent decades with no corresponding hike in the growth rate. Instead, Jones suggests that productivity in the R&D sector should stand in an inverse relationship to the level of accumulated knowledge. By positing a declining rate of return in the R&D sector, the model becomes more realistic. As R&D becomes more difficult, the rate of technological change, the pace of innovation, and the aggregate rate of growth decline.[11]

Criticism of endogenous growth models thus takes various forms but is mainly directed at how knowledge is disseminated and transformed. It should be emphasized that while the weakness of the earlier neoclassical model was that knowledge was perceived as "manna from heaven," knowledge-based models fail to explain how knowledge is spread. At present, its conversion into commercial goods is based on abstract assumptions and consequently becomes exogenous in the model. Moreover, the utilization of new knowledge is not associated with any costs for firms. This shortcoming is probably one reason why the empirical literature does not find unequivocal support for the notion that investment in R&D, and to some extent education, has positive effects on growth.

However, recent empirical research has identified certain mechanisms as particularly important for disseminating and transforming knowledge into economically valuable goods and services. These include labor mobility, entrepreneurship, and advanced clusters.[12] These factors are in turn affected by the institutional (largely politically determined) framework within which they operate. The causes of different growth rates across countries and regions should thus be sought, among other things, in how the conditions under which entrepreneurs and firms transform and develop knowledge vary over time.

Even more importantly, by depicting the entrepreneur as an actor whose economic function is to invest in calculable outcomes, the role of the neo-Schumpeterian entrepreneur is relegated to that of a routine decision-maker in pursuit of discoverable business opportunities. However, as emphasized by Knight (1921), many—perhaps most—innovations are undertaken without full information on their potential value, not even in a probabilistic sense. The activity is marked by genuine uncertainty. This implies that innovations lack strictly objective benefits against which their costs can be weighed. Instead, they can be expected to be wholly or partly pursued based on the subjective valuations and judgment-based decisions of individual entrepreneurs (e.g., Bylund and Packard 2021). Thus, given elements of genuine uncertainty, entrepreneurs cannot solely rely on objective knowledge regarding the final economic uses of ideas to determine their expected economic

[11] One consequence of assuming a declining return on R&D is that the growth rate in equilibrium no longer depends on population size, i.e., the scale effect disappears.

[12] See Braunerhjelm (2012), Braunerhjelm et al. (2022), and Kaiser et al. (2015) for more in-depth discussions.

value. Instead, they must maintain an active role in identifying the economic uses of innovations if they wish to appropriate their economic value.

At the same time, introducing incalculability and subjectivity into the economic models does not imply that innovation outcomes are driven solely by chance and subjectivity. On the contrary, several determinants of innovation success can likely be incorporated to increase both the causal interpretability and predictive power of existing frameworks. Notably, Knight (1921) stresses the central role of the knowledge, experience, and innate abilities of entrepreneurs in the selection and outcome of disruptive innovations, i.e., what he refers to as "judgment."[13] For example, it is likely that the tacit knowledge gained from past experiences of creating and exploiting innovations is a core element of entrepreneurial acumen.

Given that innovations are, at least partly, associated with genuine uncertainty, this implies that extant neo-Schumpeterian growth models run the risk of providing misleading guidance to policymakers aiming to stimulate economic growth. A potential counterargument is that neo-Schumpeterian growth models seek to explain and predict the macroevolution of the economy, and at the aggregate level, it may be fair to abstract from the genuine uncertainty of innovative outcomes at the micro-level.[14] Although the validity of this assertion is debatable per se (Frydman et al. 2019), this line of reasoning is also likely to be controversial in this specific context for at least two reasons. First, given that economics seeks to explain the *causes* of economic growth, a deeper causal understanding is called for. Second, economists aspire to provide reliable policy advice and the adequacy and precision of policy proposals hinge on a good causal understanding of the growth process and its micro-economic foundations.

2.2 Evolutionary Growth Models: Schumpeter's Legacy

As mentioned before, Schumpeter considered the entrepreneur to be the agent that transformed knowledge into innovation. By developing and combining both new and existing knowledge in new ways or in new contexts, the entrepreneur contributes to creative destruction and economic development. Sometimes the researcher/inventor/entrepreneur can be one and the same person, but this seems to be the exception rather than the rule. On the other hand, the outcome tends to be successful when researchers or inventors collaborate with entrepreneurs, because such

[13] A general point made in the literature emphasizing genuine uncertainty is that even though entrepreneurial efforts are rife with uncertainty, chance favors the prepared mind—or economy (e.g., Wurth et al. 2022).

[14] However, given that endogenous growth models—both neo-Schumpeterian and variety-expansion models—make an explicit point of being grounded in microeconomic fundamentals, this argument quickly becomes contradictory. Moreover, this is at odds with the literature's own perception and goal of capturing fundamental *causes* of growth (Acemoglu 2009, p. 19).

collaborations increase possibilities for commercialization (Braunerhjelm and Svensson 2010).

What Schumpeter did not anticipate was how small and new businesses can collaborate with large incumbent firms—something that has been facilitated by new information and communication technologies. On the contrary, he argued in his later work (Schumpeter 1942) that investment in R&D and innovation by large firms would disadvantage smaller ones—which, he feared, would hobble capitalism and undermine it in the long run. However, new research suggests that large firms can create a market for entrepreneurial ideas and thereby contribute to innovation and entrepreneurship (Norbäck and Persson 2012).[15] As we pointed out above, technological developments are also likely to have diminished economies of scale in several areas.

2.2.1 The Role of Entrepreneurship

The idea that knowledge and skills are spread over a large number of individuals and firms dates back to Menger (1871) and Hayek (1945) and characterizes the older Austrian school.[16] At both the individual and firm level, opportunities for renewal and innovation therefore differ radically from one situation to another, as does the expected outcome of such initiatives. Based on this view of the economy—decentralized knowledge and the spontaneous confluence of individuals and ideas with the surrounding economic policy environment—it becomes much more difficult to formulate an economic policy that promotes innovation in a targeted manner.

A complex, non-linear economy that deviates from the traditional equilibrium model always features unexploited opportunities and inefficiencies which have consequences for how the economy functions and develops. Continuous experimentation is required—to test, alter, innovate, and imitate—to identify both business opportunities and workable methods of production and distribution (Eliasson 2009; Dosi and Nelson 2009). Information is not only important and scarce (and therefore precious) but also dispersed. Individuals have different information about different things, and their interpretations of that information may also differ. Not even the most knowledgeable expert, economist, or entrepreneur can be well informed about more than a fraction of any country's industries and sectors.

As information is scattered and fragmented, economic decision-making needs to be decentralized. Centralized states are finding it increasingly difficult to manage an economy consisting of millions of employees and consumers and hundreds of thousands of firms as they become more sophisticated and knowledge intensive. In the same way, large, centrally controlled firms will find it difficult to focus effectively

[15] In addition, labor mobility seems to enable a better sorting of talents and thereby enhances corporate entrepreneurship (Braunerhjelm et al. 2020).

[16] See Raffaelli (2003). This also explains why the Austrian school has such a negative attitude towards aggregate analysis; different individuals and companies interact, not abstract averages.

on more than a few specific markets. In an advanced economy, it is therefore vital that its main actors—each with disparate fragments of knowledge but no full perception of the whole—can act on the basis of their own information. In business, this is done through reorganization and decentralization within firms, and through entry and exit.

Economic growth is thus driven by the identification (or generation), commercialization, and selection of successful business opportunities:

- The *identification process* is characterized by the ability to identify (generate) new ideas and innovations.
- The *commercialization process* is characterized by the will and ability to introduce these to the market.
- In the final *selection process*, inferior innovations are screened out and replaced by better ones.

In this way, the economy is in perpetual motion, continuously exposed to pressure to adapt and transform (Acs et al. 2009). In such a dynamic economy, products, firms and sometimes entire markets disappear and are replaced by novel, better products and more efficient firms. New markets or niches function as experimental workshops where new ideas are tested against old ones; the most successful survive, while those without a future are discontinued and thereby free up resources that can be used elsewhere.

2.2.2 The Importance of the Entrepreneur for Growth

Figure 2.2 schematically illustrates the market process and the importance of entrepreneurship for growth and economic development, as these appear within the evolutionary growth framework described above. New entrepreneurial discoveries are identified (generated) and commercialized in the market, where a selection process takes place. This market process leads to both direct and (more long-term) indirect effects.

There are two direct effects. First, if entrepreneurial commercialization is successful, new capacity and new structures are created, either by the founding of new firms or the expansion of existing ones. The second direct effect is the exclusion of capacity or business-stealing effect. Old operations lose profitability and are replaced by new ones, which can also turn out to be poor investments, become unprofitable, and need to be liquidated.

In addition to these direct effects, at least six indirect effects can occur that affect output: higher efficiency, more rapid structural change, an increased propensity to innovate, a greater variety of goods and services, new skills (increased entrepreneurial human capital), and the creation of role models. These indirect effects occur mainly through tougher competition and are crucial for the long-term development

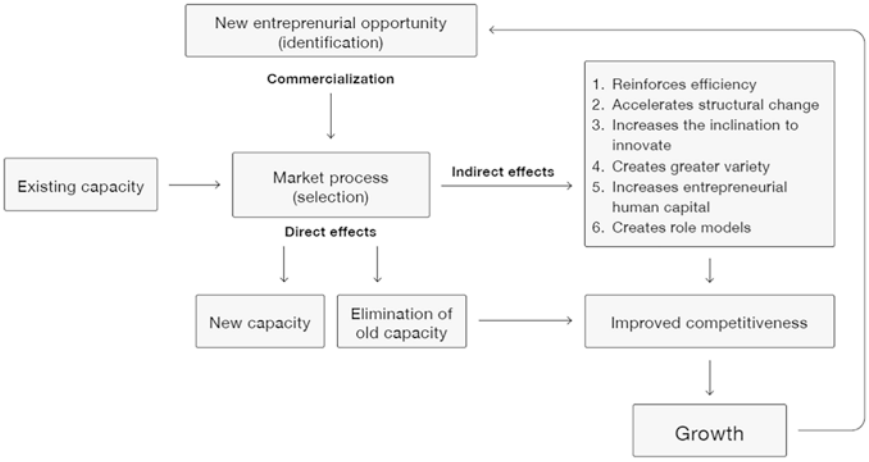

Fig. 2.2 Entrepreneurship and economic growth. *Source*: Further developed from Fritsch and Mueller (2004)

of an economy. The entrepreneur plays a decisive role in this process, functioning here as an active agent of change.[17]

Furthermore, entrepreneurship often has a self-reinforcing effect. New discoveries and products generate new opportunities. In Fig. 2.2, this is marked by the arrow from "growth" back to "new entrepreneurial opportunity," as entrepreneurship itself gives rise to new opportunities. An influx of new entrepreneurs can also have a "demonstration effect," i.e., a new business can act as a signal to other potential entrepreneurs to take the step of starting a business themselves (Verheul et al. 2001).

Aggregate data make changes in economic growth seem fairly small. In developed countries, economic growth rarely exceeds three percent, but the aggregate figure conceals a more tumultuous reality. Economic growth is not primarily about firms growing by a similar percentage or productivity rising in existing jobs because of technological change and more capital per worker. More accurately, growth emanates mainly from churning (firm and job turnover) and restructuring—primarily shifts in production from less to more successful firms within narrowly defined industries, rather than from declining to growing sectors (Caballero 2007).

[17] Related ideas were developed as early as the 1940s by Erik Dahmén; see, for example, Dahmén (1950, 1994). In his doctoral dissertation, Dahmén maps the dynamics of Swedish industry at the firm level during the interwar period. In this analysis, the individual entrepreneur is at the center. Dahmén also emphasizes the indirect effects that are included in Fig. 2.2. When an innovation is implemented, chain reactions arise that create new opportunities in what Dahmén calls "development blocks." Dahmén is careful to distinguish between "competitiveness," which he sees as a static concept, and "development power," which is a dynamic concept. According to Dahmén, development power is a function of companies' innovation potential, which is primarily determined by the quality of the institutional framework.

Table 2.1 Job creation and destruction in the U.S. economy, annual average, 1977–2016

Job creation by entry	6.6%	Job destruction by exit	5.1%
Job creation by expansion	10.3%	Job destruction by contraction	9.4%
Gross job creation	16.4%	Gross job destruction	14.5%
Job reallocation rate (gross job creation + gross job destruction) = 16.4 + 14.5			30.9%
Net job growth (gross job creation – gross job destruction) = 16.4 – 14.5			1.9%
Excess job reallocation rate (job reallocation rate – net job growth) = 30.9 – 1.9			29.0%

Source: Own estimations based on Business Dynamic Statistics data at https://www.census.gov/ces/dataproducts/bds/

Growth requires some firms to fail or contract so that resources can shift to entering and expanding firms. Growth presupposes structural transformation: new firms manufacturing new products in new ways and old ones innovating and reorganizing or liquidating. In order to achieve growth, substantial turnover of companies and jobs is required. This is indeed the essence of the creative destruction process envisaged by Schumpeter (1934 [1911]).

As shown in Table 2.1, over the four decades 1977–2016, new jobs averaged 16.4% of total jobs, a third of them in new firms; 14.5% of jobs were lost annually through closures and contractions. The net result was an aggregate annual job growth of 1.9%. As a consequence, this 1.9% net gain was associated with a gross job reallocation rate of 30.9% (16.4 + 14.5) and thus with an excess job reallocation rate—the amount of job-churning beyond the minimum required to accommodate the net employment change—of 29%.

Although churning is higher in the United States, extensive churning is pervasive in all OECD countries and more so in the wealthiest ones.[18] At least 80% of the reallocation of workers in developed countries takes place within narrowly defined sectors.[19] This reallocation has two main drivers: adjustment among firms with different technologies, and experimentation with improved products, management, and other production systems. Excess job reallocation rates are higher for newer plants because of greater uncertainty, experimentation, and variability in the quality of goods produced.

2.2.3 The Importance of New Firms

The indirect effects referred to above are often linked to new firms. In practice, an influx of new entrepreneurial firms is essential for an economy's development, renewal, and transformation. Although entrepreneurship can take place within incumbent firms and among employees,[20] new and (at least to begin with) small

[18] Martin and Scarpetta (2012).

[19] Caballero (2007).

[20] See Zahra et al. (2016).

firms are required to maintain a sufficiently high level of innovation pressure. Moreover, the objectives and effects of innovative activities differ between young and small firms on the one hand, and more established incumbents on the other. A dynamic innovative environment needs both types of innovators.

New firms expose existing ones to competition and encourage them to become more efficient while contributing to structural change and innovation. Incumbent firms are often tied to existing technologies through extensive investments in physical and human capital, which can become obsolete in the face of radically new innovations. This applies not only to investors (who have invested capital in a certain technology and business plan) but also to employees (who master a certain technology and production process). Thus, it is not only investments in financial capital that are threatened by new challengers, but also old investments in human capital.

An incumbent firm that develops new products thus competes with itself, as its new products can erode the profit made on its established products. This may weaken the firm's motivation to further innovation. An innovation may also require a completely new organizational or compensation structure (Cullen and Gordon 2006). As a result, genuinely new products and production methods may be difficult to introduce in large, mature firms. Incumbent firms instead tend to safeguard and exploit their already existing markets, while new products are best produced in new firms, which are often established precisely for this purpose.[21]

Hence, a division of labor between large and small firms seems to have emerged. Large ones are relatively better at R&D focused on improving existing products, while radical innovations often emerge in smaller ones. The latter, in turn, are often spin-offs from larger firms (Andersson and Klepper 2013; Klepper 2016). New technology is thereby developed, implemented, commercialized, and often disseminated in the form of new entrepreneurial firms. William Baumol has shown the importance of small businesses for the emergence of many revolutionary American innovations, which have since in many cases been further developed and reached their full potential in large firms. Baumol (2004) speaks of a "symbiosis between David and Goliath."[22] Many incumbent firms acquire other firms precisely to gain access to new technology.

[21] According to calculations by Acs and Audretsch (1990) based on data from the 1970s and early 1980s, small businesses in the United States created 2.4 times more innovations per employee than large ones. As reported by the U.S. Small Business Administration, this was still the case in 2018 (SBA 2022). Cohen and Klepper (1996) argue that the probability that firms are engaged in innovation increases with size, which is questioned by Athreye et al. (2021).

[22] Baumol's analysis has been formalized by Norbäck and Persson (2009).

2.2.4 *Entrepreneurship as a Factor of Production*

To equate business with entrepreneurship is to downplay the special skills that are necessary for innovative entrepreneurship (see also the Appendix to this chapter for a discussion of how entrepreneurship should be measured). Most firms are neither innovative nor growing, and most entrepreneurs do not have, nor will they ever have, a single employee in addition to themselves. It is thus important to distinguish between business owners as a group and the smaller number of fast-growing firms where entrepreneurship is more prominent. Potentially innovative entrepreneurs are few, not possible to identify *ex ante* and not easily interchangeable. They also tend to already have secure and well-paid jobs in the career hierarchies of existing businesses, which they must relinquish if they wish to engage in independent entrepreneurship.

In line with Audretsch and Keilbach (2005) and Baumol (2010), we find it fruitful to treat entrepreneurship as a separate factor of production. What the entrepreneur does in the start-up phase of a business is precisely this: he or she creates more capital, both using the firm's existing capital and by means of his or her own specific entrepreneurial labor. This capital can be based on science or technology, and it may also be organizational or structural. In the case of a successful start-up, the economic value of this new capital is many times greater than the financial resources invested. Companies such as Moderna, Skype, or Tesla serve as striking examples. We would argue that in economic models that seek to achieve a deeper understanding of innovation, dynamism, and growth, it is necessary to include entrepreneurship as a separate factor of production that includes unique characteristics providing a distinct contribution to the production result.

In market transactions, prices and volumes can be measured, which means we can distinguish the return on labor and capital, respectively. For entrepreneurial activities, such measurement is impossible, as the return is a result of the value generated through the combination of the entrepreneurs' own labor, their entrepreneurial input, and financial resources. Entrepreneurship interacts with other input factors and can thus be described as an indivisible bundle of these inputs. An entrepreneurial firm whose founder does not reinvest a high proportion of the return will generally not be able to grow. Entrepreneurship is largely about building companies that can generate future returns, i.e., creating capital by means of one's own labor and previously built-up capital.

Another important argument for treating entrepreneurship as a separate factor of production is that, empirically, entrepreneurs seem to behave differently than employees (Baumol 2010; Hurst et al. 2014). For example, their behavior is more sensitive to financial incentives than that of hired workers. Comparisons generally show that the incomes of the self-employed are affected more by taxes (more tax-elastic) than those of employees, perhaps because the self-employed have greater control over their working hours and how they report their income (Chetty et al. 2011; Kleven and Schultz 2011; Harju et al. 2022). This is an argument for taxing

entrepreneurs differently than employees in certain contexts; for more on this aspect, see Chap. 5.

Braunerhjelm and Lappi (2023) provide additional evidence that entrepreneurs should be viewed as a separate factor of production, although from a somewhat different angle. By introducing a new and hitherto neglected measure of human capital, defined as employees' former involvement in entrepreneurship, they investigate the influence of such entrepreneurial human capital (EHC) on firm performance. Based on longitudinal register data for Sweden over the period 1993–2018, they construct a stock variable of EHC for all private incorporated firms. The results strongly support the observation that higher EHC among employees is associated with higher levels of productivity and innovation. More precisely, a ten percent increase of employees who are former entrepreneurs increases firm-level productivity by 3.9%. The results are shown to be robust to adding control variables, estimation techniques, alternative definitions of EHC, and other performance measures.

To summarize here, it seems that the entrepreneur fulfills an important function in converting a scientific discovery or an invention into an innovation that can be commercialized and introduced in the marketplace. The entrepreneur is thus the missing link in knowledge-driven or endogenous growth theory, responsible for transforming knowledge into innovation.[23] Based on this insight, the concept of the entrepreneur—the agent of change in the economy—becomes strategically decisive and a starting point for economic policy. Thus, exclusive investment in R&D and education, without further analysis of how knowledge is disseminated and how entrepreneurs can use it to bring about change, risks becoming sterile or suboptimally exploited.

2.2.5 The Evolutionary Approach to Economic Growth

Schumpeter coined the term "creative destruction" to describe an evolutionary market dynamic characterized by selection, dynamism, and growth. He expressed it in this way: "The essential point to grasp is that in dealing with capitalism we are dealing with an evolutionary process" (Schumpeter 1942).[24] In recent decades, an evolutionary growth approach has been developed in parallel with the endogenous growth models. It emphasizes conditions and opportunities at the microlevel, i.e., the opportunities for individuals and firms to exploit new and existing knowledge for innovation purposes. This perspective also underlines the importance of diversity, variety, and selection. Small firms and start-ups are significant because they can

[23] Other links include increased mobility in the labor market.

[24] The importance of growth in an evolutionary perspective was not new; it had previously been pointed out by, for example, Marshall (Raffaelli 2003). Harrod (1948) and Keynes (1936) also gave evolutionary processes and animal spirits a significant role in the growth process, while Fabricant (1940) and Kuznets (1953) asserted that the growth and decline of industries were explained by entrepreneurship, innovation, and competition.

be expected to work with different varieties and combinations of new and existing knowledge, testing them on the market.[25] These innovative activities are characterized by experimentation, uncertainty, and risk-taking, where a product's commercial potential is ultimately decided in the marketplace.[26]

Evolutionary models emphasize disequilibrium dynamics as a general feature in the search for new production methods, new products, and economic behavior in the broader sense. This process entails trial and error, gross mistakes, and unexpected successes, as firms persistently search for and adopt new technologies as well as new organizational forms and new behavioral patterns in order to gain advantages over their competitors. Markets are characterized by experiments and uncertainties about how new knowledge is best combined and applied, which generates an influx of new firms, firm growth, and corporate failures. This is what Metcalfe (2000) refers to as "restless capitalism." Different abilities to innovate and imitate are central aspects and drivers of industrial evolution, shaping the patterns of growth, decline and exit over populations of competing firms, as well as the opportunities for entry of new businesses. The dynamics of evolutionary processes are then driven by the twin forces of idiosyncratic learning by persistently heterogeneous firms, on the one hand, and (imperfect) market selection delivering prizes and penalties—in terms of profits, growth opportunities, and survival probabilities—on the other across heterogeneous corporate populations. These dynamic processes rhyme less well with the stereotype entrepreneur in the neo-Schumpeterian endogenous growth models.

Another key component is that replication and adoption of technological knowledge concerning processes, organizational arrangements, and products are associated with costs and uncertainty linked to the tacit elements involved in technological know-how (Mansfield et al. 1981; Dosi and Nelson 2009; Maurseth and Svensson 2020). This creates lumpiness, retards the diffusion and application of new technology, and strengthens path dependence. As knowledge about the new technology is accumulated, recipes—that is, coded programs—are increasingly used to implement even newer technologies. Meanwhile, Winter (2016) stresses the importance of including alternative strands of science, e.g., psychology, to better understand how human nature and entrepreneurial behavior can be explained. In particular, entrepreneurial behavior may be less constrained than presumed by the forces of habit and fear of uncertain outcomes and ultimately failure, thereby diminishing the risks that the entrepreneur will be daunted or delayed by path dependence.[27]

The roots of these insights originate in work by Hayek (1945) and von Mises (1949). They argue that unevenly distributed individual abilities and capacities play a central role in transformative processes and growth. Subsequently, it is important

[25] Jovanovic and Rousseau (2005) argue that new firms are more likely to exploit new areas of technology. Small firms also innovate more often in areas where innovation has been unusual (Almeida and Kogut 1997; Almeida 1999).

[26] Research also shows that a larger number of small and new firms offer dynamic environments that positively affect profits and value (Pastor and Veronesi 2009; Fink et al. 2005).

[27] See also Sarasvathy (2008) on the effectuation view.

to examine how this dynamic is affected by the institutional framework within which entrepreneurs operate. Nelson and Winter (1982) were the first to present an evolutionary growth model incorporating several of the features discussed above. One starting point was that firms are generally reluctant to change their operations, which, in combination with endless possibilities for change and a finite ability to rationally review these possibilities (bounded rationality), creates a need for rules of thumb, or more precisely, routines. Firms are assumed to be continuously involved in a search process either to develop new routines themselves (R&D), which Nelson and Winter call innovation (process innovation), or to imitate other firms. All search behaviors are associated with costs; the probability of discovering an improvement increases as R&D or other search costs increase. Innovation thus requires more resources but can also generate higher returns. Finally, it should be noted that Nelson and Winter assume that the resources invested in searching for new routines depend on a firm's profitability. This tends to lead to the gradually increasing domination of the economy by large firms as they succeed in attaining higher profits.

Nelson and Winter's approach explains both variation and selection and how knowledge is preserved and transferred across periods. Their theory led to extensive research that modified and further developed variants of their original model.[28] Of particular interest is Winter's own (1984) extension of the model to include entrepreneurs and start-ups. Two dominant innovation activities are postulated—one entrepreneurial and one traditional. The former, which is assumed to be more dependent on external knowledge, is dominated by entrepreneurs and newly established firms, while the latter is assumed to be associated with the in-house R&D of existing larger firms.

Other models were to a greater extent based on the dominant general equilibrium paradigm. Jovanovic (1982) presents a model for industrial development based on learning. The model assumes an infinite number of small firms that take price as a given. They have perfect information about the equilibrium structure but are ignorant of their own performance (productivity); however, they learn after market entry. These small firms are at greater risk of failure and are also assumed to have poorer growth opportunities.[29]

Acs et al. (2004) and Braunerhjelm et al. (2010) take one of Romer's models as their point of departure and show how entrepreneurs who are not involved in research also contribute to innovation and growth. In the model, the business community consists of incumbents that invest in research, as well as entrepreneurs who do not contribute to it. The ability of entrepreneurs to innovate is based on their capacity (unevenly distributed) to draw on previous research investment and to use that knowledge to launch new goods and services. In this way, the entrepreneur becomes an instrument for disseminating knowledge; he or she contributes a

[28] See Fagerberg (2002), Soete et al. (2010), and OECD (2015) for an overview.

[29] See also Pakes and Ericson (1995, 1998) and Klette and Kortum (2004) for versions of Jovanovic's model stressing learning and internal resources, respectively.

mechanism for knowledge to be commercialized. In a model that includes entrepreneurs, the opportunities for sustainably higher growth increase.

In a slightly different model, Acs et al. (2005, 2009) show how entrepreneurship can be endogenized on the basis of knowledge investment and institutional conditions (regulations, well-functioning financial markets, etc.). Given an environment that promotes entrepreneurship, knowledge investment will result in individuals with different entrepreneurial abilities choosing entrepreneurship over employment. There is thus a complementarity between existing and new firms that leads to the testing and exploitation in the market of a larger proportion of an economy's knowledge base.[30]

Several of these models seek to incorporate more of the evolutionary elements into a general equilibrium structure, which has occasionally led to drastic assumptions regarding prices, information, transaction costs, distribution of profits, exogeneities, and more. Other models are so complex that it becomes difficult or impossible to calculate a solution, so that simulation methods must be used instead (this includes Nelson and Winter and their successors).[31] In many cases, Schumpeterian creative destruction is not satisfactorily modeled. The more aggregated the data, the more difficult it becomes to distinguish which components are driving the processes.

Nevertheless, the contribution of these newer models is significant. First, they show how variation and selection under competition characterize market economies and are crucial for business sector development. Second, these phenomena take place in dynamically adaptive systems where learning and feedback take place continuously. One conclusion is that change tends to materialize slowly and is dependent on several factors that affect both knowledge building and knowledge dissemination and commercialization. These in turn are affected by institutions and norms. Finally, the evolutionary system is adaptive, complex, and partly self-organizing, while a state of (traditional) equilibrium is usually an exception rather than the rule.

2.3 Small Businesses and Entrepreneurs: The Empirical Picture

An increasing number of studies point to the importance of new and small firms for the development and commercialization of knowledge, even though they invest relatively modest sums in R&D. Instead, they contribute through their efforts to

[30] A parallel, and to some extent overlapping, research strand has aimed to integrate neo-Schumpeterian growth models with insights derived from the industrial organization field. The focus of this research has been how barriers to start-ups, strategic R&D, strategic collaboration, and other factors affect innovation and growth (Laffont and Tirole 1993; Acemoglu et al. 2003; Durnev et al. 2004; Aghion et al. 2004, 2006; Howitt 2007).

[31] See also Eliasson's (1991, 1996) micro-to-macro simulation model.

apply knowledge. However, according to Cooper's (1964) analysis based on case studies, when small firms undertake R&D, they manage it more efficiently than large firms. He suggests two major explanations: (i) smaller firms have an advantage in exploiting employees' abilities and (ii) there are different attitudes as well as more direct communication among R&D personnel in small firms. Acs and Audretsch (1987, 1990), drawing on more extensive data, concluded that even though larger firms accounted for the bulk of R&D investment, smaller ones were significantly more innovative in certain industries, such as computers and machine tools, while the reverse was true in the automotive industry. For manufacturing as a whole, the rate of innovation was significantly higher in smaller firms. Similar findings were presented by Baldwin and Johnson (1999) for electronics, instrumentation, medical equipment, steel, and biotechnology. Other studies show that smaller firms are more skilled at producing radically new products. Based on both a theoretical model and an empirical analysis, Michelacci (2003) shows that relatively weak commercialization of research can be explained by too few entrepreneurs.[32]

Regarding the importance of new and smaller firms for economic development, a number of empirical analyses have also found a positive relationship between small businesses and growth when other factors such as investment, employment, R&D, and internationalization are taken into account. Already in the early 1990s, Levine and Renelt (1992) argued that there was a strong positive relationship between the share of small businesses in an economy and economic growth.[33]

Haltiwanger et al. (2013) show that it is young firms, rather than small ones, that create a disproportionately large number of jobs. Controlling for age, they find that there is no longer any relationship between size and job creation. This has major implications for policy: job creation should be supported by targeting young firms rather than small firms. If the latter are old, they should not be expected to create many jobs. Young firms with superior capabilities and routines move "up" in terms of size and performance, while young ones in which inferior capabilities are discovered are more likely to decline and exit from the market (Huber et al. 2017). Indeed, while the majority of new firms will fold in their first five years, the remaining survivors will show considerable growth.

Later studies on both Sweden and the United States confirm these findings; here, the net contribution of jobs can be disproportionately attributed to young and small firms. On the other hand, productivity seems to have been dominated by larger firms. These differences are explained by the division of labor where low-educated workers can increasingly be found in small and medium-sized enterprises (SMEs) whereas the share of highly educated workers increases with the size of the company. Furthermore, productivity growth is determined in large part by the

[32] For the importance of entrepreneurs and small businesses for technological development, knowledge, and commercialization, see, for example, Cohen and Klepper (1996), Hopenhayn (1992), Audretsch (1995), Acs (1996), Klepper (1996, 2002), and Almeida (1999).

[33] Initially, an influx of smaller firms can lower productivity (Shane 2009). But at the same time, new firms contribute to increasing productivity in existing ones, with a certain time lag (Andersson et al. 2012; Fritsch and Mueller 2004, 2008).

composition of an industry; aggregate productivity growth will be higher if the share of industries where fast-growing and technology-intensive firms are particularly important. As a corollary, this finding indicates that labor mobility across firms of different sizes is important for the diffusion of knowledge.[34] At the same time, the probability of survival is lowest in these firms, especially in technology-intensive industries (Audretsch 1995; Parastuty 2018; Braunerhjelm and Halldin 2022). An influx of new firms and the testing of new ideas—but also their exclusion—is nevertheless a critically important component of dynamic economies.[35]

To establish a causal relationship between the entry of new firms and aggregate growth implies further difficulties in tracing how different variables interact and whether any actual impact on growth can be identified. However, all growth models emphasize the role of innovation for growth and given that small, young, and new firms contribute a disproportionate share of innovation, entrepreneurial ventures should have either a direct or indirect effect on growth. Several studies also report a correlation between entrepreneurship and growth, which seems to have been reinforced over time (Thurik 1999; Acs et al. 2004; Salgado-Banda 2005; Block et al. 2009; Braunerhjelm et al. 2010; Galindo and Méndez 2014; Urbano et al. 2019). Klapper et al. (2010) note that entrepreneurship is a necessary condition for a dynamic market and that it leads to both tougher competition and greater growth.

Based on an endogenous growth model that includes entry and exit of firms, Akcigit and Kerr (2018) demonstrate the impact that different types of innovations (explorative versus exploitative) have on economic growth. The classification of innovation strategies on explorative and exploitative paths was suggested by March (1991). The former refers to innovation having a more general scope of search whereas exploitative innovation implies prioritizing search depth, i.e., improvement of current products, services, and processes. According to Tushman and Smith (2002), there is a link between these and previous concepts where exploitative innovations can, to a greater extent, be associated with process innovation. In Akcigit and Kerr's model firms invest in explorative R&D to acquire new product lines and in exploitative R&D to improve their existing product lines. They show that explorative R&D does not correspond as strongly with firm size as exploitative R&D, suggesting that smaller and younger firms are important for the latter type of innovations. They also find some empirical evidence that new firm entry together with SMEs has relatively higher growth spillover effects.

[34] See Davis et al. (1996), van Stel and Storey (2004), Baptista et al. (2008), and van Stel and Suddle (2008). Haltiwanger et al. (2013) present an analysis for the U.S., which is replicated for Sweden by Heyman et al. (2019).

[35] Even though smaller firms generally grow faster than larger ones, the prevailing view since the early 1970s that SMEs accounted for the major share of employment growth has been somewhat modified and more emphasis is placed on young firms. Gibrat's law—which states that firms grow just as fast regardless of size—has been rejected in a series of studies; see Almus and Nerlinger (2000) for a general overview, and Heshmati (2001) and Daunfeldt and Elert (2013) for the Swedish case.

At the regional level—where the analysis is facilitated by the fact that the formal institutions are the same—there are a large number of studies concluding that entrepreneurship and knowledge levels both contribute strongly to higher growth and prosperity.[36] Several studies of U.S. states show that entrepreneurship (approximated by inflows and outflows to the market) has a positive effect on productivity and employment. In Europe, similar results have been found, for example, in Spain and Germany (Audretsch and Keilbach 2005; Habersetzer et al. 2021). The results have been interpreted as evidence that international convergence towards more entrepreneurship-led growth is underway, despite differences in institutions and regulations. However, there are still significant variations between countries.

Given the role attributed to new, young, and small firms in the above-mentioned studies, the recent decline reported in entrepreneurship in several countries is reason for concern (Hathaway and Litan 2014; Decker et al. 2017; Naude 2019; Salgado 2020). This seems to be a trend in most developed countries, Sweden being an exception. According to Heyman et al. (2019), this is due to the reforms introduced in Sweden since the 1980s, in particular in the aftermath of the severe crisis in the early 1990s. This is consistent with new and young firms having played a prominent role in job creation during the period, spurred by labor market reforms such as permitting staffing agencies, the allowance of temporary contracts, informally coordinated wage negotiations, and the Industry Agreement adopted in 1997 (see Chap. 6).

Simultaneously, product markets were deregulated (transportation, education, healthcare, etc.) and a new competition act in 1993 replaced the one from 1925, while the lifting of all foreign exchange controls exposed Swedish firm owners to international competition. As a result, Sweden experienced the highest labor productivity growth rate among the OECD countries between 1995 and 2011 paired with improved allocative efficiency and firm-level productivity as the forces of creative destruction were unleashed. This was a huge step away from the interventionist policies pursued in the 1970s and 1980s, an era characterized by lagging productivity and decreased efficiency.

2.4 In Sum

New theoretical and empirical research within the evolutionary approach that we consider to be the most promising shows how a number of institutional factors interact to promote knowledge dissemination and entrepreneurship, thereby paving the way for important innovations. Within this approach, the challenge is much more complex compared to the traditional knowledge-driven growth model, where policy

[36] See, for example, Reynolds (1999), Audretsch and Fritsch (2002), Callejon and Segarra (1999), Glaeser et al. (1992), Audretsch et al. (2006), Braunerhjelm and Borgman (2004), Feldman (2014), Fritsch and Wyrwich (2017), and Del Del Monte et al. (2022). See Braunerhjelm (2008, 2011) for overviews of the earlier literature.

implications tend to be limited to subsidies or tax breaks for R&D, and measures to expand and prolong formal education. The difference in policy conclusions compared with those derived from endogenous growth models is straightforward: If knowledge and entrepreneurial abilities are decentralized and spread across a large number of actors, policy should be more general and ensure that the measures implemented cover everyone in a non-discriminatory manner and embrace several policy areas. The government should thus refrain from engaging in active "industrial" policies by identifying certain sectors or technological niches.

In the next chapter, we will take a closer, more concrete look at these factors and analyze how their design affects innovation activities.

Appendix: Measuring Entrepreneurship

Economists have often chosen to measure the degree of entrepreneurship in a country or region as the share of total employment constituted by the self-employed.[37] This is a crude simplification because the definition of "entrepreneur" as a self-employed worker fails to capture all facets of entrepreneurship. In addition, a variety of reasons may lie behind the choice to start one's own business. This is shown in Table 2.2, which presents various motives for entrepreneurship. The term "self-employed" includes both those who are sole proprietors and those who run their business as a limited liability firm.

Motivations for becoming a self-employed person can include the prospect of a better life or realizing the full entrepreneurial potential of an idea. Often, however, self-employment is a way of circumventing restrictive regulations and obstacles within the company where a person works. Alternatively, the labor market may be too regulated for employees. A third—less agreeable—reason is that self-employment can increase opportunities for rent seeking and improper tax evasion.

The prevailing conceptual confusion regarding entrepreneurship, where completely different kinds of entrepreneurs are lumped together, sometimes gives inconsistent research results and policy recommendations. According to Schumpeter's (1934) definition—the one to which we adhere—most new businesspeople and self-employed are *not* entrepreneurs, as they lack the ambition to be innovative or growth-oriented.[38] Most self-employed people in Sweden do not have and will never have a single external employee. It is thus important to distinguish between self-employed people as a group and a small number of—often fast-growing—firms where entrepreneurship is more prominent.[39] The latter group accounts for a disproportionately high share of restructuring and job creation in the

[37] Carree and Thurik (2010) and Wennekers and Thurik (1999).

[38] This is discussed in detail in Henrekson and Sanandaji (2020).

[39] High taxes can, for example, lead to more self-employment, if taxes are also high on the alternative (employment) and if self-employed people can more easily avoid taxes (Engström and Holmlund 2009; Hurst et al. 2014). Countries with high taxes do not have fewer self-employed

Table 2.2 Entrepreneurial and non-entrepreneurial motives for self-employment

	Entrepreneurial	Non-entrepreneurial
First best	Pursue a business opportunity most suitably pursued in a new firm.	Seek independence, a certain lifestyle, etc. Local service production; working in networks in temporary projects.
Second best	Inferior management by current employer bars efficient intrapreneurship. Mechanism to escape effects of discrimination or lack of social capital for marginal groups.	Safety valve to circumvent excessive labor-market regulations. Means to achieve flexibility hindered by other regulations. Mechanism to escape effects of discrimination or lack of social capital for marginal groups. Necessity self-employment.
Unproductive/ predatory	Set up a business to exploit subsidies and tax breaks rather than creating value for customers. Fraud. Looting, warfare, etc.	Transform consumption expenditure into tax-deductible business costs. Fraudulence, where revenue is partly unreported, etc.

Note: The table lists the major motives behind self-employment. Intermediate cases also exist. For instance, entrepreneurial self-employment may be partially pursued in search of independence. "First best" means that the choices are both privately and socially optimal. "Second best" implies that the optimal choice is blocked by regulations or some other institutional barrier, but self-employment may still more or less offset the negative effects that arise
Source: Developed further from Henrekson (2007)

economy.[40] The category of firms with ambition and potential for innovation and rapid growth is significantly smaller than the broad group of entrepreneurs and differs markedly from the majority.

It is sometimes claimed that these are all the same kind of firm, and that it is only chance that determines who manages to grow. Of course, there is a large gray area here, for example firms that originally had no ambition to grow but which changed their targets when their growth unexpectedly took off. However, we believe that there are also *ex ante* fundamental differences between different types of entrepreneurs. The overwhelming majority of self-employed people in Sweden state that they do not define themselves as entrepreneurs based on ambitions to grow, a large number of employees, or innovative ideas. There are other important differences between these separate business owner categories. While self-employed people are similar to wage earners in terms of education, entrepreneurs in the United States who have received venture capital funding are 20 times more likely than the average American to have a doctorate (Bengtsson and Hsu 2010).

We dare say that there is a strong international trend among researchers and experts towards using the terms entrepreneur, entrepreneurial activity, and

people but tend to have fewer exceptionally successful entrepreneurs (Henrekson and Sanandaji 2011, 2014).

[40] Henrekson and Johansson (2010), Hölzl (2010), and Criscuolo et al. (2017).

entrepreneurship for people, actions, and phenomena where the intention is to create valuable benefits through (growth-oriented) economic activity based on the identification and/or creation of new products, processes, and markets. Due to its complexity, this concept is impossible to capture in a single indicator. Those who wish to delve into the problems of measurement are referred to OECD (2008), which offers 18 different indicators of the degree of entrepreneurial activity.

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Chapter 3
Promoting Entrepreneurship and Innovation: The Institutional Framework

In the previous chapters, we have consistently emphasized the importance of entrepreneurship for innovation, renewal, growth, and job creation. However, these beneficial forces do not automatically reflect the individual entrepreneur's aims. Even if factors such as social recognition and testing one's ideas influence the desire to become an entrepreneur, the pursuit of profit plays a part that cannot be ignored. When entrepreneurs search for and attempt to create entrepreneurial rents, they are largely governed by the incentives—the reward structure—that prevail in the environment in which they pursue their entrepreneurship. These incentives are essentially determined by the institutional setup of the economic system, which is sometimes called "the rules of the game." Good institutions or favorable rules are prerequisites for encouraging innovation and entrepreneurship and for channeling entrepreneurial effort towards socially productive venturing.

In this chapter, we will identify and analyze the most important institutions and contextual factors involved when discussing the design of policies to promote innovation and productive entrepreneurship in both new and incumbent firms.

3.1 The Rule of Law and Protection of Property Rights

A market economy, based on voluntary transactions and decentralized decision-making with the entrepreneur as its *primus motor*, works best in systems with well-functioning institutions in which political freedom thrives. The entrepreneur collects and exploits decentralized information; society's institutions in the broadest sense govern accessibility and opportunities to assimilate, develop, and exploit knowledge. Studies building further on Nobel Laureate Douglass North's research (North 1987, 1990) also find strong evidence for the notion that certain basic institutional arrangements are vital to economic growth, of which the rule of law—*de facto*, not only *de jure*—and well-defined and secure property rights seem to be the most

P. Braunerhjelm, M. Henrekson, *Unleashing Society's Innovative Capacity*,
International Studies in Entrepreneurship 55,
https://doi.org/10.1007/978-3-031-42756-5_3

important.[1] It is also crucial that the state treats citizens equally and impartially, and does not engage in "clientelism," that is, favoring particular groups. The latter easily leads to corruption, which greatly distorts the driving forces of entrepreneurship (Rothstein 2011).

The lack of well-defined property rights may partly explain weak economic growth in the world's poorest countries (de Soto 2000). When properties cannot be mortgaged because they were built without a permit or a legal title, the impact on investment is palpable. Insecure and poorly defined property rights thus undermine the use of assets in prosperity-enhancing productive activities. Kleptocracy can then become a significant element of government activities. In a nation governed by the rule of law, fewer resources are wasted on conflicts because both citizens and authorities are subject to the law, and the law in turn is rooted in public consciousness. The state is impartial, and enforcement of the law—as well as the imposition of sanctions for violations—is guaranteed by independent courts (Bingham 2011).[2]

Private ownership is thus central to productive entrepreneurship. By this we mean something more than simply the right to dispose of an asset and to compensation in the event of expropriation. Also crucial are the right to exploit and develop the asset, the right to the return that the asset can generate, the right to transfer all or part of these rights through sale, gift, or rent, and protection against infringements by the government or individuals.

Particularly important in a knowledge-based and innovation-driven economy are the right to ideas and a framework that enables individuals and businesses to transform ideas into new and growing firms. Examples include intellectual property law and patent law. If the protection of property rights is strong, investors can count on retaining the profits they expect from entrepreneurial activities. If legal certainty is high and the legal system is credible, it will be much safer for them to engage in long-term, often risky, projects, as the basic "rules of the game" can be expected to remain stable.

Likewise, risks are lower when entering into agreements and performing transactions with other parties. In a society governed by law with well-defined property rights, there is more room for division of labor. The opportunities are then greatly enhanced for individuals and organizations to acquire specialized skills and form combinations or trade to take advantage of the skills and capabilities of others in addition to their own. Such an environment provides favorable opportunities for entrepreneurs to exploit their ideas by gaining access to external capital and the necessary skills through contracts.

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[1] Rodrik et al. (2004) argue that certain aspects of institutional quality—especially well-defined and secure private property rights—are more important for growth than factors such as trade and geography, e.g., not being landlocked and having access to fertile arable land. See also Acemoglu and Robinson (2012).

[2] However, Shleifer (2005) notes that even seemingly impartial courts are subject to different kinds of pressure from a variety of groups.

3.2 National Innovation Systems

In the debate and research on innovations and innovation-promoting institutions, the so-called national innovation systems occupy a central place. A common definition of such a system is the following (Metcalfe 1995, p. 38):

> …that set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artefacts which define new technologies. The element of nationality follows not only from the domain of technology policy but from elements of shared language and culture which bind the system together, and from the national focus of other policies, laws and regulations which condition the innovative environment.

Similar definitions are suggested by other leading scholars in the field. For example, Patel and Pavitt (1994, p. 12) define a national innovation system as

> the national institutions, their incentive structures and their competencies, that determine the rate and direction of technological learning (or the volume and composition of change generating activities) in a country.

Innovation systems that are organized appropriately have the potential to serve as powerful engines of progress. On the other hand, if poorly organized and fragmented, they may seriously inhibit the process of innovation (Freeman 1987). Metcalfe (2022) interprets innovation systems as a way of organizing labor across universities and industries while testing facilities in search of innovations. As Freeman does, he stresses the need for connectivity, but also structure, between these actors to attain the objectives of new knowledge and innovative outcomes.

Volumes of research and numerous inquiries have also been conducted exploring how such systems should be designed.[3] In an overview of research on innovation systems, however, Carlsson (2007) concludes that most of this activity concerns inventions rather than innovation, and a mere two to three percent of the studies Carlsson identifies involve entrepreneurship.[4] Policy issues are addressed in about a quarter of these works, but they are almost exclusively focused on technology policy, i.e., technological infrastructure, R&D, patents, private versus public R&D, and collaborations between public and private actors. Incentive structures, which vary between actors in an innovations system (e.g., between research institutes and in

[3] For Sweden, see, for example, Gergils (2006) and Bager-Sjögren (2011). For an analysis of strength and weaknesses in a particular part (biorefineries) of Swedish innovation systems, see Hellsmark et al. (2016). See especially Lundvall (1992) and Edquist (2005) for an in-depth discussion of innovation systems. As pointed out by Carlsson (2007), these approaches are mainly descriptive, aggregated, and static—there is no room for dynamism. Magro and Wilson (2013) present a policy analysis of innovations systems. See Elert et al. (2019) for the European Union.

[4] We have not found any more recent evaluation analysis with a similar degree of detail. Jurickova et al. (2019) evaluate national innovations systems by studying how the number of researchers and R&D expenditure hae affected publication of scientific journal articles and applied patents during 2006–2016 in the European Union. They document a declining performance.

firms), are entirely overlooked and less than one percent of them concern the issue of finance.

Even more interesting is the fact that, in the extensive literature on innovation systems, the outcome of these initiatives is almost completely overlooked; less than three percent of the research into innovation systems examines success criteria (productivity, growth, innovation, patents, start-ups, etc.). From our perspective, the fact that the innovation system approach attempts to identify and analyze the mechanisms that cause existing and new knowledge to be transformed into economic growth, while it only to a minor extent includes incentive structures, is problematic in terms of its normative power. This shortcoming makes it practically impossible to analyze the incentives required for various actors and functions to work together to create the most value.

A good example of how an overly partial innovation system analysis can easily lead to erroneous conclusions is the introduction of soft loans for start-ups to stimulate innovation and entrepreneurship. Such loans are often a central component of a country's innovation policy, even though they normally have a dubious or even counterproductive effect (Lerner 2009; Dvoulety 2017; Svensson 2017). The reason is that the underlying analysis used to justify such a measure does not take into account the specific characteristics of entrepreneurial activity (we will return to these below). Without a detail-oriented and competent provider, there are obvious risks that systems in which one main element is soft government loans will develop into a system of subsidies, where various pressure groups (regional bodies, industry representatives, interest groups) compete against each other around the pork barrel. The result is often less than optimal, despite the good intentions. We have observed this phenomenon in the Swedish innovation system. There are numerous actors (e.g., Vinnova, ALMI, Industrifonden, the AP funds, and several regional funds) at the regional and national level which all provide loans, credit guarantees and investments in sizable amounts earmarked for the promotion of new firms and innovations.[5] Their assessed impact seems ambiguous. We need to better comprehend how these bodies interact, compete, and overlap as well as what overall impact they achieve.

It is thus unclear whether and how innovation systems, traditionally defined, lead to more innovation and higher growth. As Fig. 3.1 shows, it is also difficult to establish a simple positive macro-level relationship between aggregate innovation measures (here measured by the EU innovation index) and the economic growth rate. This observation is in line with Akcigit and Nicholas's (2019, p. 623) observation: "Yet it is perhaps surprising how difficult it has been to establish a robust empirical link between innovation and growth. To our knowledge, no paper has actually shown that innovation is related to U.S. economic growth over the long run."

For us, this suggests that the innovation system approach does not focus sufficiently on incentives and drivers for innovation and entrepreneurship. Hence, even though the literature on national innovation systems is purportedly influenced by the Schumpeterian tradition, the entrepreneur remains largely absent therein.

[5] Svensson (2017) and SOU 2020:59.

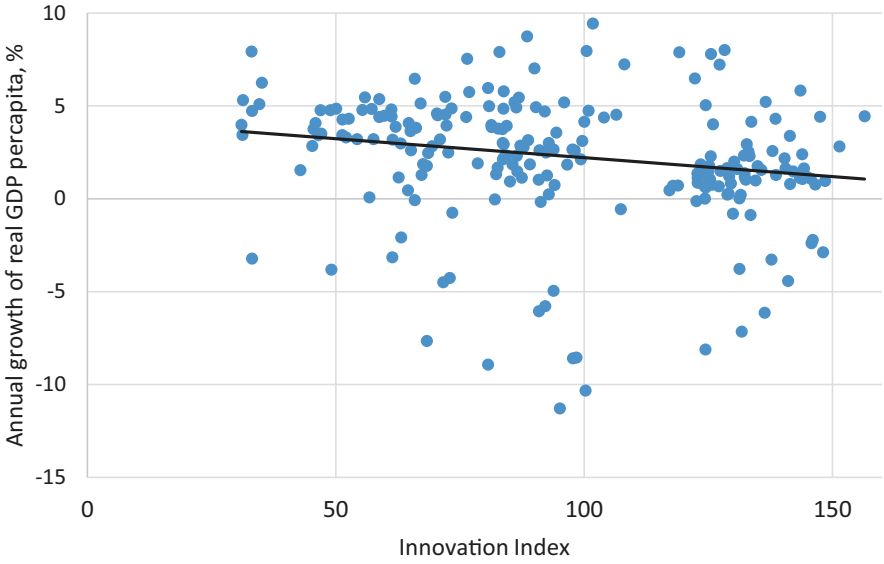

Fig. 3.1 The EU innovation index and annual GDP growth per capita, 2014–2021, all EU member countries. *Source*: European Commission (2021), OECD Statistics, and Braunerhjelm (2011).

3.3 Public Support for R&D

Support for firm R&D is not considered to be in breach of EU state aid rules, despite the fact that the EC Treaty prohibits general state aid for activities which, according to the Treaty, must be subject to free competition.[6] This is justified by the fact that R&D is considered central to achieving economic growth, and that there is reason to believe that the social return on R&D investment is greater than the private return. As long as support is non-discriminatory and potentially available for all firms, it is therefore considered compatible with state aid rules.

As shown in Table 3.1, there is significant public support for R&D in wealthy countries. This support can manifest in both direct and indirect form:

- Direct support for R&D activities engages targeted firms directly. A classic example is the 1960s U.S. lunar landing project, which in its final phase employed some 400,000 people, most of them in private firms. All OECD countries today use direct support.
- Indirect support is intended to stimulate the development of knowledge in firms in general. The individual firm determines the purpose of its R&D efforts with no intervention by the state or its agencies. Indirect subsidies are designed as tax

[6] Note that the state aid rules have largely been abolished since 2020 due to the COVID-19 crisis, followed by the war in Ukraine and the energy crisis. There is currently an ongoing debate on the design of future rules.

Table 3.1 Business enterprise R&D support (BERD) as a share of GDP in 27 countries 2020 (%)

	Directly financed BERD	Indirectly financed BERD	Total support for BERD	Business enterprise R&D (BERD)	Share of BERD financed by government
UK	0.148	0.312	0.460	1.25	36.8
Portugal	0.059	0.237	0.296	0.92	32.1
Turkey	0.077	0.126	0.202	0.71	28.5
France	0.130	0.291	0.421	1.56	27.0
Ireland	0.032	0.176	0.208	0.91	22.9
Norway	0.129	0.106	0.235	1.24	19.0
Hungary	0.192	0.038	0.230	1.23	18.7
Poland	0.118	0.029	0.147	0.87	16.9
Iceland	0.106	0.177	0.283	1.68	16.8
Netherlands	0.104	0.154	0.258	1.54	16.8
Austria	0.082	0.274	0.356	2.22	16.0
Italy	0.044	0.101	0.145	0.93	15.6
Spain	0.075	0.026	0.102	0.78	13.0
Belgium	0.091	0.228	0.319	2.53	12.6
Slovenia	0.112	0.082	0.195	1.57	12.4
Slovakia	0.017	0.043	0.060	0.49	12.3
Greece	0.052	0.029	0.081	0.69	11.7
USA	0.143	0.119	0.262	2.60	10.1
Czechia	0.082	0.037	0.119	1.21	9.9
South Korea	0.200	0.142	0.342	3.81	9.0
China	0.053	0.068	0.122	1.84	6.6
Sweden	0.110	0.029	0.139	2.55	5.5
Denmark	0.045	0.034	0.085	1.82	4.7
Japan	0.022	0.094	0.116	2.58	4.5
Finland	0.072	0.008	0.080	1.95	4.1
Germany	0.067	0	0.067	2.11	3.2
Switzerland	0.034	0	0.034	2.13	1.6
Median	0.082	0.094	0.195	1.56	12.6
Sweden's ranking	20	23	18	24	22

Note: Indirectly financed BERD consists of indirect government support through R&D tax incentives. Directly financed BERD: Iceland 2014, Switzerland 2019. Indirectly financed BERD: Finland 2014, Spain 2017, the U.S. 2019. Business enterprise R&D: Switzerland 2019. Countries are ordered based on the share of BERD financed by the government
Source: Eurostat and OECD

incentives, either through the granting of a deduction that exceeds the actual expenditure (Sweden had such a system in 1973–83) or as a tax rebate such as a reduced payroll tax on the salaries of R&D personnel (which Sweden has had

since 2014).[7] However, indirect support presupposes that the expenditure conforms to the R&D requirements set by the authorities, which in itself can affect its composition.

An overwhelming majority of OECD countries use indirect support for R&D in the form of tax incentives.[8] Of the 27 countries in Table 3.1, Sweden had the eighth most extensive direct subsidies as a share of GDP, but due to its low level of indirect subsidies, Sweden is well below the median for total R&D subsidies. At the same time, Sweden's business sector R&D as a share of GDP is the fourth highest in the world after South Korea, the United States, and Japan, which means that state support constitutes a relatively small part of the business sector's total R&D (just over five percent).

Hovdan et al. (2023) concluded in a recent survey article that both indirect and direct support to private R&D have positive input and output effects. According to the authors, the effect is somewhat larger for indirect support than for grants, which is confirmed in an econometric study for Belgium. However, they also stress that public support invariably leads to partial crowding-out as firms substitute state aid for their own R&D expenditures, thereby imposing a welfare loss on society as such. In addition, they argue that knowledge regarding how different policy instruments interact is necessary to avoid suboptimal policy designs.

In recent decades, a new kind of tax incentive has attracted increasing interest—the so-called patent boxes (alternatively called innovation boxes to underscore that these are not contingent upon granted or applied patents). This means that profits generated by patents, intellectual assets, or intellectual property rights are taxed at a considerably lower rate than corporate profits in general.

There exists no definitive evidence regarding the effect of patent boxes on innovation or economic outcomes. The effect, whether positive or negative, hinges on the design of the scheme. It was first used by some European countries as far back as the 1970s and has spread rapidly to several other countries in recent years. At present, 13 European countries, in addition to several regions, have adopted some form of patent boxes.[9] Their popularity seems to have levelled out after the OECD linked it to the Base Erosion and Profit Shifting (BEPS) initiative and imposed several restrictions setting limits on the level of intellectual property income eligible for preferential taxation.

Interpretations of the empirical evidence of how patent boxes affect location, innovation outcomes, and R&D investments are mixed. For instance, Gaessler et al. (2021) and Miller and Pope (2015) find negative effects, while Mohnen et al. (2017)

[7] Government Bill 2013/14:1, section 6.9.

[8] The number of OECD countries that use some form of tax incentive has increased sharply in recent decades; in 1995, it was only used in 12 OECD countries (OECD 2011, p. 15).

[9] These are Belgium, Cyprus, France, Hungary, Ireland, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovakia, and Spain (federal, Basque Country, and Navarra). Non-EU countries such as Andorra, San Marino, Switzerland, Turkey, and the United Kingdom have also implemented patent box regimes. *Source*: Bunn (2022).

and Bradley et al. (2021) see positive effects. Obviously, one must acknowledge the vast methodological difficulties in assessing the effects of R&D support (OECD 2011).

Overall, we argue that there are several reasons why governments should be restrictive in supporting private R&D. First, there is always the risk that government support will displace private expenditure, i.e., some of the government-financed spending would have occurred in any event. Second, in addition to crowding-out effects, R&D support, in particular tax incentives, always creates distortions in how resources are allocated. These can be costly since:

(i) We can expect firms to become increasingly skilled at defining expenditure as R&D investment eligible for subsidies, which increases costs.[10]
(ii) Those industries that are R&D-intensive benefit at the expense of other industries. More specifically, many service industries will be disadvantaged, even though these industries are central to wealth and job creation.[11]
(iii) The tax revenue that the government foregoes through these incentives must be considered in the total assessment.[12]

The government can use additional policy measures to promote innovation, one of these is public procurement. In Sweden, this amounted to SEK 819 billion in 2020 (for the state, municipality, and county councils in total), which was more than one-sixth of GDP (Swedish Competition Authority 2020). Given its size, and the fact that public procurement can be an important part of the innovation process, there is a good reason to consider how innovation can be integrated into the procurement process and how smaller businesses can be involved.

The United States pioneered a system targeting smaller firms—Small Business Innovation Research, SBIR—in which innovation-procuring agencies were obligated to allocate a certain proportion of their funds to smaller firms. Other countries, including the Netherlands and the United Kingdom, have introduced similar systems. This model is based on a two-step procedure, where initial public financing is aimed at several potential innovators (firms), and the one that succeeds in producing the most promising prototype receives significantly more financing in the second step. In the United States, evaluation of the SBIR policy points to positive results for firm R&D, R&D collaborations, firm growth, and start-ups.[13]

[10] Kärnä et al. (2020) and Svensson (2024).

[11] Bhidé (2008) argues convincingly, for example, that the so-called non-codifiable/non-scientific knowledge is of extraordinary importance for transforming knowledge into economic value. Thus, it is often not a result of regular R&D, and it is even less often patentable.

[12] For example, Martinsson (2012) estimates that implementing the Dutch innovation box system in Sweden would immediately cost SEK 5 billion per year in reduced tax revenues. In the long run, the cost would be even higher once companies adapt to the system. Wilson (2009) studies the effects of U.S. state R&D subsidies to businesses. He finds that these subsidies are a zero-sum game; activities are relocated as a result of the subsidies, but the aggregate effect at the national level is zero. See also OECD (2011).

[13] See OECD (2010, pp. 106–107) and Link and Scott (2010).

More generally, public procurement to stimulate innovations is still unevenly adopted across countries and the outcomes at the country level have not yet been analyzed nor understood in depth. Uyarra et al. (2023) argue that in order to become an efficient instrument in enhancing innovation, procurement initiatives need to be integrated into a national and sectoral context and aligned with other policy initiatives.

3.4 National Systems of Entrepreneurship/Entrepreneurial Ecosystems

The essence of national systems of entrepreneurship (NSE) is defined by Acs et al. (2014, p. 479) as

> the dynamic, institutionally embedded interaction between entrepreneurial attitudes, activities, and aspirations, by individuals, which drives the allocation of resources through the creation and operation of new ventures.

The insight that a more efficient allocation of resources, and the concomitant restructuring of an economy, are driven by entrepreneurs is profound and important. It clearly alludes to Schumpeter's view on the role of entrepreneurship and creative destruction but adds rigor and stringency.

Thus, the NSE aims at integrating the country-specific context in which entrepreneurs (and potential entrepreneurs) are embedded with decisions taken by individuals identifying an entrepreneurial opportunity, where the costs and benefits of such decisions are considered (Acs et al. 2016). The NSE is clearly associated with previous research focusing on the existence of entrepreneurial opportunities (Acs et al. 2009). However, it differs from previous research by stressing reallocation and structural change at a more aggregate level. This is a definitive step forward in understanding the dynamics of innovation.

In the NSE framework, bottlenecks, or deficiencies, are identified through cross-country comparisons. Even though lessons can be learned from other countries, interdependencies and links across policy areas and other institutional characteristics tend to center on a certain country-specific context. As Acs et al. (2016) note, identifying these relationships and understanding their implications should guide the design of an NSE. Obviously, such interactions consist of a complex web, rendering it an intricate and context-dependent task to design the appropriate policy measures required to strengthen the NSE (Autio and Levie 2015).

Another related and largely overlapping concept under which one can frame the relationship between the individual opportunity and the context within which it operates concerns the entrepreneurial ecosystem approach.[14] According to Stam and Van de Ven (2021), this entails a multitude of diverse and interrelated organizations

[14] Malerba and McKelvey (2020) attempt to integrate these two strands in the literature more seamlessly into a coherent framework.

and institutions that co-exist and co-evolve. The actors either compete or cooperate, depending on their specific characteristics and the circumstances under which they operate. In a well-designed ecosystem, these organizations, and the ways in which they interact, are claimed to contribute to a dynamic but complex economic environment. In such ecosystems, the different roles played by agencies and institutions are emphasized. Stam and Van de Ven also stress how endowments and access to resources are dependent on both the formal and informal institutional setup.

While these modified system versions offer valuable insights and add dynamic elements lacking in previous versions, we would argue that critically important variables that determine individual behavior, and the outcome at the aggregate level, are absent. In particular, countries are characterized by their specific formal and informal prerequisites and bottlenecks, generating direct and indirect effects, which should be analyzed within their specific context (Audretsch 2015). One of a policymaker's most powerful instruments, taxes, will be discussed in Chap. 5 as one example. In addition, some of the institutional variables used to determine the functioning of an NSE, such as technology absorption, gender equality, R&D spending, and depth of capital markets, seem to be outcomes resulting from the structure of the NSE rather than institutional determinants (Braunerhjelm and Henrekson 2016, p. 101).

We argue that a detailed analysis of each individual economy is required to design appropriate policies. Moreover, importing "best practices" from other countries and making them work under local circumstances is a challenging task, although lessons can certainly be learned from them. This is also highlighted in the critique of national innovation systems (NIS) by NSE proponents. For instance, Autio et al. (2014) argue that the NIS literature studies entrepreneurial activities and performance based on the implicit assumption that observed differences are the outcome of institutional influences operating in the same way across countries. However, in fact, they feature a range of different formal and informal institutional settings, different cultures, norms and values, and attitudes towards entrepreneurship that affect entrepreneurial performance. Hence, even though the NSE approach provides valuable insights on how countries deviate in terms of entrepreneurial effort and orientation from a cross-country average measure taking institutions into account, an appropriate policy design requires additional disaggregation and attention to detail.

3.5 Growth at the Firm Level: The Collaborative Innovation Bloc

As we have already noted, it is not enough to create new knowledge, as much new knowledge is not in itself economically valuable. The economy therefore needs "knowledge filters" that distinguish economically relevant knowledge and convert it into economic activity (Carlsson et al. 2009). Moreover, the entrepreneurial process

that causes the market order to evolve is inherently collaborative: To pursue their innovative projects, entrepreneurs engage in cooperation with a number of actors, whose complementary skills greatly increase the probability that an innovation-based venture will be successful. The actors are drawn from several skill pools, which together form what we call the *collaborative innovation bloc*. Thus, we recognize that entrepreneurship is crucial, but other actors are as well: early-stage financiers, key personnel, inventors, knowledgeable and demanding customers, and later-stage financiers. Successful entrepreneurship that generates rapid growth is a function of how well these actors acquire and apply their skills. The opportunities and impetus to do this are largely determined by the institutional framework, or what in everyday speech we call "the rules of the game."

Figure 3.2 schematically captures the phases in which various actors enter the innovation and commercialization process. In the initial stage, the entrepreneur identifies potential profit opportunities; knowledgeable customers often play an important part in this process. Inventors are engaged to solve technical problems, but as the business grows, innovators and key personnel, especially experienced managers but also R&D specialists, are needed to lead more comprehensive development projects. Sometimes the process can be initiated by inventors, whose ideas are then further developed by innovators and entrepreneurs.

The early commercialization phase mainly involves entrepreneurs (possibly also inventors) and, to a lesser extent, other types of skilled labor. In the scale-up phase, professional managers, salespeople, and R&D specialists are activated and skilled labor is then essential. Founders, family and friends, business angels, and venture capital firms finance development in the early stages, while actors in the secondary market, later-stage financiers, enter the picture later. Figure 3.2 is obviously a simplification—for example, experienced managers and later-stage financiers can be involved much earlier, and different actors can work in parallel with each other, overlapping or lagging each other in different phases. The same person can

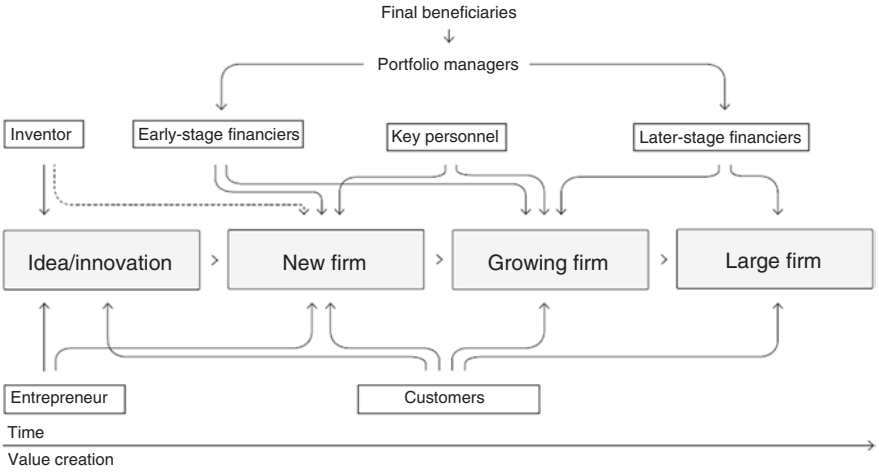

Fig. 3.2 The collaborative innovation bloc. *Source*: Elert and Henrekson (2019, 2020)

sometimes fulfill more than one function, for example that of both an entrepreneur and a manager of the firm when it reaches a more mature stage.[15]

Later-stage financiers potentially fall under a number of different categories: wealthy individuals/families, closed-end investment funds, stock-market activists, institutional investors, buyout firms, stock-picking individual savers, and competitors aiming to take over the firm's operations through a so-called trade sale. Later-stage financiers have similar skills and carry out similar functions as venture capitalists, in terms of financing and the transmission of knowledge and skills, but this selection occurs at a later stage when entrepreneurs and venture capitalists wish to exit their investments. Hence, these actors evaluate firm performance and assess whether there are potential profits in assuming control, replacing the entrepreneur and top management in the event of sustained inferior performance. An important distinction among later-stage financiers is between those who take an active part in a company in which they invest or wholly control its governance, and passive investors, such as pension funds and open-ended stock-market funds as well as physical persons who own listed shares directly.

A trade sale—selling the firm to another one, usually a firm in the same industry—is arguably the most common way of exiting. In this case, full control over the firm is handed over to the buyer, and the entrepreneur/founder leaves the business with substantial financial assets. These assets make it possible to start new firms or act as a business angel or venture capitalist. A trade sale is likely an indication that some crucial skill is lacking in the firm in its existing form, making an independent scale-up of its operations unfeasible.

Consumers are the ultimate arbiters of an innovation's success (as such, they make the final selection), yet they seldom appear in studies of innovation. The omission is regrettable—the willingness and ability of individual consumers to dare to purchase and effectively use new products, and the openness of intermediate producers to new know-how and products, may be crucial drivers of innovation. Usually, the role of the alert, competent, and interested customer is essential to the supply of innovative products. Especially in the early stages, demanding collaborators function as particularly important sources of information regarding consumer needs and preferences, provided that they are representative of a large group of customers. Sometimes they even act as strategic partners who take an active part in the development and commercialization of products, thus having a decisive influence on the development and design of new products (Bhidé 2008).

In Fig. 3.3, we present a more detailed version of the collaborative innovation bloc. Here we observe the vital interplay between final beneficiaries and actors in the early- and later-stage markets of financing, as well as the main categories of key personnel and customers. For an innovation to have a high probability of reaching its full potential, the collaborative innovation bloc must acquire sufficient size and depth to reach critical mass, i.e., it must have sufficiently large pools of each skill

[15] The view of collaboration between actors described in Fig. 3.2 was originally developed by Gunnar Eliasson, e.g., Eliasson (1996). See also Johansson (2010) and Elert and Henrekson (2019).

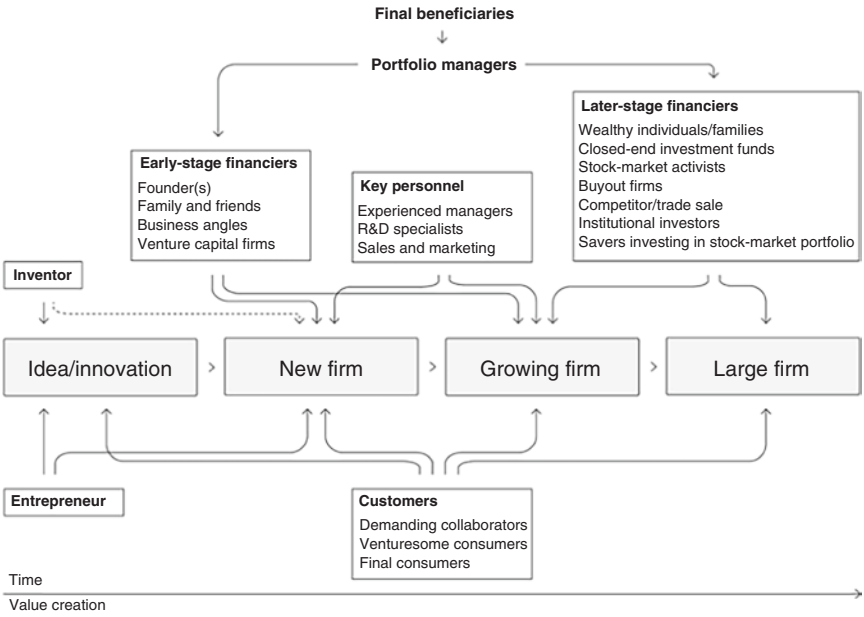

Fig. 3.3 The collaborative innovation bloc—a detailed overview. *Source*: Elert et al. (2019)

from which actors can be recruited to fulfill each function in the collaborative team. A lack of requisite skills or an important actor category may significantly impede or even prevent collaborations from taking place.

As we have stated, part of what it means to be an entrepreneur is to be able to gather skills and productively combine them. This is where economic policy and the institutional framework underpinning the innovation bloc come into play. Whether an innovation bloc can emerge spontaneously, because of the actions of entrepreneurs and other actors, depends on conditions faced by the actors who could potentially comprise the collaborative innovation bloc. Some institutions, such as the rule of law and the protection of private property rights, may be relevant for all actors in the innovation bloc, while others are more specific, e.g., the removal of bottlenecks that hinder the emergence of a sufficient mass and variety of one or several skills in the structure.

3.6 Financing Expansion

During its life cycle, a business is dependent on different sources of finance. In Fig. 3.4, the main phases of a firm's development are described schematically. Above all, the figure highlights how best to resolve the specific incentive problems that exist when the entrepreneur/founder lacks the means to finance the company's

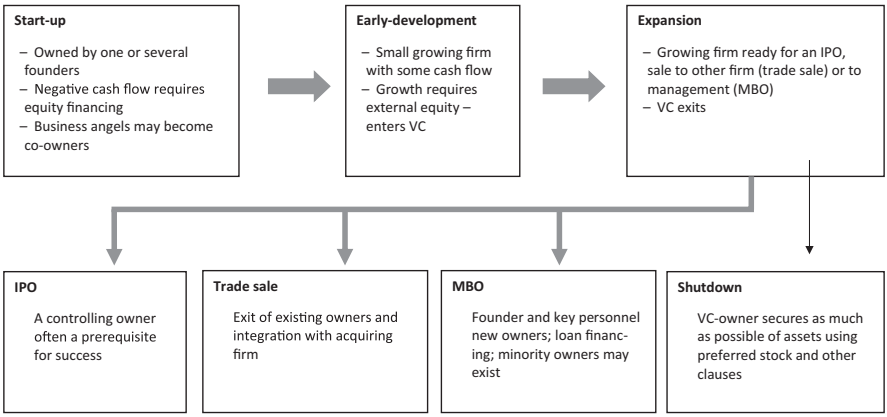

Fig. 3.4 Central phases in the evolution of an entrepreneurial firm. *Source*: Henrekson and Sanandaji (2016)

development alone. Silicon Valley is the region that has come the furthest in developing contracts and formal and informal institutions to deal with these incentive problems (Ohlsson 2019). In the following, we will therefore draw some inspiration from this area.

For a start-up firm based on a unique and untested idea, the risks are apparent and considerable. Even in cases where the business is a success, some time usually elapses before its products reach the market, and even more to achieve a positive cash flow.

The shared risk is seldom calculable, either by the founders or by external parties, and is thus a matter of genuine uncertainty. This is a common and particularly important problem in entrepreneurial venturing. When investing in public firms, the investor often uses historical experience as a basis for an assessment of expected outcomes. When investing in a new, innovative firm, however, the investor cannot possibly predict the outcome—not even its probability distribution—before the product is fully developed and introduced in the marketplace. Before the product exists in physical form, it is impossible to predict what technical problems will arise, or whether a market even exists. The return on investment in start-ups has an exceptionally high variance, with a very high risk that the entire investment will be lost.[16]

The fundamental difficulty in creating the right incentives is that it is impossible to establish agreements that cover all eventualities. When the parties cannot draft contracts that are detailed enough to cover all possible outcomes, it is important that

[16] Three-quarters of VC-backed entrepreneurs in the United States receive zero returns on exit (Hall and Woodward 2010)—a risk profile which, in combination with low liquidity and difficulty in diversifying, means that requirements for private return are high. It is also noteworthy that the rate of return on U.S. VC investments declined substantially for funds raised in the 2000s (Kaplan and Sensoy 2015).

ownership and control in different situations are allocated in advance between those involved. Innovative entrepreneurship is an activity where the uncertainty is particularly great, where the value of assets is relationship-specific, and where parties with widely differing interests must cooperate. Therefore, the need is particularly great for contracts in which ownership and control are conditioned on unpredictable future outcomes.

Due to transaction costs and non-calculable risks, equity financing is often necessary. Debt financing is problematic, as firms have neither fixed assets to pledge nor a cash flow to borrow against. This means that banks have little interest in financing risky entrepreneurial firms. The problem of asymmetric information about a firm's potential, and the risk of excessive optimism among its entrepreneurs, also make loan financing more difficult. At the same time, few founders have enough capital to finance the company themselves up to the point where the cash flow is positive or the level of uncertainty has diminished sufficiently to enable loan financing. Many new firms may therefore disappear prematurely due to a lack of capital for development and expansion. One attempt to solve this problem can be soft loan*s* from public bodies.

However, providing access to soft financing, including public risk capital that spurs entrepreneurial success, is a difficult task and the outcome is often disappointing.[17] Lerner (2020) claims that such policies may be successful if conditioned on factors such as independent governance structures, matching funds, and a careful evaluation of effects. Such elaborate policy measures are rare. One reason is that politicians may be tempted, for political reasons, to set up agencies on a regional and industry basis with the authority to issue such loans—something that entails a large number of different and unmanageable conditions, often without properly considered long-term plans.[18] The most successful international experience to learn from may be that of Israel.[19]

Those external financiers who are usually most suitable for providing equity for the first seed phase are the so-called angel investors. These are wealthy individuals with their own experience as entrepreneurs or business leaders, and who have the time, commitment, and capital to invest in promising new business ideas. Through the angel's own network, the company often also has access to additional capital and expertise.[20]

In the next phase of a company's development, there is more information about the viability of the business concept, which lowers the level of uncertainty. In this situation, the company also becomes interesting to those providing venture capital (VC). Like angel investors, VC firms are not only passive financiers, but also

[17] See Lerner (2009) for a survey of international research. For a Swedish overview, see Svensson (2011), Daunfeldt et al. (2014), and Sandström et al. (2019).

[18] IVA (2011).

[19] See Avnimelech and Teubal (2006) for a description of the structure and evolution of the Israeli support system.

[20] For a more detailed discussion of small business financing by angel investors and their other contributions, see Landström (2007), Kerr et al. (2010), and Henrekson and Sanandaji (2018).

contribute to the development of new businesses and the commercialization of their ideas.[21]

3.6.1 Stock Options Help to Build Firms

The problem of asymmetric information is best remedied by the investor entering as a partner in the firm and thus gaining more insight into its workings. Otherwise, the investor will initially be reluctant to invest a large amount, as the information asymmetry cannot be significantly reduced until they have become a partner. Over time, however, uncertainty about the firm's technical and commercial potential decreases, as experience is gained and more information becomes available. Agreements have therefore been developed in the market where external investors pay out financial support in several rounds (staged financing), so that there is enough, but just enough, funding available for the business to reach a certain milestone in its development. This creates many opportunities to evaluate the results at each stage—as well as to exit the investment if the firm's performance fails to meet investor expectations.

Even if external financiers contribute a number of key competencies, the entrepreneur or founder is normally crucial to the firm's development for several years. Still, of course, the business can arrive at a point at which it would develop better under new management, for example if the founder's strength is in the start-up phase itself but he or she is less suited to leading a growing firm. External financiers will want a substantial ownership share in order to receive a substantial part of the value they expect to be created, but the ownership share should not be so large that the entrepreneur has insufficient incentive to contribute their unique expertise. At the same time, external investors will want an opportunity to replace the founder and/or close down the firm to minimize losses if predictions about its success are not sufficiently positive.

Normally, neither the entrepreneur nor his or her close associates have the skills or financial resources required to cope with the more capital-intensive development phase. External financiers must therefore quickly contribute a large amount of equity relative to what the founder can invest. This means the founder loses control of his or her firm, which weakens their incentives to contribute further to its development. Thus arises a dilemma.

The solution, which began to be used with great success in the United States in the 1980s, is *stock options*.[22] External investors take control of the firm, but the

[21] Hellman and Puri (2002) have shown that North American venture capitalists can influence an entrepreneurial firm's strategy choices, for example by ensuring that start-ups pursue active personnel policies and marketing. They have also found that firms supported by VC more quickly commercialize new products. Bottazzi et al. (2004) find similar evidence for European VC firms.

[22] For more details regarding the functioning of stock options and the incentive problems they are used to solve, the reader is referred to Bengtsson and Hand (2013), Chang et al. (2015), and Cumming (2012).

founder (and other key employees) receives inexpensive stock options that guarantee they will regain substantial ownership in the future, provided that a number of stipulated "milestones" are attained. Many firms offer options with a low exercise price, similar to (free) shares. Such agreements are usually also designed with "vesting," i.e., the purchaser may only buy shares if he or she remains in the firm and continues to contribute expertise.

The option instrument is therefore an elegant way of giving the founder and other key employees with limited or zero personal wealth a share in the future value of the firm, the creation of which presupposes their participation. A well-designed options program makes the founder/entrepreneur behave as if she herself were still the owner of the project. In practice, it is difficult to harmonize the interests of the founder and the firm by using stock options, but it is often possible to achieve a much better correspondence between the interests of the two parties than before. This solution also inhibits wage claims from those who receive the options.

3.6.2 Exit Routes

When an entrepreneurial firm's cash flow becomes more stable and predictable, the financial risk also becomes increasingly calculable. Then it is possible to make forecasts of future growth opportunities and profitability. Once the firm is on stable ground, it is time for early-stage financiers to relinquish their ownership role. Such an exit can be made in several ways. Provided that the firm has developed satisfactorily, founders and other key employees who have received options are now able to exchange these for common stock and become major owners in the firm.

A first exit route is an initial public offering (IPO). For this to succeed, it is usually necessary, after the listing, that there be one main owner who has the motivation and ability to take responsibility and lead the firm in the medium term. An IPO can be implemented more easily if the management, normally the founder, has been granted sufficient stock options to become a major shareholder in the firm if it becomes successful. Stock options also give the founder strong incentives to remain in the firm and contribute to its development, since, in addition to securing ownership of a large part of the value created, he or she now also has the chance to become the controlling owner of a listed company.

Two other exit strategies bear mentioning. A second route is a *trade sale*, which means that the entrepreneur/founder leaves the business, but with financial assets that enable them to start a new business or become an angel investor and/or venture capitalist. This is often the most profitable alternative from the acquirer's perspective, because in addition to utilizing the assets they buy, the buyer also wants to prevent competing firms from gaining access to them (Cunningham et al. 2021; Norbäck and Persson 2009). A third possibility, if the firm is performing very well, is that the founder and other senior executives buy out the VC firm in a loan-financed management buyout (MBO), possibly in collaboration with long-term private co-financiers.

In many cases, the firm will not develop in line with the business plan, which may be due to the business idea having less potential, the competition being tougher than expected, or the management—usually the founder—not performing as expected. The VC firm can then take measures such as removing the management or closing down the business to recover as much as possible of their investment. In the United States, this is achieved by the VC firm owning preferred stock or having priority loans; management instead has common stocks, or options on them, which are usually worthless if the firm is closed down (Metrick and Yasuda 2011; Bengtsson and Sensoy 2011).

The fact that the venture capitalists by and large have the power to decide whether to close down the firm or replace the management team if certain milestones are not met entails a risk that they will behave opportunistically. However, there are a number of mechanisms and forms of agreement to prevent such opportunism (i.e., alleviate the hold-up problem; Black and Gilson 1998).[23] These contracts are complex, which reflects the fact that the market is characterized by high transaction costs and great uncertainty. Such agreements stipulate the distribution of cash flow, control over board membership and voting rights, under what conditions financiers have the right to liquidate the firm and how the remaining assets and other rights are distributed in such a scenario. The outcome is conditioned on the firm's performance, and stock options are consistently an important component of these agreements. An additional mechanism that protects the founder(s) from being held up by the investor is that the VC firm cares not only about its reputation for competence but also as a reliable business partner.[24]

In turn, the open control protects the founder(s) from being held up by investors since outside board members are unlikely to vote to replace the founder unless performance is truly inferior (Kaplan and Strömberg 2003). A reverse hold-up problem may also arise in cases where the firm is particularly dependent on the skill of the original founder(s). To mitigate this problem, it is common for VCs to include non-compete and vesting provisions that make it more expensive for the entrepreneur to leave the firm prematurely (Kaplan and Strömberg 2003).

3.7 Human Capital and Academic Entrepreneurship

We have established that entrepreneurs are important, that information is decentralized and fragmented, that a focus on "innovation systems" is too narrow, and that financing of entrepreneurial activities entails particular complexities. We now want to broaden the perspective to the supply of entrepreneurial skills and the incentives

[23] Kaplan and Strömberg (2003, 2004) analyze in detail the forms of agreement that have emerged in the United States between venture capitalists and entrepreneurs.

[24] Results from experimental economics suggest that making investments observable is a good way to remedy the hold-up problem as it enhances the investor's incentive to adhere to social preferences of fairness (Yang 2021).

to develop and exercise such skills productively. For individuals to acquire valuable skills, it is important to have the right incentives at all levels. We know from the United States that truly successful entrepreneurs are usually more highly educated than average, and that their success hinges on their ability to recruit competent and exceptionally motivated people to build their firms.[25] Potential entrepreneurs face educational and career choices several times during their lives, not least in their youth. With the wrong incentives and unclear signals, there are many instances in which an individual risks making choices that inhibit the acquisition of the knowledge that can deliver a good financial return in a successful business.

Figure 3.5 outlines the main steps in the creation of a knowledge base that can be translated into commercial activity.

The first strategic choice the individual encounters is in high school when he or she must decide whether to start gainful employment after graduation or to advance to college. Once she has opted for college, the next decision will be whether to pursue a degree in science and technology or the humanities and social sciences. After having received a bachelor's degree, the graduate must choose between finding employment or further studies. If the latter is chosen, the subsequent choice is between a university career or leaving academia for work outside it.

Successful scientific or technical research-based entrepreneurial activities consequently depend on academically educated and highly motivated individuals. When university professors and researchers are actively involved in spin-offs and start-ups on campus, this phenomenon is referred to as academic entrepreneurship (Shane 2009).[26] In addition, there are other important sources for recruitment to scientific and/or technically based entrepreneurship, such as the pool of individuals with an academic degree as well as people with an academic background who work in other firms. Finally, as pointed out by Arora et al. (2021), the diffusion of knowledge, breakthrough innovations, and general purpose technologies (GPTs) requires close interaction between academia and industry. Such interaction is also likely to spur university spin-offs. Currently, the trend seems to be in the opposite direction, characterized by an increased division of labor between university researchers (basic research) and corporate research (applied research).[27]

Academic entrepreneurship has increased substantially over the last decades (Caputo et al. 2022). For example, 3,376 university spin-offs were documented in the United States between 1980 and 2000, another 2,885 between 2001 and 2007, and 4,539 more between 2008 and 2014. These numbers probably underestimate the true extent of academic entrepreneurship since not all instances are disclosed to universities. Moreover, faculty members may start businesses that are not based on

[25] See Henrekson and Sanandaji (2014, 2020) and references in those studies.

[26] Sometimes the term "spin-out" is used instead. Some advocate using the term "spin-off" when the university retains equity, and "spin-out" when the university receives nothing (Walter et al. 2014).

[27] Arora et al. (2021, p. 94) conclude that although firms make greater use of scientific knowledge, they are "less willing to produce such knowledge, preferring to shift attention and resources from upstream research to downstream development."

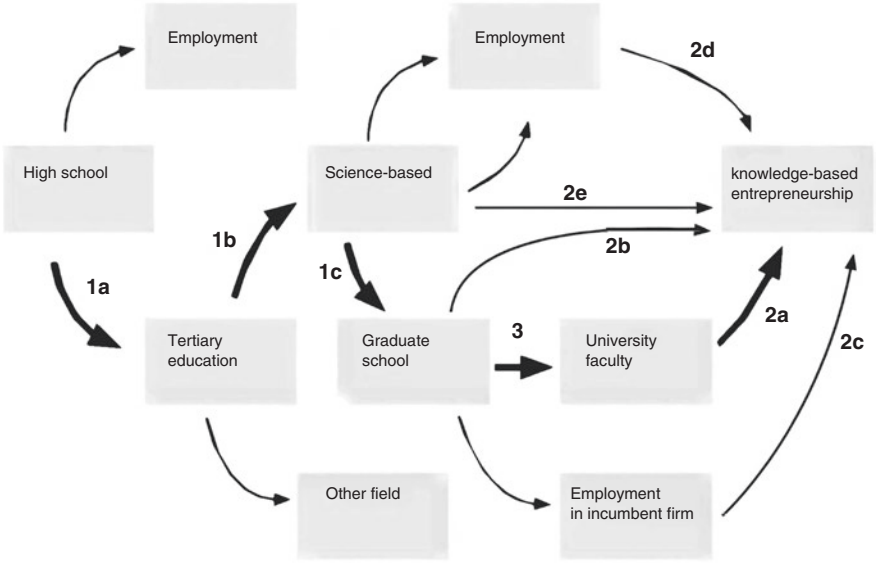

Fig. 3.5 From educational choice to knowledge-based entrepreneurship. *Source*: Henrekson and Rosenberg (2001)

university intellectual property rights. This development is not confined to the United States; similar patterns can be observed in other countries (Åstebro 2016). Still, the licensing of university patents to established companies strongly dominates over spin-offs as a form of technology transfer (Åstebro et al. 2019).

U.S. universities were long seen as role models for commercializing university-based inventions and for academic entrepreneurship. The reason for their superiority was typically attributed to the Bayh–Dole Act instituted in 1980. It transferred all intellectual property rights for inventions to the university, provided that it had funded the underlying research. This reform was originally claimed to have contributed to the overall surge in innovation in the United States (Merrill and Mazza 2010; Mowery and Sampat 2005). Others were more skeptical, arguing that the Bayh–Dole Act coincided with a number of other major policy changes said to be instrumental in improving commercialization of university-based research, notably tax reforms, increased federal resources to university research, and more flexible investment policies for pension funds (Kenney and Patton 2009; Lissoni et al. 2009).

Around ten years ago, and simultaneously as the effects of the Bayh–Dole Act became increasingly questioned in the United States, several countries decided to implement a similar intellectual property rights (IPR) regime (e.g., Germany, Belgium, Denmark, Japan, Norway, Finland, and China). These changes were introduced with the aim to increase technology transfer and innovations, thereby strengthening the competitiveness of firms in the respective country. However, according to the evaluations of these reforms, the results are rather bleak. In fact, relatively recent and remarkably consistent evidence from several countries (e.g.,

Denmark, Germany, and Norway) indicates that implementing a Bayh–Dole system appears to have been detrimental to technology commercialization, or, at best, have had no effect at all. Scholars in Europe thus seem to have applied for patents to the same extent as their U.S. colleagues and to interact as much with industry, despite the previous "Professor's Privilege" (where IP rights remain with the inventor in academia). Czarnitzki et al. (2015) find that the volume of university citation-weighed patents decreased by 27% (19% unweighted) in Belgium. In the most extreme case of Norway, there was an approximate 50% decline in the rate of new venture creation and patenting by university-based researchers after the reform. The quality of university start-ups and patents also appears to have declined (Hvide and Jones 2018).

Granting intellectual property rights to the university may work in the United States where universities are generally independent institutions that operate in a highly competitive environment. By contrast, in most European countries, universities are part of the government sector and less exposed to competition. This makes it far less likely that universities in Europe will do their utmost to make sure that the intellectual property rights they have been granted will be exploited commercially (Henrekson and Rosenberg 2001). Here is yet another example of the difficulties encountered when adopting institutions from other countries.

Figure 3.5 shows that several links must be present and considered sufficiently attractive for the right persons to create an environment where scientific research-based entrepreneurship can flourish:

- First, there must be incentives to invest in scientific and/or technical human capital at the university, especially at the graduate level (links 1a, 1b, 1c)
- Second, strong forces are needed that drive involvement in scientific entrepreneurship, both for university employees and for non-employees with a scientific background (2a, 2b, 2c, 2d, 2e)
- Third, incentives within the university system are required to adapt student choices and course curricula to the demands of the private sector, facilitating the transition from academia to entrepreneurship and the business world. This third factor has complex repercussions throughout the decision tree in Fig. 3.5—it directly affects the universities' propensity to be active in entrepreneurial activities (2a) but also students' choices regarding their own development (1b, 1c, 3).

The overarching condition is that it must be profitable to acquire productive knowledge and to use it intensively. Income taxes, pay differences, and a well-functioning service sector that enables specialization are important components. Social insurance systems are also crucial—they must not weaken incentives to change jobs but rather offer an equivalent safety net under this transfer. In addition, they should not entail a high opportunity cost in the form of lost pension rights and other amenities when one switches to an employer who offers higher expected social value creation. The tax system and social insurance system interact, and their effects need to be jointly analyzed. In Chap. 4, we will explore how this interaction manifests in practice in the Swedish case.

3.8 Dynamics in Tax-Financed Welfare Services

Innovations and entrepreneurship are essential for growth and development not only in the goods-producing sector. They play at least as important a role in the service sector, in order to develop new services, streamline organizations, and reduce costs. How service production is organized—not least how competition works in these markets—is of great importance in this respect. Regulations, procurement, and monitoring affect the impetus and opportunities for entrepreneurs to attempt new ways of doing things and to experiment and innovate in the service sector.

The leading European welfare states made a strategic choice in the twentieth century: to rely primarily on tax financing and government production of healthcare, education, and social care. The public sector was then still small, the overall tax burden was low, and these services were relatively inexpensive. Welfare services were considered too important to the cohesion of society to be kept under government control and not be subject to the vagaries of market forces. Distributional aspects and positive externalities could be invoked to justify both government production and financing, especially in education and healthcare. At the time, neither the efficiency of government production, nor whether taxes were the most appropriate form of finance, were discussed.

As Table 3.2 shows, government spending as a share of GDP on education and care services is now sizable in major OECD countries. Cross-country variation around the average of 14.3% is surprisingly small, despite sometimes sizable differences within subcategories. There is also large additional private spending on several services, notably in the United States, where total spending on education and care is well above 25% of GDP.

As incomes rise, the demand for services such as education, healthcare, and social care tends to rise even faster, i.e., the income elasticity of demand is larger than one. At the same time, these services are particularly labor-intensive, and in most cases, it is not possible to reduce staff without reducing quality. Machines

Table 3.2 Government spending on education and care as a percentage of GDP in selected OECD countries (latest available year)

Country	Child-care	Primary school	Secondary school	Tertiary educ.	Health-care	Elderly care	Total
Canada	0.23	1.97	1.22	1.2	8.70	1.50	13.31
France	1.32	1.14	2.19	1.1	10.34	0.39	16.09
Japan	0.69	1.12	1.28	0.5	9.28	1.85	12.86
Netherlands	0.64	1.14	1.82	1.1	9.47	0.83	14.18
Sweden	1.58	1.94	1.97	1.3	9.79	2.10	16.58
UK	0.56	1.64	1.78	0.5	9.90	0.31	14.38
United States	0.32	1.52	1.69	0.9	8.50	0.01	12.93
Average	0.76	1.49	1.53	0.94	9.42	1.00	14.33

Source: OECD

cannot replace people in this area as they can in manufacturing. This makes it more difficult to achieve increases in productivity, although there are exceptions (mainly due to IT and development of artificial intelligence, AI). The relative cost of welfare services therefore tends to rise, especially if citizens demand that quality be raised in tandem with real incomes. Healthcare, education, and social care are therefore becoming increasingly expensive in comparison to food, travel, or mobile phones. We have already mentioned Baumol's Cost Disease.[28] However, there is some potential for rationalization due to the fact that a larger proportion of total working hours can be devoted to producing the service (teaching, patient care, and the like) if activities are organized efficiently.

In a modern knowledge society, education becomes increasingly important. Both the quality of education and the time spent pursuing it need to increase. With rising incomes, the expectations of quality in child and elderly care are also heightened, at the same time as demographic development further increases the demand for the latter. Increased incomes create a rapidly increasing demand for healthcare, while technological advances make it possible to offer increasingly more treatments and interventions for conditions that were previously untreatable. New medical breakthroughs (more powerful medicines, joint replacements, keyhole surgeries, etc.) can entail lower costs for specific procedures. At the same time, however, demand rises for these services as they become available to more people—while the demand for quality rises inexorably. The overall effect is increased costs (Smith et al. 2022).[29]

This combination of rising costs and the fact that most Western countries have reached a point at which further tax increases are not possible presents a significant challenge. There is only one solution to this dilemma: innovation. To this end, competition needs to be allowed between government and private (non-profit and for-profit) providers by establishing the so-called quasi-markets (Le Grand 2009), where consumer choice is combined with government financing. However, in order for quasi-markets to fulfill the potential of their innovative promise, the regulatory framework must be properly designed (and continually revised). Currently, the production of welfare services is surrounded by a wide range of restrictions—on funding, procurement, quality, and governance—which severely limits the framework for what can be done. Several of these restrictions need to be recast to allow for more entrepreneurship; at the same time, competence in monitoring and governing these services requires improvement (see Chap. 4).

[28] Named after William Baumol, who pointed out that a string quartet cannot increase its productivity by playing Beethoven faster. On the other hand, technological advances, for example in the distribution of the string quartet's performances—formerly radio and records, now downloads or streaming—may mean that increasingly more people have the opportunity to listen to the performance at low or even no cost.

[29] For an extensive discussion of this issue, see Eliasson (2009).

3.9 Urbanization, Agglomeration, and Innovation

How we live, work, and travel have a crucial, and sometimes overlooked, role among the mechanisms for disseminating knowledge. We therefore wish to conclude this chapter with a section on urbanization, agglomeration, and regional labor markets—factors that are becoming increasingly important driving forces for societies that aspire to be entrepreneurial and innovative.

Since the early 1990s, urbanization has gained momentum in Sweden and other nations in the Western world. Historically, population growth has been concentrated in the larger cities, while it has declined in many medium-sized towns. In the OECD, half of the population live in cities, while roughly one-quarter live in towns and semi-dense areas and one-quarter in rural areas (OECD 2022).[30] The share of the population living in cities is expected to continue to increase. In 2000, 84% of the Swedish population lived in urban areas (defined as towns with at least 200 inhabitants), which had increased to 88% in 2020. Even though population growth seems to have levelled out in some cities, notably Stockholm, at the municipality level growth continues in all the larger cities in Sweden.[31] Most forecasts indicate that this trend will continue, even though the current shift towards a larger share of employees working remotely at least part of the week may alter previous forecasts.

The main reason for urbanization is that higher population density provides not only economic benefits but also social and living amenities. Specialization and increased division of labor is one source of prosperity and higher wages, often referred to as the urban premium. Until the early 1970s, specialization and rising prosperity were primarily driven by increased standardization and mass production, aided by technology and specialized capital equipment. In step with the growth of the service sector, digitalization, and increased specialization, production of services is becoming the most important source of job creation and development, often concentrated to cities.[32]

In any event, the service sector in all developed industrial countries is today significantly larger than the goods-producing sector. At the same time, the boundaries between the various sectors have become more fluid. Physical products contain components of services to an increasing extent, while many services are now produced in industrial processes. A customer who buys a truck from Scania or Volvo,

[30] Cities are defined as local units where at least half of the population lives in clusters of densely populated grid cells with at least 50,000 inhabitants plus adjacent local units with high levels of commuting (travel-to-work flows) towards the cities.

[31] In 2021, only one of the 50 largest municipalities in Sweden had any sizable population decline ($\approx 0.5\%$).

[32] The production of hardware also continues to grow through new advanced implementation of automation, robotization, and 3D technologies. A parallel development that has recently intensified revolves around new and more sophisticated versions of artificial intelligence (AI) and machine learning (e.g., Open AI's GPT4 and Google's Bard). However, whether these technological developments will result in a net loss of jobs is an open question, as previous alarmist predictions have so far not materialized (Frey and Osborne 2013; Arntz et al. 2019; Frey 2020).

or for that matter a Tesla, not only buys a vehicle but a transport service, including repairs and software that are continually updated. Traditional service firms such as banks and insurers conduct their business using powerful computers, just as in manufacturing.

3.9.1 Agglomerations and Cluster Formation

Increased specialization in the production of services does not have to mean that an individual's tasks become simplified or more monotonous. On the contrary, the work can instead be characterized by more collaboration, continuous skill development, and high flexibility. Densely populated environments then become attractive, partly because they provide entrepreneurial opportunity due to knowledge flows and proximity to markets and customers. They also become attractive because clusters tend to emerge in dense, agglomerated areas where companies of a similar nature can collaborate, compete, and learn from each other—and benefit from the dynamic labor market for specialists typical for such clusters.[33]

There is an extensive literature on existing clusters and agglomeration forces. Normally these are categorized as either Marshallian or Jacobian types of agglomerations, related to whether agglomeration effects occur within an industry (intraindustry) or are spread across industries (interindustry). The underlying mechanisms refer to the type and extent of spillovers, which are categorized as either knowledge or pecuniary spillovers. The latter refers to different types of linkages predominantly between customers and suppliers of goods or services. Some of these issues are more peripheral to our analysis, e.g., the causes and effects of agglomeration in a broader sense.[34]

Our main focus is how clusters and agglomerations influence innovations associated with different types of microlevel interactions and spillovers. This is a dimension of clusters and agglomeration where research is relatively scarce (Combes and Gobillon 2015). There are some exceptions, such as Carlino and Kerr (2016), who also stress the importance of pursuing more research covering this perspective. Using a spatial panel data analysis, Kosfeld and Mitze (2023) find that R&D-intensive regional clusters in Germany have contributed to higher productivity within the region. They also conclude that it is not cluster diversity that matters for productivity growth but rather cluster strength. However, they did not use specific innovation data.

[33] Agglomeration means that similar or related economic activities by firms and other institutions, interconnected through various channels, are located in more or less immediate geographical proximity to each other. The definition of clusters is overlapping, even though clusters may refer to a more distinct industry or economic activity.

[34] These broader issues are thoroughly surveyed by, for instance, Combes and Gobillon (2015) and Hennig et al. (2016).

The improved availability of microlevel data that allows the identification of inventors, mobility, and networks has expanded the possibilities for such research. One crucial issue that deserves increased attention concerns the resilience and longevity of cores of innovation located in clusters, not least since new clusters emerge that compete with those already in existence. In the United States, innovation centers have shifted between locations such as Austin, Boston, Detroit, and Silicon Valley. In recent decades, Tel Aviv and Bangalore have also emerged as strong innovation nodes.

Sorenson (2018) addresses this issue from a different angle. He finds that entrepreneurial activity and innovation are strongly embedded in socially and spatially bounded relationships. By combining insights from sociology, economic geography, and economics, he challenges some of the established views on the microeconomic foundations of spatial formations, knowledge diffusion, and interactions between economic agents. Instead, he emphasizes how more soft ties based on family and the individual's established networks influence location and agglomerations.[35]

Overall, policymakers need to be better assisted by research to understand how clusters and agglomerations develop and how policy can strengthen both agglomeration and innovation (Carlino and Kerr 2016). This is a complex task, spanning several policy areas, where there are obvious knowledge gaps. However, these knowledge gaps have not stopped governments from spending billions of dollars in their attempts to promote innovative clusters.

An attempt to provide some insight into the process of emerging clusters was provided by Braunerhjelm and Feldman (2006). They analyzed whether clusters emerge by coincidence or as a result of deliberate policy efforts, and the extent to which entrepreneurs could influence policy design. They found, that, to a great extent, these can be attributed to chance and entrepreneurial initiative, but after this initial phase, policy has generally been crucial where entrepreneurs also contributed to its design. For instance, there were initially many potential "Hollywoods." That Hollywood became Hollywood was due not only to the climate but also to the fact that policies adapted to the film industry's needs; the government did not reject the industry as "immoral" but rather encouraged it.

Another example is Israel, which has benefited from the particular combination of a high-quality education system, the immigration of skilled engineers from Eastern Europe, and access to American venture capital. In Israel, several attempts were made to establish a high-tech sector; the big boost came only when it was realized that this required both a knowledge platform and entrepreneurial skills, which

[35] As a case in point: When William Shockley founded his firm in Mountain View, California instead of in New Jersey, where his former employer Bell Labs was located, he did so not because he aimed to create something like Silicon Valley but because he was nostalgic about his boyhood and wanted to move closer to his mother who suffered from failing health. Furthermore, his failures as a boss were not intended to usher in a host of spin-outs by "the treacherous eight" and the founding of the broader web of collaborative innovation blocs currently known as Silicon Valley (Klepper 2016, pp. 114–120).

generated a supply of ideas (deal flow) that was combined with competent venture capital. The state played a crucial role in building a venture capital market, enlisting the assistance of private investors early in this process.[36]

Furthermore, as shown by Henrekson et al. (2021) in a study of the emergence of the Silicon Valley venture capital model and the Hollywood film industry, specialized institutions that regulate these entrepreneurial ecosystems were not designed by policymakers. Instead, they emerged through actions by business entrepreneurs. Thus, Schumpeterian entrepreneurs not only created new companies; they also created new institutions as an integral part of the restructuring process. At times, efforts by identifiable entrepreneurs were crucial, while in other instances institutional change resulted from a Hayekian process of emergence fueled by the efforts of business entrepreneurs.

In general terms, the benefits of agglomeration and dense areas can be summarized as follows:

- *Innovation and entrepreneurship* have been shown to be concentrated activities which predominantly take place in population-dense environments (Audretsch and Feldman 1996; Moretti 2012). There is more knowledge transfer when people interact and change jobs both within and between industries. Talented entrepreneurs tend to be drawn to metropolitan environments where there are plenty of opportunities and access to specialized labor.
- *The service society* tends to develop in agglomerated areas. Despite globalization, an increasing share of current consumption expenditure consists of locally produced services. These can be directly related to the consumption of goods, such as retail and transport, but also specialized services per se such as restaurants, cultural experiences, specialized care, and education services. The fact that many people live in close proximity to each other within a relatively small radius is a necessary condition for many goods and services to be in supply at all.
- Agglomeration provides a market for *specialized labor*. Highly specialized firms demand labor with specialized knowledge and skills. For an individual employee in a large city, it is thus less risky to invest in highly specialized knowledge, as the risk of being left at the mercy of a single employer is lower than in a small town with only a few firms.
- Economies of scale result in *lower costs of production*. An important difference between goods and services is that the latter can usually not be stored (although there are exceptions, such as services that can be digitized). If a hair salon lacks customers, nothing is produced, even if it is staffed. The same applies to health centers and restaurants. Producing specialized services at a reasonable cost therefore requires high-capacity utilization, which as a rule presupposes a certain population density.

[36] See Braunerhjelm and Feldman (2006) for a cross-country comparative analysis of emerging clusters in biotech as well as in information and communication technologies (ICT).

However, there are also forces working in the opposite direction. The advances made in digital technologies such as artificial intelligence and advanced machine learning may lead to the demise of advantages related to physical proximity. Still, there is a long way to go before agglomerated and dense areas more generally can be replaced by more remote systems. Production costs will therefore vary with population density.[37]

There are thus strong forces that propel agglomeration and the co-location of firms/employers and individuals/employees. Every time a new job is created in the competitive sector, more jobs are created in the local service sector. The multiplier effect stems from rising income, which generates demand for salon services, restaurant visits, medical care, and so on. Successes in the competitive sector thus create more jobs in the local service sector. Based on U.S. data, Moretti (2010) finds that every new job in the competitive sector in a city generates 1.6 new jobs in the service sector in the same city. The higher the skill level, the greater the ratio, i.e., an increase in income generates correspondingly higher and more extensive knowledge spillovers. Moretti and Thulin (2013) conducted a similar study for Sweden and found the same multiplier effect here as well.[38]

3.10 In Sum

In this chapter, we have presented some of the necessary institutions and conditions for innovative activities to take place, such as the rule of law and the security of private property rights. We have also surveyed previous research efforts to identify institutional frameworks that are intended to govern innovations, notably national innovation systems and their "progeny," national systems of entrepreneurship and entrepreneurial ecosystem approaches. While these system approaches give valuable insights regarding the shaping and understanding of the innovation landscape, we argue that their microeconomic foundation needs to be reinforced. Finally, we addressed a number of key areas required to promote innovation and entrepreneurship, such as the financial market, access to human capital, the organization and production of welfare services, and the importance of dense and knowledge-intensive areas. One important message from this chapter is that we should not be afraid of large, expanding cities. In the next chapter, we will focus more intently on the details in designing policies required to encourage and stimulate innovative endeavors.

[37] Jansson (2014) shows that each visit to a health center costs as much as five to ten times more in upper Norrland than in a medium-sized city such as Linköping. In the same way, the cost per capita for roads, electricity networks, sewage systems, waste management, and other infrastructure will be considerably lower in dense environments with a higher degree of utilization.

[38] If Stockholm is included as a separate region, the multiplier effect is exceptionally large—more than three. High-tech industries are associated with higher multiplier effects.

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Chapter 4
Policies to Stimulate Innovation and Entrepreneurship

Most advanced industrialized countries today justify their innovation policies on the basis of the dominant knowledge-based growth paradigm—primarily investment in R&D and education, as we saw in Chap. 2. However, in terms of how growth policy should be formulated, this provides an incomplete guide which even borders on the misleading. The reason behind this misguided thinking is simplistic assumptions, both about how an economy functions and about the innovation process itself. Innovation is still seen as an exogenous force that can be stimulated through government funding targeting R&D, start-ups, and small businesses, which will then fuel higher growth and increased prosperity.

We claim that this line of reasoning is also subject to debate in the specific context we address in at least two respects (Frydman et al. 2019). First, given that we seek to explain the causes of economic growth, a deeper causal understanding is required. Second, the adequacy and precision of policy proposals hinge on a good causal understanding of the growth process and its microeconomic foundations. Innovation is an intricate and complex process involving a multitude of actors with complementary competencies. The willingness to handle uncertainty is key, a feature often attributed to the entrepreneur, but it also involves other important agents in an innovation bloc. Thus, to stimulate innovative processes, policies must encourage risk-taking and increase the willingness of agents to act without certainty of success. Since uncertainty is genuine, there will be failures, and these will negatively influence those who have been engaged in innovative endeavors. The policymaker can cushion such failures to some extent but, perhaps more importantly, incentivize innovation activities by, for instance, maintaining taxes at reasonable levels should the attempted venture prove successful.

Given that the group of countries doing cutting-edge innovation of great commercial value is no longer restricted to wealthy industrialized countries, this task becomes even more important for the policymaker. The former planned economies have become market economies, millions of new engineers are being herded through universities in China and India, and considerable fortunes are being made thanks to

P. Braunerhjelm, M. Henrekson, *Unleashing Society's Innovative Capacity*,
International Studies in Entrepreneurship 55,
https://doi.org/10.1007/978-3-031-42756-5_4

new business models and rapid technological development. Sophisticated new knowledge is being created all over the world and spread through new channels at a furious pace. Even small firms can, with the help of modern information technology, become internationalized and make use of research expertise on the other side of the globe. Still, the so-called born globals are a rare phenomenon and entail considerable risks (Braunerhjelm and Halldin 2019; Ferguson et al. 2021).

Nevertheless, increased trade (including internal trade within firms), rising investment between countries, and increasingly intensive exchanges between universities are some of the mechanisms for disseminating information and knowledge. Economies are linked via sophisticated Internet-based tools that promote cross-border networks and collaborations—as well as commercialization. The result is intensified global competition, making it increasingly difficult to obtain a high return over a longer period in the form of high relative prices for advanced products where Swedish companies have traditionally held market power. Some of these links have, however, become weaker due to the present tendencies towards deglobalization and increased geopolitical tensions.

For a small country like Sweden, the first task in this new landscape will be to *build a globally competitive body of knowledge* based on domestic education and research efforts but also on knowledge acquired from abroad. The second task is to *create effective mechanisms that disseminate knowledge and transform it into societal benefits*, i.e., innovations that lead to new and growing businesses, rising investment, higher value-added and increased employment. Maximum leverage from policy initiatives to boost innovation and entrepreneurship is achieved when such measures are *coordinated* across different policy areas. At the same time, we are well aware that it is not politically feasible to implement all proposed measures simultaneously; whether to implement a specific policy must be weighed against societal interests other than boosting innovation and entrepreneurship.

Innovation presupposes a long-term perspective, trust, and transparent systems. Existing institutions and regulations strongly influence the opportunities for entrepreneurs to develop and commercialize innovations. In this chapter and the subsequent one, which deals exclusively with taxation, we review a number of policies and measures that can promote innovation. We will describe in some detail the changes in tax codes, regulation, education, and other policy areas that we consider most important. In the concluding Chap. 6, we will then summarize the proposed measures in the form of an innovation policy framework, inspired by the frameworks for monetary and fiscal policy introduced after the 1990s crisis, which created long-term predictability in macroeconomic policy.

4.1 The Need for a Broad Strategy

Our approach is much broader than the one that dominates the daily political debate on innovation and innovation policy, which still largely revolves around support for R&D investment and capital for start-ups. As discussed in Chap. 3, some basic

institutional conditions must be in place for other policies to be effective. Most prominent are the enforcement of the rule of law such that contracts are honored, property rights are well-defined and secure, and corruption is minimal. According to Transparency International, Sweden ranked among the top five countries with the lowest level of corruption in 2022.[1] However, the Swedish score has continually declined since 2012, indicating that corruption is on the rise. According to the ranking of the Heritage Foundation Index of Economic Freedom, Sweden is also among the top global performers, ranked at tenth place out of 163 countries in 2022. The organization states in particular that "the transparent and efficient regulatory and legal environment encourages robust entrepreneurial activity."[2] Hence, from an international perspective, Sweden seems well-positioned when it comes to the most basic prerequisites for the emergence of an environment conducive to innovation. Nevertheless, these are merely necessary conditions that must be fulfilled to foster innovation. In this chapter, we will present what we deem to be the most important of the remaining and critically important building blocks of an effective innovation policy, excluding tax policy, which will be discussed in the subsequent chapter.

4.1.1 Subsidies to R&D?

"Innovation strategies"—in other words, R&D investment and seed financing—are often presented as the solution to future challenges. The OECD launched its innovation strategy in 2010 (OECD 2010), which was updated in 2015 (OECD 2015), and the so-called *Innovation Union* was one of the flagship initiatives in the European Union's Europe 2020 Strategy to strengthen the EU's global competitiveness. The most recent framework program to bolster the EU's R&D, innovation, and competitiveness—Horizon Europe—stretches from 2021 to 2027 and has a budget of EUR 95.5 billion. It builds on three pillars—excellent science, global challenges, and industrial competitiveness—and takes a mission-oriented approach.[3]

These ambitions are commendable, and the bar is set high. However, the arsenal of means to achieve these goals is not described in sufficient detail. Policymakers often run into obstacles when translating general principles into practical proposals. Strategies developed by international organizations seldom become particularly innovative. Member countries' ministries of industry all too often merely impose their own blueprint on the general measures prescribed, especially if these are kept at a general level, such as "support for R&D"—a proposal that virtually everyone

[1] https://www.transparency.org/en/cpi/2021/index/swe

[2] https://www.heritage.org/index/country/sweden

[3] For details, see https://www.catalyze-group.com/horizon-europe-2023/?utm_campaign=Horizon%20Europe&utm_term=Horizon%20Europe%20funding&gclid=Cj0KCQjwn9CgBhDjARIsAD15h0AaRKeKJVsfl7n53IpZCHNzgvVIasoBbgjayJUAqfOkjaCQuPnwkqYaAksEEALw_wcB

will endorse. But the path to success resides in the specific and often unique competencies and conditions that are best defined on a much more disaggregated level, information which must be translated into concrete proposals covering a wide range of policy areas.

As we have already discussed, there are a number of evaluations of the effects of R&D support. Table 4.1 summarizes the advantages and disadvantages of subsidies and tax relief, respectively.

In this comparison, tax reliefs are socioeconomically preferable to direct subsidies. Most international studies also identify a positive effect, albeit the magnitude differs and crowding-out effects are present (Hall and Van Reenen 2000; Hovdan et al. 2023). In particular, recent research provides evidence that effectiveness differs sharply across firms of different sizes and between countries, depending on the specific institutional context in which businesses operate. There are also signs that firms act tactically by increasing the level of R&D just enough to achieve maximum state support. When it comes to large firms—particularly those with multinational operations—they tend to relocate R&D activity to locations with greater R&D tax relief, implying R&D tax incentives could raise R&D domestically but at the expense of R&D in other locations. Hence, tax incentives work as a beggar-thy-neighbor instrument, which casts doubt on its ability to increase R&D globally (Knoll et al. 2021). More generally, R&D tax incentives and subsidies seem more efficient for smaller firms (Galindo-Rueda et al. 2020). Further, the OECD (2020) concludes that there are vast differences in returns to companies of different sizes, with most bang-for-the-buck for the smallest firm cohorts. In addition, tax incentives seem better suited for supporting R&D projects closer to the market, while direct government funding—such as grants and R&D procurement—is more efficient when targeting basic research.

The Swedish experience is mixed. In the 1970s, there was a targeted R&D tax relief scheme that allowed firms to deduct more than 100% of their R&D spending. However, the tax relief accrued long after the spending was incurred, which contributed to the inefficiency of the system. Since the subsidy reduced tax revenues

Table 4.1 Effects of R&D support

Direct R&D subsidies	Tax incentives
Primarily when subsidies can be allocated to projects where the social return greatly exceeds the private return.	Market-based, the government does not have to try to "pick the winners" (which is difficult).
Greater budget control.	Firms and the market are better placed to allocate investment than the government.
Most suitable if there is great uncertainty pertaining to the investment and there is a long time before the product/technology reaches the market, i.e., basic research.	Most suitable for encouraging applied R&D and when the product/technology can reach the market in a relatively short time.
	More predictable for firms. Reaches more firms. Lower administrative costs compared to direct R&D subsidies.

Source: Guellec and van Pottelsberghe (2003) and OECD (2010)

without yielding the intended results, it was repealed. Later evaluations have shown that Sweden was among the countries with the highest tax expenditure related to R&D.[4] In 2014, a new subsidy was introduced that targeted employees working with R&D. Initially, payroll taxes on firms' R&D staff could be reduced by ten percent of wage costs before taxes with a ceiling of SEK 230,000 per month. This design gave the subsidy a small firm angle, i.e., the relative benefit was largest for smaller firms. Effective from July 1, 2023, the maximum payroll tax reduction for a firm amounts to SEK 1.5 million per month, designed as a reduction of the payroll tax rate by almost two-thirds for R&D workers.[5] Overall, evaluation of the subsidy finds significant positive effects on the number and share of scientists. Moreover, the treatment effect of the subsidy does not differ across firms by size or debt ratio but seems to be somewhat higher for labor-intensive firms (Stavlöt and Svensson 2022).

The European Union does not allow general state aid within the internal market.[6] Nevertheless, a plethora of national R&D subsidies exists. The reason is that the EU's regulatory framework is more permissible towards supporting R&D as a means of increasing productivity and growth. As stated above, this form of competition is difficult to avoid completely—virtually all countries engage in it (as do individual states in the United States). We therefore arrive somewhat reluctantly at the conclusion that limited subsidies for R&D can be an innovation policy tool. But our main message is that innovation policy should be well-balanced across different policy areas, where subsidies might be one component but requires careful evaluations before being implemented, and the strategy as a whole should be much broader.

4.1.2 Not Only Start-Ups or Small Businesses

The emergence of new and growing firms is crucial for the transformation of R&D into production and prosperity. This presupposes favorable conditions for innovative entrepreneurship. Policies to promote it have all too often been equated with measures that favor small and new businesses.[7] Our analysis in Chaps. 2 and 3 makes clear that such an approach is too narrow; instead, the focus should be on *more general measures* that facilitate the dynamic transformation of as many firms as possible, and in every sector. These broad-based measures should propel *the*

[4] See Hall and Van Reenen (2000), Table 1.

[5] Government Bill 2022/23:79. The payroll tax is reduced by 19.59 percentage points (from 31.42 to 11.83%). In practice, a maximum total reduction for all R&D staff of SEK 1.5 million per month (roughly USD 150,000) means that with a typical monthly salary for an R&D worker, the rebate can apply to as many as 120 employees.

[6] As mentioned above, EU's state aid rules have been partly abolished, partly modified, since the beginning of the COVID-19 pandemic.

[7] Often referred to as SME policy. See, for example, Lundström and Stevenson (2005).

economy as a whole towards a new competitive landscape by encouraging entrepreneurial experimentation and business growth *throughout* the economy.

Consequently, policy should encourage renewal and growth, regardless of whether development takes place in start-ups or incumbent firms, large or small. New entrepreneurial initiatives exert competitive pressure on other firms, which requires adjustment and rationalization or, for those entities that fail to cope, closure. When the goal of policy is to facilitate the rapid growth of high-quality firms, the focus shifts from encouraging the establishment of new ones to creating a coherent framework that affects a large number of policy areas and basic institutions. Such a policy should encourage (Hölzl 2010, p. 191):

> a heterogeneous pool of entrepreneurs to generate new ideas and ventures, as well as mobilize productive resources by enhancing a society's educated workforce and capacity to generate new knowledge. … it should also provide an undistorted process of competitive selection, in which small firms face equal opportunities and the market spurs the reallocation of resources from exiting firms with low performance to fast growing firms with high performance.

The main differences between small business policy and entrepreneurship policy are summarized in Fig. 4.1. Entrepreneurship policy facilitates productive entrepreneurship activities. Whether such activities involve a high or low proportion of self-employed individuals or small firms is of minor importance. Instead, the policy focuses on more qualitative aspects, favoring entrepreneurial firms with the potential to become high impact entrepreneurship (HIE).

4.1.3 The Importance of High-Growth Firms

When companies are compared, it turns out—unsurprisingly—that there are large differences in terms of age, size, growth ambitions, profitability, and growth rate. The small business researcher David Birch coined the term "gazelles" 30 years ago to denote the small group of firms that create the majority of all new jobs in the economy.

In later studies, a distinction has been made between gazelles and high-growth firms (Petersen and Ahmad 2007). High-growth firms are defined as firms with an average annualized growth greater than 20% over a three-year period, where growth

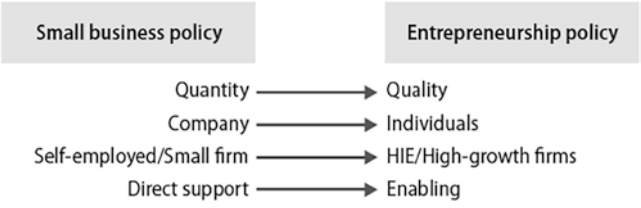

Fig. 4.1 Small business policy versus entrepreneurship policy

is measured either in terms of employment or turnover. Gazelles are a subset of high-growth firms, which are up to five years old. The definitions also include the qualification that enterprises should have at least ten employees at the start of any observation period.

In their reviews of available studies on high-growth firms, Henrekson and Johansson (2010) and Coad et al. (2014) found that:

- High-growth firms are crucial to net job growth, generating a large share of all net jobs. This is particularly pronounced during recessions, when high-growth firms continue to grow while other firms decline.
- Although small firms are overrepresented among high-growth firms, such firms come in all sizes. A small subgroup of large high-growth firms are major job creators.
- High-growth firms are younger on average.
- Young and small high-growth firms grow organically and make a larger contribution to net employment growth than do larger and older high-growth firms.
- High-growth firms are present in all industries, though they are slightly overrepresented in service industries.

Young firms that survive have higher productivity and grow more rapidly than more mature ones, suggesting an "up or out" dynamic. Firms have higher productivity *and* grow more rapidly than incumbents or they fail. Thus, the evidence suggests that high-growth firms, especially those that grow rapidly when young and small, are instrumental to economic growth (Haltiwanger et al. 2013; Heyman et al. 2019).[8]

Heyman et al. (2021) have examined how the Swedish economy managed during three major crises since the 1990s: the real estate/bank crisis 1991–1994, the IT-bubble 2001–2003, and the financial market crisis 2008–2009. Their overall conclusion is that the restructuring of the Swedish economy was relatively smooth, particularly during the two latter crises. Some companies shrunk, some went bankrupt, while others were started. Moreover, the reallocation of labor was quite efficient. The authors attribute this ability to cope with crises to policies that have facilitated mergers and acquisitions of firms, good opportunities for laid-off workers to acquire relevant competencies through retraining programs, and improved channeling of savings to new and young firms. Firms of different types and sizes chose different strategies to adjust to a crisis, but by and large the economy jumped back to its pre-crisis path relatively quickly. Heyman et al. argue that it is preferable to strengthen the crisis resilience of businesses through proactive policies that foster and encourage dynamics rather than providing governmental support when a crisis strikes. However, there is room for improvement regarding insolvency institutions, i.e., transfer of ownership is crucial as are the possibilities for new and young firms to exploit market opportunities and absorb dismissed labor.

[8] Caballero (2007) estimates that half of aggregate productivity growth results from the reallocation of resources from low- to high-productivity firms *within* an industry and that roughly half of that emanates from start-ups and closures.

One important conclusion from this research is that innovation and entrepreneurship policy should focus on general measures. Instead of focusing exclusively on start-ups, the objective is to create an environment facilitating the further development of potentially fast-growing firms irrespective of size, age, and industry. This means a policy that rewards education, knowledge transfer, competition, entrepreneurship, experimentation, and risk-taking. This is what characterized Swedish policy during the "golden" period 1870–1913 when many of Sweden's large, still extant, multinational firms were founded—companies such as Atlas Copco, Ericsson, Electrolux (a merger of two firms founded in that period), Ericsson, SKF, Asea (now ABB), Scania, and Astra (now AstraZeneca). Moreover, firms grew rapidly and became highly internationalized. These large, innovative firms became important "anchors" and nodes for further industrial development in the form of spin-offs and as a breeding ground for other new and growing firms. However, as described by Bornefalk (2017), after World War II, the Swedish economy gradually became more regulated, interventionist, and sclerotic. As a result, no new large firms emerged and remained domiciled in Sweden after the 1960s. Instead, exceptional entrepreneurs emigrated to countries with more business-friendly institutions (notably IKEA's Ingvar Kamprad and Tetra Pak's Ruben Rausing). Economic dynamism stalled and growth was impaired for several decades.

The structural problems of the Swedish economy became increasingly apparent during the 1980s, and these foibles eventually triggered a market-oriented reform process lasting for roughly 25 years, from the mid-1980s until 2010. This set off a wave of entrepreneurial effort, where numerous new firms attained considerable market value, although there are no examples of such firms achieving global prominence rivalling the level attained by several businesses established before World War I. Instead, several of these firms have been acquired by foreign firms and investors and expanded from bases outside of Sweden. Thus, even if Sweden has become something of a start-up nation, it is far from what could be labelled a scale-up nation. This poses a potential threat, not only to Sweden's future industrial base but also to its future welfare and prosperity. Large growing firms are an essential part of a competitive industrial setting based on heterogenous and complementary competencies. In the remainder of this chapter, we will discuss the most important building blocks of a broad innovation policy (except for tax policy, which we will discuss in the next chapter).

4.2 The Education System

As mentioned, our strategy has two main pillars: first, to build knowledge and ensure that it reaches a critical mass, and second, to disseminate and commercialize knowledge. A natural starting point for policy proposals is the first pillar: knowledge building. Obviously, a precondition for knowledge dissemination is that citizens are endowed with useful knowledge and have the ability to absorb knowledge held by others, i.e., absorption capacity is important (Cohen and Levinthal 1990).

As we will see in the next section, the estimated effects of school quality on national economic performance are sizable.

4.2.1 Test Results and National Economic Performance

What explains economic growth and thus social welfare at the country level? Over time, it became increasingly clear that the share of GDP used for capital investment could explain only a small share of per capita growth, perhaps as little as 10–20 percent. In the 1980s, endogenous growth theory brought human capital to the fore. Human capital is the stock of habits, knowledge, and social and personality attributes (including creativity) constituting the ability to perform labor to produce economic value.

A problem arose when policymakers began to equate human capital with quantitative measures of formal schooling. Large cross-country differences in the average scores in internationally comparable tests among students with the same number of school years provide compelling evidence that, in fact, the quality of the educational system matters.[9]

Studies focusing on the effect of the average number of years of formal schooling across countries have not been able to establish any robust effect on economic growth.[10] In contrast, empirical research shows a strong positive relationship between the results of internationally comparable tests and economic growth. Moreover, the estimated effect is large. Hanushek and Woessmann (2015) estimated the effect for 50 countries during the period 1960–2000, where cognitive skill is measured as the average score on all international test 1964 to 2003 (notably TIMSS and PISA) in math and science. They find that an increase of one standard deviation in the average test results in mathematics and science, i.e., 100 points, "is associated with approximately two percentage points higher annual growth in GDP per capita."[11] Thus, the fact that the quality of the educational system is what matters rather than the duration of schooling per se is crucial for economic growth. More precisely, the purpose of a high-quality school system is not simply to impart substantial knowledge to students but also to instill noncognitive skills such as

[9] International assessments of knowledge and skills in certain subjects began to be developed in the early 1960s. Since the mid-1990s, there have been comparable tests for a large number of countries in mathematics and science, and, since the turn of the millennium, tests to measure levels and trends in students' reading comprehension as well. The two most important tests are the *Trends in International Mathematics and Science Study* (TIMSS), and the *Programme for International Student Assessment* (PISA) of mathematics, science, and reading. TIMSS has been repeated every four years since 1995, and PISA every three years since 2000. TIMSS is conducted in grades 4 and 8, as well as at the secondary level (for a select group), and PISA is conducted with 15-year-old students.

[10] Krueger and Lindahl (2001) and Gennaioli et al. (2013).

[11] Hanushek and Woessmann (2015, p. 40). To give an example: the average result in Mathematics 2015 was almost exactly 100 points higher in Sweden than in Oman.

self-discipline, perseverance, reliability, and emotional maturity. International tests also capture such skills, suggesting a double-dividend effect of a high-quality school system: A school system that imparts a high quantity of valuable knowledge to students cannot succeed in doing so without at the same time teaching them noncognitive skills, such as the ability to focus, diligence, and perseverance.

Heller Sahlgren and Jordahl (2023) updated Hanushek and Woessmann's studies, adding results from the PISA and TIMSS tests in mathematics and science through 2015 to explain average GDP growth per capita in 50 countries for the period 1960–2016. Thus, this analysis includes the years after the financial crisis of 2007–2008. Their results are presented in Fig. 4.2, which shows a strong positive relationship between the test results and economic growth when average years of schooling and initial GDP per capita are controlled for. The estimated effect is substantial: average test results at one standard deviation higher—corresponding to 100 PISA or TIMSS points—are associated with an increase in the GDP growth rate of 1.3 percentage points. In contrast, the corresponding calculation between number of years of schooling (controlling for the effect of initial GDP per capita and test results) shows no effect, which concurs with earlier results.

Heller Sahlgren and Jordahl (2023) also find that the share of high-performing students is substantively more important than the share achieving basic skills. While an increase of ten percentage points in the share of students who achieve basic skills is associated with an increase in the GDP growth rate of 0.18 percentage points, an equal increase in the share of high-performing students is associated with an increase of 0.87 percentage points.[12]

There are several reasons why the share of high-performing students is especially important to economic development and social welfare. High scorers are more likely to support growth-friendly policies and institutions and to hold politicians accountable for abuse and malfeasance.[13] A highly educated population is generally more likely to resolve disputes through negotiations and informed democratic decision-making than through violent conflict and coercion.[14] Other reasons why high scorers are particularly important are that they tend to save more, be more cooperative, be more innovative and more successful at using highly productive team-based technologies, and be more prone to imitate and adopt productive behaviors and solutions used by others.[15]

[12] Hanushek and Woessmann (2015, pp. 62–63) also find (for the period 1960–2000) that the estimated effect of the share of high-performing students is more than four times the estimated effect of the share of students with basic skills.

[13] See, e.g., Jones and Potrafke (2014).

[14] See Glaeser et al. (2004), who find that growth in income and human capital causes institutional improvement.

[15] Jones (2016).

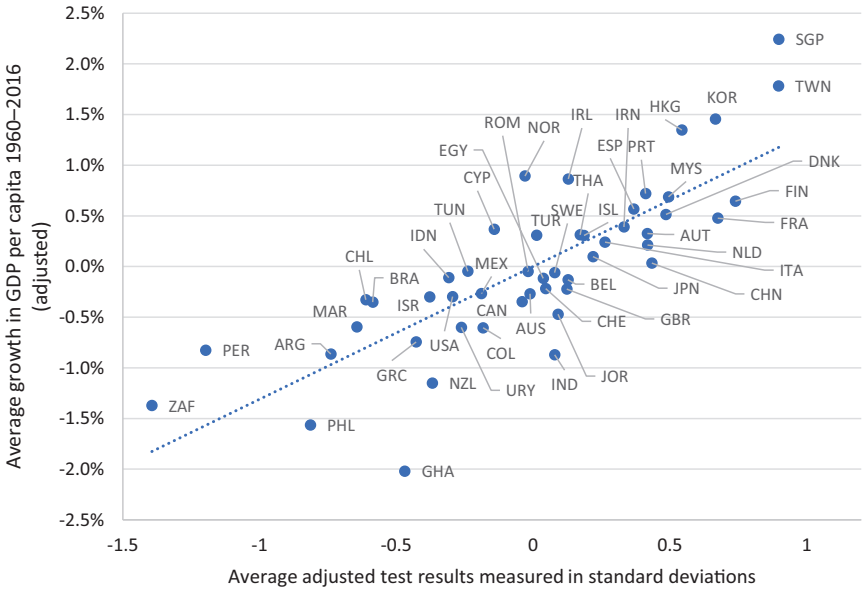

Fig. 4.2 The relationship between international test results and growth in GDP per capita, 1960–2016. *Note*: Added Variable Plot showing the relationship between average growth in GDP per capita and average test score after having removed the estimated effect of initial GDP per capita and average years of schooling. The values on the *x*- and *y*-axes thus indicate the difference between the actual results and what is projected by the two control variables. *Source*: Own figure based on data from Heller Sahlgren and Jordahl (2023)

4.2.2 The Quality of Sweden's Primary and Secondary Education

The quality of the Swedish education system is no longer as high as it once was (especially relative to other countries) in terms of building knowledge among its children and adolescents. Research consistently points to growing problems in Swedish schools—not everywhere, but in too many places to ignore: low quality, low reading comprehension, weak mathematical knowledge, and all too often, poor teachers. Every fourth student fails to achieve passing grades, both in primary school and high school. Among those who did not manage to receive credit in at least one of the core subjects—Swedish, English, and mathematics—failure in mathematics was most common.

In international comparisons such as PISA and TIMSS, Sweden has fallen far behind the leaders. Its weakest students lag the furthest behind, students' socio-economic background has a strong impact on results, and extremely few students reach the advanced level in mathematics, while 35–50% of students do so in the leading countries. Swedish students also performed below average in the PISA creativity test, which was conducted in 2012. Sweden ranked 20th out of 28

participating countries.[16] Moreover, low status for the teaching profession means that schools do not attract the quality of teachers that they need.[17]

If we apply Heller Sahlgren and Jordahl's estimated effects of test results on growth, we can see that the effect for Sweden is sizable. Based on the average decline of 34.5 points (or 0.345 standard deviation) in mathematics and science in TIMSS from 1995 to 2015, the average growth in GDP per capita can be expected to decline by 0.45 percentage points (0.345 × 1.3). By using the estimated effect of the share of students attaining the advanced level, we can infer that if the Swedish share had been at the same level as Singapore, it would be associated with an increase in the annual growth rate of GDP per capita of an impressive 1.3–1.4 percentage points.

Weak basic education spills over directly into universities. The throughput time is long, and a large share of university students drop out before graduation, approximately 30% on average but with considerable variations across disciplines (among engineering students, the dropout share is about 50%).[18] Interest in science is weak (partly due to poor mathematical skills at earlier stages), and the number of graduating engineers is therefore low.

Poor education also complicates recruitment to the labor market. In tandem with increasing dropout rates and lower quality of student skills, the mismatch on the Swedish labor market has accelerated. As shown by Eklund and Larsson (2023), the ratio between vacancies and unemployment has steadily increased since the 1980s. At present, Swedish firms fail to recruit the right person in three out of ten recruitment processes despite a high level of unemployment. More generally, seven out of ten firms report difficulties in finding the competence they need, in particular when it comes to people with advanced vocational training (Svenskt Näringsliv 2022). Companies say that lack of skills is by far the most important reason why they fail to recruit, and they have a particularly difficult time finding engineers. It is noteworthy that young people, who ought to have the most up-to-date education, have particular difficulty finding jobs. In international comparisons, Sweden has a high level of youth unemployment. As of October 2022, Sweden had the fourth highest unemployment rate among the young (15–24-years-old), only surpassed by Greece, Italy, and Spain.[19]

Our conclusion is that the quality of both secondary and higher education needs to increase. Improvement at the basic level presupposes a move away from the current postmodern social constructivist view of knowledge, which determines both how subjects are taught and the role of teachers. Swedish schools need to return to an updated classical view of knowledge characterized by teacher-led instruction, a well-structured teaching environment with clear objectives and systematic

[16] Se Henrekson and Wennström (2022, Chap. 3) for detailed results.

[17] Åman (2011) provides a summary of the literature through 2010. For new evidence for the United States, see Kraft and Lyon (2022).

[18] For 2021, see https://allastudier.se/tips-o-fakta/h%C3%A4r-hoppar-flest-av-16910

[19] https://www.statista.com/statistics/613670/youth-unemployment-rates-in-europe/

progression based on concrete course syllabi and curricula. Experience from other countries shows that such a reform would lead to rapid and sharp improvements.[20] Furthermore, apprenticeships to counteract the exclusion of students who are not motivated to enter academic studies and better collaboration between schools and businesses—and above all a real improvement in the education and status of teachers—deserve considerably more attention in the case of Sweden.

4.2.3 The Role of the University Sector

Swedish R&D spending is still high in relation to GDP—3.4% in 2021. Between 2001 and 2015, the trend showed a decline, but it began to rise again in 2016. Almost 72% of R&D investment is private. Over the last 20 years, Sweden has sustained its position as a leading nation in terms of R&D spending compared both to other similar countries and to leading research nations (Vetenskapsrådet 2021). However, government R&D spending is the lowest in the Nordic region at 0.9% of GDP. Moreover, with regard to government-funded research at universities, Sweden has produced several internationally successful graduate programs and research centers, mainly in medicine and technology. But in recent years, these have dropped in international rankings. Sweden no longer has a research institute or university that can be said to be among the world leaders, with the possible exception of the Karolinska Institute in the medical field.[21]

The United States maintains its leading position, with huge investments in terms of both finance and personnel, but quite a number of East Asian countries, notably but not only China, have progressed rapidly and can now be found high on the list of world rankings of universities. In recent years, China's R&D spending has exploded, attaining a share of 22% of global R&D spending in 2019, second only to the U.S. share of 28%. Since the year 2000, China's R&D expenditures have increased by almost 1500%, which compares with 250 and 175% in the United States and the European Union, respectively. In absolute numbers, China has now surpassed the European Union although it still lags the United States (NSF 2022). Together with India, China has a greater focus than the traditional research countries on applied and needs-motivated R&D in technology, AI/digitization, and materials science—which is a likely reason for their rapidly increasing competitiveness in fields relevant to those sectors that are exposed to international competition.[22]

With such large and fast-growing competitors, a small country like Sweden must invest available resources wisely. But Sweden faces the problem that its resources

[20] For an in-depth explanation of the crucial role of the view of knowledge in determining the quality of a country's school system, the reader is referred to Hirsch (2016) and Henrekson and Wennström (2023).

[21] The Karolinska Institute is ranked 49 in the Times Higher Education list for 2022, a drop by ten positions compared to 2021.

[22] McKinsey Sweden and McKinsey Global Institute (2012).

are too widely dispersed. Instead of concentrating on large research universities where a critical mass can be achieved, government research funding is dispensed across too many academic institutions, many of which are, in effect, regional university colleges. A system based to a greater extent on quality criteria for the distribution of governmental research funding would—together with the opportunity for specialization that follows from greater autonomy—create critical mass in research and innovation.

The organization of university research in Sweden also seems to be more rigid than in the United States, for example. In Sweden, it is still quite common for researchers who have earned their PhD to continue at the same university when they proceed to the postdoc level. In the world's leading research nation, the United States, this is nowhere near as common. In principle, the top universities always demand that their PhDs leave to pursue their career as assistant professors at another university. It is believed that this stimulates creativity. Rothstein (2009) asserts that a different practice in Sweden is connected with the fact that Swedish researchers tend to continue to work within the same tradition and even at the same institution as their supervisors, while the tradition in the United States is rather that younger researchers challenge their senior colleagues.[23]

The leading U.S. universities are also characterized by intense and close contacts—including the creation of research-based spin-offs—with the regional business community, as well as greater opportunities for immigrant researchers and entrepreneurs. More than half the start-ups in Silicon Valley reportedly have at least one immigrant founder.[24] Even more strikingly, Andersson (2022) reports that of the 582 "unicorn" start-ups valued at USD 1 billion or more in the USA, 55% had at least one immigrant founder. That number rose to two-thirds when counting companies that were founded or co-founded by immigrants or the children of immigrants.

From our point of view, while both knowledge building and knowledge transfer are important, *collaboration with the business community* is central. This can take many different forms, such as spin-offs, research villages, and adjunct professorships. A general trend, likely to also characterize Swedish companies, is that less research is conducted jointly or in consultation with private industry.[25] Within the so-called knowledge triangle—research, education, and innovation—greater emphasis should be placed on innovation. In 2009, a major reform was implemented with the aim of increasing the autonomy of universities, thus reducing government regulation regarding recruitments and senior appointments, and giving individual universities more room to specialize their research and curricula.

However, this increased autonomy was not extended to their innovation systems. In our opinion, this is a shortcoming; universities should own and develop their own innovation processes. We also believe that they should adopt the intellectual

[23] See Rothstein (2009) for a more in-depth discussion of several of the factors that probably lie behind the lack of innovation in many Swedish universities. See also Andersson and Thulin (2008).

[24] Saxenian (2002).

[25] Arora et al. (2021).

property institutions they believe serve them best, i.e., where faculty own their ideas (professors' privilege) or the university system does (Bayh–Dole).[26] Rules that prevent universities from developing holding companies should be altered. Even though they are referred to as the universities' holding companies, they are fully government-owned and their activities are constrained in several ways: Any additional capital injections must be decided by the government, dividends to the universities are not allowed, and contractual agreements involving the universities are complicated (Braunerhjelm 2021). Another area of concern is the low mobility between different academic environments and between academia and business. Here there is obvious room for improvement.

Furthermore, we suggest that research resources should be allocated according to quality and innovation criteria, and that the time horizon in research policy should be extended. Today, the latter usually lasts four to five years. But research, not to mention its commercialization, often takes much longer. A declaration of intent concerning research investment along a longer perspective—10 to 12 years—would create greater predictability and confidence.

4.3 Private R&D

R&D also takes place on a large scale within private firms in terms of financial outlay, investment there is more than twice as high compared to universities. Firms also face much greater pressure to commercialize their results than do universities. Sweden has proud traditions, not least in medical-technical R&D. The number of granted patents from Swedish applicants increased between 2005 and 2018 even though this rate has decreased in recent years. Throughout the period, Swedish patents increased by 28% while the corresponding figure for the world was 29.5%. Sweden matches the world average and exceeds both the OECD average (13%) and the United States (19%). China exhibits an outstanding development with an increase of 589% between 2005 and 2018, although its starting level was low, and it is rapidly approaching the U.S. level.[27]

A large part of Swedish R&D investment takes place within a few large company groups, which often have R&D centers outside Sweden, and where different divisions compete for internal investment. In some cases, research centers have been relocated to other countries, such as AstraZeneca's large research centers previously in Lund and Södertälje. There are also a few research nodes that have been established in Sweden recently, e.g., Volvo Car's R&D establishment in Gothenburg (following Chinese Geely's acquisition of Volvo's automobile division), and Northvolt's establishment in Västerås.

[26] SOU 2016:72.

[27] Figures in this paragraph are from the OECD's patent database. 2018 is the most recent year for which reliable data are available (https://stats.oecd.org/Index.aspx?DataSetCode=PATS_IPC)

There are several explanations for this reshuffling of R&D activities. One is that Swedish firms have not succeeded in asserting themselves sufficiently in international network-based research, where firms must increasingly acquire ideas, inventions, and material assets from other firms or foreign universities. This development is taking place increasingly on the borderline between products, services, and business models.[28] However, the most commonly invoked economic reason is the lack of adequately skilled domestic researchers (here we return to the issue of inadequate education) and the combination of low salaries and high income taxes. Low net salaries make it difficult to attract leading researchers from abroad. If foreign researchers are to find Sweden attractive, their pre-tax salaries need to be set very high. New R&D establishments are primarily linked to the so-called re-industrialization of the north of Sweden and related to mining, steel, and battery production. Several of these investments face considerable challenges, not least in terms of energy supply, and the future outcome remains uncertain.

We have already expressed our skepticism about focusing excessively on increased government R&D subsidies. This skepticism is reinforced by the problems described above. We believe that the system itself should be reformed. One of the most important measures concern taxes, and in the next chapter, we present a number of proposals in this area that have direct and indirect effects on business R&D.

4.4 Channeling of Savings

In the welfare state, the household partially relinquishes the need to save—the state and the social insurance sector save for it. As a result, household saving dropped sharply in tandem with the growth of government transfer systems that removed most of the need for precautionary saving and saving for retirement. As shown in Fig. 4.3, household saving even turned strongly negative in the 1980s. Therefore, a typical individual rarely has any major savings available to start a firm or join one as a (part) owner.

The deep crisis in the early 1990s, the gradually reduced replacement rates of public transfer systems and the growth of (largely mandatory) supplementary pension schemes has led to a sharp rise in household saving, exceeding ten percent of disposable income by a wide margin in the most recent decade. However, it is also clear from the graph that saving is dominated by pension insurance saving; collectively agreed supplementary pension schemes cover virtually all tenured employees with payments into those systems amounting to approximately ten percent of taxable wage income.[29] In 2022, the total assets of private life and pension insurance

[28] McKinsey Sweden and McKinsey Global Institute (2012).

[29] Marginal payments are at least 37.2% on the part of wages exceeding SEK 46,440 in 2023. This wage level is a mere 20% above the average wage for full-time workers (including a tax of 24% on collectively agreed pension premiums).

funds amounted almost exactly to 100% of Swedish GDP and almost 200% of household disposable income.[30]

As a long-term solution, the best way to ensure the financing of entrepreneurial firms is likely to be the pursuit of policies that encourage private wealth accumulation in forms that do not preclude the assets being used as equity in entrepreneurial ventures.[31] At the same time, for the foreseeable future, the combination of welfare-state arrangements and the extensive contractual pension insurance saving will stifle direct individual saving. Since such a large share of this money goes into pension funds, there is a growing need for at least part of these assets to be invested in entrepreneurial firms and not almost entirely in real estate, public stocks, and high-rated bonds. Although Swedish pension funds are allowed to invest in venture capital and buyout funds, these investments are still very small. The largest pension fund, Alecta, had total assets of SEK 1155 billion in 2022. Investments in private equity assets constituted a mere 11.1 billion or one percent of total assets.[32]

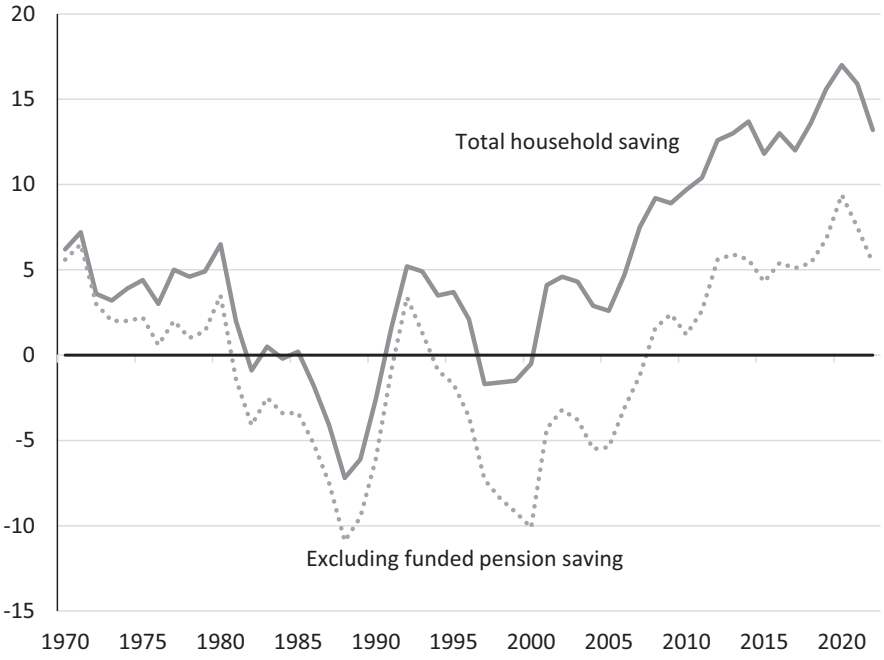

Fig. 4.3 Household saving as a share of disposable income, 1970–2022 (%). *Source*: Statistics Sweden

[30] https://www.svenskforsakring.se/statistik/marknadsstatistik/placeringstillgangar/

[31] Pelikan (1988) provides forceful arguments supporting this view.

[32] https://www.alecta.se/globalassets/dokument/finansiella-rapporter/alectas-ars%2D%2Doch-hallbarhetsredovisning-2022.pdf

Thus, the assets of many savers are placed in funds which are managed in such a way that they cannot be used as risk capital in the saver's own or related firms. This institutionalization of saving, combined with the fact that tax legislation until recently, as we have seen above, made it very difficult to develop an efficient VC industry, has further contributed to complicating the supply of capital for entrepreneurial firms. However, beginning in the 2010s, numerous previous entrepreneurs who had achieved successful exits assumed new roles as business angels and investors, which has boosted access to early-stage funding.

With one stroke, rule changes that enable a "deinstitutionalization" of pension savings would make a large share of pension assets available for equity investment in entrepreneurial firms. Of course, limits would need to be set, both in terms of the amount and to prevent tax arbitrage. Here it can be noted that it was such a rule change that made a small part of pension savings available for start-up financing that formed the basis of the North American VC industry (Henrekson et al. 2021).

Changing the foundations of the entire pension system and institutionalized saving is not feasible. But some changes can and, in our view, should be made. We propose that a certain proportion of pension savings be made available for investment in unlisted firms. At present, only one out of the six public pensions funds can invest in unlisted companies (AP6),[33] targeting the segments of buyouts, venture/growth, and secondaries (when investors in a fund would like to divest their holdings before the fund is closed). They do not invest in early stages. The rules that govern which financial instruments may be included in pension savings, in individual investment savings accounts (ISK) introduced in 2012, and in capital pension savings accounts (now only listed securities and funds) should thus be made less restrictive so that some portion of the assets can be invested in unlisted (i.e., private) firms.

4.5 The Functioning of the Labor Market

In a functioning market economy, a massive restructuring of jobs and employees is constantly taking place. Firms hire and fire people, young people enter and retirees leave, people enter and exit because of parental leave, illness, further education, and more. The gross flows in the labor market are many times greater than the unemployment figures suggest.[34] In the midst of these flows, fast-growing firms have a dire need for flexibility in terms of contract and space to vary the size and composition of their workforce. Technological breakthroughs and changing markets mean

[33] https://www.ap6.se/en/

[34] In the U.S. labor market, about 15% of all jobs disappear every year, but at the same time even more new jobs are normally created, i.e., roughly every seventh job has existed for less than a year (Caballero 2007; Haltiwanger 2011). The pattern in Sweden is similar, although somewhat less pronounced (ITPS 2008; Heyman et al. 2021).

that businesses are continuously faced with demands for adaptation and alterations in work organization and relative wages.

Acemoglu (2002) states that the profitability of a firm strongly affects the connection between new technology and wages. During early industrialization, companies were able to achieve large increases in productivity as well as higher profitability by replacing advanced craftsmanship with machines operated by unskilled labor. The past century, on the other hand, has largely been characterized by the fact that technological development, a well-educated workforce, skills, and professionalism have been complements rather than substitutes. In economic terms, this is usually called skill-biased technical change (Berman et al. 1998).

The main explanation for the increased spread of wages in recent decades is that technical change has increased the need for skills, especially those not learned through formal education and work experience measured in years of service. Highly valued skills include ability to cooperate, conscientiousness, ability to cope with new tasks and perhaps above all the individual's general capacity to work diligently (Juhn et al. 1993). At the same time, new technology has made it possible to rationalize many labor-intensive production processes while simultaneously paving the way for the gig economy. These divergent patterns also show up in a widening income distribution over the last decades, squeezing middle income earners. Hence, technical change not only affects wage formation, but also the entire organization of the labor market in a way that includes not only institutions and policy but also the organization of production and firms.

Key labor market institutions affect how well the skill structure functions. Regulations that restrict freedom of contract limit the opportunities to find the most efficient mix of the factors of production. Three areas are particularly important for fast-growing firms: labor-market regulations, wage formation, and social insurance.

4.5.1 Labor Market Regulations

The design of labor market regulations varies considerably between different countries (OECD 1994, 2004; Skedinger 2010). Research on structural change and gross flows of firms, jobs, and workers gives us reason to believe that strict employment protection and other regulations that reduce freedom of contract are more troublesome for firms that want to grow quickly than for mature firms and those without growth ambitions. As the employer acquires a clearer picture of the individual employee's skills—which develop over time—the appropriate tasks for that employee are constantly changing. The opportunities to find new tasks within the firm are usually better in a larger firm, because the large firm has more positions to choose from. In an unregulated labor market, a continuous matching of individuals to optimal work tasks means that individuals change employers. Such changes thus become more common for people who work in smaller, often younger, firms, and their staff turnover tends to be high.

Higher mobility in the labor market turns out to be positively related to increased productivity and the ability to pay higher pay wages. As shown by Kaiser et al. (2015) and Braunerhjelm et al. (2020), labor-market mobility is associated with higher rates of innovation. The explanations are more efficient matching, network effects and efficient knowledge diffusion. Labor is endowed with different types of know-how, abilities, and skills, and when these knowledge bearers enter an environment where their knowledge can best be combined with the knowledge of others, innovation is more likely. Research has also shown that labor market regulations tend to have different effects on small and large firms. Smaller ones have a greater need to vary and change their knowledge base—sometimes in rapid, large steps—while larger ones can benefit from a more rigid labor market where innovative staff can be more easily retained (Braunerhjelm 2011).

Strict regulation of the conditions for employment and redundancy therefore makes it difficult for entrepreneurs to adapt their workforce to fluctuations in demand. This increases the risk for fast-growing firms (Audretsch et al. 2002). In general, the proportion of jobs that are created and disappear decreases as the firm grows larger, older and more capital-intensive. Strict regulation is therefore relatively favorable towards mature firms, but creates disadvantages for young, fast-growing firms. This is illustrated in Fig. 4.4, which shows the relationship between the degree of labor market regulation and the degree of what in the literature is called high-growth expectation early-stage entrepreneurship—the type of entrepreneurial activity associated with fast-growing gazelles. The figure shows a clear negative connection between stricter employment protection and such entrepreneurial activity.

The relative value of having permanent employment also decreases if employment protection is weak, which reduces the opportunity cost of being self-employed) (van Stel et al. 2007). Strong employment protection increases the opportunity cost both of changing jobs and becoming an entrepreneur. This reduces the tendency to attempt to start a fast-growing firm and makes it more difficult for such firms to recruit good employees.

Admittedly, firms can increase flexibility by taking advantage of temporary employment. However, there are clear disadvantages to this. Fixed-term employees are less motivated to invest in firm-specific knowledge than permanent employees, which makes it more difficult to attract workers who have or are prepared to develop valuable skills. The greatest obstacle caused by stringent labor market regulations is probably that it makes it more difficult for the individual to improve, advance, and take on new challenges. Temporary employment and staffing companies can to some extent remedy this shortcoming, but rarely for the recruitment needs of the type of highly skilled entrepreneurs that are central to a dynamic economy.

The Swedish labor market has undergone significant regulatory alterations to foster greater flexibility. The primary aspects of these changes, which became effective in 2022, and their potential implications for the labor market's responsiveness to shifting economic conditions are as follows (Iseskog 2022):

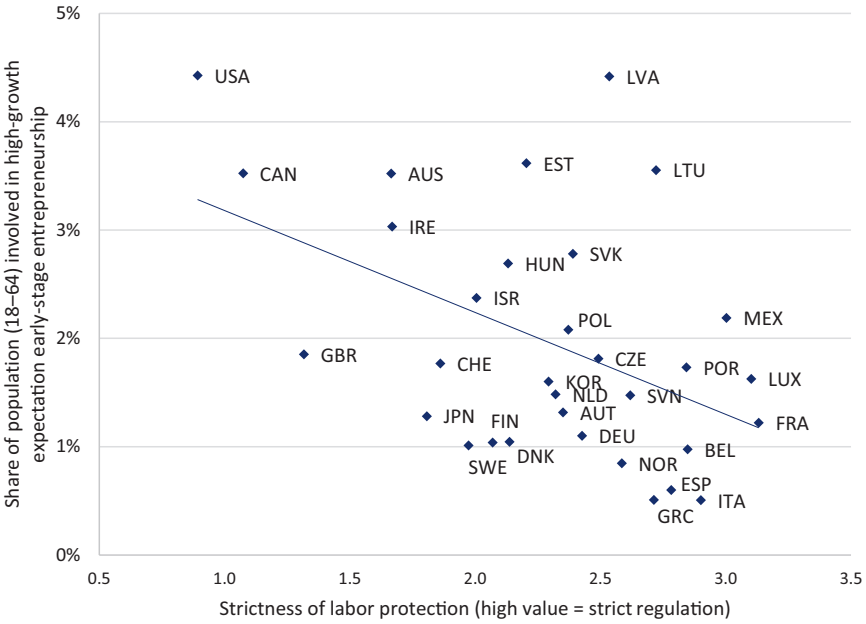

Fig. 4.4 The strictness of employment protection, 2013, and high-growth-expectation early-stage entrepreneurial activity, 2015–18. *Note*: High-growth-expectation early-stage entrepreneurial activity is averaged over the four years 2015–18. Permanent employment protection legislation (EPL) is given a weight of 2/3 and temporary EPL a weight of 1/3. *Source*: Global Entrepreneurship Monitor and OECD/IAB Employment Protection Database, 2013 update

- Emphasis on Permanent Full-Time Employment: The modified regulations stipulate that permanent full-time employment should be considered the norm. Employers' ability to hire workers on temporary contracts has been reduced from 24 to 12 months. After 12 months, the employee is entitled to a permanent contract. In addition, there are provisions for permanent contracts under certain conditions, notably that temporary employees who have been hired for more than 12 months over a five-year period are automatically granted a permanent employment contract.
- Modified Criteria for Employee Dismissal: The criteria for terminating employees has shifted from "objective foundation" to "objective reason." This subtle alteration is intended to simplify the process of dismissing employees for misconduct, while maintaining the burden of proof on employers and the requirement to find a suitable replacement before terminating employment.
- Expansion of Employee Exemption Criteria: The regulations have broadened the scope for exempting employees from seniority-based termination orders, permitting greater flexibility for employers. Previously two employees could be exempted provided that the firm did not have more than ten employees, which has been extended to three employees irrespective of firm size. However, this

change may not significantly differ from prior negotiated agreements and associated economic compensation.
- Adjustments to Exemption Limits Based on Firm Characteristics: The updated regulations allow for variations in exemption limits based on the number of establishments a firm has in one location and the collective agreements with different unions. These adjustments offer employers the possibility to exempt up to 15% of their labor force, subject to certain restrictions.

Despite the expanded possibilities for employers to exempt workers from the "last in – first out" principle during layoffs, the new regulations also impose stricter obligations on full-time and permanent employment, potentially limiting the use of temporary contracts. Consequently, the overall effect of these changes on labor-market adaptability remains to be seen.

4.5.2 Wage Formation

An important step towards more predictive and business-friendly wage formation was taken in 1997 with the Industry Agreement (collaboration between employers and trade unions on industrial development and wage formation). The Industry Agreement prioritizes negotiations between unions and industries that are highly exposed to international competition. The outcomes of these negotiations serve as a reference point for wage increases and other employment-related conditions across the broader economy.

The Industry Agreement contributed to consistent real-wage growth annually until 2021/2022, demonstrating its effectiveness in fostering economic prosperity for workers. Prior to 1997, a significant portion of wages were determined centrally, with a focus on relative wage development across industries and worker categories. The Industry Agreement has facilitated a shift towards greater emphasis on individual skills development and productivity. The shift towards collaborative negotiation has led to a decrease in labor-market disruptions, such as strikes, which previously resulted in substantial costs for employers.

The major share of the Swedish labor market is covered by the Industrial Agreement, or by other agreements based upon it. Under the Agreement, many arrangements are made without any connection to centrally negotiated wage structures—everything is decided at the local level. However, most of these agreements still include minimum wage-level guarantees. The Industrial Agreement stipulates that trade unions and employer organizations must take greater responsibility for wage formation by concluding special collective agreements on cooperation and negotiation.[35]

[35] To come into force, an agreement must contain a timetable for negotiations, rules regarding the appointment of impartial mediators and the extent of their influence, as well as rules for the termi-

Despite the fact that the Industrial Agreement constitutes a major improvement compared to the previous arrangement, it is still the case that the norms and institutions that govern wage formation have not been fully adapted to the new economic context in which firms operate, which creates recruitment problems for fast-growing firms. Centralized wage negotiations in combination with high minimum wages (compared to the median in the industry) tend to disadvantage smaller and younger firms, especially in the service industries where it is otherwise usually easiest for firms with a good business idea to grow quickly (Henrekson and Johansson 2010). This follows from the fact that the wage level is consistently higher in larger and older firms (Oi and Idson 1999).

This compressed wage structure also means that the private financial return on higher education is relatively low in Sweden, which reduces the incentive for individuals to treat education as an investment in economically valuable knowledge and skills. As stated by Andersson and Thulin (2008), a low private economic return on higher education also tends to lead to a low societal return, probably because individuals pay less attention to demand in the labor market when deciding what to study. Instead, the consumption element in education is given greater weight, and education is postponed and becomes less useful (which can be seen in the fact that graduates work fewer hours after completing their education than they used to).

The further from the individual workplace that the salary is set, and the less the consideration given to the specific circumstances of each individual case, the more difficult it becomes for fast-growing firms to build a workforce with the right skills and competencies. Idiosyncratic intrafirm differences tend to be particularly large in new, small but fast-growing industries and firms (Caballero 2007; Haltiwanger 2011). Thus, these firms tend to be harmed the most by wage-setting institutions that render it difficult to take into account specific circumstances and individual employee characteristics when employees are compensated for their efforts.

4.5.3 The Labor Market and the Social Insurance System

By providing insurance against failure, the public sector can reduce the risk for individuals in entrepreneurial firms characterized by high levels of uncertainty. Here, however, it is important that the social insurance system is generous enough to be relevant even to income earners with above-average salaries, and that security is not linked to length of employment with the current employer. There is reason to believe that a Danish flexicurity-type system combining weaker employment protection with more generous public income insurance makes it easier for firms to grow quickly (Klindt 2010).

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nation of the agreement. For a more detailed discussion of the Industrial Agreement's design and function, see Elvander (2002) and Calmfors et al. (2019).

Research and policy recommendations in these areas are obviously controversial in a Swedish context. Nevertheless, it is important to clarify the inverse relationship here between security and dynamism. Unfortunately, it is a fact that several of Sweden's traditional social security systems and norms for wage formation restrict freedom of contract and limit the possible combinations of competencies in the labor market and in production. This makes it more difficult for entrepreneurs to experiment and test new ideas according to the ideal model of their socio-economic and innovative role described above. The entrepreneur therefore creates less value than in an environment with less restrictive rules.

Against this background, we believe that a comprehensive policy for a more innovative society should strive to make the security aspect of social insurance systems completely mobile. Public risk insurance should provide flexicurity. This means a decent and generous unemployment insurance fund that places high demands on mobility, accepting new jobs, and being prepared to retrain and acquire new, more productive knowledge. Sickness and unemployment insurance should be clearly designed as transition insurance, not as an alternative to permanent employment, and pension systems should be fully actuarial.

In a number of countries (including Sweden), the self-employed have poorer social insurance coverage than employees. And for those who succeed in profiting from their entrepreneurship, high social security contributions become an additional marginal tax if the beneficiary reaches the ceiling of the system.[36] Moreover, the self-employed, regardless of the legal form chosen (incorporated, sole proprietorship, etc.), do not utilize welfare schemes to the same extent as ordinary employees; they cannot afford to completely ignore their businesses if they are sick or on parental leave, which is a requirement for various transfers. In addition, it is a considerably more complex task to calculate the wage that provides the basis for remuneration from social insurances since these are based on historical wages. As an example, the remuneration for employees is based on an average of wages over the prior 12 months up to a certain ceiling. Wages above the ceiling can be covered through income insurances. For the self-employed entrepreneur, wages are much more volatile and total income is often reported later, i.e., when the business closes the books for the year. Income insurance is also harder to obtain.

The remuneration of entrepreneurs therefore tends to be much more uncertain and volatile than for employees, implying higher risks. Combined with a progressive tax system, this makes the overall environment less conducive to entrepreneurship. This aspect is accentuated by the emergence of the gig economy, where it is often unclear whether workers are employees or self-employed; institutions need to be adjusted to accommodate these new contractual arrangements in the marketplace (SOU 2016:72).

[36] Above an annual wage of SEK 557,250 (in 2023), the mandatory social security contribution becomes a pure tax, i.e., all links to the social insurance system are severed. In addition, more than one-third of the social security contribution of a self-employed person (normally 28.97%) is also a pure tax below the ceiling (the "general wage fee" of 11.62%).

4.6 Product Market Regulations

If product markets are to give participants the impetus to dare to experiment, dominant firms must not abuse their market power. Regulations must be appropriate and provide the right incentives to market actors. This is easier said than done—it is easy to find examples where regulations miss the mark, benefit a certain interest group, or entail insurmountable costs. Technological progress can also make regulations obsolete and thereby hinder growth and adaptation to new conditions.

Recent research points in particular to the risk that regulations may weaken competition by making it more difficult for new entrants to establish themselves in the market. Weak competitive pressure erodes companies' drive to innovate and adopt new technology. Not least, research shows that adaptation to new IT and communication technologies can thereby be inhibited, which has major negative effects on productivity growth. Whereas the United States used to be considerably less regulated and more flexible than Europe (Poschke 2010), this advantage seems to have at least partially eroded (Philippon 2019). More generally, the trend towards a more lenient regulatory framework between the 1990s and 2010 seems to have levelled out or reversed. This mirrors political concerns regarding financial market stability after the 2008–2009 crisis, the emergence of digital platform firms, and more generally an increasingly insecure and tense geopolitical situation that has prompted governments to define certain strategic areas and to impose trade restrictions.

Regulations that reduce competitive pressures also mean weaker incentives to move capital and labor from firms with lower productivity to those where it is higher. High-productivity growth presupposes that such transfers can take place relatively painlessly, given that productivity differences are often large between firms in a given industry at any given time. Depending on the composition of the industry and the skills of the workforce, the effects can vary. Nor must they be linear—according to Arnold et al. (2011), regulation can cause abrupt shifts in the production function. Between 2020 and 2023, such impediments to efficient allocation of resources have been aggravated by the plethora of support schemes and tax reliefs introduced during and in the aftermath of the pandemic.

In the case of Sweden, major deregulatory steps were taken in the early 1990s, in connection with the crisis. After that, the tempo has slowed down. However, Fig. 4.5a and b shows that Sweden still retains a favorable position compared to other countries in terms of product market regulation

It is critically important that the recent tendencies towards increased regulation are kept at bay, or that altered regulation strives to improve the functioning of markets, such as constraining obvious instances of abuse by dominant firms, or increasing national security. At the moment, there are forces that seek to limit the extent of the market: trade and foreign ownership restrictions, competition and state aid regulations, and the introduction of a laxer fiscal policy framework in the European Union (in 2024).[37] These factors, individually and in combination, open up

[37] https://ec.europa.eu/commission/presscorner/detail/en/ip_23_1410

possibilities for curbing competitive forces and partially insulating domestic markets from international competition (Braunerhjelm and Lappi 2022). There is consensus that regulations that restrict market entry and competition also inhibit productivity (Inklaar et al. 2008; Andersson et al. 2012), since such regulations protect old and less efficient firms. This is one likely reason why productivity growth has slowed in the last decade.

Since most sectors have innumerable and detailed regulations, we will refrain from submitting detailed proposals, sector by sector and industry by industry. Instead, we want to expand the mandate of Sweden's Better Regulation Council (established in 2008 with the aim of simplifying business regulation), and concurrently provide the Council with substantial resources to be able to conduct thorough impact assessments.[38] It should examine new legislative proposals and identify any risk that they will have an inhibiting effect on competition and innovation.[39] In the event of major risk, the Council should have a right of veto. It should also review existing regulations. In addition, all new proposals should be subject to a "sunset clause"—new regulations must be reconsidered on an ongoing basis; otherwise, they will automatically expire after a few years.

4.7 Tax-Financed Welfare Services

In welfare services, machines cannot replace people in the same way as in industry or transport. A nurse, for example, cannot be automated. Labor productivity—output per working hour—therefore tends to increase more slowly in welfare services than in manufacturing. This in turn means that the relative cost of welfare services will rise. Therefore, it becomes especially important to organize this activity in such a way as to stimulate new thinking and innovation. In particular, competition and transformation pressure are required to help offset higher costs. Without such competition, the cost of schooling, nursing, and social care will rise even further.

As early as the 1980s, certain initiatives were taken that allowed for private alternatives (such as the private nursery school franchise Pysslingen), but the main decisions were made in the early 1990s. Parliament then adopted the position that tax financing would be retained as a basic principle, but that private alternatives, for example in childcare, healthcare, elderly care, and education, should meet the same financial conditions as the ones administered by the local or regional government. Other possibilities such as public basic financing with a right for competing

[38] The Swedish Better Regulation Council, established in 2008, is an advisory body intended to assist the government and the authorities in their work with regulatory simplification for companies. The Council examines the formulation of proposals for new and amended rules that may have effects of significance for companies' working conditions and competitiveness. The Council also provides information and advice that promotes cost-conscious and effective regulation. See www.regelradet.se

[39] See also Eklund (2011).

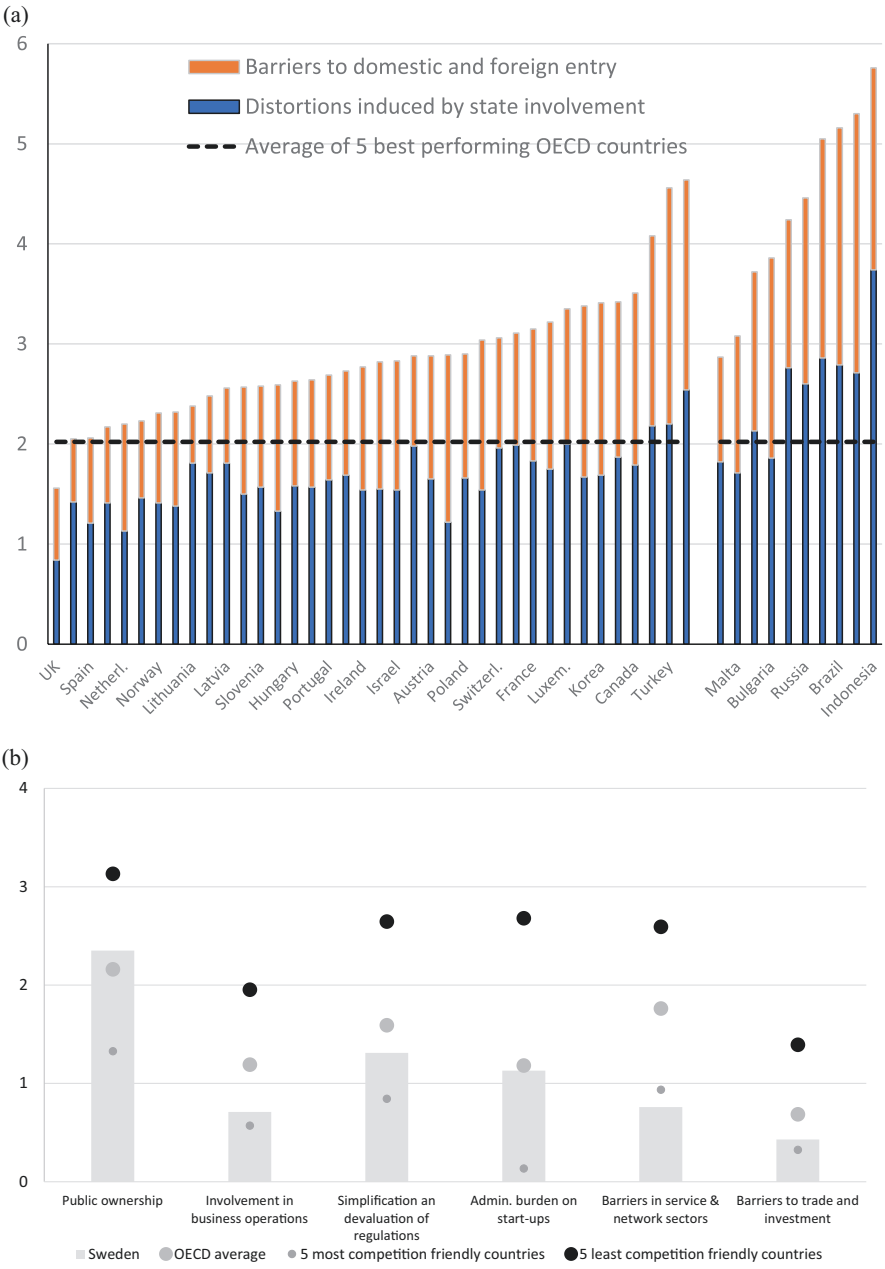

Fig. 4.5 (**a**) Product market regulations in a number of leading countries (index 0 to 6). (**b**) Economy-wide product market regulation indicators broken down by major components. *Note*: Index scale from 0 to 6 from most to least competition-friendly regulations. *Source*: OCED (2018)

contractors to charge fees for better quality or additional services were never considered.

As always, it takes time before institutional changes take effect in a meaningful way. Firstly, actors must realize the consequences of the changes, which must be perceived as lasting, and secondly, behaviors on both the producer and consumer side must adapt to new conditions. Today, several decades after the opening up of social, medical, and educational services to competition, the growth of private service providers has gained momentum. This is clear from Table 4.2, which examines the private sector production share for major welfare services that are either entirely or primarily tax financed. The private health center share is rapidly approaching 50%, for elderly care the share is around one quarter, almost one third of secondary school students attend a private school, and two-thirds of personal assistants for the disabled are employed in the private sector.

There are now more than 15,000 private firms in the health and social care sectors. Several large firms have also been built up in a fairly short time, both in education (the largest one is AcadeMedia with 18,800 employees) and in healthcare and social care (notably Attendo, Ambea, Humana, and Capio with roughly 30,000, 26,000, 16,000, and 11,000 employees in the Nordic countries, respectively).

In normal markets with private financing and production, it is hardly controversial that freedom of choice and competition benefit consumers. That the same should apply in markets with private production but public financing is far from obvious. Today's welfare services are traded in quasi-markets with a wide range of problems: the services in question are complex and difficult to procure; formalized procurement processes benefit large actors and limit competition; information is asymmetric between users, producers, and financiers; quality improvements are not sufficiently rewarded when the producer cannot charge a higher price for improved quality; overcapacity can arise; lack of information makes it difficult for users to make decisions; follow-up and control are skill- and resource-intensive; there are segregating forces; and individual users do not take into account how society as a

Table 4.2 Private sector production share for major services that are primarily publicly funded, 1996 and 2020/2022 (%)

Service	1996	2020/22
Primary school	2.2	16.1
Secondary school	2.3	30.5
Institutional childcare	12.5	19.0
Care of the elderly at nursing homes	8.3	20.8
Personal assistance due to disability		67
Home help services for elderly	2.6	25.3
Hospital care	4.3	9.0
Health centers	28	45.0
Share of doctors privately employed	10	23.8
Children's dental care	5	14
Purchases from private firms by regional and municipal authorities as a share of total spending		13.2

Source: Werenfels Röttorp (1998) for 1996 and the Swedish National Agency for Education, SKR (2022), National Board of Health and Welfare (2022), and Vårdföretagarna (2022) for 2020/22

whole is affected.[40] Manipulation and waste occur more easily when an anonymous and absent third party (the taxpayer) acts as an intermediary and finances all transactions between producer and consumer. In addition, most of these services are ideologically charged, which also makes technical and administrative details politically controversial.

The difficulties posed by quasi-markets are at their most challenging with respect to the so-called credence goods. These goods are characterized by, on the one hand, the producer knowing more than the consumer about the latter's needs, and on the other, the fact that the quality of what is bought cannot be observed by the consumer even after purchase. Expert services such as medical procedures, automobile repairs, and dietary supplements are typical examples. The consumer often finds it difficult to assess for herself whether she needs a certain service, for example a certain type of treatment under the care of a specialist. A producer of a credence good can therefore, by virtue of their expertise, exaggerate or understate the consumer's needs. In order to achieve good quality and efficiency in the production of credence goods, the producer must therefore provide the correct information. If it is not possible to verify the treatment performed (or the care or training provided), or to hold the producer accountable for a bad outcome, the producer is unlikely to deliver the desired quality.[41] If, on the other hand, at least one of these conditions is met, it is possible to draft an agreement that gives the producer the right incentives to provide an appropriate and high-quality product or service. To some extent, consumers can rely on the producer's reputation, but reliable information can only be disseminated by consumers who can understand and evaluate the service in question.

Empirical studies of contract procurement confirm that credence goods have the worst outcomes (Andersson et al. 2019). This is illustrated by institutional care of young people, where the total cost was found to be twice as high for young people in private homes compared to municipal ones (Lindqvist 2008). How such tendencies are counteracted is decisive for the functioning of quasi-markets.

4.7.1 Public or Private?

Privatization of quasi-markets creates challenges when the profit motive has wider scope. Without adequate regulation, lenient grading becomes a means of competition among schools; reduced staffing in nursing homes is a means of increasing returns; and an unnecessary number of return visits to health centers is a way of increasing patient reimbursements. But we must not forget that large segments of the public sector still suffer from the same kind of problems highlighted in the political battles of the 1980s: vague goals, problems with delegating responsibility,

[40] Le Grand and Bartlett (1993) present a theoretical analysis of quasi-markets. For an in-depth discussion of the problems listed, see Hartman (2011) and Elert and Henrekson (2023).

[41] See Balafoutas and Kerschbamer (2020) for an overview and assessment of the research on credence goods.

lack of competition and low quality of services provided, absence of "carrots and sticks," inability to process dispersed and fragmented information, "soft" budget constraints that keep underperforming entities afloat, political considerations during election years, and so forth. Third-party financing cannot simply be designed so that these problems disappear (Andersson et al. 2019). Our point is that there is no evidence to suggest that public actors—despite the imperfections of private alternatives and despite sensationalist media headlines—outperform private ones. Swedish comparisons indicate that differences in quality between public and private contractors are generally small and uncertain (Blix and Jordahl 2021). Moreover, it should be noted that the best suppliers are often private.

Comparisons between public and private service providers must be based on a theoretical assessment of the advantages and disadvantages of different incentive systems and the organization of production of the service in question so that empirical tests are formulated correctly. One starting point is Shleifer (1998). He sets out four criteria under which public production can be superior to private:

- When it is impossible through contracts and penalties to prevent the producer from reducing his costs through lower quality
- When the potential for innovation is relatively small
- When competition is weak and consumer choice is inefficient or inoperative
- When damage to the supplier's brand carries no consequences, or if the brand is hard to damage

Shleifer himself sees these criteria as highly restrictive for publicly produced services, as it is usually possible to create adequate conditions for private services through regulation that can ascertain whether the above criteria are met. He asserts that the number of activities that must be carried out by the government is very limited, but not zero.

However, if the regulatory framework is not properly designed, it may well be that Shleifer's criteria are met in practice. In cases where the choice of producer and the framework for production are determined by public procurement, the competitive element (Shleifer's third criterion) is limited compared to a market in which several producers sell directly to multiple consumers. It is therefore all the more important that competition be maintained throughout the (often highly complex) procurement process. A great deal of development and learning has taken place in this area in recent years. However, there still remains much to be done, not least when it comes to how the rules for auction processes should be designed.

The contract itself (Shleifer's first criterion) is also crucial. One challenge is to draft contracts that make it impossible to reduce costs by lowering quality. On the other hand, contracts must not be so detailed that they rule out productive cost savings or innovations. There is an extensive literature discussing how such agreements should be designed and how the procurement process should be structured to achieve maximum efficiency and clarity.[42] The simpler the service to be procured,

[42] See Andersson et al. (2019) for an overview.

the easier it is to arrive at the right form of contract or the right procurement process. The more complex the service becomes, the greater the demands on both.

Our conclusion is that the public sector should be exposed to sustained and intense pressure to reform. Wise procurement, good regulatory systems, and well-functioning competitive markets can improve the quality and reduce the cost of welfare services—even if the task is difficult. Procurement by tender is also absolutely necessary for major energy and infrastructure projects where the time horizon is too long for private investors. Stronger institutions and regulations are thus necessary to monitor contracts, ensure compliance, and impose fines and other sanctions when the contractual terms are not met.[43]

4.7.2 Customer Choice and Consumer Protection

No matter how well one succeeds in the development of contract and procurement processes, the competitive element is limited for certain markets to the actual procurement opportunity. The actor who wins a tender acquires a temporary monopoly in the relevant area. One should therefore strive for providers of welfare services to be determined by customer (or user) choice.

A fundamental problem, however, is asymmetric information. The buyer is consistently at an information disadvantage in relation to the seller. In other areas, this has been solved by means of consumer protection regulations. These grant the consumer a number of rights, such as the right of return, price information, and opportunities to sue for damages. In addition, the consumer receives information, for example in the form of product comparisons and blacklists of sellers who do not comply with the rules. For property sales—a situation in which the problem of asymmetric information is obvious—there is extensive regulation governing the sales process which aims, among other things, to neutralize the seller's information advantage. If the seller has withheld negative information about the property, the buyer can seek legal remedies.

In the welfare sector, consumer information and protection are limited and at times nearly non-existent. We find this odd, because there is usually significantly more at stake for the consumer regarding the delivery of welfare services than when purchasing other goods and services. Finding the best cataract surgeon should be more important than finding the right hotel on a package holiday. The quality of a child's education is more important than the quality of one's domestic appliances. Sweden's National Board for Consumer Disputes can intervene if a traveler has a bad hotel experience, if their flight is delayed, or if the hotel's broadband connection is slow. But quality in the welfare sector is seldom "verifiable" in the sense that it is possible to prove to a third party (i.e., in court) that the quality is unacceptable. For example, in elderly care (public as well as private), although staff and clients may

[43] See Eliasson (2009) for an in-depth discussion.

know when quality is substandard, they still cannot prove this claim "beyond all reasonable doubt."

Unfortunately, the weak regime of consumer protection and advice regarding public sector welfare services has been transferred to emerging private sector services. Private welfare firms are thus probably the only consumer firms in Sweden that operate in markets that are largely devoid of consumer advice and protection. This contributes to inefficient consumer choice. The media debates caused by the negligence and quality problems involving a number of service providers show—despite exaggerations and perhaps even false alarms—that media scrutiny is a corrective to abuse. However, such scrutiny is probably insufficient to prevent such abuse and neglect, regardless of whether care is provided privately or publicly. An important element of any strategy in conveying the benefits of entrepreneurship to the welfare sector is effective rules for consumer advice and protection in these areas as well.

4.7.3 The Role of Profit in the Welfare Sector

Shleifer notes in his analysis that profit-seeking and dividend opportunities are necessary for the creation of the dynamics that make a private, market-based system superior to a planned economy. Opportunities for profit are an important impetus for innovation (Shleifer's second criterion), which grows in importance in pace with the growing importance of the welfare sector. Opportunities for profit also accelerate the dissemination of innovation and good examples to other establishments—companies are quick to codify and standardize elements that have a positive effect on the bottom line. In addition, if entry is allowed, competition is likely to bring back profits to more normal levels.

Evolutionary development of contracts, procurement procedures, and quality evaluations within the framework of a transparent regulatory framework is the most effective value-creating way to proceed (Elert and Henrekson 2023). When markets are functioning well, nurturing one's own brand serves as the strongest corrective against abuse. This in itself creates competitive advantages for larger players, where users know that damage to a brand in a single branch can jeopardize the reputation of the entire firm, thus leading to large losses for the owners. However, this mechanism is much weaker for smaller enterprises such as private families caring for young people with serious social problems.

Non-profit foundations can also play a role as producers of welfare services, and they can raise the bar and intensify competition. They also contribute to diversity and broader options for consumers. However, it is hard to imagine that non-profit providers, whose market share is falling, can satisfy the increased demand resulting from rising real incomes. Some non-profit providers want to remain exclusive and do not wish to grow (some prestigious schools, for example), while others aim for niches where supply would otherwise be lacking (such as parochial schools).

Therefore, it is hard to see how anyone other than for-profit firms can accommodate the mass market and thus be able to respond to an increase in demand.

This makes it necessary to improve the management of the profit motive. Although there are no simple solutions to this issue, further measures can be taken. External evaluation should become more significant. In educational institutions, grading and examinations should be conducted externally; this appears to be a reform that can increase the consistency of grades for all students and over time.[44] To manage the risk of rising costs, increased elements of personal financing should be considered in areas where the distributional effects are small. For example, increased patient fees in primary care would raise cost awareness without seriously ill people suffering major financial damage. Another example relates to nursing homes. In this area, it would be much more acceptable to allow the purchase of additional services (topping up). This would remedy the epistemic problems generated by fixed prices and create a sort of experimental workshop including a diagnostic tool to identify users' true needs.

Requirements for transparency and documentation should be equal for public and private contractors. The fines levied against for-profit companies should be significantly higher, and for international groups in particular where no local owner has a reputation and personal finances at stake. The fines should also be levied against the owners and not the establishment.

Several of these proposals require new forms of oversight. To use the terminology of McCubbins and Schwartz (1984), some argue that the so-called "fire alarms" can be a more effective surveillance strategy than "policing." As the labels suggest, policing refers to centralized, active, and direct surveillance, while alarms are based on regulatory systems that give individual citizens and interest groups the opportunity to be noticed and to demand accountability. Both aspects are needed. But while policing is more objective, it risks becoming rigid and formalistic. Fire alarms are more subjective, for better or worse—they are triggered when an interested party believes the situation has gone too far and flags this to the media or authorities.

4.8 The Housing Market and the Benefits of Agglomeration

In the previous chapter, the point was made that conditions for growth and job creation are generally more favorable in metropolitan areas than in smaller towns.[45] Urban areas also create fertile ground for innovation, particularly in the service

[44] See Wikström and Wikström (2005) and Vlachos (2019) for a discussion of independent schools and the equivalence of grades.

[45] Naturally, there are exceptions. This is particularly true for a small town that features a unique attractive asset: opportunities for outdoor recreation (Åre, Båstad, Tavira, Verbier), a beautiful cultural environment (Antibes, Truro, Visby, Zadar), natural resources (Kiruna, Stavanger), a strong entrepreneurial culture (Belluno, Gnosjö, Mount Pleasant), or a unique company serving as the town engine (Älmhult, Bentonville, Maranello, Sandviken).

sectors, and are thereby essential for overall growth in an economy (Andersson and Larsson 2022). A large city is attractive not only because salaries tend to be higher there and cultural offerings more ample; one's income has a higher value because there are more goods and services available to spend it on. In other words, the benefits of earning more are therefore greater in most cases.

4.8.1 The Importance of Price Efficiency

In larger and more densely populated cities, land is a scarce resource. This means that the market price for both housing and commercial premises is higher. Under such circumstances, a well-functioning housing market is crucial. To this end, price formation to arrive at a structure that correctly reflects how users value different locations and types of premises is central. This is because it sends the right financial signals to city planners, construction companies, and landowners regarding how and where new development will attain the greatest value. Healthy price formation is also necessary because requirements for living space and the form of housing change during the span of a resident's lifetime.

Given these factors, it is essential to determine how the housing market can work better. A look at Sweden's recent history of rent control can be enlightening in this respect. At the beginning of World War II, Sweden began to regulate rents, a situation which later became permanent despite extensive criticism.[46] Above all, the value-in-use principle has meant that rents have only marginally reflected location. Apartments in attractive locations have therefore been far less expensive than had they been offered on the free market. This in turn has created significant lock-in effects. However, some measures have been taken to loosen the value-in-use principle.[47] In 2011, the role of municipal housing corporations in setting rents was abolished. According to these new rules, the standard, quality, and location of each individual apartment must to a greater extent determine its rental value. However, rents are still negotiated collectively, and these negotiations are normative for all tenancies. Municipal corporations are required to operate commercially, i.e., construction costs no longer form the basis for rent negotiations.[48]

This new practice is a step towards rents that more accurately reflect the overall economic picture, but the system is still complicated and will continue to give rise to large and unjustified differences while falling short of creating a well-functioning market. In attractive areas, the lock-in effects on the rental market will to a large extent remain.

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[46] See Bentzel et al. (1963) and Lindbeck (1972).

[47] Prop. 2009/10:185, *Allmännyttiga kommunala bostadsaktiebolag och reformerade hyressättningsregler* (Non-profit municipal housing companies and reformed rent pricing rules).

[48] In 2021, the government suggested that market-based rents should be allowed for newly built apartments, i.e., for a miniscule proportion of the overall housing sector (SOU 2021:50). Following a heated debate, the proposal failed to attain a parliamentary majority.

At the same time, pricing is determined more freely for another type of apartment, namely condominiums (and from 2009 owner-occupied apartments as well). This has given rise to a strong tendency for property owners to convert their rentals into condominium/owner-occupier arrangements.[49] The housing market needs both a large tenancy sector and a large ownership sector in order to be healthy; however, many households are unable or unwilling to take the risks that ownership entails. It is also unfortunate that many are forced to exhaust all available credit on a home, when they for example may have preferred to use some of it to finance a business, either their own or that of an acquaintance. Similarly, private residential housing causes a loss of the economies of scale provided by property management, maintenance, and so forth.

It is also those new to the property market who must bear the costs of the regulated system. They are pushed into risk-taking through condominium purchases, subletting, or transactions on the black market. Poor adaptation of housing consumption to consumer preferences also has side effects on the labor market and production. If it is difficult for newcomers to find housing, this affects a company's ability to recruit labor. All in all, one can consider today's housing market—in terms of construction, renting, and mortgages—an unnecessary obstacle to entrepreneurial development.

4.8.2 Driving Forces for Relocation

Relocation is an important factor in a healthy property market, but tax regulation in Sweden causes impediments to it. We believe that continuous taxation of housing would facilitate growth in those densely populated environments where the benefits of agglomeration are greatest. Given that housing needs change during one's life span at the same time as there is a shortage of living space in densely populated environments, it is important that there are strong incentives for relocation, such as selling a detached house and moving to an apartment or a smaller home when the children move out. This is facilitated if housing is taxed on an ongoing basis rather than when the occupants move out, as is now the case. The change in property taxation from continuous taxation to payment of a high capital gains tax has therefore damaged the market. In metropolitan areas in particular, where the need for relocation is greatest, moving from one property to another may trigger a significant capital gains tax which reduces the inclination to move to a new residence when the family situation or preferences change. This effect has been mitigated since 2021, when it became possible to defer the capital gains tax if the seller bought another home.[50]

[49] For example, the proportion of tenancies in apartment buildings in the inner city of Stockholm decreased from 70% in the early 1980s to 34% in 2020 (Thambert and Tottmar 2022).

[50] For full deferral, the new home has to cost at least as much as the old one; if a cheaper home is bought the deferral will be reduced commensurately.

If a tenant does not wish to move, more relaxed rules for subletting could increase the supply of apartments, especially for first-time residents in large urban areas. To increase the number of residents living in sublet accommodations,[51] these rules would need to include freedom of contract and a radical alteration of the right to tax-free subletting.[52] Increased opportunities for subletting and tax incentives that do not lock households into oversized housing would also make it easier to introduce market rents.

In the current situation, market prices for housing are being gradually introduced in practice, but in a very cumbersome way: by converting rental apartments into condominiums. Unfortunately, this also forces many to take an undesirably large financial risk in order to find housing. Without freedom of contract for rentals, these condominiums often remain unused during times when the actual owner is not utilizing the apartment.

4.8.3 Other Measures to Increase the Benefits of Agglomeration

Facilitating the growth of metropolitan areas also presupposes improved infrastructure and expanded public transport. Investment in railways and trams, both locally and regionally, is particularly important.[53] In contrast to long-distance, high-speed trains, requiring large investments,[54] these are often profitable. Often, their development requires several local and regional centers; in other words, high population density must be combined with multiple urban "cores," which further underlines the need for investment in local infrastructure.

Another challenge to be addressed is the system of municipal tax levelling, in which a large part of richer municipalities' tax revenues is siphoned off to poorer municipalities. An amount corresponding to roughly three percent of GDP is redistributed through the system.[55] The purpose of this redistribution is legitimate: to guarantee equal service regardless of the strength of the local tax base. However, the cost of many public services usually rises in line with municipal income per capita. This is partly due to the fact that local costs are higher in denser environments.

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[51] This group merely comprises roughly two percent of the population (Swedish National Board of Housing, Building and Planning 2018, pp. 31–32).

[52] For example, the Stockholm Chamber of Commerce estimated that more flexible rules and tax exemptions for subletting could create more than 50,000 second homes in Greater Stockholm almost immediately (Handelskammare 2007).

[53] Skogö (2010) has pointed to the lack of rail capacity in the Mälaren Valley, despite the fact that this is the region in Sweden where an expansion of rail traffic is by far the most profitable. See also Larsson (2010).

[54] For example, in a government investigation (SOU 2009: 74).

[55] https://www.ekonomifakta.se/Fakta/Offentlig-ekonomi/kommunal-ekonomi/kommunala-utjamningssystemet/

Another reason is that staff employed in tax-financed activities must have wages in line with those in the local business sector so that the city can afford to recruit and retain competent personnel. A desired increase in urbanization, and thus higher innovation and growth, requires a well-balanced redistribution of municipal taxes across urban and more rural communities.

4.9 Attitudes and Cultural Perceptions

The behavior of entrepreneurs and other actors is obviously not governed solely by economic incentives. Cultural and psychological factors also play an important role. An entrepreneur can, for example, be driven by a desire to realize a project or business idea for its own sake, or by the dream of proving to herself and others that she is capable of putting an idea into practice and achieving success. A society that rewards and encourages such dreams becomes more creative and more entrepreneurial than one that rewards conformity.[56]

Hence, the entrepreneur does not need to be rewarded primarily in pecuniary terms. Social standing, media attention, awards of various kinds—the driving forces can be many and varied.[57] But even if financial gain does not need to be an end in itself, it still serves a function as an indicator of ability and success. In addition, successful entrepreneurs serve as role models who encourage others to enter this field and test their own entrepreneurial abilities. Profit, actual or anticipated, is also a necessary condition for obtaining the resources for innovation and growth. Although the pursuit of profit may not be the final goal for the individual entrepreneur, profit in the current economic system is a means for those who want to realize their entrepreneurial vision in the form of a successful business.

A measure of the change in entrepreneurial intention is presented in Fig. 4.6. As can be seen, the share of individuals who report plans to start a business in Sweden has increased since 2016–2017, but this trend was broken in 2022. The Netherlands also regressed somewhat in 2022 after a remarkable increase in entrepreneurial intentions in the last two decades. The United States and Switzerland experienced a rise after the financial crisis, which was likewise reversed in 2022. Israel showed the most marked increase until 2018/2019, which was followed by a similarly sharp decrease. Then there was a sharp upturn in 2022, making Israel the country with the

[56] The social prestige of entrepreneurship and the public's perception regarding this career choice is roughly ranked as average among other similar countries and there have been no significant shifts in these attitudes over the years (Thulin 2023, pp. 48–49).

[57] Schumpeter (1934) highlights these motives as the most important, in addition to the desire to establish a "private kingdom" that gives the entrepreneur a high social reputation as well as influence and independence. He believes that pecuniary motives are important almost exclusively as an objective measure of success, and particularly of relative success. Baumol (2002) also argues that the entrepreneur's driving forces are complex. He believes that most entrepreneurs are guided by the pursuit of prosperity, power, and prestige.

highest entrepreneurial intentions of the included countries. At the bottom, we find the large EU countries together with Norway. Overall, most countries saw a decline in 2022, likely to have been influenced by an increase in pandemic-related bankruptcies in several countries and faltering growth prospects.

In a broader sense, attitudes in society significantly influence the opportunities and career paths an individual considers or even notices. In this book, we have explained the importance of providing room for curiosity and experimentation and of rewarding success. But concrete policy measures in these areas are unlikely to occur unless the broader culture and its values provide an impetus in that direction. Positive attitudes towards entrepreneurship and business ownership are thus a prerequisite for maintaining a high level of entrepreneurial activity or stimulating increased entrepreneurship. Politicians play an important role in signaling the value that a society attaches to entrepreneurial endeavors.

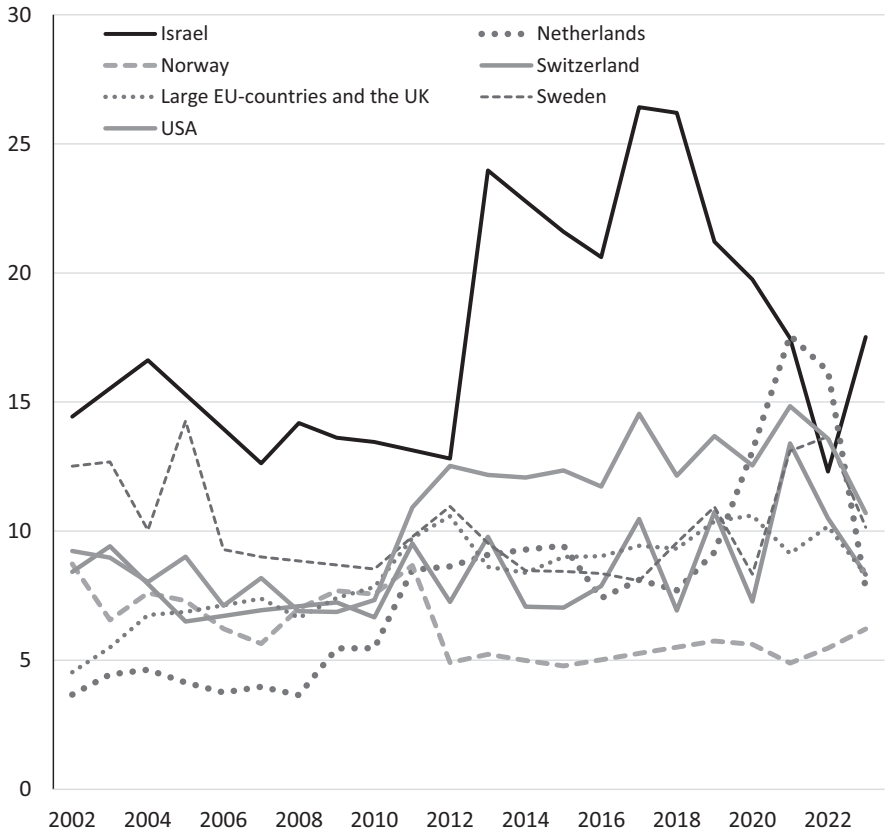

Fig. 4.6 Entrepreneurial intention: Share of 18–64-year-olds who intend to start a business within three years, 2002–2022 (%). *Note*: Large EU countries consist of France, Germany, and Spain. *Source*: Thulin (2023)

Many of the attitudes and beliefs we carry with us originate in the home, in school, and in our closest circles of acquaintances, often when we are quite young. Much can be done to promote entrepreneurship during the formative years, for example through training and encouraging creativity and entrepreneurship in children. Not infrequently, entrepreneurs have family members, for example a parent, who have also chosen to be entrepreneurs.[58]

At the same time, the expressed attitudes regarding firm ownership and entrepreneurship are likely to be a reflection of regulations and reward structures. For many individuals, pursuing a career as an entrepreneur does not seem sufficiently attractive. The expected compensation for successful entrepreneurship is not perceived to be in reasonable proportion to the risks and uncertainty it entails.

Negative attitudes towards entrepreneurship can thus be based on more fundamental factors and deep-seated ways of thinking. To a large extent, reward structures in a society are a codification of attitudes and norms. The previous tax regime—so unfavorable for entrepreneurship and business ownership in Sweden—was thus, as we have argued above, an expression of an underlying attitude that the optimal state of society was well-functioning capitalism—but without individually successful capitalists.

The relationship between norms and attitudes, on the one hand, and the institutional framework on the other is complex and difficult to change. If institutions facilitate and encourage value-creating activities that lead to increased welfare for the majority, it is more likely that people will favor institutions that lead to increased predictability and legal certainty, stronger protection of private property rights, and a high return on productive entrepreneurship.[59] But changing legislation, tax codes, and societal reward structures often presupposes changing attitudes. Policies more favorable to an entrepreneurial society therefore include both technical and practical interventions in tax rates and regulatory systems as well as opinion building in the long term to reshape attitudes towards entrepreneurship and business ownership.

4.10 Conclusions

In this chapter, we advocate a much broader policy approach than the one that dominates the daily political debate on innovation and entrepreneurship policy. Focus should be on general measures to lay the foundation for the emergence of an environment facilitating the further development of potentially innovative and fast-growing firms irrespective of size, age, and industry. We have reviewed the following policy areas that we deem crucial to promote innovation and entrepreneurship: the

[58] See, for example, NUTEK (2003) for further discussion. Reynolds et al. (1999) have found a positive correlation between respect for entrepreneurs and the degree of entrepreneurship. For a more detailed discussion of culture, attitudes, and entrepreneurship, see Freytag and RoyThurik (2007).

[59] See also Khalil (1995).

quality of the education system, the role of the university sector, incentives to private R&D, the channeling of saving, the functioning of the labor market, the social insurance system, product market regulations, tax-financed welfare services, the housing market, and attitudes and cultural perceptions.

We have devoted a separate chapter to what is arguably the most potent measure in the government's policy arsenal, namely taxation. The overall conclusions we draw from our analyses of the different areas, including taxation, will be presented in the concluding section of the next chapter.

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Chapter 5
Tax Policy to Stimulate Innovation and Entrepreneurship

Taxation, undeniably one of the most influential tools at a policymaker's disposal, plays a pivotal role in stimulating innovation and entrepreneurship. As such, we dedicate here a separate chapter to tax policy and the effects it can have. The tax structure influences not only the overall volume of innovative entrepreneurship, but also the channels through which it wields its impact. Tax rules and tax rates determine the extent to which net return differs from gross return for potential entrepreneurs and other actors in the collaborative innovation ecosystem.

As we have emphasized throughout, the journey from a mere idea to a large-scale industrial enterprise is often an arduous, time-consuming, and expensive process, encompassing several stages. Taxation has a potential impact on each stage of this process, with the unique characteristics of each phase necessitating a comprehensive analysis to understand the effects of taxes.[1] Consequently, taxes influence the incentives for identifying and cultivating entrepreneurial opportunities, as well as the motivation to capitalize on these prospects.

5.1 Taxation of Ownership and Different Sources of Finance

The most important change agents in the economy—entrepreneurs—may have several and widely divergent motivations, but money and return on their work and firm ownership are undeniable driving forces.[2] Income from successful entrepreneurship often comes in the form of the rising value of shares in one's own firm. Moreover, as already noted, innovation-based venturing is highly uncertain, and the cash flow of a project is always initially negative. Debt financing cannot be secured in such

[1] See Elert et al. (2022) and Henrekson and Sanandaji (2016) for in-depth discussions.

[2] Henrekson and Sanandaji (2011) and Berglann et al. (2009).

P. Braunerhjelm, M. Henrekson, *Unleashing Society's Innovative Capacity*,
International Studies in Entrepreneurship 55,
https://doi.org/10.1007/978-3-031-42756-5_5

ventures. Financing by means of retained earnings is only possible in historically profitable incumbents. These have accumulated equity that their owners prefer to retain within the firm rather than dispensing it as dividends.

The real effective taxation on an investment assumed to yield a real return of ten percent at certain points over the 40 years 1970–2010 in Sweden is listed in Table 5.1,[3] which shows the large differences in real effective taxation depending on type of owner and source of finance at various points. We start by illustrating four key aspects of the Swedish tax system during the 1970s and 1980s:

1. Debt financing enjoyed the most favorable tax treatment and new share issues the least favorable. More than 100% of the real rate of return was taxed away for an individual buying newly issued shares.
2. Retained earnings were taxed at lower real rates than newly raised capital for individuals, which favored incumbent firms over newly established firms.[4]

Table 5.1 Effective marginal tax rates for different combinations of owners and sources of finance in Sweden, selected years, 1970–2010 (%)

	Debt	New share issues	Retained earnings
1970			
Individuals	51.3	122.1	57.1
Tax-exempt institutions	−64.8	15.9	32.7
Insurance companies	−45.1	42.4	41.2
1980			
Individuals	58.2	136.6	51.9
Tax-exempt institutions	−83.4	−11.6	11.2
Insurance companies	−54.9	38.4	28.7
1991			
Individuals	31.3	62.0	54.6
Tax-exempt institutions	−10.0	7.3	20.4
Insurance companies	14.0	33.5	32.0
2010			
Individuals	22.9	48.1	32.7
Tax-exempt institutions	−1.2	23.2	23.1
Insurance companies	18.2	44.6	42.6

Note: The effective marginal tax rate is calculated based on the assumption that the real rate of return before tax is ten percent. The calculations conform to the general framework developed in King and Fullerton (1984). The average holding period is assumed to be ten years, and actual inflation rates are used. The wealth tax on private firms was abolished in 1992 and on all assets in 2008
Source: Calculations provided by Jan Södersten; see Södersten (1993) for assumptions and methods

[3] The real effective tax rates as calculated in Table 5.1 have been largely unchanged since 2010. Important changes since then concern ownership through holding companies and closely held firms.

[4] Effective taxation for retained earnings as the source of finance became so low due to various accounting measures and tax allowances applied to retained earnings. These measures enabled firms to sharply reduce the statutory corporate tax rate; large industrial firms frequently managed

3. Individuals were taxed at much higher rates than the other two owner types. Moreover, individual taxation increased during the 1970s (except for retained earnings), whereas the reverse was true for insurance companies and tax-exempt institutions.[5]
4. Tax-exempt institutions enjoyed a substantial tax advantage relative to individuals and insurance companies.

The tax reform of 1991 entailed a significant levelling of the effective tax rate across ownership types and sources of finance, but institutional ownership and debt were still favored, albeit to a lesser extent. By 2010, the differences had diminished even further. This was an enormous shift relative to the period before the 1991 tax reform.[6]

The enormous shift in the real rate of taxation of direct individual ownership of stock becomes even more evident if we, as in Fig. 5.1, look at a broader time series

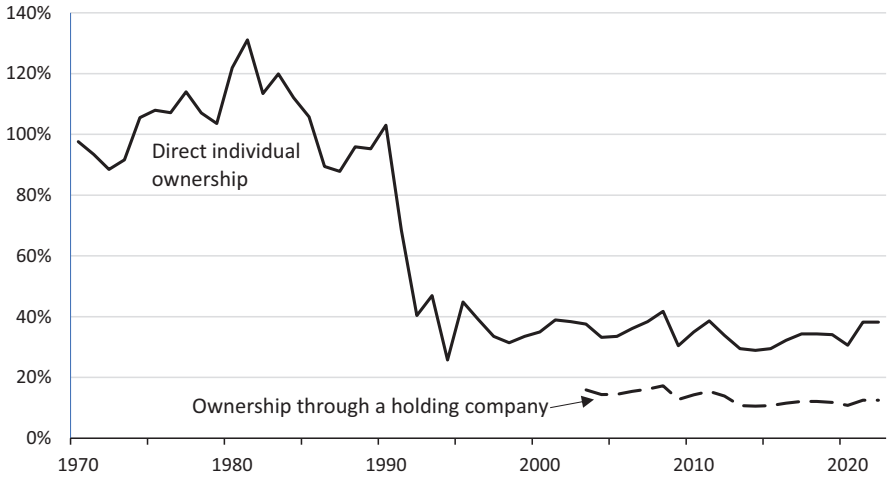

Fig. 5.1 Effective real marginal tax rate in the case of direct individual ownership (1970–2022) and ownership through holding companies (2003–2022). *Note*: 60% of the return is assumed to be in the form of capital gains and 40% in the form of dividends. Actual inflation rates have been used in the calculations. *Source*: Henrekson et al. (2020) plus our own updates for 2019–2022

to reduce the effective corporate tax rate to negligible levels. See Södersten (1984), Norrman and McClure (1997), and Du Rietz et al. (2015b) for further details.

[5] By definition, tax-exempt institutions pay no tax on interest receipts, dividends, or capital gains. This category includes the government at the central, regional, and local level, charities, scientific and cultural foundations, foundations complying with the government's requirement for public interest, foundations for employee recreation set up by companies, pension funds for supplementary occupational pension schemes, and the National Pension Funds (the AP Funds).

[6] This was partly a consequence of a societal attitude that strived for "capitalism without capitalists" (Henrekson and Jakobsson 2001).

covering the period 1970–2022. Here the real rate of return of ten percent before tax at the corporate level of a listed company is assumed to accrue to individual investors as follows: 40% in the form of dividends and 60% in the form of capital gains and taxed accordingly. It is clear from the graph that, on average, the real rate of taxation exceeded 100% significantly through 1990, despite our assumption that the largest portion of the return is taxed at the long-term capital gains tax rate (60% of nominal gains were tax-exempt 1974–1990, and it was even more advantageous before then).[7] Since the early 1990s, the real rate of taxation has largely stabilized in the 30–40% range.

Several factors contributed to the precipitous drop in the real rate of taxation: the corporate tax rate, which peaked at roughly 60% in the 1980s,[8] has been reduced six times and currently stands at 20.6% (since 2021); since taxation is nominal, the sharp drop in the average inflation rate from eight to roughly 1.5% (through 2021); a standard capital tax rate of 30% substituted for the marginal labor income tax rate (which was roughly 75% even at fairly modest incomes in the 1980s) when taxing dividends and capital gains; and finally, several measures were taken to reduce and finally eliminate the effect of the wealth tax on stock holdings (it was abolished on private firms in 1992 and repealed altogether in 2008).[9]

The real effective tax rate on firm ownership was roughly cut in half through a seemingly minor change in the tax code enacted in 2003. This change implies that no tax is levied on distributed profits to the parent company from ownership in other unlisted firms regardless of whether they can be considered part of the parent business.[10] Capital gains on such stock also became tax-exempt. The tax exemption applies to all stock holdings in unlisted incorporated firms regardless of ownership share and to holdings of stock in listed firms as long as the holding company owns shares comprising at least ten percent of the votes or ten percent of the equity.

By owning stock through one's own holding company rather than directly, it has become possible to avoid (or indefinitely postpone) owner-level taxation both for controlling owners of listed firms and for individuals with ownership shares in unlisted firms. Tax will then only be paid on that part of the return that the owner requires for private consumption purposes. Typically, such withdrawals will be subject to a 25% tax. In other words, since 2003, owners of large firms and large private investors in unlisted firms—such as the start-up sector—are subject only to a

[7] See Du Rietz et al. (2015b) for further details.

[8] The statutory rate peaked at 52%, but, in addition, a specific "profit-sharing tax" was levied on firms with at least 50 employees. This tax was levied to finance the so-called wage-earner funds. It has been estimated that this tax increased the corporate tax rate by roughly five percentage points (Henrekson 1996; Agell et al. 1995).

[9] For details about the wealth tax, the reader is referred to Du Rietz and Henrekson (2015). It is also worth mentioning that the previously extremely high inheritance and gift taxation (peaking at 70% for spouses and descendants in the mid-1980s) was reduced to 30% in 1992 and abolished altogether in 2004 (Du Rietz et al. 2015a). This not only created stronger incentives for entrepreneurs to harbor dynastic ambitions but also greatly facilitated generational transfers of corporate ownership.

[10] The legal term in Swedish is *näringsbetingade andelar*.

consumption tax, and profits remain untaxed as long as they are not paid out from their holding company.

At the same time, full tax exemption was granted to listed closed-end investment funds (Investor, Industrivärden, etc.) for dividends and capital gains from companies in which they hold at least a ten percent voting or equity share. Until then, listed closed-end investment funds, the most important vehicle for controlling the largest Swedish firms, had been taxed quite heavily unless they paid out dividends received and part of their market cap to their shareholders.[11] This gradually undermined their capacity to wield control over their portfolio companies.

To offset the incentives for business owners to lower their effective tax rate by redefining more highly taxed labor income as capital income, the sharp reduction in the real tax rate resulting from the tax reform in 1991 did not apply to closely held firms. A closely held firm is defined as an incorporated business with no more than four active owners controlling more than 50% of the voting rights. Initially, such firms were severely constrained to pay dividends taxed at the capital income rate of 30%, and half of any capital gains were taxed as labor income.[12]

Since 2006, a series of changes in the rules for closely held firms has been implemented that substantially expands the share of the owners' income that may be taxed as capital income. In addition, the capital income tax rate on private firms was lowered to 25% for non-active owners and to 20% for active owners of unlisted firms in 2006. The complex rules are described in some detail in the Appendix to this chapter.

Following this characterization of the evolution of the taxation of Swedish business owners, we can now evaluate owner-level taxation of the various owner categories in the early 2020s. In laying out the collaborative innovation bloc in Chap. 3 (Fig. 3.3), we identified the ownership categories in Table 5.2.

All early-stage financiers—founders, family and friends, business angels, and venture capital firms—can now invest through holding companies which pay no dividend or capital gains tax. If shares are owned directly, the tax rate is limited to either 20 or 25%.

In examining later-stage financiers, we observe that the favorable tax rules lead to many more individuals/families that are sufficiently wealthy assuming a controlling ownership role for larger firms. Likewise, the elimination of the previously onerous taxation of listed closed-end investment funds, a very important controlling ownership category in Sweden, has greatly strengthened their capacity to assume an active ownership role in more mature firms.

The partners of buyout firms can invest through holding companies, institutional investors are invariably tax-exempt, and individual savers investing in a

[11] Prior to 2003, an investment company was subject to a 1.5% annual tax on its market cap, unless its dividend payouts were as large as all dividends received plus the 1.5% wealth tax on its market cap.

[12] For someone who had established a business based on the minimum equity requirement, the allowance for paying dividends taxed at 30% was negligible. Moreover, the capital gains tax was 40% (43% after 1995) instead of 30%, as half of capital gains were taxed as labor income.

Table 5.2 Equity financiers in early and later stages

Agents making investment decision/Investors	Source of funds	Final beneficiaries
Early stage		
Founder(s)	Own assets, retained earnings	Private individuals
Family and friends	Own assets	Private individuals
Business angels	Own wealth from previous entrepreneurial venturing	Private individuals
Venture capital firms	Institutional investors + small share from general partners	Mostly current and future pensioners and savers
Later stage		
Wealthy individuals/families	Wealthy individuals/families	Private individuals/families
Closed-end investment funds	Control bloc held by family plus equity investors	Controlling family and other equity holders
Stock-market activists	Institutional investors + small share from general partners	Current and future pensioners, savers
Buyout firms	Institutional investors + small share from general partners	Current and future pensioners, savers
Competitor/trade sale	Own funds, retained earning	Owners of buyer
Institutional investors	Pension plans, open-ended stock-market funds	Current and future pensioners, savers
Savers investing in stock-market portfolio	Private financial savings	Individual savers

stock-market portfolio can do so through an individual investment savings account, for which taxation is a small percentage of the market value and thus unrelated to any dividends or capital gains.

The radical reversal in the taxation of firm owners and the concomitant strengthening of incentives for innovative entrepreneurship is also highly visible in the development of the stock market. In the 1970s, there were virtually no new rights issues in the Stockholm Stock Exchange, *Tobin's q*, the market value of listed companies divided by their assets' replacement cost was 0.3,[13] and the p/e ratio of firms such as Electrolux and Ericsson was around three. A handful of listed closed-end investment funds controlled almost all large companies through a combination of dual-class shares, cross ownership, and pyramiding.[14] In turn, the closed-end

[13] Södersten (1984).

[14] The use of dual-class shares to ensure concentrated control increased strongly after the mid-1960s, reaching almost 90% of listed firms in the early 1990s (Agnblad et al. 2001). The largest voting differential allowed is one to ten. Historically, a voting differential of one to one thousand was allowed and used by companies such as Ericsson and Electrolux. In a pyramid of two companies, a controlling-minority shareholder holds a controlling stake in a holding company that, in turn, holds a controlling stake in an operating company. In a three-tier pyramid, the primary holding company controls a second-tier holding company that in turn controls the operating company. In this way, the owner who controls the holding company at the top of the pyramid can control the operating company despite having a very small ownership share.

investment funds were often controlled by a family foundation.[15] The number of listed firms was only 103 in 1975 and the total market capitalization as a share of GDP reached a nadir of ten percent.

As shown in Fig. 5.2, there was an extraordinary revival of the Stockholm Stock Exchange during the 1980s and 1990s, and market capitalization rose from ten to around 150% of GDP at the turn of the millennium. In line with the further changes in taxation outlined above, the Stockholm Stock Exchange—now Nasdaq Stockholm—has continued to develop strongly. The total market capitalization reached a record level of 227% of GDP in 2021. Despite a falling market in 2022, the market capitalization still exceeded 150% at the end of 2022. At the time of writing (April 2023), a total of 832 companies were listed on Nasdaq Stockholm with 365 companies on the main market and an additional 447 listed on secondary markets (Nasdaq First North and Nasdaq First North Premier). In addition, there were 295 companies listed on other markets (MRE, Spotlight, and Pepins).[16]

Admittedly, the strong development of the Stockholm Stock Exchange from 1975 until the mid-1990s coincided with a renaissance for stock-market ownership across the globe. For instance, the number of listed firms increased by more than 50% in the United States from 1975 until the peak in 1995. Since then, the development has reversed. The number of U.S. listed firms was almost halved during the

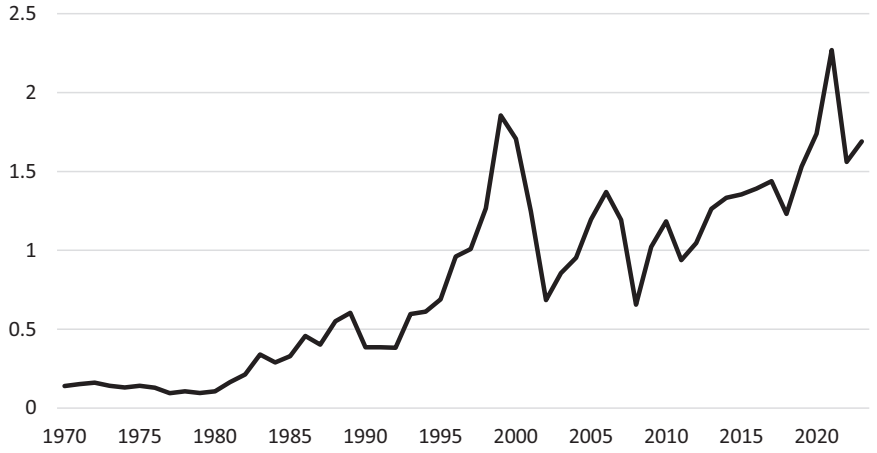

Fig. 5.2 Stock-market capitalization on the Stockholm Stock Exchange (Nasdaq Stockholm) relative to GDP, 1970–2022. *Source*: The Stockholm Stock Exchange Annual Reports (1970–1987), Annual Reports of the Riksbank (1988–1999), and NasdaqOMX (2000–2022)

[15] Agnblad et al. (2001) and Henrekson and Jakobsson (2001).

[16] Although newly listed companies, with few exceptions, have controlling owners, control is now typically wielded by virtue of a sizable equity share and not by means of cross ownership, dual-class shares, and/or pyramiding. Virtually all cross ownership was already dismantled in the 1990s. By 2021, the share of companies listed on Nasdaq Stockholm with dual-class shares had fallen to 42% and the corresponding share on First North was only about 20% (Henrekson 2021).

following two decades (Doidge et al. 2017). Although not as pronounced, the trend is similar for the OECD as a whole (Koptyug et al. 2020). Thus, Sweden stands out as an exception to this global trend.

Moreover, the stock market has not boomed at the expense of the private equity market. In fact, Sweden has the largest private equity market in the European Union. In the period 2017–2021, Swedish private equity funds annually raised funds corresponding to two percent of Swedish GDP, and in 2020, private equity-backed firms employed 240,000 people in Sweden (of which 20,000 by VC firms), corresponding to 7.1% of total private sector employment.[17] In addition, the very early stages of new ventures have benefited from a dramatic increase in business angels and informal investors where Sweden presently ranks ahead of the United States (Thulin 2023).

The dynamic stock market as well as the large and highly competent private equity sector contributes both to a high valuation of firms and to ample exit opportunities, which results in stronger incentives to pursue innovative entrepreneurship (Norbäck et al. 2016).

Despite these reforms, which have sharply increased the incentives for founders and investors to engage in and finance innovative entrepreneurship, there remains one Achilles heel: the remuneration of key personnel (R&D specialists, experienced managers, etc.) that need to be recruited at an early stage when the firm's future is still highly uncertain.

5.2 Taxation of Other Entrepreneurial Efforts

The above discussion mainly concerns financial investors. But several others are involved. Figure 3.4 in Chap. 3 described key phases in a firm's development. A start-up firm based on a unique idea is normally established by one or more founders. Building a successful and fast-growing firm requires a skilled workforce, and part of the entrepreneurial function is performed in practice by employees who lack co-ownership in the firm, the so-called intrapreneurs. The tax burden on earned income has been very high in Sweden throughout the post-war period. Despite all the reforms, the marginal tax rate on higher incomes, including non-preferential social security contributions, is still around 65%.[18]

[17] The data in this paragraph are from Næss-Schmidt et al. (2022).

[18] In 2023, the highest marginal tax rate was 55% and mandatory uncapped social security contributions amounted to 31.42% on wages (https://www.ekonomifakta.se/fakta/skatter/skatt-pa-arbete/marginalskatt/). However, this is still much lower than the marginal income tax wedge before the 1990/91 tax reform. In the early 1980s, the marginal tax wedge peaked at 87% for workers with an annual wage 67% above the wage of an average production worker and it peaked above 70% for the average worker as well (Du Rietz et al. 2015a, b). For monthly wages exceeding roughly SEK 162,000 (≈ the 98th percentile for full-time workers), the marginal tax rate falls to 52%. This is explained by the fact that the earned income tax credit that lowers the marginal tax rate by four percentage points for most workers (≈ up to the 87th percentile for full-time workers)

The previous chapter showed that employee stock options could be used to stimulate employees to become more entrepreneurial and to reward their entrepreneurial efforts. Stock options are most effective as incentive mechanisms in entrepreneurial firms largely financed by external equity investors if:

1. They can be granted to key personnel at zero or low cost without any immediate tax consequences
2. Additional layers of state-contingent contracting, vesting, is allowed; the grantee loses all or part of the options if he or she no longer remains an employee, and or the granted options are lost if the firm does not meet certain performance milestones
3. Gains are taxed at a low capital gains tax rate
4. The grantee can defer all taxation until the options or the shares received are eventually sold
5. No social contributions are levied on the value of the granted stock options

It is quite obvious that any form of taxation of stock options that falls due before the acquired shares are actually sold greatly reduces the attractiveness of this instrument for employees. By contrast, if obtaining or exercising stock options has no tax consequences and if the employee faces a low capital gains tax, then stock options can be used to create strong incentives for entrepreneurial effort. The key employees who drive the innovation and entrepreneurship in the firm can then receive a substantial part of the capital value created, even though they do not invest financially.

However, these instruments have historically been subject to high taxes in Sweden. If options are linked to employment, the return has always been taxed as labor income and full payroll tax has been levied (in practice, this means the highest marginal tax rate). Until recently, the only feasible way to set up an equity-based incentive scheme was therefore to use warrants. Employees must buy the warrants at market value. The warrants give the employee a right, but not an obligation, to buy shares at a fixed price (the strike price) at a later date. If the company does well, the warrants can become quite valuable. No tax on capital gains is due until the warrants or the acquired shares are sold.

The warrant premium depends on current company valuation, strike price, and time to maturity. If the tax authority deems the premium to be too low, the difference will be subject to immediate labor income taxation and payroll tax. If the strike price is fairly close to the current valuation and the time to maturity is long, the premium becomes sizable, possibly 20% of the current share price or even more.[19] The employee needs to pay the premium to the company in cash even though the

is pulled back linearly by means of levying an extra three percentage points against the marginal tax rate on income exceeding the 87th percentile until the entire earned income tax credit is returned to the government.

[19] The value of the warrant is calculated on the basis of the investing VC firm's valuation of the underlying shares. This in itself means a valuation that is too high, since the VC firm owns a portfolio of companies and therefore can reduce its risk through diversification, while the employee has already invested all of their human capital in the company.

warrant may prove worthless, in which case the employee loses the initial investment. Finally, the employee can theoretically, after some years, sell the warrants rather than exercising them. In such a scenario, the purpose of the incentive scheme—to heighten the employee's sense of co-ownership—is hardly achieved.

Effective beginning in 2018, a law was passed which instituted more beneficial tax rules for Swedish start-ups, allowing companies to grant the so-called qualified employee stock options (QESOs) to their employees. QESOs make it possible for most Swedish early-stage companies to provide stock options in a tax-efficient manner to key employees. In 2022, the system was extended and made even more generous.[20]

If the company and the employee meet certain criteria, the company can grant stock options to the employee at no cost, which gives the employee the right (but not the obligation) to purchase shares or warrants in the company, or in a company within the same company group, for a fixed price (typically almost zero) at a fixed date 3–10 years in the future.

The future growth in the value of the shares (or warrants) is only taxed as capital gains (generally 25% for shares and 30% for warrants if the warrants are sold rather than exercised to buy the shares) when the employee sells the shares (or warrants), compared to traditional stock options, which are taxed as wage income.[21] The stock options are tied to the employment position and cannot be resold. If an employee leaves the company prematurely, some of the stock options will become invalid based on a vesting schedule through which the employee gradually earns the right to retain an increasing share of the stock options.

In order to grant QESOs, the issuer must be a Swedish limited company (or a similar foreign company with a permanent establishment in Sweden), be less than 11 years old, have fewer than 150 employees, and have assets or revenues less than SEK 280 million (roughly USD 28 million in 2023). In the case of public bodies, these cannot control 25% or more of the company.[22]

The grantee must serve as an employee of the company, work 30 hours per week, receive a moderate wage, and be a Swedish tax subject. At the signing date, the value of the employee's total stock options cannot exceed SEK three million, and the total value of all employees' stock options cannot exceed SEK 75 million (defined as the value of the underlying shares). At least three years (the minimum vesting period) must elapse from the signing date before the employee can buy shares and the right to buy shares automatically expires ten years after the signing

[20] The rules pertaining to QESO are spelled out in the Swedish Income Tax Act, Chap. 11 a (*Inkomstskattelagen 1999:1229*). There are some further qualifications not mentioned here which we do not believe restrict the use of QESOs for the new or recently started innovation-based firms we have in mind.

[21] That is, 52–55% income tax for the employee plus 31.4% payroll tax for the company.

[22] For further details of the Swedish QESO rules, see https://startuptools.org/se/ultimate-guide-stock-options-swedish-startups/

date. The company is allowed to set the strike price as low as the nominal value (*kvotvärdet*), which in most cases is virtually zero.[23]

Thus, the five conditions that make stock options most effective as incentives mechanisms for entrepreneurial firms largely financed by external equity investors are essentially met. As in the United States, it is now possible to create incentives for key personnel so that they will agree to work at a lower salary in exchange for a future ownership stake. Naturally, the system is not without its drawbacks. The value of the firm is not allowed to exceed SEK 280 million, and for promising tech start-ups, that valuation may be exceeded fairly quickly after one or two rounds of financing. Moreover, if the start-up is a spin-off from an existing firm that is older than ten years or if the firm (or holding company) that provides more than 50% of the original funding is older than ten years, then the QESO scheme cannot be used. In addition, if the firm is still defined as closely held at the time of sale of the shares received based on the QESOs and the QESO grantee owns less than four percent of the total number of shares in the firm, then the capital gains tax will be 52 instead of 25% (30% on capital gains exceeding 100 income base amounts, SEK 7.1 million in 2023).

Despite the changes, the Swedish tax rules tend to encourage the founder/founders to sell the entire firm as soon as external owners come in, as this is the most straightforward way to benefit from a lower tax rate on all or most of the capital gain. In that case, what has so often proved to be crucial for building a valuable firm is lost, namely an agreement whereby the entrepreneur and other bearers of key competencies have strong incentives to continue to create value precisely by guaranteeing them a future ownership stake in the firm without needing to subject themselves to the entire financial risk. If the founders sell the entire firm at an early stage, the possibility of staged financing also disappears as well as the well-known benefits this entails. The initial investment then becomes larger, since the risk and operational costs increase because the founder has left the business and key employees demand higher salary compensation if stock options cannot be used.

If the founder remains in charge, he or she will instead maintain control during the company's development until an IPO or a trade sale. Thus, external owners cannot take control of the firm while at the same time retaining the founder and other key employees for as long as this is favorable for the firm. This is possible in the United States, where the founder receives stock options that can again make him or her the principal owner, provided that the firm has developed in accordance with the business plan (which may be revised along the way).[24]

The fact that the tax rules have blocked the emergence of effective agreements between founders and key personnel, on the one hand, and external financiers on the other hand can be seen in the fact that the Swedish VC market is very small in relation to the buyout market. By contrast, together with the United Kingdom, Sweden

[23] The nominal value is defined as the company's share capital (typically SEK 25,000 or 50,000) divided by the number of shares in the company.

[24] See, e.g., Gilson and Schizer (2003) and Kaplan and Strömberg (2004).

has Europe's largest buyout sector.[25] This significant difference between the buyout and VC sectors is in line with what we would expect based on the historical tax treatment of stock options in Sweden, where it has been almost impossible for external investors in start-ups to conclude effective agreements with founders and other key employees. However, we would expect this imbalance to be gradually reduced once market participants begin to exploit the new opportunities to remunerate key personnel utilizing the QESO scheme.

5.3 Taxation and the Return on Human Capital Investment

If labor income is highly taxed, it becomes more difficult for an efficient and transparent service sector to compete successfully with the self-employed working cash-in-hand. Profitable market transactions are blocked, as high taxes lead to an inefficient allocation of working time across tasks. Efficient jobs in the formal economy are crowded out by less efficient cash-in-hand employment. In addition to these static effects, at least three different dynamic effects have a negative impact on growth:

- A less extensive specialization of the workforce lowers productivity because some of the learning effects are absent.
- The reduced opportunities for workforce specialization weaken the impetus to invest in specialized human capital, i.e., to acquire specific skills through training or on-the-job experience (Rosen 1983).
- When the degree of specialization is lower, innovation incentives become weaker, since the smaller the share of total working time devoted to activities exploiting an innovation, the lower the return on that innovation. Many innovations also concern building organizational capital with the aim of reducing the cost of organizing a large number of highly specialized employees (Becker and Murphy 1992; Haskel and Westlake 2018).

High taxes thus block large portions of the service sector to entrepreneurial business development. This is a major concern—especially in light of what we have noted above regarding the Baumol effect. In the early 2000s, the number of hours of unpaid household work and work in the informal economy was almost as large as the number of hours worked in the formal economy (Davis and Henrekson 2005).

When services are provided professionally, incentives arise to invest in new knowledge and capital equipment, to develop new technologies, to enhance contractual arrangements, and to create more flexible organizational structures. High labor taxation counteracts the market production of goods and services that replace domestic labor, thereby reducing the scope for entrepreneurial expansion into new businesses that economize on people's time.

[25] For a comparison with Europe, see Tåg (2012) and Næss-Schmidt et al. (2022).

The tax wedge for some services has in recent years been greatly reduced by the introduction of the so-called "RUT" rebate in 2007—a tax cut for services performed around the home. Each taxpayer can buy household-related services (cleaning, childcare, gardening etc.) for up to SEK 75,000 per year and have the labor cost reduced by half by means of this tax rebate. Given this tax reduction, it is sufficient for the professional producer to have approximately 50% higher productivity than the buyer for it to be worthwhile to purchase the service rather than producing it herself. A similar system exists for the renovation or extension of one's own home (the "ROT" deduction). Systems such as these soften the inhibiting effect of high taxes on the development of a private services sector.

These large reductions in the tax on household services should have significant effects in the long term. The sharp fall in unpaid household work documented by Statistics Sweden in their time use surveys is consistent with a trend towards increased professionalization of household services. Particularly striking is the sharp decline in women's unpaid domestic work. This decreased by an average of one hour per day, or 20%, between 1990 and 2010, while their market work increased by around half an hour on average.

Payroll taxes have at times also been reduced through employment rebates and reductions in social security contributions, namely a halving of the payroll tax on young people under 26 years of age, a reduction from 24 to 10.2% for pensioners, and zero or sharply reduced payroll deductions for people who have been on long-term sick leave or taken early retirement. Restaurant VAT was also reduced in 2012, which means that professionally prepared food now has the same VAT rate as that cooked at home. These reductions make the tax system more opaque but, from an entrepreneurial perspective, still entail small steps in a more favorable direction.

To further stimulate innovation, we advocate reductions in the part of payroll taxes that are a pure tax. This would have major effects on the labor market, increase skills, reduce cash-in-hand work, and intensify competition for personal services. In addition, it seems to be a fair demand that the pure tax component of mandatory social security contributions ("the general wage fee")—amounting to 11.42 percentage points, more than one third of the total—be made salient through separate itemization. Most importantly, no benefits accrue on social security contributions above an annual income of 7.5 income base amounts (a sum related to the development of the average wage). This corresponded to an annual salary of SEK 600,000 (roughly USD 60,000) in 2023. Hence, mandatory social security contributions of 31.46% above this threshold constitute a pure tax. If this tax were repealed, it would lower the top marginal rate (or more correctly the marginal tax wedge) from 63.4 to 52%.

A specific feature of the Swedish labor market we have already mentioned refers to the high tax on researchers and specialists. To alleviate this problem and make it easier for knowledge-intensive firms and organizations to recruit specialists from abroad, an expert tax relief scheme was introduced in 2001, the so-called expert tax rebate. This rebate comprises a 25% salary exemption from income tax for a maximum of five years. Effective from 2024 this will be extended to seven years. This reduces the marginal tax rate from 52 to 40%. In 2023, a person earning a monthly

salary of at least SEK 105,000 (roughly corresponding to the 98th percentile in the wage distribution)[26] was automatically granted the rebate. If the salary is below the "automatic" threshold, the tax authority tends to be restrictive and slow in arriving at a decision in individual cases. This means that it is precarious for firms to rely on such a scheme in the attempt to increase their competitiveness in recruiting specialists from abroad.

We advocate that eligibility be a function of skills regardless of the specialist's salary. With today's rules, only senior managers (and top athletes!) are automatically eligible for the expert tax rebate. Paradoxically, it is extremely rare for prominent researchers to have such high salaries that they qualify for the rebate, especially if they are younger. In practice, it is thus the experts' supervisors who benefit from the expert tax.

5.4 Conclusions Regarding Taxation

The evolutionary approach to understanding economic growth that we laid out in Chap. 2 emphasizes the roles played by experimentation, diversity, variety, and selection, placing the spotlight on the importance of the environment and of opportunities for individuals and firms to exploit new and existing knowledge. The design of the tax system is of fundamental importance here. Taxes affect the incentives to discover and create entrepreneurial opportunities and the desire to exploit these opportunities. The tax code must encourage entrepreneurship and active ownership. To fully compensate for a tax system that disincentivizes innovation and entrepreneurship by other measures is not only cumbersome and expensive, but also often impossible. The body of research on the role of innovation and entrepreneurship in a healthy economy leads us to the following conclusions regarding the appropriate design of the tax system:

- Owner-level taxation should treat all types of owners equally
- Labor income taxes should not inhibit individual incentives to invest in human capital nor its subsequent use
- Taxes should not prevent key employees and entrepreneurs from obtaining a fair stake in the substantial capital value that materializes when a successful firm is developed, even if they lack financial resources of their own
- The tax burden should be reasonably neutral with respect to the size, age, industry, and financing structure of a firm
- No wealth tax should be levied on corporate assets
- Dividend and capital gains taxes should be low. In particular, it is important that the capital gains tax is low on long-term holdings

[26] According to available salary statistics from the Swedish National Mediation Office, less than 1.3% of employees had such a high monthly salary (based on the monthly salary concept in the salary structure statistics).

Sweden still has relatively favorable conditions for entrepreneurship in the knowledge-intensive sector, which is due to a relatively high proportion of people with STEM degrees combined with several large, global, and R&D-intensive firms. However, in recent years, there are clear signs that Sweden's advantages are eroding. Competition in this area, not least from China and India, has intensified significantly in recent years as the level of education in these countries has risen and continues to rise.

If the tax rules do not encourage entrepreneurship and active ownership, there will be a shortage of venture capital.[27] In the last few years, more generous and tax-efficient opportunities have featured stock options as a means to remunerate key individuals and facilitate scaling-up of young ventures. It is still too early to draw any firm conclusions regarding its effect on the supply of early-stage financing, but based on U.S. experience, there ought to be a substantial positive effect, although it may take some time to gain momentum.

With a more favorable tax system in place for most of the key agents in the collaborative innovation bloc, the government should refrain from additional interventions.[28] We are convinced that policies directed towards incentives to strengthen the impetus for productive entrepreneurial initiative are much more effective. This is likely to have a beneficial impact on both the demand for venture capital and the return on R&D investment. It is therefore important to maintain owner-level taxes and other taxes at levels that do not inhibit entrepreneurs' ability to find venture capital.

Entrepreneurs who run successful, fast-growing firms in knowledge-intensive sectors tend to be exceptionally competent. This usually includes an extensive education, creativity, high risk tolerance, leadership skills, and industrial experience. Potentially successful entrepreneurs are therefore few and not easy to replace. Those with the greatest potential tend to already have well-paid, secure careers in existing firms. To abandon an attractive job and expose oneself to the risk of failure—which is always high, often well over 50%—requires a reward sufficiently attractive for those who succeed. This is not the case if the lion's share of the return is paid as taxes.

It is therefore important to follow a general strategy for stimulating entrepreneurship rather than to spend resources on targeted subsidies of R&D expenditure and risk capital or to earmark public funds for investment in entrepreneurial firms (Svensson 2024). The public sector has—not unexpectedly—proven less successful than the private sector in identifying projects that can be developed into successful firms (Kärnä et al. 2023; Holcombe 2024). Selecting successful enterprises is difficult enough for the for-profit financial specialists. In addition, success

[27] There is strong theoretical and empirical evidence that poor access to risk capital inhibits innovation (e.g., Veugelers 2011).

[28] The weak development of VC financing in Sweden in the 2000s led to demands for government support in the early stages, both in the form of soft loans and as risk capital. Many such systems have also been introduced, but with a few exceptions the results have been disappointing (Svensson 2011).

seems to require tough company management and at times brutal corrective measures when something goes wrong—something that is not part of the public sector's core competence, to put it mildly. Although the research is not unequivocal, reviews by Lerner (2009), among others, show that direct government initiatives to stimulate entrepreneurship have often failed when they are not coupled with specific measures regarding governance, evaluation, and funding structure (Lerner 2020).[29]

In sum, the Swedish tax system has become much more beneficial to entrepreneurship compared to the 1970s and 1980s. It is particularly favorable for founders and external equity owners. The remaining problems mainly concern the lack of tax-efficient measures for compensating key personnel and intrapreneurs in the form of future ownership stakes in the values they are instrumental in creating. Moreover, financial integration has intensified institutional competition in the area of taxation, which makes it important to continuously benchmark the taxation structure applying to innovative entrepreneurship in one's own country relative to other countries in a similar economic and demographic position.

5.5 Lessons from Chapters 4 and 5

In Chap. 4 and this chapter, we have argued that if an innovation is to be commercially successful, it is necessary to blend together a set of skills and competencies. The complexity of the process is often huge, and such obstacles as financing and recruitment of highly skilled people must be surmounted. The entrepreneur plays a decisive role here. Many new and initially fast-growing businesses subsequently fail. But those who succeed are major contributors to growth, development, and job creation.

Weak incentives for knowledge transfer, innovation, and firm building among those directly involved—researchers, universities, entrepreneurs, businesses, commercial knowledge brokers, and capital brokers—are sometimes replaced by an extensive bureaucracy to offset this deficiency. In Sweden, measures to facilitate commercialization have to a large extent been designed *from above*, but these cannot compensate for a lack of good financial incentives. Both may be needed, however. A comparison can be made with the United States, where legal structures (including pertinent tax rules) have been introduced that encourage spontaneous emergence *from below* of appropriate incentive structures.[30] Such a "bottom-up policy" constitutes a broad-based, market-compliant instrument to encourage voluntary profit-sharing arrangements between universities, researchers, institutions, venture capital firms, entrepreneurs, and all other actors necessary to transform knowledge and innovation into growth and prosperity (Elert et al. 2019; Henrekson and Stenkula 2024; Sanders et al. 2024).

[29] Svensson (2011) draws the same conclusion for existing and former systems in Sweden. He also notes that a very small share of government funds—an estimated 16%—is channelled to the very earliest phases of entrepreneurial activity, i.e., to the phases where market failure is most likely to justify government support. See also Daunfeldt et al. (2014) and Sandström et al. (2019).

[30] For a comparison between the two strategies, see Goldfarb and Henrekson (2003).

To connect the specific competencies of all the various actors, well-functioning institutions and policies are thus required in a wide range of areas, from taxes to product market regulations, from education to social insurance. Some of the building blocks that must exist to ensure rapid structural transformation and successful innovation activities include the following:

- The legal system must be characterized by certainty, transparency, and efficiency in the handling of legal disputes, both between individual actors and the state and between individual firms.
- Regulation should prevent abuse and frivolous entrepreneurship in an effective way without burdening firms with unnecessary costs. These act as barriers to the establishment of new enterprises.
- The labor market must be sufficiently flexible and encourage mobility so that labor can be reallocated from workplaces with lower productivity to those with higher productivity at the lowest possible cost and with the shortest possible period of unemployment. Such flexibility also promotes the diffusion of knowledge embodied in labor.
- Safety nets provided by the government and through contracts should be designed in such a way as to facilitate and encourage the individual to seek employment with more productive firms and workplaces.
- Product markets should be sufficiently competitive to prevent firms from becoming or remaining dominant, either because they have established market power that cannot be challenged, or because they enjoy unfair advantages through special benefits from the government.
- The regulation of financial markets, including the tax system, should be designed in such a way that new and potentially fast-growing firms can readily access external capital.
- The infrastructure should be of such high quality that both start-ups and existing firms with high growth potential are not hindered by bottlenecks in the form of substandard transport and communication.
- The education system should prioritize quality throughout the entire system, from elementary school through PhD programs. This requires, for instance, independent and impartial evaluation of education providers, whether public or private.
- Agglomeration forces should be welcomed and facilitated through appropriate policy measures. These embrace several of the policy areas referred to above; the ultimate objective is to build an environment that attracts businesses and talent. Important but often overlooked factors are the infrastructure and the housing markets.

Appendix: Owner-Level Taxation of Closely Held Firms

Since 2006, a series of changes in the rules for closely held firms have been implemented that substantially expand the share of the owners' income that may be taxed as capital income. In addition, the capital income tax rate on private firms was

lowered to 25% for non-active owners and to 20% for active owners of unlisted firms in 2006. Regardless of the size of the firm, the owner can always pay a dividend taxed at 20% of 2.75 income base amounts (SEK 204,325 in 2023). If the owner does not select this option, low-tax dividends can be paid based on the sum of an imputed rate of return equal to the government bond rate + nine percentage points, plus a so-called wage-base allowance. To exercise the wage-base allowance option, the owner must receive an annual salary of 9.6 income base amounts. In such a case, the owner(s) can pay total dividends based on the wage-base allowance amounting to 50% of the total wage bill of the firm (however, the total low-tax dividend payouts cannot exceed 50 times the annual wage of the owner).[31]

These rules have created substantial room for paying low-tax dividends to owners of large and medium-sized closely held firms. For example, in such a firm with a total wage bill of SEK 20 million, the owner can pay dividends of up to SEK 10 million taxed at 20% even when the firm's original equity base is a mere SEK 25,000 (assuming that the firm has sufficient profits to pay this amount). Unused dividend allowances are carried forward and can be accumulated at an interest rate equaling the government bond rate plus three percentage points. For passive owners of unlisted shares, both the dividend and the capital gains tax rate are 25% instead of the standard 30%.

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[31] For a detailed analysis of the current rules and the numerous changes over the years, see Stenkula and Wykman (2022).

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Chapter 6
Conclusions: A Framework for Innovation Policy

In the previous chapters, we have discussed the future challenges faced by the European welfare states, in particular Sweden. We have also presented the theoretical and empirical foundations for a restructuring of innovation policies in order to handle an uncertain and demanding future. The issue at stake is how well-equipped countries will cope with a novel competitive landscape, characterized by transformations to abate and adapt to climate change, escalating geopolitical tensions paired with an (as it seems) intensified use of state aid and subsidies, new digitized instruments, and the emergence of platform firms. Even though the world seems to have entered a stage of deglobalization, more and more countries have become integrated into the world economy over the last decades. Several of these countries are resolutely and systematically building up their knowledge bases, with a long-term perspective, increasing their innovation capacity and developing their business sectors. These changed circumstances make innovation imperative and warrant new and distinct policy strategies that strengthen the incentives to engage in risky, often experimental, endeavors to deal with these challenges.

The growth models and the ensuing prescriptions that have dominated both Swedish and international economic thinking have not lived up to the high expectations that they originally engendered. This is evidenced by the slowdown in economic performance in virtually all mature economies. Throughout this book, we have argued that an important explanation emanates from a major flaw in knowledge-driven growth models. In these models, it is assumed that investment in education, research, and development will more or less automatically be transformed into new business models, products, processes, and firms. The fact that sufficiently strong economic incentives, aligned across all relevant actors, are also required for knowledge to be developed into innovations and welfare-enhancing benefits is neglected—or completely ignored—in these models. An important lesson is that without appropriate incentives, even the most advanced knowledge risks being left unutilized.

A strategy for greater innovation—a more creative country—must, to simplify somewhat, be based on two pillars: First, the capacity to build and upgrade an

P. Braunerhjelm, M. Henrekson, *Unleashing Society's Innovative Capacity*,
International Studies in Entrepreneurship 55,
https://doi.org/10.1007/978-3-031-42756-5_6

internationally competitive knowledge base; second, the institution of policies that ensure effective mechanisms for transforming knowledge into valuable goods and services through commercialization. If these two conditions are not in place, the probability of producing innovations diminishes. This impairs the capacity to establish new and growing firms, raise investment, boost value added, and increase employment.

Once again, we want to emphasize that innovation policy involves not only R&D and seed financing for new businesses. Nor does innovation concern advanced technology alone—it embraces *all* goods, services, and organizations, regardless of industry or technology level. Countries should aim to be successful both in terms of skills and well-functioning, dynamic markets for basic and personal services as well, not least in education, health, and social care.

Do our policy conclusions in this chapter differ from those of previous commentators? Obviously, there are overlapping components. But compared to the proposals of our colleagues, our approach is broader and focuses on *incentive structures and driving forces* for creating an environment that fosters innovation and the entrepreneurial effort necessary for any innovation to attain its full potential. These incentive structures must be well defined for both private and government actors. Today, there are shortcomings in this regard, especially among public actors.

The ways in which countries and regions prioritize across initiatives vary significantly, but several of our proposals work well in many other countries as well. Institutional competition has been increasing, which is likely to have real economic effects. The United States emphasizes entrepreneurship and "cut-throat capitalism," while European countries often focus on more traditional business policies and "cuddly capitalism" (Acemoglu et al. 2017). Within the EU, there is some coordination of research policies and measures for a better functioning internal market. Several countries have also introduced substantial tax subsidies for research-intensive activities. Israel is one example of a successful cooperation between the government and the business sector to strengthen early-stage supply of risk capital and encourage entrepreneurship and innovation. It was preceded by several policy failures before the appropriate constellation was found (Avnimelech and Teubal 2006). China is investing massive resources in R&D and has managed to sharply increase its patenting activity. But as far as we know, no country has prioritized measures for knowledge transfer in the broad sense as systematically as we are proposing here, in particular measures to strengthen incentives for all relevant actors to *transform knowledge into social benefits* through innovative entrepreneurship and/or intrapreneurship. We believe adopting such a broad approach is particularly important for small open economies.

6.1 The Use of Frameworks for Key Policy Areas

Since the 1990s, it has become popular to talk about "frameworks" for different policy areas. This has been inspired by the successes of the monetary and fiscal policy frameworks that have played a central role internationally as well as in Swedish macroeconomic policy since the crisis of the 1990s:

- In monetary policy, the Riksbank (Sweden's central bank) has a price stability target (interpreted as two percent inflation) together with a secondary target, namely, to support growth and employment insofar as this does not threaten the inflation target. Its primary tool is the repo rate, which is set after transparent, recorded debate on the Riksbank's Executive Board. The Riksbank's activities are evaluated by, among others, its Finance Committee and now also regularly by external assessors.
- There is a surplus target in fiscal policy which stipulates that the consolidated government sector should have a surplus of one-third of one percent of GDP over the business cycle.[1] The goal is motivated by a perceived need for building a buffer against rising costs because of future social changes (e.g., aging) and unexpected economic disturbances. It is combined with a debt anchor, implying that the consolidated governmental debt cannot exceed 35% of GDP. The fiscal framework also includes a ceiling on central government expenditure and a requirement that local government budgets be balanced annually. Additionally, the framework stipulates that the government budget contain an account of how the surplus target will be met. Fiscal policy is evaluated partly by the parliament and partly by a special expert body, the Fiscal Policy Council.[2]

When these goals and the frameworks for achieving them were set, they were far from uncontroversial, and they are still debated. Monetary policy had experienced an experimental period as the inflation target was not met, which triggered vivid debate and seems to have lowered confidence in the Riksbank. In fiscal policy, there was controversy surrounding the surplus target itself and its effects, but also about how it was to be defined (annually or over the business cycle, with or without a capital budget for public investment, and so forth).

While the monetary policy framework has been more heatedly debated, the success of the Swedish fiscal policy framework is extraordinary. Government debt is below the ceiling despite the recent crises, expenditure has been kept below the stipulated level, and budget deficits have been on target. This stands in stark contrast to most other EU countries, which have failed to exercise similar budget discipline

[1] Initially, the required surplus was two percent of GDP, which was lowered to one percent in 2007 and then to the current level in 2019. At the time of writing, there is a discussion to switch to a balanced budget target.

[2] https://www.government.se/government-agencies/swedish-fiscal-policy-council/

despite the Maastricht conditions prescribing a debt ceiling of 60% of GDP and budget deficits not exceeding three percent of GDP.[3]

Both frameworks are based on quantitative targets using a special set of policy tools according to a set schedule, which are tractable and transparent. Still, this is considerably more complicated in other areas. New frameworks may therefore be more politically and analytically controversial than existing successful macroeconomic frameworks.

At the same time, it is important to affirm that long-term growth is *not* created by the establishment of a certain level of government spending or by an independent central bank with an inflation target. Continued prosperity presupposes above all that ideas—innovations broadly defined—can be implemented in the form of new firms, renewal of incumbent firms, new products, new ways of organizing production, and new markets. Macroeconomic stability must therefore be combined with microeconomic dynamics fueled by policies that incentivize the relevant agents to create and act on opportunities, aiming at increasing innovation capacity and the forces of creative destruction.

Consequently, there are reasons to implement a clearly defined framework governing innovation policy as well in order to achieve long-term credibility and transparency. However, such a policy must be able to handle a myriad of conceivable situations of different characters and magnitudes, and in which knowledge and information are spread across a large number of actors. This means that the policy must, as far as possible, be general and ensure that competitive neutrality prevails both among domestic actors and between domestic and foreign actors.

A general policy does not preclude targeting specific sectors or issues under certain circumstances, notably when there is a market failure. Problems can arise as a result of information gaps or asymmetries regarding, for example, the commercial potential of an invention, when economies of scale risk leading to monopolies, or when oligopolistic structures make it hard for innovative firms to enter the market. When there is reason to expect significant societal externalities even if firms or innovative endeavors fail, taking measures to rectify the situation, such as specific policies, is a justifiable course of action.

With the approach we are advocating—a micro-based, evolutionary approach—it goes without saying that it will be much more difficult to identify a number of clear-cut quantitative targets or a few unambiguous tools and transparent methods to evaluate how well the innovation policy framework performs. The arsenal of tools will be larger and not as rigorously defined as for macroeconomic policies. The policy instruments suggested by our approach can also have political and redistributive consequences in more areas than a change in the repo rate, to cite one example.

[3] The fiscal framework of the European Union is currently being renegotiated as a consequence of the COVID-19 pandemic and Russia's invasion of Ukraine in February 2022. Government spending triggered by these two events has moved most EU countries even further away from meeting the Maastricht conditions.

6.2 An Innovation Policy Framework

Before we outline our policy recommendations, let us briefly recapitulate the theoretical and empirical arguments in favor of an innovation policy framework. In Chap. 2, we identified and discussed at some length the shortcomings of the current mainstream knowledge, or endogenous, growth models. Instead, we argued that research in the vein of Schumpeter's thinking and that of the evolutionary growth school is more fruitful and provides better guidance for policy. It highlights the conditions and opportunities at the micro level, i.e. how individuals and firms facing genuine uncertainty exploit new and existing knowledge for innovation, but also the heterogeneity and variety of these environments. One key notion in this research is that knowledge and skills are decentralized across markets and spread over a large number of individuals and firms. This situation requires appropriate institutions that harmonize the incentives of the different types of actors with complementary competencies. The key differences between the so-called neo-Schumpeterian growth models and the view we advocate are summarized in Fig. 6.1.

Empirical research in the field of innovation has shown, among other things, that:

- Relatively few firms demonstrate any extensive innovation activity, broadly defined. Most small businesses are not, and do not see themselves as, entrepreneurial, and the distribution of R&D expenditure is heavily skewed; in Sweden, firms with more than 250 employees account for approximately 75% of R&D and the ten largest firms account for roughly 50%.[4] The proportion of Swedish firms with up to ten employees that have any R&D activities at all is far below one percent. Swedish industrial R&D is thus heavily concentrated to a few large firms.
- Access to cash flow and equity, a high equity-to-debt ratio, and access to a well-educated workforce are crucial for firms aiming to pursue sustainable innovation initiatives. As discussed in Chap. 1, patenting in Sweden exceeds both the EU and OECD averages, paralleled by increased access to early-stage financing over the last decades. This coincides with an increase in Swedish entrepreneurship (Thulin 2023).
- Innovative firms have three to five times as many employees with several years of post-secondary education, often belong to a multinational firm, and are generally classified as high-tech or medium-high-tech. They are usually internationalized. The connections seem to work in both directions: More innovative firms are more involved in international trade, while trade generates learning as well and contributes to a higher capacity for innovation (Fassio 2022). In other words,

[4] See https://www.scb.se/hitta-statistik/statistik-efter-amne/utbildning-och-forskning/forskning/forskning-och-utveckling-i-sverige/. There also seems to be a digital divide between large and small firms with regard to digital technologies. In 2019, less than five percent of Swedish small firms used some kind of AI application (https://www.teknikforetagen.se/nyhetscenter/nyheter/2020/industrin-leder-sveriges-fou-utveckling-av-ai/). See also Andersson and Lööf (2012).

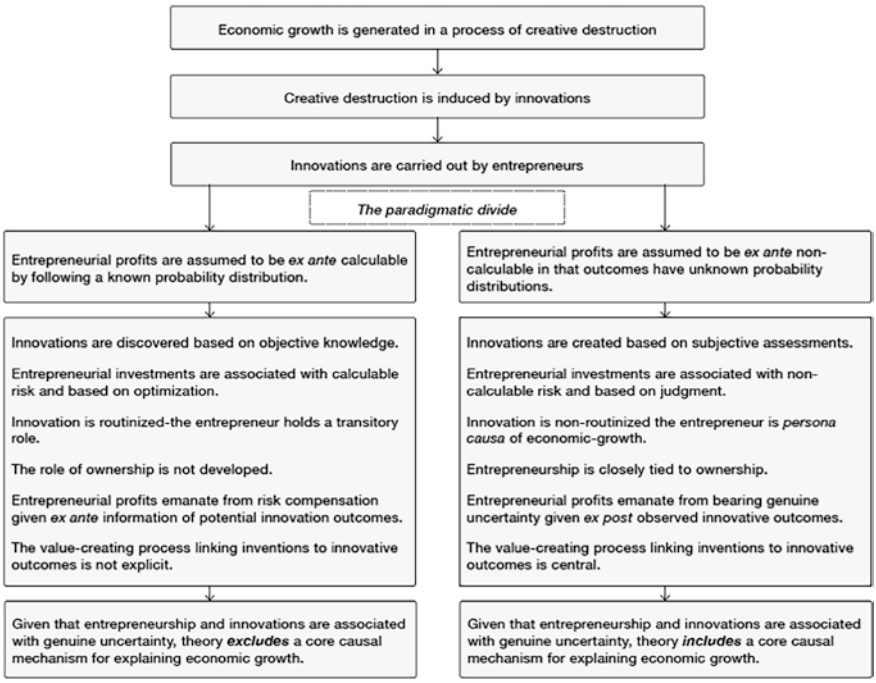

Fig. 6.1 The key difference between the neo-Schumpeterian view and our view. *Source*: Adapted from Henrekson et al. (2023)

international knowledge sources, connectivity, and competition are important drivers of innovation and productivity.

- The cost of adopting new technology can be significant. Skills are also required to import and adapt technology developed by others. Replicating technology can generate costs that amount to as much as 65% of the original development expense. Likewise, the transfer costs of technology between firms or units in a firm can amount to 25% of the original outlay. If the recipient does not conduct significant R&D in-house, absorption capacity suffers, further increasing transfer costs (Mansfield et al. 1981).[5]
- R&D and innovation efforts make a clear impact on firms' productivity and competitiveness (Griffith and Van Reenen 2021). Private return is high, and the productivity effects are significant. Companies with a sustainable innovation strategy have—compared with other similar firms—about ten percent higher productivity and two percent higher productivity growth (Martinsson 2010).
- The success of university-based innovation depends on which pedagogy and which system are implemented. For example, students play a much more significant role in establishing new firms than university-employed researchers—at

[5] Gillingham and Stock (2018) examine the costs of adopting climate-friendly technology.

least ten times more, according to several studies. In addition, several studies indicate that up to 80% of start-ups are located close to universities, and that there is positive feedback between these entrepreneurs and universities. They are therefore important for cluster formation and agglomeration.[6] Nevertheless, most innovation efforts at universities are directed towards researchers rather than students.

Based on this view of how the economy works—decentralized knowledge, the combination of individuals and ideas with the surrounding institutional environment—we would like to summarize our analysis, all the associated analytical and political difficulties notwithstanding, in what can be called a *framework for innovation policy*. This framework focuses on the two main tasks presented above: to build and gather knowledge, and to disseminate and commercialize that knowledge.

The purpose of the main recommendations we make is to anchor innovation policy in a few fundamental principles in order to foster a long-term perspective and transparency. The policy recommendations can in turn be divided into two categories: those that are declarations of intent, and those that should be codified in legislation. Although the Swedish economy is our point of departure and reference case, we argue that our recommendations are, on the whole, applicable to most other countries.

6.2.1 Build and Assemble Knowledge

The first pillar of our proposed framework—a globally competitive knowledge base—is based on the following recommendations:

1. Sweden should, based on international knowledge assessment, set *quantitative targets for Swedish students' performance* in the TIMSS and PISA assessments. As shown in the OECD study *The High Costs of Low Educational Performance* (OECD 2010) and in research showing that results in these assessments are strongly associated with economic growth (Henrekson and Wennström 2023; Heller Sahlgren and Jordahl 2023), there are major gains to be made in social welfare if primary and secondary school education is improved.
2. Based on best practices experience elsewhere, universities and colleges should use *the pedagogical methods that have been shown to have the greatest effect on innovation and entrepreneurship*. This means, among other things, involving students more directly in innovation and entrepreneurship initiatives, which also has a positive effect on regional development and cluster formation.
3. Resources for research and innovation should be distributed according to *quality criteria* to a greater extent, while *university autonomy* should be strengthened.

[6] See Link et al. (2015) and Åstebro et al. (2011), and references in those studies. See also Michelacci and Silva (2007).

This would clarify the often obscure and even counterproductive incentive structures currently in place at institutions of higher learning.[7] Universities should themselves be able to choose which IPR regime they prefer to adopt (professor's privilege, where ideas are owned by faculty, or a Bayh–Dole type system where the IPR belongs to the universities). This is likely to stimulate deeper collaboration and more diverse relationships with the business sector. A university's basic funding should be partially tied to its accomplishments with respect to innovations and the commercialization of ideas.

4. Research and innovation proposals in parliament should be supplemented with a more *long-term "statement of intention"* regarding government research initiatives, with a possible horizon of ten to 12 years. One version of this was introduced in Sweden approximately ten years ago and has created greater predictability and confidence in research and innovation policy among both business and academia, which is important for the planning and location of both companies and individuals. Based on the Swedish experience, we recommend that other countries follow suit.

With the exception of the second recommendation, these proposals could be decided by parliament and codified in law. A mandatory report on future research investment plans (comparable to reports on infrastructure investment plans) must of course be subordinated to the fiscal policy objectives, but it is nevertheless central to the long-term perspective.

6.2.2 Dissemination, Innovation, and Commercialization of Knowledge

Our second pillar concerns the transformation of knowledge into innovation. Here we choose to highlight the following recommendations:

5. There are strong tendencies to advocate for over-regulation of the economy. To the greatest extent possible, only effective and socially justified regulations should be introduced. Therefore, a *Better Regulation Council should be established for the submission of regulatory proposals and incisive analyses of the direct and indirect consequences of new regulations*. These Councils should also have the authority to *block regulations* that entail large socio-economic costs. In specific cases, the Council's decision could be revoked by a qualified parliamentary majority. This should be complemented by a "sunset" clause: regulations that are not used or become obsolete should be repealed. Authorities

[7] Regarding public R&D and innovation initiatives, an overall guiding principle should be that these take place where private engagement is hindered by extensive risks, while the potential social return is high due to positive externalities. Otherwise, there is a great risk that public capital will also be channelled to sectors where private returns are high, to achieve quick results.

should be required to periodically review their regulatory frameworks and propose simplifications and streamlining.

6. Labor market mobility, particularly among highly skilled workers, has been shown to have a positive impact on innovation (Kaiser et al. 2015; Braunerhjelm et al. 2020) thanks to better matching and improved knowledge networks. Policies should therefore facilitate mobility of employees across organizations and from salaried employment into entrepreneurial occupations. This entails streamlining different social security systems such that *social insurance entitlements and workplace-related benefits become fully portable* when changing employers or labor-market status.
7. Competition is an important driver of innovations. Prerequisites for well-functioning competition are informed customers and the weeding out of substandard goods and services. In regular markets, this happens in the course of day-to-day transactions—firms that deliver inferior quality go bankrupt in the long run. In markets for tax-financed social services, this control mechanism is not operative. Deregulation, customer choice models, and competitive neutrality therefore require other forms of monitoring, follow-up, and control. Today, the Swedish Competition Authority is the supervisory agency for laws on public procurement, freedom of choice and competition, and the possibilities for monitoring the public sector have been expanded. The Competition Authority, or another appropriate agency, should also be made responsible for *monitoring and control of quality and customer information*, combined with credible and financially sensible sanctions of public services. Moreover, the global platform firms that have emerged recently may pose a threat to long-run market entry and innovation; this must be counteracted by appropriate measures.
8. To a greater extent, the government should provide *digital infrastructure, information, and statistics* which can be used by private actors to build companies and create innovations. The government should not attempt to establish its own services. Simultaneously, the government has a responsibility to protect individual integrity.
9. Tax systems must be structured from the perspective of entrepreneurship and innovation. Three measures should be prioritized: *Stock options should be taxed as capital gains* according to the model described in the previous chapter; *highly progressive income taxes should be avoided*; and *equality should apply between debt- and equity-financed activities*. The tax system must avoid lock-in effects for potential venture capital, and direct government support should be restricted to the earliest investment phases. Owner-level taxes need to be adjusted to the level of competitor countries. Increased mobility of firms, entrepreneurs, and talent serves as motivation for an independent agency to regularly provide a transparent benchmark analysis to position the country in relation to other relevant economies.
10. Knowledge dissemination, innovation, and productivity are promoted by regional expansion, geographic density, and cluster effects. Dense and knowledge-intensive environments also have greater fiscal viability. The innovation policy framework should therefore aim towards *strengthening existing*

or emerging clusters through labor market, housing, and infrastructure policies. In the Swedish case, this means larger regional units than today's county councils, with greater decision-making powers.

Of these six recommendations, the first three and parts of the tax proposals are more suitable for consolidation into law, while the others are declarations of intent. Finally, imposed policies should be subject to regular, independent, evaluations of their effects, followed by modifications in the design of policy measures if deemed necessary.

Thus, our framework is based on ten innovation policy principles, four of which can be classified as support for knowledge reinforcement and knowledge building and the rest for the transformation of knowledge into innovations, new and growing firms. Implementation and credibility require that several of these (at least seven out of ten in our assessment) be concretized in legislation. Innovation policy should also be prioritized by top political leadership. As there is reason to believe that current attitudes towards entrepreneurship and innovation are influenced by the existing regulatory framework, a clearer policy in this area is likely to contribute to positive indirect effects that are reflected in a more positive view of entrepreneurship.

Regarding more direct investment of public funds to strengthen research (except for university research as discussed above) or innovation—where the guiding principle should be that the social return is estimated to significantly exceed the private economic return due to large positive externalities—there is no reason to further define what this may be. Public investment will vary from time to time and across projects. They may concern areas where countries, according to well-defined criteria, can develop international excellence with significant future potential or more large-scale projects where pilot facilities may be necessary (for example, in the fields of climate, environment, and energy), where public initiatives can contribute to increasing Sweden's attractiveness (for example, making data available), or where clear system weaknesses have been identified. Such interventions should always be time-limited and continually evaluated.

6.3 An Innovative and Inclusive Society

Finally, we would also like to emphasize that the above-mentioned proposals for reorienting and institutionalizing innovation policy only cover the areas we consider to be the most significant. At the same time, we emphasize the importance of entrepreneurial and innovative efforts in all sectors: the bureaucrat who quietly reorganizes her department and provides better service; the forester who develops new methods for felling and pulping wood; the mining engineer who develops a better method of refining ore; the principal who reorganizes his school so that students become more knowledgeable—they and other hard-working colleagues are as important, and can be at least as creative as, any art director, event organizer, or industrial designer.

Our prioritized areas can of course be questioned, but our starting point is that knowledge and knowledge transformation are crucial for modernization, economic growth, and prosperity. In addition, there are a number of other measures that are also important but which either fall within the scope of the above recommendations or do not really carry the same weight. The list could be made longer, but we refer instead to Chaps. 4 and 5 for our more detailed proposals.

We realize, of course, that not all of these proposals may be implemented at once. Conflicting targets vis-à-vis other policy areas are in some cases significant. But as a gross list and a comprehensive program for more innovative and entrepreneurial economies, we consider it important to present them in their entirety. Overall, these concrete proposals address the challenge of influencing society's basic attitudes and values—to create a more innovative and entrepreneurial economy. There is thus no shortage of information here for the innovative and entrepreneurial politician. And continued sustainable growth, high welfare levels, and societal prosperity are rooted in continued innovative efforts.

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https://doi.org/10.1007/978-3-031-42756-5