

A Critical Analysis of the Impact of Insufficient Energy Supply on Germany's Economic Development

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Abstract: Since 2022, Germany has faced prolonged economic weakness alongside major disruptions to its energy supply system. This paper examines how changes in energy availability, structure and cost have affected Germany's economic development between 2022 and 2026. Using a descriptive case-study approach, it analyses trends in GDP growth, inflation, energy prices, corporate insolvencies and manufacturing employment, while also assessing changes in coal, natural gas, oil, nuclear power and renewable energy supply. The findings show that high and volatile energy costs have increased pressure on industrial production, weakened business confidence and competitiveness, contributed to rising corporate insolvencies, and accelerated employment decline in manufacturing. At the same time, Germany's energy transition has reduced reliance on coal and nuclear power and expanded the role of renewable energy, but it has also exposed tensions between decarbonisation, energy security, affordability and industrial stability. The paper argues that an energy transition should not be assessed only by the expansion of renewable capacity. It should also be evaluated in terms of supply resilience, price stability and wider economic consequences. Based on Germany's experience, the paper identifies five policy priorities for other countries: strengthening energy-security awareness, diversifying energy supply, maintaining strategic reserves, accelerating the green transition and promoting technological innovation in energy systems.

1. Introduction

In March 2026, five leading German economic research institutes released a new Joint Economic Forecast and sharply reduced their forecast for Germany's 2026 economic growth from 1.3% in the previous autumn forecast to 0.6%. In April 2026, the International Monetary Fund also lowered its forecasts for Germany's growth in 2026 and 2027 to 0.8% and 1.2% respectively, below its January forecasts of 1.1% and 1.5% [1,2]. Research institutions argue that regional conflicts have pushed up oil and natural gas prices, keeping Germany's energy costs high. These costs have been transmitted to industrial production, transport, and household consumption, making overall economic activity more expensive. Germany is therefore entering a more difficult stage of development.

2. Analysis of Germany's Current Economic Conditions

According to data released by the Federal Statistical Office of Germany on 15 January 2026, Germany's real GDP grew by 0.2% in 2025, ending two consecutive years of economic contraction [3]. However, Germany's growth outlook was revised down sharply within just over two months [1,2]. This revision reflects a deeper structural problem: weak economic performance has persisted for several years, while declining manufacturing competitiveness, subdued corporate investment, high energy costs and falling employment have continued to constrain the growth capacity of Europe's largest economy [9,10,14].

As shown in Figure 1, Germany's GDP growth weakened sharply after 2022, remained negative throughout 2023 and 2024, and recovered only marginally in 2025. Eurostat data show that year-on-year GDP growth fell from 3.7% in the first quarter of 2022 to 0.8% in the fourth quarter. Growth subsequently turned negative in 2023, falling as low as -0.9%, and remained between -0.5% and -0.2% throughout 2024. Although GDP growth returned to approximately 0.2%–0.4% in 2025, the recovery remained weak [4]. This prolonged period of near-stagnation suggests that Germany risks moving away from its traditional role as Europe's "economic engine" towards that of a low-growth economic stabiliser. Although Germany is likely to remain Europe's largest economy for the foreseeable future, its current structural weakness is unlikely to be reversed quickly.



Figure 1. Germany's GDP Trend, 2022-2025

Source: Eurostat.

As shown in Figure 2, Germany's HICP inflation rose sharply in 2022 before gradually moderating during 2023, 2024 and most of 2025. The year-on-year rate peaked at 11.6% in October 2022, declined to 3.7% by the end of 2023, and then fell further to approximately 2.1%–2.8% in 2024. During 2025, it remained comparatively stable at around 2.0%–2.5% [4]. However, preliminary estimates indicated that Germany's inflation rate increased from 2.0% in February 2026 to 2.8% in March, its highest level in more than a year [6]. Final data subsequently placed the March inflation rate at 2.7% [5]. This renewed acceleration suggests that rising energy costs interrupted Germany's earlier disinflationary trend and continued to place pressure on households and the wider economy [5,6].

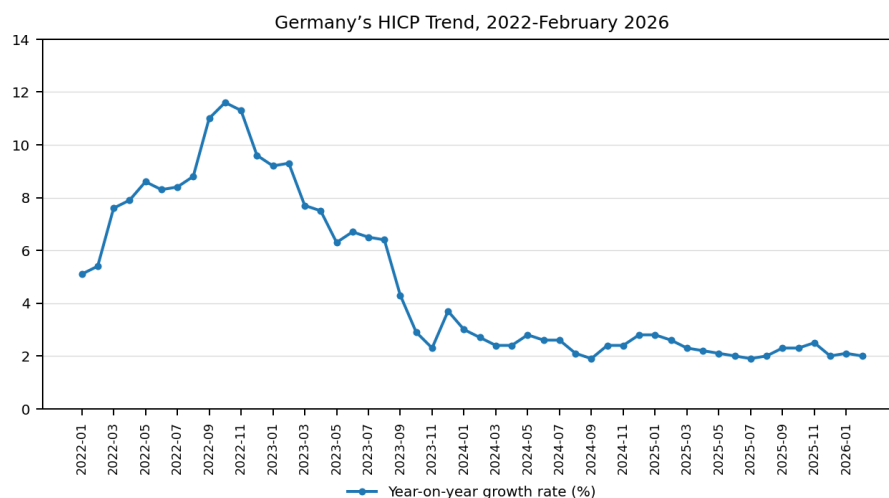


Figure 2. Germany's HICP Trend, 2022-February 2026

Source: Eurostat.

As shown in Figure 3, Germany's energy-price inflation was highly volatile between 2022 and early 2026. It reached an exceptionally high level in 2022 before turning negative during much of 2024 and 2025. Following the outbreak of the Russia–Ukraine conflict, the year-on-year growth rate of energy prices rose sharply and peaked at 44.2% in September 2022. It then declined substantially during 2023 and turned negative in September, reaching -0.8% . During most of 2024, energy-price inflation remained between approximately -1.5% and -7.5% . It also remained negative during much of 2025 and stood at -1.3% at the end of the year [4]. However, renewed geopolitical tensions in early 2026 placed fresh upward pressure on energy costs and contributed to a renewed increase in German inflation [2,6]. This reversal demonstrates that Germany's economy remains highly exposed to external energy shocks. Rising and volatile energy costs increase production expenses for energy-intensive industries, weaken industrial competitiveness and create additional uncertainty for investment and economic growth.

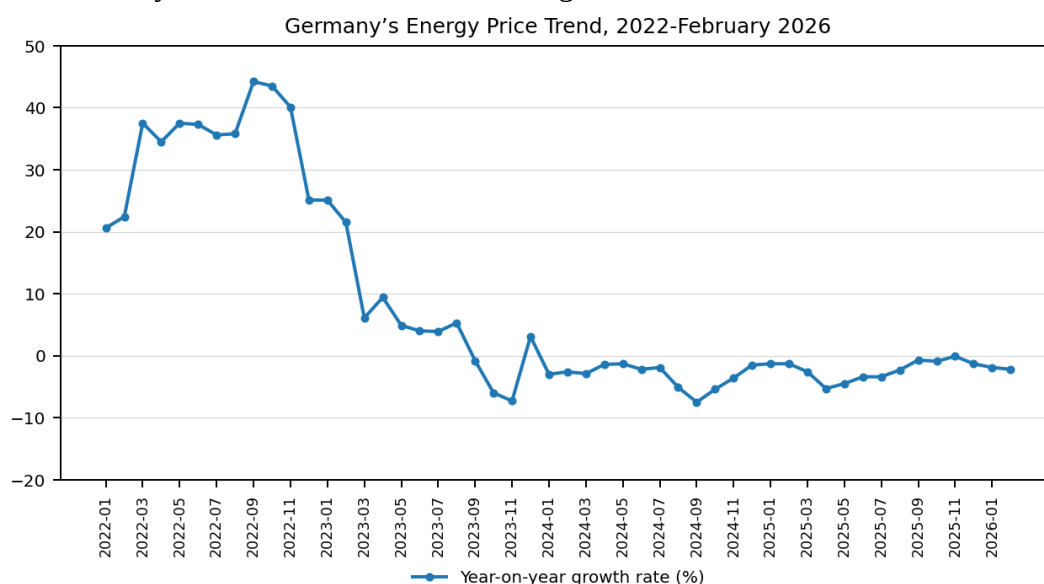


Figure 3. Germany's Energy Price Trend, 2022-February 2026

Source: Eurostat.

As shown in Figure 4, the annual number of business insolvencies in Germany rose steadily from 14,590 in 2022 to 17,814 in 2023, 21,812 in 2024 and 24,064 in 2025 [7]. The 2025 total was 10.3% higher than in the previous year and represented the highest level recorded since 2014 [8]. This increase should not be attributed to energy costs alone. Rather, it reflects the combined effects of prolonged economic weakness, subdued demand, financing pressures and structural difficulties facing German businesses. Nevertheless, energy costs remain an important part of this wider problem. Germany's continued exposure to expensive imported natural gas and persistently high electricity prices has weakened the competitiveness of industrial and energy-intensive firms [14]. Rising insolvencies are therefore both a symptom of Germany's economic stagnation and a mechanism through which that stagnation may deepen, as business closures can reduce productive capacity, employment and investment.

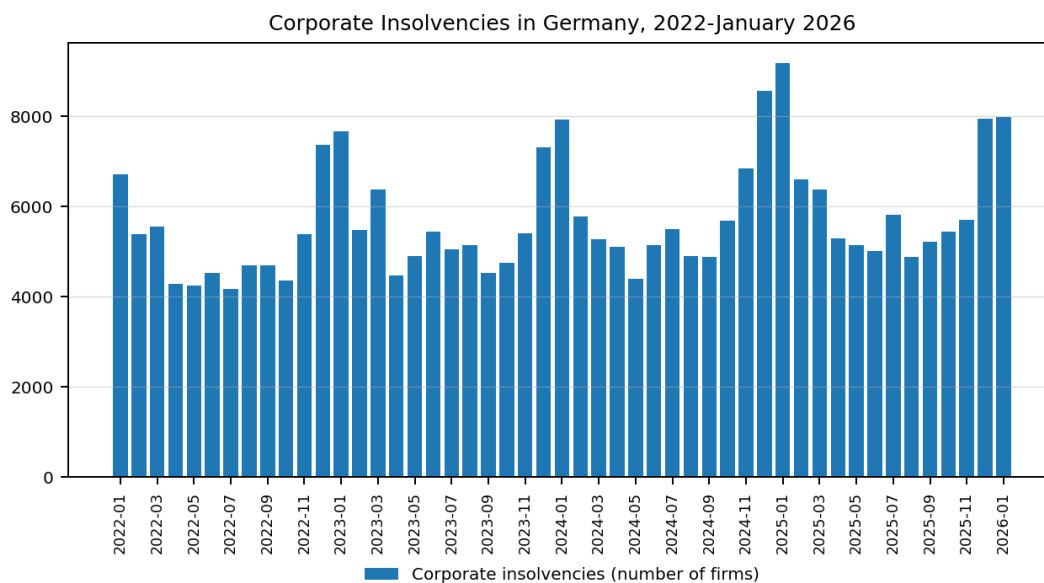


Figure 4. Corporate Insolvencies in Germany, 2022-January 2026

Source: Federal Statistical Office of Germany.

Labour-market conditions in Germany weakened for a third consecutive year in 2025. According to the Federal Employment Agency, the annual average number of registered unemployed people increased by 161,000 to 2.948 million, while the registered unemployment rate rose by 0.3 percentage points to 6.3% [9]. Labour demand also weakened: the average number of registered job vacancies declined by 62,000 to 632,000, indicating that firms had become more cautious about recruitment [9]. As shown in Figure 5, manufacturing employment remained broadly stable between 2022 and 2023, increasing marginally from 7.486 million to 7.489 million, before falling to 7.413 million in 2024 and 7.254 million in 2025 [10]. This represented a net decline of approximately 232,000 manufacturing jobs between 2022 and 2025. The simultaneous rise in registered unemployment and decline in manufacturing employment indicate weakening labour demand, particularly in industrial sectors. These developments may reduce household income and consumption while further constraining Germany's economic recovery.



Figure 5. Manufacturing Employment in Germany, 2022-2025

Source: Federal Employment Agency.

3. Analysis of Germany's Current Energy Supply

Germany has limited natural resources. Apart from relatively abundant reserves of hard coal, lignite, and salt, it depends heavily on imports for energy. This import-dependent energy supply model is highly exposed to external factors such as international geopolitical tensions and local armed conflicts. These external pressures have directly contributed to major changes in Germany's energy supply structure in recent years.

Coal. Coal historically played a major role in Germany's electricity system. In 1990, lignite and hard coal together generated approximately 311.7 billion kWh of electricity, accounting for about 56.7% of Germany's gross electricity production [12]. By 2020, their combined share had fallen to approximately 23.3%. Coal-fired generation temporarily increased during the energy crisis in 2022, when lignite and hard coal produced a combined 179.9 billion kWh and accounted for around 31.1% of total electricity generation. However, this increase was short-lived. By 2025, coal-fired generation had fallen to 104.3 billion kWh, representing approximately 20.5% of total generation and a decline of about 42% from its 2022 level [11]. This trend indicates that coal is playing a progressively smaller role in Germany's electricity mix, while renewable energy has become the country's dominant source of electricity generation.

Natural gas. Natural gas remains an important component of Germany's energy system and is widely used in industry, heating and electricity generation. In 2024, it accounted for approximately 25.9% of Germany's primary energy consumption. Germany also remained highly dependent on external supplies, with imports covering around 95% of its natural gas consumption in 2023 [12]. Before Russia's invasion of Ukraine, approximately 55% of the natural gas consumed in Germany was supplied by Russia through pipelines, creating a significant concentration of supply risk [13]. Since 2022, Germany has diversified its gas supply by increasing pipeline imports from countries such as Norway, the Netherlands and Belgium and by developing liquefied natural gas import capacity. However, diversification has not eliminated Germany's broader import dependence. Its industry and heating sectors remain exposed to high and volatile international gas prices, particularly during periods of tight global LNG supply [14].

Oil. Mineral oil remains a central component of Germany's energy system. In 2024, it was still

the country's largest source of primary energy, accounting for approximately 36.2% of total primary energy consumption [12]. Germany is also highly dependent on external supplies, with imports covering almost 97% of its mineral-oil requirements in 2023 [12]. Oil products are used predominantly in the transport sector, particularly in road transport and aviation, while the chemical industry also uses petroleum products as both an energy source and an industrial feedstock [12]. Preliminary data from the Federal Statistical Office show that Germany's crude oil imports declined from approximately 84.66 million tonnes in 2020 to 75.13 million tonnes in 2025, a reduction of around 11.3% [15]. However, lower crude oil import volumes do not necessarily mean that oil's share of the energy mix has declined, because this share also depends on changes in the consumption of other energy sources. Germany therefore remains structurally dependent on imported oil despite the recent reduction in crude oil imports.

Nuclear power. Nuclear energy once formed a significant part of Germany's electricity system. By the 1990s, 17 nuclear reactors supplied more than one-third of the country's electricity. Although Germany had adopted an earlier nuclear phase-out policy, the Fukushima nuclear accident in 2011 led the government to accelerate and firmly re-establish the withdrawal from commercial nuclear generation [16]. Gross nuclear electricity generation fell from 34.7 TWh, or 6.0% of total generation, in 2022 to 7.2 TWh, or 1.4%, in 2023 [11]. Germany's final three reactors—Emsland, Isar 2 and Neckarwestheim 2—were shut down on 15 April 2023, completing the country's nuclear phase-out [16]. Consequently, nuclear electricity generation fell to zero in 2024 and remained at zero in 2025 [11]. The phase-out increased the importance of renewable-energy expansion, electricity storage, grid development and other flexible generation capacity for maintaining a secure and affordable electricity system [14].

Renewable energy. Renewable energy has become an increasingly important part of Germany's electricity system. According to the Federal Network Agency, electricity generated from renewable sources accounted for 55.0% of Germany's grid load in 2023, up from 48.42% in 2022 [17]. Total renewable electricity generation reached 251.2 TWh, representing a year-on-year increase of approximately 7.5%. Onshore wind made the largest contribution, with generation rising by 18.0% from 100.6 TWh in 2022 to 118.7 TWh in 2023. By contrast, offshore wind generation declined by 4.9% to 23.5 TWh, while solar generation remained broadly stable at 55.2 TWh [17]. In terms of the grid-load share, onshore and offshore wind together accounted for 31.1%, followed by solar at 12.1%, biomass at 8.4%, and hydropower and other renewable sources at 3.4% [17]. These figures show that renewable energy had become the dominant component of Germany's electricity supply by 2023, although growth remained uneven across different renewable technologies.

Overall, Germany's energy supply structure has changed substantially in recent years. Traditional energy supply has declined, while green energy supply has increased. However, continued upward pressure on energy prices has directly affected industrial production and daily life, contributing to the weakness of Germany's economic development.

4. Conclusion

The history of human development shows that energy supply shapes the location of industry, the capacity for sustained economic growth, and the quality of people's lives. Energy competition also affects national strength and the level of social development. Based on the analysis of Germany's economy and energy supply, countries should consider the following points when planning their energy supply strategies.

Maintain a strong awareness of risk and recognise the critical importance of energy security. Energy is the foundation of economic and social development and the basic power source of modern society. Industrial production, transport, information and communications, and everyday

life all require large amounts of energy. As the global economy grows and the world's population increases, energy demand will continue to rise, and competition over energy will become more intense. Countries must therefore understand energy security from the perspective of strategic security. They should strengthen energy security education from top to bottom and encourage society to value energy, protect energy resources, and use energy rationally.

Strengthen self-reliance and use comprehensive measures to protect national energy autonomy. Energy is closely connected to the lifeline and security of the national economy. In a period of deepening de-globalisation, energy has become a key strategic resource for national development. Control over energy means greater control over economic development. Countries should therefore explore, extract, and use domestic energy resources in a scientific, rational, and orderly way. Coal can still play a backup and stabilising role where necessary, while hydropower, wind power, photovoltaic power, solar thermal power, and nuclear power should be developed in a diversified and integrated manner. At the same time, countries should use diplomacy, technology, and economic tools to secure the right to purchase or use energy resources from other countries and regions, thereby improving their capacity for autonomous energy protection.

Promote the green transition and continuously increase the share of new energy supply. Traditional fossil fuels such as oil, natural gas, and coal are non-renewable resources formed over hundreds of millions of years. Their reserves are limited, and continuous extraction and use will eventually exhaust them. Accelerating the green transition and promoting the development and use of new energy are major trends in the global energy revolution. As carbon peaking and carbon neutrality goals are gradually implemented around the world, the development of new energy has become urgent. To support future economic and social development and national security, countries must actively search for, develop, and compete for new sources of energy. In particular, they should increase the share of non-fossil energy such as wind power, hydropower, solar power, and nuclear power, and also develop biomass, geothermal, and ocean energy according to local conditions. These measures can improve both the diversity and the security of national energy supply.

Adopt worst-case thinking and accelerate the development of a sound national oil reserve system. Preparation is essential for avoiding failure. The world is undergoing profound changes, and the international environment is complex and unstable. Geopolitical conflicts, local wars, industrial competition, and technological barriers are all intensifying. The recent impact of conflict in the Middle East on global energy supply again reminds countries of the importance of preparedness. Energy security is a national priority and requires high-level planning. Countries should build a full-chain energy supply system covering exploration, extraction, transport, supply, operation, and maintenance. They should also improve energy management mechanisms and gradually form a reserve system for coal, oil, gas, and electricity in which government reserves and corporate reserves complement one another. This would help protect energy supply security at the national, corporate, social, and household levels.

Use technology to strengthen energy supply and promote innovation in energy systems. With the rapid development of digital and information technologies, the global energy supply system is shifting from resource dependence to technology-driven development. Energy supply is moving away from a structure dominated by coal, oil, and natural gas towards a new structure in which wind, solar, hydro, biomass, geothermal, and other renewable resources play a larger role. At the national level, governments should strengthen basic research on energy supply, support breakthroughs in key technologies, and accelerate engineering applications. At the corporate level, firms should address weaknesses in key energy equipment, promote technological research and development, and strengthen the industrial foundations of the energy sector. At the social level, countries should promote the deeper integration of digitalisation and energy, including the industrial application of big data and the Internet of Things in energy supply. This can make different forms

of energy more information-based, digital, and intelligent, allowing technology and digital systems to support a more diverse and sustainable energy supply and better meet the needs of production and daily life.

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