David B. Audretsch

Entrepreneurship in the United States and Germany: Attaining the Promise of Innovation

KEY MESSAGES

- **If innovation is necessary to tackle the huge economic, political, and social challenges facing society, then entrepreneurship is needed to drive innovation**
- **Both Germany and the US are not only among the most innovative, but also among the most entrepreneurially active countries in the world**
- **Entrepreneurship in Germany and the US has both its strengths and its challenges**
- **The entrepreneurial challenge in Germany is to strengthen and maintain the traditional strengths of incremental innovative entrepreneurship, while building on the impressive transformative entrepreneurship that is taking root in large cities**
- **In contrast, the entrepreneurial challenge for the US is to continue to drive its radical and disruptive innovative entrepreneurship, while expanding the spread of entrepreneurship to less densely populated and more rural regions**

THE INNOVATION MANDATE

Nearly a quarter through this century, Western democracies are confronted with challenges that would have seemed unimaginable only a few short years earlier. The mandate for sustainability imposes dauting demands for enhancing the environment, distribution of wealth, and social inclusion across the entire spectrum of society. The European Union, along with member countries, adhere to "The Sustainable Development Goals (SDGs)" articulated by the United Nations 2030 Agenda for Sustainable Development "to eradicate poverty, find sustainable and inclusive development solutions, ensure everyone's human rights, and generally make sure that no one is left behind" (European Commission undated).

The viability of democracy itself is fundamentally challenged. It is not just the global wave of wars and hostilities that threaten democracy. Democracy is also threatened within, by totalitarian and authoritarian forces amassing power and influence. As Freedom House, the premier global institution monitoring the viability of democracy, warns, "acceptance of democracy as the world's dominant form of government – and of an international system built on democratic ideals – is under greater threat than at any point in the last 25 years" (Freedom House 2015). Within the arc of a generation, the conclusion that the "Fall of the Berlin Wall" had ushered in the undeniable triumph of democracy over totalitarianism, which was widely heralded as *The End of History* (Fukuyama 1992), has disintegrated.

All this comes at a time when economic growth has stalled throughout Europe and many of the OECD countries, rendering it that much more difficult to take on new challenges. In Germany, stagnant economic growth led The Economist (2023) to wonder, "Is Germany Once Again the Sick Man of Europe?" As Stelzenmüller points out, these four challenges are not isolated: "Germany had outsourced its security to the United States, its energy needs to Russia, and its export-led growth to China" (The Economist 2022).

Economic stagnation combined with unanticipated challenges and demands is tantamount to having to do more with less. Economic doctrine teaches us that there are two paths to respond to this dilemma. The first is the path paved by Thomas Malthus – acceptance of the finality of ever-increasing demands on limited resources and capacity. The second is what proved Malthus to be wrong – innovation.

IDEAS DRIVE INNOVATION

Innovation requires new ideas, or economic knowledge (Arrow 1962). Without new ideas, there can be no innovation (Romer 1986 and 1990). Research and development (R&D) is a key source generating new knowledge and ideas. While Germany remains among the R&D leaders in the EU, R&D expenditures as a share of gross domestic product (GDP) has been similar in Germany and the United States. The US spent USD 789 billion on R&D in 2021, or 3.34 percent of GDP. Germany spent EUR 121 billion, or 3.13 percent of GDP, on R&D in 2021. However, as Stelzenmüller alluded to, there are vast differences in how that R&D is allocated between Germany and Europe, on the one hand, and

David B. Audretsch

holds the Ameritech Chair in Economic Development at Indiana University and is Director of the Institute for Development Strategies. He also holds a professorship at the Alpen-Adria-Universität Klagenfurt.

the US, on the other hand. National defense accounts for a substantial share of R&D in the US but not in Germany. In the United States, 53 percent of R&D is funded by the government, of which 47 percent is allocated to the Department of Defense (NCSES 2023).

Both Germany and the United States rank among the global leaders in patented inventions. In 2022, Germany had 24,684 new patent applications (Statista 2023). There were 646,855 new patent applications in the United States in 2022 (Lexology 2023).

Industrial policy in the United States enhances not just the total amount of R&D but also its allocation toward targeted industries. Most notably, the 2022 *CHIPS and Science Act* authorized USD 50 billion for revitalizing the semiconductor industry to bolster American and national security, of which USD 11 billion was dedicated to semiconductor R&D through four specific programs – the CHIPS National Semiconductor Technology Center (NSTC) Program; the CHIPS National Advanced Packaging Manufacturing Program (NAPMP); the CHIPS Metrology Program; and the CHIPS Manufacturing USA Program (US Senate Committee on Science, Commerce, and Transportation 2022).

ENTREPRENEURSHIP

New knowledge and ideas emanating from R&D are not enough to generate innovative activity. Innovation also requires something else – the implementation or commercialization of those ideas into society. The widely known Swedish Paradox and European Paradox around the turn of the century described a paucity of innovation even with substantial R&D expenditures (Audretsch 2007). Even though Sweden undertook among the highest investments in R&D in the world, as a share of GDP, innovative activity in the country remained disappointing. Europe similarly expressed concern about the glaring gap between investments in knowledge and new ideas on the one hand, and actual innovative activity on the other hand (Audretsch 2007).

As Johan Wolfgang von Goethe observed, "Knowing is not enough; we must apply. Willing is not enough; we must do." However, not all ideas are good ones, in that they will result in innovation. Companies, financial organizations, and other non-profit organizations, such as universities and research institutions, all make decisions about which new ideas to pursue for innovation and to commercialize, and which have less potential. This decision-making process forms what has been characterized as the knowledge filter, which is the result of efforts to separate out the viable ideas from those with no promise of commercialized innovation (Audretsch et al. 2007).

Some of the ideas discarded by the knowledge filter in companies and other organizations are sufficiently promising to attract entrepreneurs to attempt to commercialize them by starting new companies. Entrepreneurship is crucial to innovation because it provides a conduit for the spillover of knowledge from the organization or company in which the new ideas are created to the new startup, where they are ultimately commercialized and implemented through innovative activity (Audretsch 1995).

Because disruptive and more radical innovations are associated with greater risk and uncertainty, they are the ones more typically discarded by the very companies and other organizations creating them through their R&D in the first place. The willingness of entrepreneurial startups to incur greater risk accounts for the paradox that those same entrepreneurial companies do not just account for a disproportionate share of innovative activity, but also have a far greater propensity for disruptive radical innovative activity than do the companies that actually created the ideas through their own R&D (Audretsch 1995).

Without entrepreneurship, less of the costly R&D will be commercialized through innovative activity. Entrepreneurship provides an important way to penetrate the knowledge filter and enhance the innovative yield emanating from investments in R&D and other new knowledge (Audretsch et al. 2008).

Measures of entrepreneurship suggest more robust entrepreneurial activity in the United States compared to Germany. The Global Entrepreneurship Monitor (GEM) estimates early-stage entrepreneurial activity in Germany of 9.1 percent in 2022. By contrast, in the US, early-stage entrepreneurial activity is nearly double (GEM 2024).

An even more striking difference involves financing entrepreneurship, and in particular ventures with high growth potential. There is considerably more venture capital to finance high-growth entrepreneurship in the US than in Germany. In 2021 there was USD 269 billion, or USD 915 per capita, of venture capital funding of high-growth entrepreneurship in the United States. By contrast, there was only USD 17 billion, or USD 202 per capita, of venture capital funding of high-growth entrepreneurship in Germany (Glassner 2021).

The greater availability of venture capital has contributed to a greater prevalence of unicorn startups in the United States than in Germany. As of 2020, there were 228 unicorn companies in the US, but only 13 unicorn companies in Germany. Still, it is important to note that Germany had the greatest prevalence of unicorns in Europe (Armstrong 2020).

A plethora of other sources of finance, both public and private, provide funding for entrepreneurial firms. In the US, for example, the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (SBTT) provide federal funding for the innovative activities of small business. The explicit purpose of the SBIR is to provide small and new companies with sufficient financing to traverse the well-known valley of death, which characterizes the early stage of an innovative project that is still too uncertain and risky to procure private finance.

The SBIR provides a mandate for the federal agencies with an annual budget greater than USD 100 mil-

lion to allocate a minimum of 3.2 percent of their external R&D expenditures to small business. The largest governmental agencies, such as the Department of Defense, National Institutes of Health, and Environmental Protection Agency, are therefore required by law to include small and new business in their R&D awards, which amounts to more than USD 3.2 billion annually (SBA 2020).

Over 5,000 grants for small business innovation are awarded each year. Phase I grants are between USD 50,000 and USD 250,000 for development of an innovative concept, with a duration between six months and one year. Phase II grants are to develop a prototype with an amount up to USD 1.5 million over a two-year period. Phase III grants are to support the actual commercialization of the innovative concept with funding from non-SBIR sources (SBA 2020). Robust studies have found the SBIR to have a positive impact on the innovative activity of recipient firms, as well as inducing university scientists and other staff to becoming entrepreneurs (Guerrero et al. 2024).

Entrepreneurship is inherently a local phenomenon influenced by conditions in the external national context (Audretsch and Feldman 1996). Entrepreneurial activity varies considerably across geographic regions in the United States, as it does in Germany. For example, entrepreneurial activity has been identified as being the highest in Austin (Texas), Boulder (Colorado), Miami (Florida), Los Angeles (California), and San Francisco (California) in the US (Audretsch 2015). In Germany, entrepreneurial activity is the greatest in Berlin, followed by Munich, Hamburg, and Cologne (Statista 2020). Recent rankings place Berlin as one of the top three cities for entrepreneurship in Europe (Ohr 2023).

The spatial variation of entrepreneurial activity has been attributed to locational disparities in attitude and culture with respect to risk taking and entrepreneurship, availability of early-stage finance, the local industry structure, infrastructure, and robustness of the local entrepreneurial ecosystem (Prenzel et al. 2024). The local entrepreneurial ecosystem reflects the capacity for the region to provide entrepreneurs and their firms with what they need to succeed, ranging from finance to technological capabilities, networking, marketing, and human resources (Stam and van de Ven 2021).

CHALLENGES

There are distinct differences in the strengths and challenges for entrepreneurship between the US and Germany. The US is more conducive to entrepreneurship based on transformational and disruptive innovation. Entrepreneurship in newly emerging industries resulting in high-growth companies that disrupt extant technologies is more prevalent in the US. This is evidenced by the high share of unicorn companies and large technology companies that were only recently founded.

By contrast, Germany is more conducive to entrepreneurship based on incremental innovation within existing technologies and industries. The manifestation of this incremental innovation is evidenced through the prevalence of Hidden Champion Mittelstand companies located in Germany (Simon 1996 and 2009). Hidden Champions are defined as relatively unknown small companies with sales less than USD 5 billion that rank among the top three in terms of global market share or else are the leading company on their continent.

Hidden Champion companies are by far the most prevalent in Germany, where 1,573 Hidden Champions have been identified as of 2021, followed by the US with 350 Hidden Champions. Hidden Champions are also highly prevalent in Austria and Switzerland but considerably less prevalent in Japan, France, Italy, the United Kingdom, and the Netherlands (Simon 2022).

The exceptional prevalence of Hidden Champions reflects a related entrepreneurial strength exhibited by the Mittelstand in Germany. The Mittelstand refers to companies exhibiting common, distinguishing characteristics. Mittelstand companies tend to be small, family-owned, have close links to the local community, be in manufacturing, have a focus on high quality product niches, have a global export orientation, eschew equity finance for relational bank finance, engage in incremental innovation, and have a nurturing and long-term relationships with employees. With their core strategy of incremental innovation and highly skilled employees, Mittelstand companies are conducive to manufacturing.

The relative success and competitiveness of manufacturing in Germany is attributable to the entrepreneurial activity inherent in the Mittelstand (Audretsch and Lehmann 2016). The high share of skilled labor in the German economy, resulting from the dual system of education combined with apprenticeship training and technical institutes, along with research institutes such as the Fraunhofer Institutes, dedicated to applied research and technology transfer, are conducive to incremental innovation not just in entrepreneurial manufacturing firms, but especially in Mittelstand companies. The share of GDP accounted for by German manufacturing was 18.44 percent in 2022. By contrast, the manufacturing share of GDP was only 60 percent as much, at 11 percent in the United States (US Bureau of Labor Statistics 2023). Similarly, manufacturing accounted for 26.87 percent of employment in Germany but only 10.3 percent of employment in the US in 2022. The relative strength of manufacturing in Germany is further evidenced compared to its lower employment share of 19 percent in France, 14 percent in the Netherlands, 17 percent in Sweden, and 21 percent in Finland (World Bank 2024).

The emphasis on incremental innovative entrepreneurship in Germany has been more conducive to greater inclusiveness, in terms of both geography

and educational attainment (Audretsch and Lehmann 2016). The Mittelstand has been found to enhance the standard of living and general prosperity in less populated and even relatively rural regions in Germany (Pahnke et al. 2023). By contrast, the emphasis on more radical and disruptive entrepreneurship in the United States has been concentrated both spatially, within urban areas, as well as among the more highly educated. The result has been a greater growth in income and wealth disparities in the US compared to Germany, as well as a growing divide between urban areas and rural regions, both of which threaten social and political sustainability.

The recent wave of Chinese acquisitions of Mittelstand companies has triggered concern about the longer-term viability of the Mittelstand and its Hidden Champions (Harper 2021). At least until now, a precondition of belonging to the Mittelstand has been ownership – not just in terms of family ownership but also by German nationality (Barve 2019).

POLICY CONCLUSIONS

If innovation is needed to address the formidable economic, political, and social challenges confronting society, entrepreneurship is needed to drive that innovative activity. Both Germany and the United States rank among not just the most innovative countries in the world but also the most entrepreneurial. While it is always important to focus on what can be improved, it is also important to remember that the glass of entrepreneurship and innovation is more than half full. The opposite view, such as that articulated by Joschka Fischer, who admonished, "if Bill Gates were German, there would be no Microsoft" (Bracey 2008), is neither constructive nor accurate.

What is accurate is that entrepreneurship in Germany and the US both have their strengths and challenges. The entrepreneurial challenge in Germany is to bolster and sustain its traditional strengths of incremental innovative entrepreneurship, while building on the impressive more transformative entrepreneurship taking root in the most entrepreneurial cities, such as Berlin, Munich, and Hamburg, enabling the country both to preserve its traditional strength in manufacturing but also increase its competitiveness in newly emerging industries such as artificial intelligence.

By contrast, the entrepreneurial challenge confronting the United States is to continue to advance its radical and disruptive innovative entrepreneurship, while at the same time diversifying the inclusiveness to diffuse entrepreneurship to less densely populated and more rural regions. The lessons from each country are that enhancing innovation to address the daunting challenges confronting the world is indeed possible. However, entrepreneurship across its full and broad spectrum of manifestations will need to be activated to fulfill the promise of innovation.

REFERENCES

Armstrong, M. (2020), "Startups: The Countries with the Most Unicorns", *Statista*, 6 July, https://www.statista.com/ chart/6696/ the-us-is-home-to-the-most-unicorns/.

Arrow, K. (1962), "Economic Welfare and the Allocation of Resources for Invention", in R. R. Nelson, ed., *The Rate and Direction of Inventive Activity*, Princeton University Press, Princeton, 609–628.

Audretsch, D. B. (1995), *Innovation and Industry Evolution*, The MIT Press, Cambridge MA.

Audretsch, D. B. (2015), *Everything in Its Place: Entrepreneurship and the Strategic Management of Cities*, Regions and Countries, Oxford University Press, New York.

Audretsch, D. B. (2007), *The Entrepreneurial Society*, Oxford University Press, New York.

Audretsch, D. B. and M. P. Feldman (1996), "R&D Spillovers and the Geography of Innovation and Production", *American Economic Review* 86, 630–640.

Audretsch, D. B., M. Keilbach and E. E. Lehmann (2006), *Entrepreneurship and Economic Growth*, Oxford University Press, New York.

Barve, M. (2019), "Enter the Dragon: China Acquiring German SMEs", *BBN Times*, 5 June, https://www.bbntimes.com/ companies/ enter-the-dragon-china-acquiring-german-smes.

Bracey, G. W. (2008), "The Entrepreneurial Thing – We're Only No. 2", *Education Week*, 16 September, https://www.edweek.org/technology/ opinion-the-entrepreneurial-thing-were-only-no-2/2008/09.

European Commission (undated), *Sustainable Development Goals*, https://international-partnerships.ec.europa.eu/policies/ sustainable-development-goals_en.

Freedom House (2015), *Freedom in the World 2015*, Washington DC, https://freedomhouse.org/sites/default/files/01152015_FIW_2015_final.pdf.

Fukuyama, F. (1992), *The End of History and the Last Man*, The Free Press, New York.

GEM–Global Entrepreneurship Monitor (2024), *Global Entrepreneurship Monitor 2023/2024 Global Report: 25 Years and Growing*, GEM, London, https://www.gemconsortium.org/report/global-entrepreneurship-monitor-gem-20232024-global-report-25-years-and-growing.

Glassner, J. (2021), "These Countries Have the Most Startup Investment for Their Size", *Crunchbase News*, 2 November, https://news.crunchbase.com/startups/countries-most-startup-investment/.

Guerrero, M., A. N. Link and M. van Hasselt (2024), "The Transfer of Federally Funded Technology: A Study of Small, Entrepreneurial, and Ambidextrous Firms", *Small Business Economics* 62, 1009–1023.

Harper, J. (2021), "China Eyes Germany's 'Hidden Champions' Model", *Deutsche Welle*, 30 August, https://www.dw.com/en/ china-eyes-germanys-famous-hidden-champions-model/a-58986878.

Lexology (2023), "2022 U.S. Patent Filings Statistics", https://www.lexology.com/library/detail.aspx?g=1170d66d-63b8-4901-b819-e88c67916a2f.

NCSES – National Center for Science and Engineering Statistics (2023), "Federal Budget Authority for R&D and R&D Plant for National Defense and Civilian Functions Totaled $191 Billion in FY 2023 Proposed Budget", 26 January, https://ncses.nsf.gov/pubs/nsf23323.

Ohr, T. (2023), "TOP 30: Europe's Biggest Startup Hubs in 2023", *EU-Startups*, https://www.eu-startups.com/2023/07/ top-30-europes-biggest-startup-hubs-in-2023/.

Pahnke, A., F. Welter and D. B. Audretsch (2023), "In the Eye of the Beholder? Differentiating between SMEs and Mittelstand", *Small Business Economics* 60, 729–743.

Prenzel, P., N. Bosma, V. Schutjens and E. Stam (2024), "Cultural Diversity and Innovative Entrepreneurship", *Small Business Economics*, https://doi.org/10.1007/s11187-024-00888-1.

Romer, P. (1986), "Increasing Returns and Long-Run Growth", *Journal of Political Economy* 94, 1002–1037.

Romer, P. (1990), "Endogenous Technological Change", *Journal of Political Economy* 98, S71–S102.

SBA – US Small Business Administration (2020), "Leveraging America's Seed Fund. Small Business Innovation Research (SBIR). Small Business Technology Transfer (STTR)", https://www.sbir.gov/sites/default/files/SBA_SBIR_Overview_March2020.pdf.

Simon, H. (1996), *The Hidden Champions of Germany*, Harvard Business School Press, Brighton MA.

Simon, H. (2009), *Hidden Champions of the Twenty-First Century: The Success Strategies of Unknown World*, Springer, Heidelberg.

Simon, H. (2022), "Hidden Champions and the Development of Regions", *IAR Journal of Business Management* 3, 1–5.

Stam, E. and A. van de Ven (2021), "Entrepreneurial Ecosystem Elements", *Small Business Economics* 56, 809–832.

Statista (2022), "Leading Cities for Startups in Germany in 2022, by Total Score", https://www.statista.com/statistics/1275436/top-cities-for-startups-in-germany/.

Statista (2023), "Number of Patent Applications Filed at the European Patent Office from Germany from 2013 to 2022", https://www.statista.com/statistics/411651/european-patent-applications-from-germany/.

The Economist (2022), "The War in Ukraine Is Going to Change Geopolitics Profoundly", 5 March.

The Economist (2023), "Is Germany Once Again the Sick Man of Europe?", 17 August.

US Bureau of Labor Statistics (2023), "A Look at Manufacturing Jobs on National Manufacturing Day", 6 October, https://www.bls.gov/opub/ted/2023/a-look-at-manufacturing-jobs-on-national-manufacturing-day.htm.

US Senate Committee on Science, Commerce, and Transportation (2022), *The Chips Act of 2022*, https://www.commerce.senate.gov/services/files/592E23A5-B56F-48AE-B4C1-493822686BCB.

World Bank (2024), "Employment in Industry (% Total of Employment)", https://data.worldbank.org/indicator/SL.IND.EMPL.ZS?locations=EU.