EXECUTIVE BOARD MEETING

SM/22/27

February 3, 2022

To: Members of the Executive Board

From: The Secretary

Subject: **Republic of Poland—Selected Issues**

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***Unless an objection from the authorities is received prior to the conclusion of the Board's consideration, the document will be published.**

INTERNATIONAL MONETARY FUND

REPUBLIC OF POLAND

SELECTED ISSUES

February 2, 2022

Approved by
European Department

Prepared by William Lindquist and Krzysztof Krogulski

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FIGURES

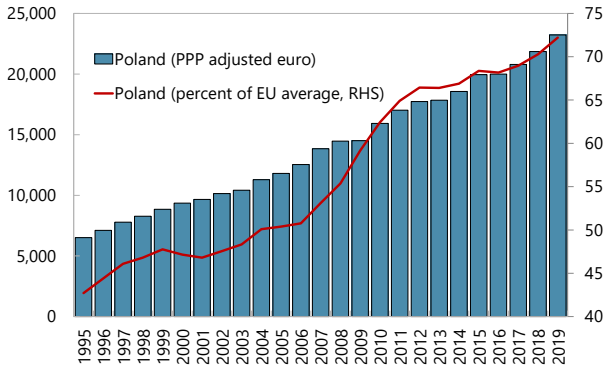
POST-PANDEMIC POTENTIAL GROWTH AND SCARRING[1]

Poland has achieved rapid post-transition convergence to EU income levels over the last thirty years, the continuation of which will necessitate the maintenance of strong potential growth. The pandemic triggered Poland's first recession in three decades. Deep recessions are typically associated with scarring, with the level of output failing to return to the previous trend over the medium term. Possible changes to the structure of post-pandemic economies also raise questions concerning the economy's ability to sustain future growth. This chapter examines the question of post-pandemic potential growth using the production function approach, concluding that the unique nature of the recession—a sharp yet short-lived drop in output—and extraordinary policy support appear to have safeguarded factors of production, limiting scarring and setting the stage for a continuation of solid growth over the medium term. While unfavorable demographics are projected to cause a modest decline in potential growth over the medium term, policy initiatives can influence the pace of future growth and convergence.

A. Introduction

1. Since the transition to a market economy, Poland has achieved significant convergence to EU income levels. The pandemic-induced recession ended three decades of uninterrupted growth. From 1995 to 2019, Poland's PPP-adjusted GDP per capita had increased from 43 percent to 72 percent of the EU average. Such convergence was achieved not only through the avoidance of significant boom-bust cycles but also the maintenance of a solid rate of potential growth.

GDP Per Capita
(In euro, purchasing power parity (PPP) adjusted; percent of EU average)



Source: Eurostat.

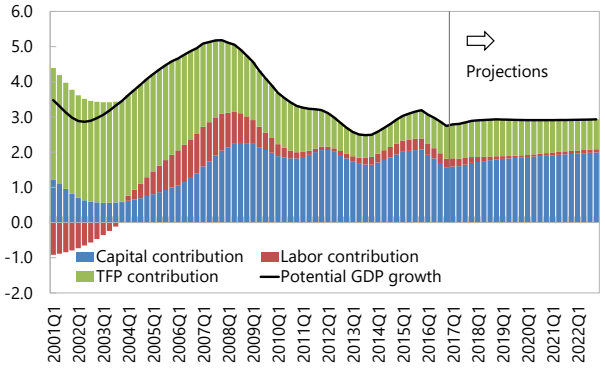
2. This chapter tackles two main questions: (1) how potential growth over the medium term may compare to its pre-pandemic level; and (2) the extent of scarring to output that may be expected following the pandemic-induced recession. The chapter begins with an overview of pre-pandemic potential growth and how actual outcomes compared to previous projections for potential growth. The main contribution of the paper is a new production function analysis of potential growth over the medium term. It is followed by a discussion of scarring after deep recessions, and how the experience in Poland may be different. The chapter concludes with a discussion of how policies can support potential growth and convergence in the years ahead.

[1] Prepared by William Lindquist. Contributions of Karim Foda on corporate balance sheets and total factor productivity are gratefully acknowledged. This work also benefited from comments from the National Bank of Poland and Polish Ministry of Finance received during a seminar as part of the 2021 Article IV mission.

B. Pre-Pandemic Potential Growth

3. A Selected Issues Paper for the 2017 Article IV consultation last analyzed medium-term potential growth.[2] Using a production function approach, IMF (2017) concluded that potential growth would likely be in a range of 2.7 to 3.0 percent over the medium term (2017–22). Such a level of potential growth would have represented a continuation of the slower level of growth observed after the Global Financial Crisis, driven by more moderate total factor productivity (TFP) growth and unfavorable demographic trends that would lower the contribution of labor to potential growth.

Contributions to Potential Growth, Projected in 2017
(Percent)

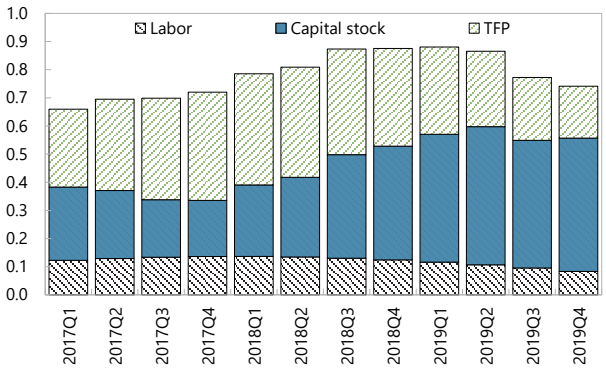


Source: IMF (2017).

4. Actual pre-pandemic GDP growth over 2017–19, however, significantly outperformed earlier estimates of potential growth. While IMF (2017) projected potential growth over this period to average 2.9 percent, actual growth subsequently averaged 5.0 percent (Figure 1). The new analysis of potential growth presented in this chapter (details in the next section) suggests that growth outperformed earlier-projected potential over this period in part because output expanded well above the level of potential, leading to the development of a positive output gap of 2.7 percent of GDP by 2019. But besides cyclical factors, new estimates for potential growth of 3.7 percent over 2017–19 also exceed those developed in IMF (2017).

5. TFP and capital stock growth were the most important factors in the outperformance of earlier potential growth estimates. The contribution of labor turned out to be stronger than projected, driven by a trend decline in the unemployment rate that was unanticipated. Whereas IMF (2017) projected the rate of unemployment to remain around 5 percent, it subsequently declined to below 4 percent and remained at this level, suggesting a lower level of trend unemployment. More importantly, earlier projections also underestimated the trend levels of capital stock growth (i.e., investment) and TFP growth.

Contributions to Difference in Potential Growth Estimates
(Percentage point contribution, 2021 minus 2017 estimates)



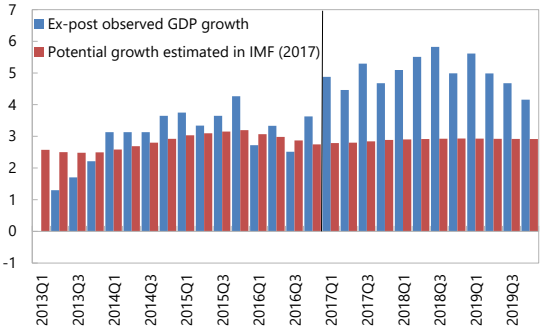
Sources: IMF staff calculations.

[2] Republic of Poland Selected Issues, IMF Country Report No. 17/221, devoted individual chapters to each factor of production. The chapter "Long-Run Growth—Baseline and Reform Scenarios" brought together baseline projections for potential growth over 2017 through 2022.

Figure 1. Ex-Post Analysis of Potential Growth Projected in 2017

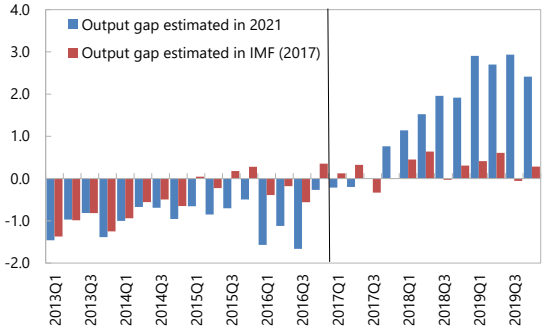
Observed GDP growth over 2017–19 significantly exceeded potential growth projected in 2017....

Real GDP Growth
(Percent, year-on-year)



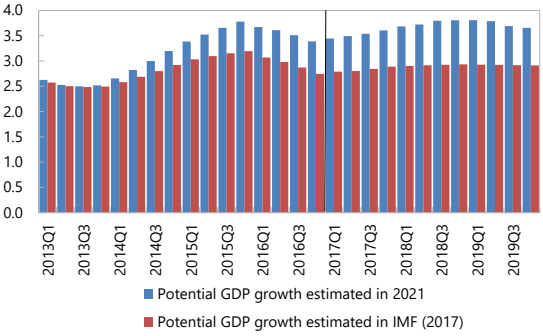
...reflecting in part a positive output gap as growth outpaced potential....

Output Gap
(Percent of potential GDP)



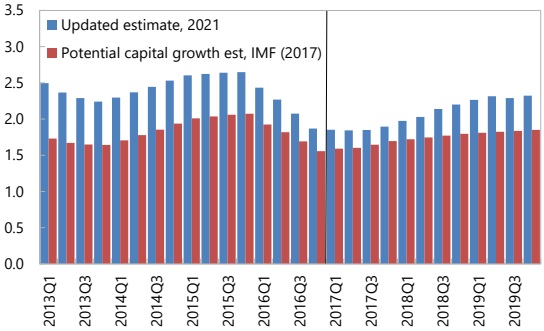
...but also the fact that potential growth had been under-projected.

Potential GDP Growth
(Percent, year-on-year)



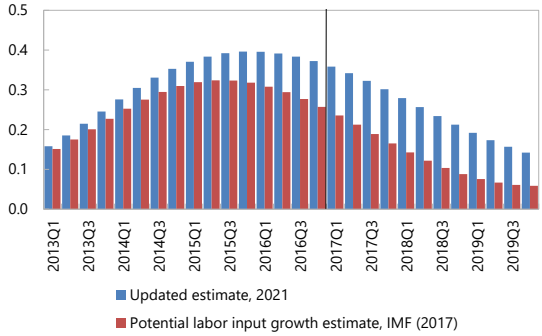
2017 projections had underestimated potential investment growth...

Capital Stock Contribution to Potential Growth
(Percentage point contribution to year-on-year GDP growth rate)



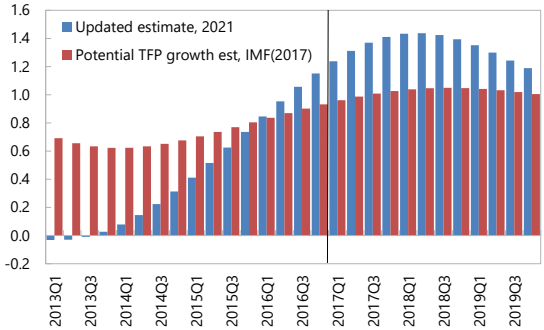
...while an unanticipated trend decline in the unemployment rate led to a larger labor contribution...

Labor Contribution to Potential Growth
(Percentage point contribution to year-on-year growth rate)



...and trend TFP growth is estimated to have outpaced the earlier projected trend.

TFP Contribution to Potential Growth
(Percentage point contribution to year-on-year growth rate)



Sources: Statistics Poland; IMF (2017); and IMF staff calculations.

C. Assessment of Post-Pandemic Potential Growth

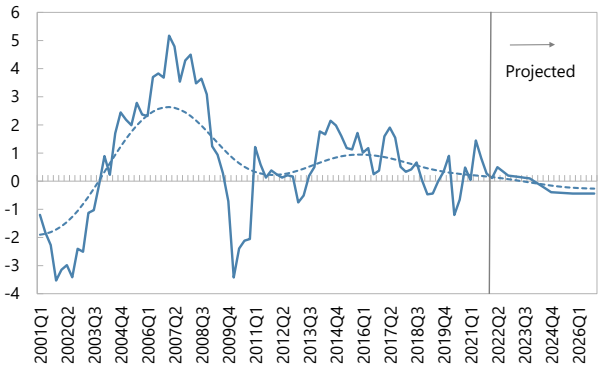
6. A new analysis of potential growth should consider developments in the Polish economy during the pandemic and the shape of the post-pandemic economy and policies. The analysis in this section takes advantage of a longer sample period and adds new dimension to the examination of the factors of production; importantly, it also discusses the implications of the pandemic and the special questions it raises. Recessions typically have a negative impact on the factors of production, though policies can help to mitigate this effect.[3] Characteristics of the post-pandemic economy remain highly uncertain, with implications for the supply of labor, investment, and especially productivity as the nature of work changes and the sectoral composition of economies evolves. Increased public investment, including that to be financed by Next Generation EU grants, can also influence potential growth over the medium term.

7. The remainder of this section analyzes the possible contribution of each factor of production to medium-term potential growth. As illustrated by the ex-post analysis of the potential growth projections made in IMF (2017), such an exercise is prone to significant uncertainty. Nevertheless, this section will present the case for the possible evolution of each factor of production over the medium term, followed by a discussion of upside and downside risks.

Labor Supply

8. The decline in employment during the pandemic recession was short lived. Employment declined by 2 percent in Q2:2020 but quickly recovered, with the pre-pandemic level of employment regained by the beginning of 2021. The decline in employment at the beginning of the pandemic was also much less severe than that experienced during the Global Financial Crisis. The overall maintenance of employment relationships owes to government policies that provided aid to companies on the condition of maintaining employment levels. Pre-pandemic labor market tightness also likely played a role, as employers sought to hoard labor in the case of a quick rebound in activity.

Employment Growth
(Percent year-on-year, with HP filter trend; not including foreign workers)



Sources: Statistics Poland; and IMF staff calculations.

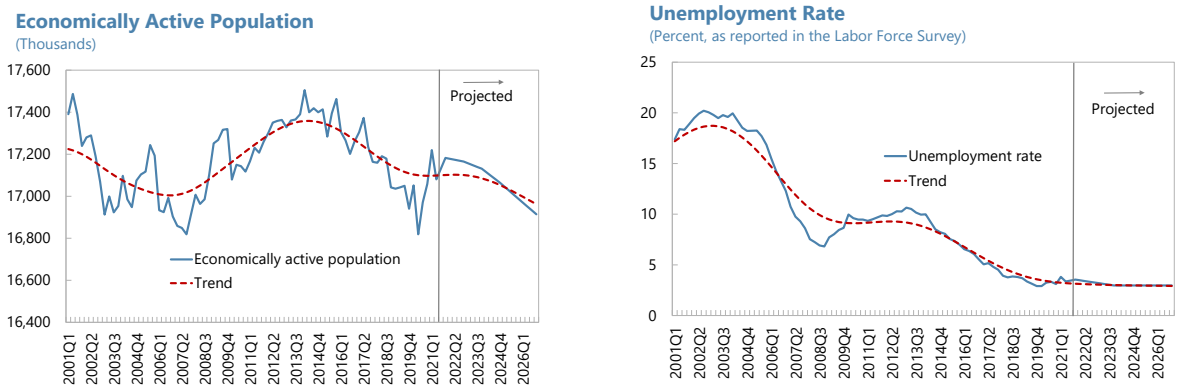
9. Labor force participation remains high. Along with a small decline in employment at the start of the pandemic, Poland also experienced a modest decline in labor force participation of about 0.5 p.p. that was quickly reversed. While the labor force participation rate continued to increase in 2021, a change in the labor force survey methodology resulted in a series break, making the increase difficult to interpret. Nevertheless, the pandemic does not appear to have lowered labor force participation. Additional increases in participation in the period ahead are hard to anticipate.

[3] See Section D for a discussion of post-recession scarring.

Although the personal income tax reforms in the Polish Deal may have some positive impact on participation on a net basis, this effect is impossible to quantify at present and has not been included in the projections.

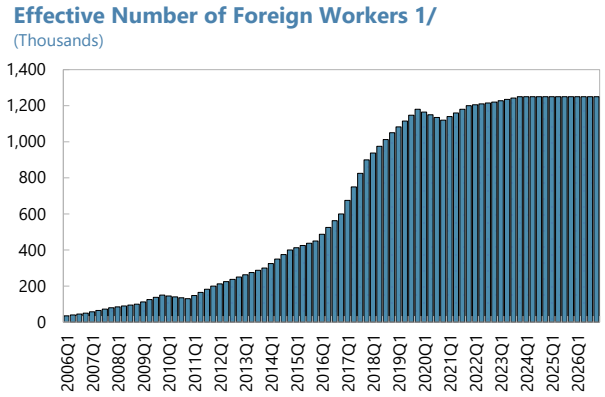
10. However, the demographic outlook is weak, and there is little scope for a further trend decline in unemployment. The working age population peaked in the early 2010s and will continue to shrink over the medium term. However, an increase in participation and a trend decline in the unemployment rate—from nearly 10 percent in 2010 to around 3 percent currently—bolstered the supply of labor over these years. Going forward, demographics and the lack of scope for a further decline in unemployment will constrain labor supply (Figure 2).

Figure 2. Labor Market Projections



Sources: Statistics Poland; and IMF staff projections.

11. A continued contribution of foreign workers to the labor supply is uncertain over the medium term. The National Bank of Poland (NBP) estimates that the effective number of foreign workers in Poland, mostly from Ukraine, has increased to well over 1 million, with a particularly sharp increase over the past few years (NBP 2021).[4] The contribution of foreign workers to potential growth was not considered in IMF (2017),[5] but foreign workers can now be estimated to have made a significant contribution to potential



1/ IMF staff assumptions begin starting in 2024.
Sources: NBP July 2021 Inflation Report; and IMF staff estimates.

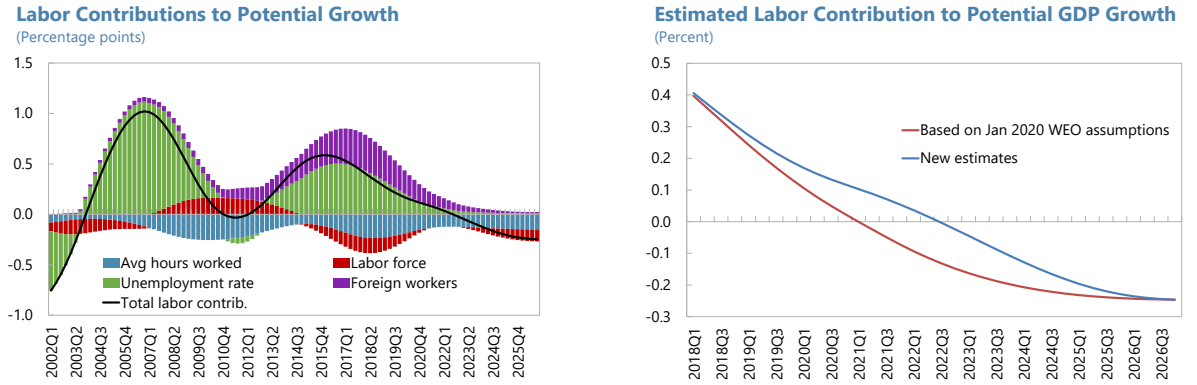
[4] The Labor Force Survey does not include foreign workers in its measures of employment or the economically active population.

[5] Reliable estimates on the effective numbers of foreign workers were not available at the time, hindering their inclusion in the analysis in IMF (2017).

growth in recent years, on average 0.3 p.p. over 2016–19.[6] While some foreign workers left Poland at the beginning of the pandemic, they have since returned. As the NBP estimates that the effective number of foreign workers may level off over 2022–23 (NBP 2021), this analysis assumes that foreign workers will not contribute further to growth over the medium term, though upside risk is evident.

12. Despite a lack of labor market scarring from the pandemic, the labor contribution to potential growth is projected to turn negative around 2022. Labor supply made a significant contribution to potential growth over 2013–19, with increasing participation, a trend decrease in unemployment, and a growing number of foreign workers offsetting a decline in the working age population. Going forward, however, absent continued growth of foreign workers, the contribution of labor to potential growth is likely to turn negative around 2022 (Figure 3).

Figure 3. Labor Contribution to Potential Growth



Sources: IMF staff calculations and projections.

13. Compared to pre-pandemic projections, labor supply is now projected to be a smaller drag on growth in the near term. The contribution of labor implied in the last pre-pandemic projections (January 2020 WEO) was projected to turn negative more quickly, based on an assumed high level of the trend unemployment rate. Assuming that the current level of unemployment can be maintained over the medium term, labor would present a smaller drag on growth for a few years, but the projections converge over the medium term (Figure 3).

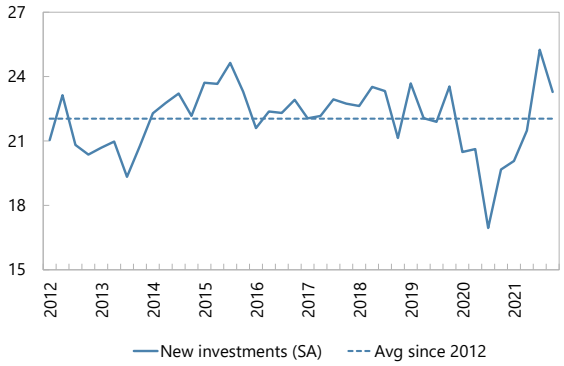
Capital Stock

14. Survey data suggest that cyclical private investment is set to rebound. The NBP's October 2021 Quick Monitoring Survey of corporates reported that investment optimism was near

[6] Strzelecki et. al. (2020) estimates that Ukrainian workers contributed about 0.5 p.p. to Poland's GDP growth per year over 2013–18.

the peak of the last investment cycle in 2018, with strong sentiment in industry, large firms, and exporters. Corporates also showed strong interest in new investments.

Index of New Investments
(Percent of companies surveyed)



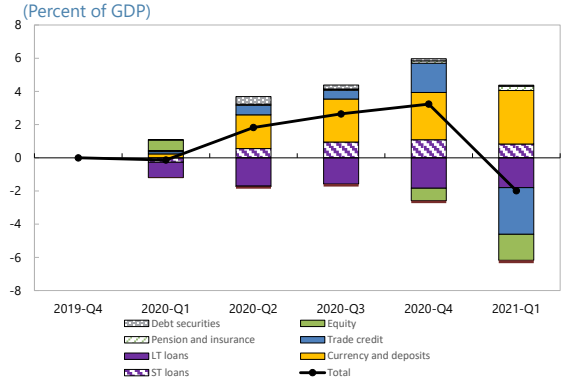
Sources: October 2021 NBP Quick Monitoring Survey.

15. Strong balance sheets position non-financial corporates (NFCs) well for future investment. During the pandemic, the net worth of NFCs in Poland increased, based on an increase in currency and deposits that can be linked to partially forgivable liquidity loans offered by the Polish Development Fund (PFR) (Figure 4). The strengthening of NFC balance sheets during the pandemic is a stark contrast to the experience after the Global Financial Crisis, when net worth deteriorated as NFCs took on more debt.

Figure 4. Non-Financial Corporate Balance Sheets

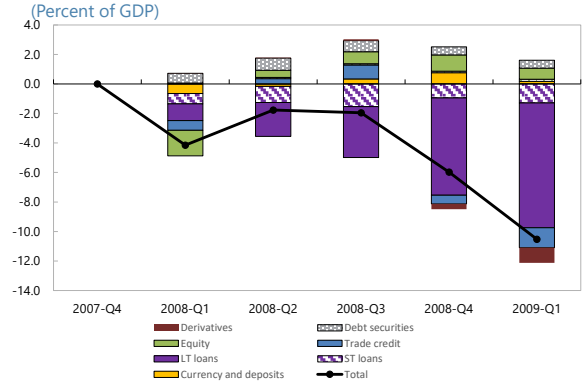
Non-financial corporate balance sheets strengthened during the pandemic…

NFCs: Net Financial Transactions by Instrument, cumulative change since 2019Q4: *Pandemic*
(Percent of GDP)



…unlike the experience after the Global Financial Crisis.

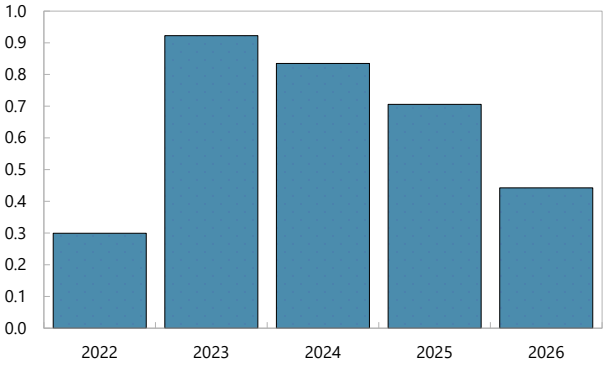
NFCs: Net Financial Transactions by Instrument, cumulative change since 2007Q4: *GFC*
(Percent of GDP)



Sources: ECB; and IMF staff calculations.

16. Looking beyond a cyclical investment rebound, Next Generation EU grants can also provide a boost to investment over the medium term. While the European Commission has not yet approved Poland's National Recovery Plan, approval would unlock some 4½ percent of GDP in grants, to be spent over 2022–26, which will increase public and private investment. The baseline projections assume that funds will begin to flow later in 2022, with

Projected Next Generation EU Funds Spending
(Percent of GDP)

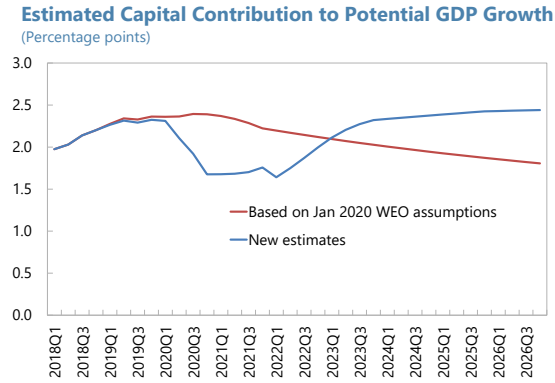


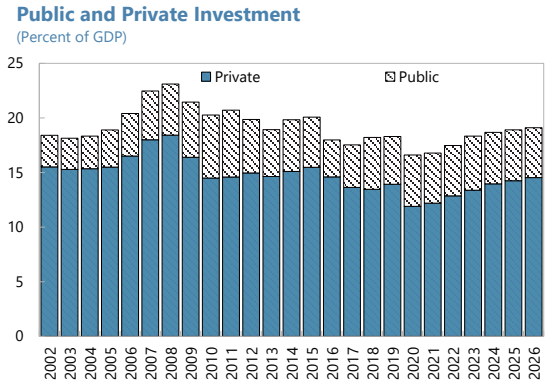
Source: IMF staff projections.

the peak impact on growth experienced in 2023. Public investment, however, would be elevated through 2026.

17. The contribution of capital accumulation to growth is projected to rebound to pre-pandemic levels over the medium term. The capital contribution to potential growth declined during the pandemic recession as private investment contracted. Over the medium term, with a recovery of private investment as a percent of GDP to pre-pandemic levels and an increase in public investment (linked to Next Generation EU projects), the contribution of capital to potential growth would return to its strong pre-pandemic level, while remaining below its peak levels a decade ago (Figure 5). Compared to the January 2020 WEO scenario, the contribution of capital would be stronger over the medium term, boosted by Next Generation EU investments and a rebound in private investment from the recession.

Figure 5. Capital Stock Contribution to Potential Growth

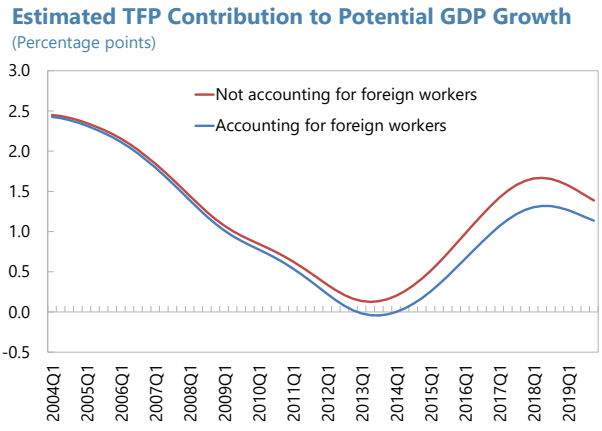




Sources: Statistics Poland; and IMF staff calculations and projections.

Total Factor Productivity

18. TFP growth had accelerated before the pandemic. After a slowdown in the years following the Global Financial Crisis, TFP growth accelerated over 2017–19, possibly in part due to strengthening external demand that tends to be correlated with TFP growth in Poland (IMF 2017). The NBP has pointed to the increasing capacity of the Polish economy for innovation and its growing position in global value chains as factors behind strong pre-pandemic TFP growth (NBP 2019).



Sources: IMF staff calculations.

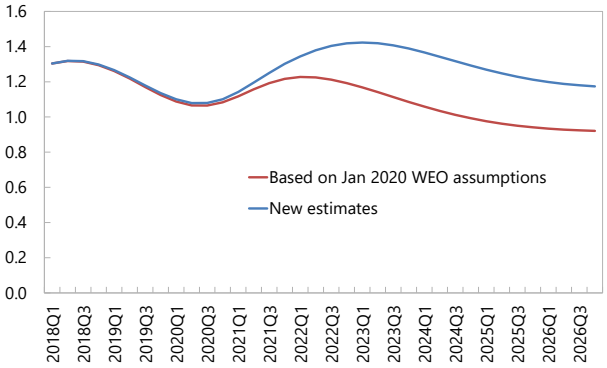
19. Including foreign workers in growth accounting helps obtain better estimates of TFP's strong contribution to pre-pandemic GDP growth. Because TFP is the residual of observed GDP and more measurable factors of production

(labor and capital), the exclusion of foreign workers—which are admittedly difficult to measure but did indeed exist and contribute to output—would allocate their contribution to TFP. Separating out the estimated contribution of foreign workers to potential growth (0.3 p.p. on average over 2015–19), TFP still made a solid contribution to potential growth before the pandemic.

20. While highly uncertain, on balance, the shape of the post-pandemic economy is likely to favor the continuation of strong TFP growth. The increased acceptance of remote and flexible work may contribute to high productivity of labor in existing jobs. Poland is also well positioned to take advantage of a likely increase in demand for remotely provided business and IT services, areas that have contributed to Polish services export growth in recent years. These jobs tend to be high productivity. Should companies seek a greater degree of localization in supply chains after the pandemic, Poland would likely be a primary destination within the EU for such nearshoring investment, which would further strengthen Poland's position in global value chains. Finally, anecdotal evidence suggests that companies are preparing to increase automation in response to labor supply shortages in Poland. Recent research also suggests that pandemics tend to accelerate robot adoption, which raises productivity (Sedik and Yoo, 2021).

21. In the baseline projections, the contribution of TFP to potential growth remains strong over the medium term. Coming out of a brief trend decline in TFP growth during the pandemic, the contribution of TFP would increase slightly above pre-pandemic levels by 2023 before moderating over the medium term. If such a path were to materialize, the contribution of TFP would still remain well below the levels observed in the early 2000s.

Estimated TFP Contribution to Potential GDP Growth
(Percentage points)

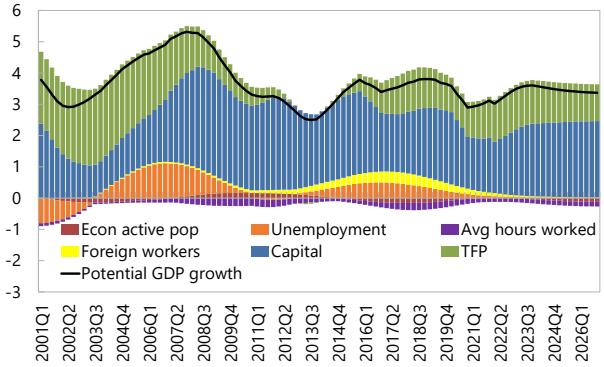


Sources: IMF staff calculations.

Potential Growth: Baseline and Risks

22. In sum, potential growth over the medium term is projected to return to near pre-pandemic levels. Potential growth would average 3.3 percent over 2022–26, compared to the 3.7 percent estimated over 2017–19. The modest slowdown in potential growth would not come from pandemic-related scarring to the factors of production but rather pre-existing labor supply challenges related to demographics. Unless the number

New Projections: Contributions to Potential Growth
(Percent)



Sources: IMF staff calculations.

of foreign workers continues to increase, the contribution of labor will soon turn negative, though capital stock growth and TFP are projected to remain strong.

23. Should upside risks materialize, potential growth could be stronger. Foreign workers could continue to arrive from Ukraine, and other sources of foreign labor could also be tapped, adding to the labor contribution to growth in the context of labor supply challenges. Possible reverse migration of Poles abroad could bolster labor supply. The recent PIT reform also reduces the labor tax wedge at lower income levels and could increase participation. A significant increase in reshoring or global supply chains could further increase investment and TFP growth. Furthermore, the contribution of remote work or automation to TFP growth could be stronger than expected. An increase in public investment, including from Next Generation EU grants, could improve infrastructure quality and productivity.

24. Downside risks to potential growth also loom. A significant delay in the implementation of Next Generation EU projects would lower investment growth and the possible future productivity gains of improved infrastructure quality. Should the worst-case legal scenarios related to foreign exchange mortgages materialize in the banking sector, banks may provide less credit to the private sector as they rebuild their balance sheets, lowering investment. A need for a significant reallocation of labor across sectors, should contact-intensive sectors fail to return to pre-pandemic activity levels, would also have implications for productivity. In the near term, productivity may decline as workers transition between sectors. However, a failure to reallocate workers away from low-productivity sectors would represent a drag on productivity over the medium term. Over the medium term, the possible cost of the energy transition may slow TFP growth, if it becomes more costly to produce a given unit of output.

D. Scarring After the Pandemic Recession

Extent of Projected Scarring

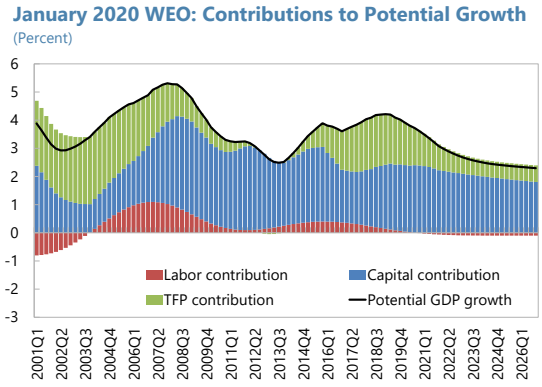
25. The current baseline projections suggest no scarring from the pandemic recession in Poland. As used here, scarring is defined as a persistent difference between pre-recession output projections and output subsequently realized over the medium term. Expected scarring would thus be given by the difference between two projected paths. The path of output is currently projected to converge to pre-pandemic projections (January 2020 WEO) in 2024, and output in 2026 would be 0.7 percent above the early projections.

26. With hindsight, IMF staff's pre-pandemic medium-term growth projections were informed by an overly pessimistic view of potential growth. In the January 2020 WEO, staff projected a slowdown in growth to 3.1 percent in 2020 and to 2.5 percent over the medium term. An ex-post analysis of the implicit assumptions on potential growth imbedded in these projections reveals that they implied sharp declines in capital accumulation and, especially, TFP growth, relative to immediately prior years. Thus, a comparison between the January 2020 WEO projections and the current projections may not be sufficient to assess expected scarring from the pandemic.

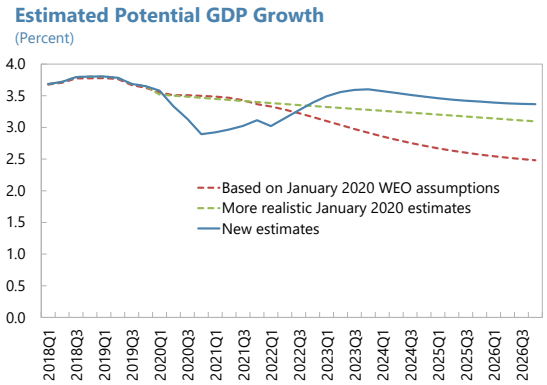
27. A more realistic pre-pandemic potential growth outlook would have been much stronger. A more positive view of potential growth in early 2020 would clearly have been appropriate. Based on information available at the time, an alternative path for potential growth would have been based on similar assumptions for labor supply and investment but taken a much more positive view of TFP growth over the medium term. A realistic path, for example, would have shown a slow decline in the rate of potential growth from around 3.8 percent in 2019 to just over 3 percent over the medium term (Figure 6).

Figure 6. Potential Growth Implied by January 2020 WEO Projections

Implicit potential growth assumptions in the January 2020 WEO projections implied sharp slowdowns in investment and TFP growth.



With the benefit of hindsight, a stronger path for medium-term potential growth would have been more realistic.



Sources: IMF staff calculations.

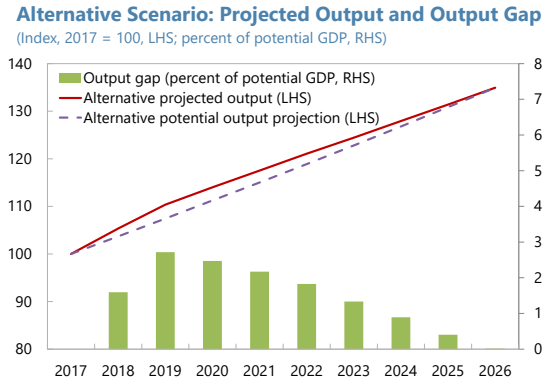
28. Counterintuitively, a stronger pre-pandemic view on potential growth would not necessarily have produced significantly faster medium-term growth projections. A full production function analysis in early 2020 would have also shown that a significantly positive output gap had formed by 2019. Because IMF staff's medium-term projections generally are constructed so that output gaps close over the medium term (approximately a five-year horizon), a reduction of the output gap would have required actual growth projections to underperform potential.[7] Counterintuitively, the growth rates required to close the output gap would have produced a projected path of GDP growth that differed fairly little from the actual January 2020 projections (Figure 7).

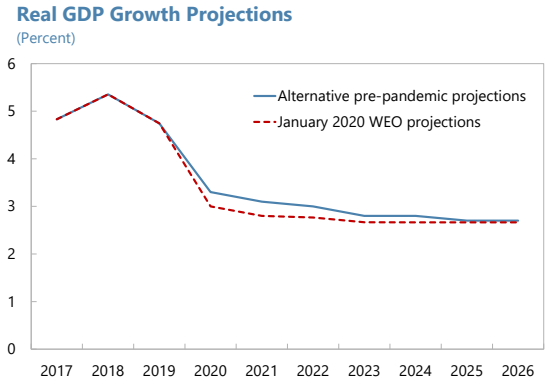
[7] The 2020 recession subsequently served to close the output gap.

Figure 7. Alternative Scenario for Early 2020 GDP Growth Projections

In the alternative estimation, a positive output gap in 2019–20 would have to be reduced in later years.

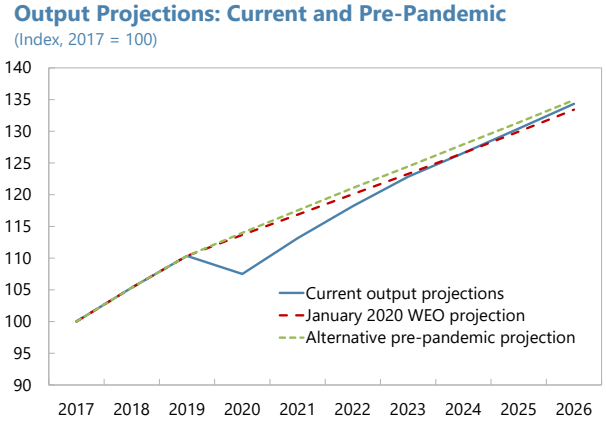
This pushes growth projections in the alternative estimation closer to those in the January 2020 WEO.





Sources: IMF staff calculations and projections.

29. Thus, even a more realistic pre-pandemic view of potential growth would still point to little scarring to the pandemic, under the current baseline projections. A comparison of the difference between currently projected output in 2026 versus that projected in the January 2020 WEO or an alternative early 2020 path shows little difference in the implied scarring. Compared to the actual January 2020 WEO projections, output is projected to be about 0.7 percent higher in 2026 in the current projections. Compared with the alternative early 2020 path, the level of output would be about 0.4 percent lower in 2026. A fair conclusion is thus that should the baseline projections materialize over the medium term, there would be only a minimal amount of scarring from the pandemic.



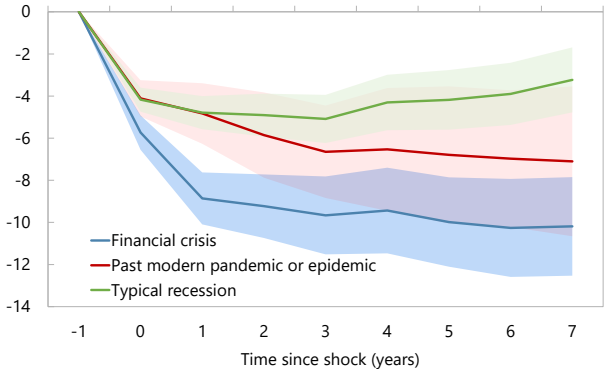
Source: IMF staff projections.

Comparison to Typical Post-Pandemic Output Losses

30. Deep recessions often leave long-lived scars to output. Scarring is the result of permanent damage to an economy's supply potential, coming through several channels. First, unemployment may remain elevated for an extended period after the recession and some workers may drop out of the labor market, leaving a smaller labor force. Second, weak investment results in

slower capital accumulation. Third, productivity can be reduced by resource allocation, bankruptcies of firms, and erosion of human capital (IMF 2021).[8]

Medium-Term Output Losses After Recessions
(Percentage points of GDP, cumulative impulse response function)



Sources: April 2021 WEO Chapter 2, Figure 2.6.

31. Scarring from previous modern pandemics and epidemics tends to be higher than after a typical recession. However, the cumulative output loss after financial crises tends to be even higher. In a typical recession, scarring is mostly the result of weaker TFP growth, whereas weak post-crisis investment, in particular, tends to drive a larger permanent loss of output following pandemics or financial crises (IMF 2021).

32. IMF staff projections suggest that Poland's economic recovery would be much stronger than the usual post-pandemic experience. The depth of the recession in Poland in 2020 was typical of modern pandemics/epidemics in emerging market/developing economies (EMDEs) (Figure 8). The estimated rebound in 2021, however, was already larger than the usual experience, and staff projections for the path of the deviation of real GDP per capita relative to the pre-pandemic baseline suggest little to no scarring to output, far from the typical experience.[9] While the projected recovery of TFP and employment relative to the pre-pandemic trend would be only moderately stronger than the typical experience, the strong recovery of the capital stock appears to be the main driver of the lack of scarring.

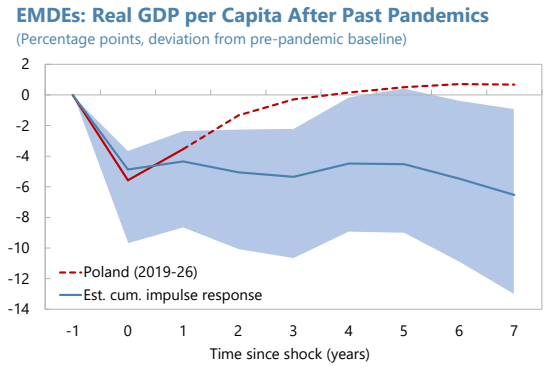
33. The strength of policy support during the recession may account for Poland's atypical experience, should such projections materialize over the medium term. As noted in IMF (2021), the global policy response to the pandemic—including in Poland—was unprecedented. Support for workers and firms helped maintain employment relationships, supported household incomes, prevented bankruptcies of firms, and averted the amplification of the shock through the financial sector. The maintenance of financial sector health also bodes well for the availability of financing for private investment. In the case of Poland, the strong recovery of the capital stock would be in part driven by new investment financed by Next Generation EU grants over the medium term, which are projected to boost investment significantly.

[8] Bankruptcies can involve the (permanent or temporary) retirement of capital from production; but given the way the stock of capital is estimated, the associated reductions in potential output would be captured as variations of factor productivity.

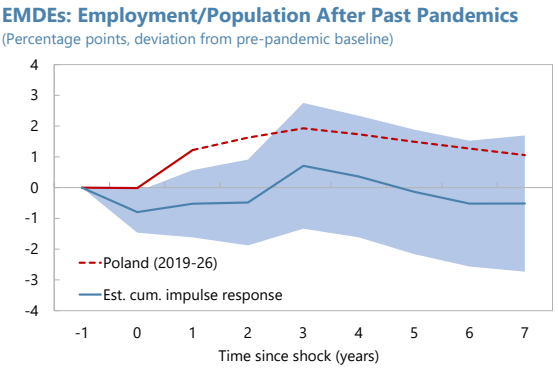
[9] As noted in the previous section, a comparison to a more realistic alternative January 2020 scenario would show a small amount of medium-term scarring to output.

Figure 8. Output Losses After Modern Pandemics and Epidemics

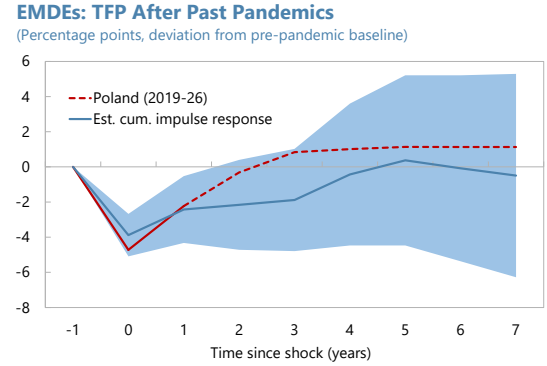
While the initial output decline in Poland was typical of past pandemics, the recovery is projected to be stronger….



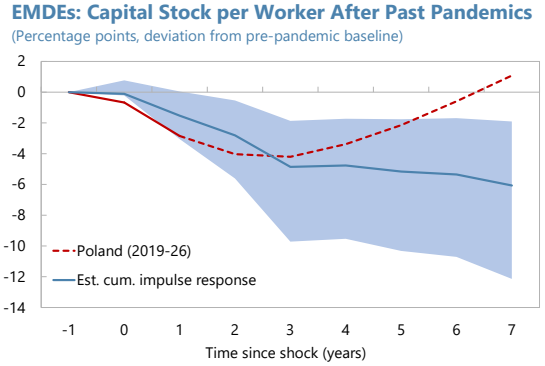
…as employed relationships were preserved during the recession….



…TFP is projected to bounce back after the initial decline associated with lockdowns…



…and especially as the capital stock is projected to strongly recover.



Note: The shaded areas represent 90 percent confidence interval bands around the WEO estimates.
Sources: April 2021 WEO; and IMF staff calculations.

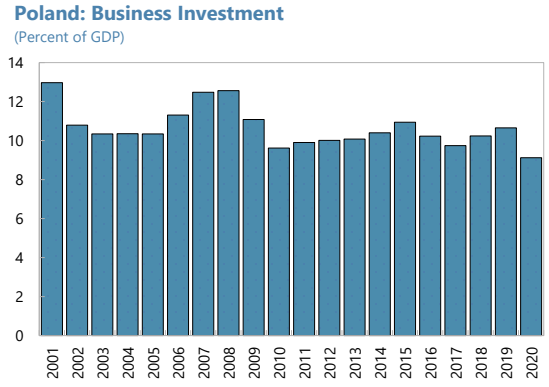
E. Policies to Support Potential Growth and Convergence

34. Underlying Poland's enviable track record of income convergence has been a strong level of potential growth. Since 2001, potential growth has averaged around 3¾ percent, near the current level of estimated potential growth, despite having achieved significant income convergence over this period. Several factors have contributed to the maintenance of potential growth, despite income convergence and a declining working age population. A steady supply of foreign workers, mostly from Ukraine, has bolstered labor supply, driven by push and pull factors. EU capital transfers have supported investment, while Poland's competitiveness, integration in the German manufacturing supply chain, and pools of skilled labor have fostered its integration into global value chains and emergence as a leader in skilled service exports in business and IT services.

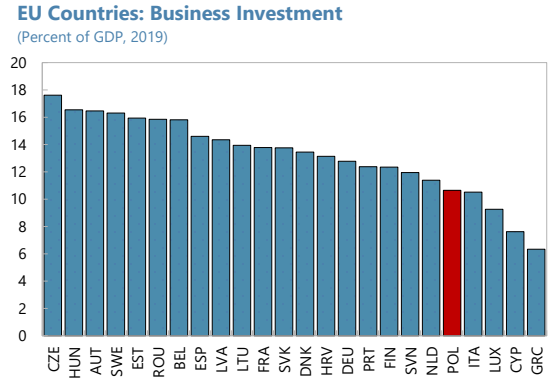
35. Policies can help support potential growth to allow continued income convergence. Beyond a projected overall decline in population, a shrinking share of the working age population poses a long-term challenge, and several factors that offset this trend—such as the large increase in foreign workers—are less certain to recur in coming years. EU transfers have supported investment since accession, but business investment remains relatively low (Figure 9). While strong TFP growth continues in the baseline projections, the post-pandemic outlook is subject to considerable uncertainty.

Figure 9. Business Investment

Business investment has been stable post-GFC….



…and the level of business investment remains one of the lowest in the EU.



Source: Eurostat.

36. The authorities should take steps to maximize labor supply. While domestic labor force participation has increased in recent years, pockets of untapped labor remain. The reduction in the labor tax wedge as part of the recent PIT reform may provide incentives for greater participation at lower income levels. As demonstrated during the pandemic, particular attention needs to be paid to supporting those with caretaking responsibilities, especially women, to facilitate participation, including through support for services such as childcare. A reversal of the previous reduction in the retirement age would also increase participation of older workers. With the supply of labor from neighboring countries such as Ukraine possibly slowing, the authorities should consider opening Poland to additional sources of immigration. The relaxation of restrictions on foreign workers' periods of employment would also boost labor supply.

37. While investment is projected to recover over the medium term, private investment is not high in international context. Business groups point to shortages of skilled labor as an important impediment to higher corporate investment. The cost of emissions has also made access to clean energy an increasingly important factor in companies' FDI decisions, underscoring the importance of the development of a long-term financing strategy for the energy transition. As the banking sector remains an important financing source of private investment, the authorities should proactively encourage resolution of foreign exchange mortgage legal risks and redesign the bank asset tax to reduce banks' incentive to hold Treasury securities at the possible expense of private

credit. The authorities should also seek to maximize the efficiency of public investment by improving information flows across public entities to facilitate a more collaborative infrastructure framework with greater complementarities of infrastructure projects.

38. Policies can also help maintain strong TFP growth. Active labor market policies, including training and upskilling, with a special focus on digital skills, can help facilitate the reallocation of labor to higher-productivity activities. The authorities should also consider policies to attract skilled, high productivity migrants. With global value chain (GVC) participation associated with TFP growth, the authorities should promote policies that tend to be associated with GVC participation, including the quality of infrastructure and institutions, and educational quality (Ilahi et al., 2019). Finally, the authorities could consider further incentives for private companies to invest in R&D and innovation.

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Appendix I. Production Function Approach

With some modifications and extensions, the production function (PF) approach is largely consistent with that taken in IMF (2017), which follows Podpiera et al. (2017). A standard Cobb-Douglas PF approach is used to decompose output into supply side factors, explicitly accounting for capital and labor inputs, with total factor productivity (TFP) obtained as the residual. The specification for quarterly real output Y_t is:

$$Y_t = A_t(K_t)^{(1-\alpha)}(L_t AHW_t)^{\alpha}$$

where:

- K denotes the capital stock. Historical capital stock data are sourced from the European Commission's AMECO database (real net capital stock). Projections are made using the perpetual inventory method:

  $$K_t = (1-\rho)K_{t-1} + I_t$$

  where ρ is the depreciation rate implied by historical data, K_{t-1} is the previous period's capital stock, and I_t is projected real gross fixed capital formation.

- L_t refers to total employment, separated by domestic employment according to the labor force survey and the effective number of foreign workers, as estimated by the NBP. Trend employment is calculated using an HP filter. The contribution of labor to potential growth is broken down into several components: (1) the trend component of the domestic economically active population; (2) the trend effective number of foreign workers; and (3) the trend unemployment rate.

- AHW_t refers to average hours worked, which takes into account the cyclical component of the intensity of the utilization of labor inputs. Estimating the contribution of average hours worked attempts to obtain a more precise estimate of the contribution of TFP (A_t).

- α refers to the labor share in the production function, which is set at 0.42, following IMF (2017). The labor share of output is set in line with the gross compensation of employees as a share of gross value added.

CHALLENGES OF DECARBONIZATION IN POLAND[1]

Over the last three decades, Poland achieved a significant reduction in carbon emissions despite rapidly growing economic activity. Nevertheless, Poland remains one of the biggest GHG emitters in Europe, with the 20th largest carbon footprint globally. Poland accounts for 0.9 percent of global emissions, broadly at par with Poland's share in the global economy. Coal is the mainstay of the energy sector and remains prevalent in household heating. The recently adopted government strategy envisages significant emissions reductions, underpinned by large investment outlays, while increasingly ambitious EU climate policy and high carbon emissions prices create pressure to accelerate decarbonization efforts. The energy transition and the associated changes in key prices will have profound social and economic implications and may need to be accompanied by actions to protect the most vulnerable groups from having to shoulder an undue burden.

A. Introduction

1. Besides contributing to global climate action, mitigation policies create opportunities for the Polish economy. An EU push towards carbon neutrality by 2050 and associated financial support opened a window of opportunity to modernize the energy sector. Investment in renewable energy sources, energy efficiency, and electromobility could also help address domestic social problems such as poor air quality, energy poverty, or transport exclusion.

2. As an EU member, Poland has strong incentives to push forward with decarbonization. The Paris Agreement embodies a global consensus on the need to limit global warming. The largest countries have already declared decarbonization targets, with the EU determined to be a leader in the road to carbon neutrality. Being part of the European carbon allowances trading system means that an unambitious climate mitigation effort by Poland would not save the country from the direct costs of higher purchases of (increasingly expensive) CO2 allowances. And some aspects of competitiveness would suffer: investors are increasingly focused on the carbon footprint throughout their value chains, and thus access to reliable, clean energy sources is becoming an important factor in the selection of FDI location. Looking at positive incentives, Poland is well positioned to tap available financial resources for clean energy research and growing a "green" economy.

3. Climate mitigation policies have implications on many dimensions. Phasing out coal from electricity generation and residential heating will require substantial investment outlays. It may also have social implications, especially in coal producing regions, and may reduce energy independence, even if only temporarily. The EU Emissions Trading System (ETS), by reducing implicit fossil fuel subsidies, affects the cost-competitiveness of coal-powered economies, while higher

[1] Prepared by Krzysztof Krogulski. This work benefited from comments from the Ministry of Climate and Environment, National Bank of Poland and Ministry of Finance received during a seminar part of the 2021 Article IV mission.

energy costs will put pressure on household budgets. All these issues are part of the debate around climate policy and working through them will matter for the success of decarbonization efforts.

4. This chapter deals with issues related to mitigation. Thanks to its favorable geographical location Poland is relatively less vulnerable to climate change: compared to most of its European peers, the direct impact of global warming on Poland is expected to be limited[2]. Adaptation is nevertheless important and is receiving attention[3]. Extreme weather events and droughts have been identified as the main risks. Adaptation planning is ongoing at the state and regional levels, supported by the EU. As an open economy integrated into global value chains, Poland may also be vulnerable to some indirect effects of climate change, such as trade disruptions or climate-related migration pressures.

5. The reminder of this chapter is organized in three sections. Section B takes stock of the sources of GHG emissions and Poland-specific aspects of energy generation and use. Section C provides an overview of current climate policies and challenges of decarbonization. Concluding Section D summarizes findings and offer policy recommendation that can support energy transition.

B. Energy Generation and Greenhouse Gas Emissions in Poland

6. Poland has achieved a significant reduction in carbon emissions despite the rapid growth of its economy. Since the 1990, the reference date for the Paris Agreement, greenhouse gas (GHG) emissions have declined by 16 percent, while size of the economy more than tripled. The emissions dropped sharply in the 1990s, reflecting a post-transition restructuring and reorientation towards a market-based economy, and stabilized thereafter while strong economic growth continued. Economic output doubled over the last two decades, implying that emissions intensity of output (GHG emissions per unit of output) halved, staying above the EU average level.

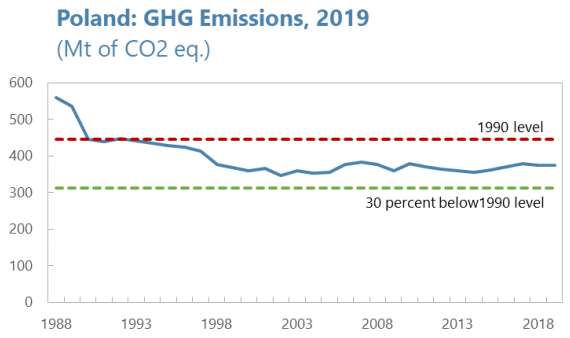
7. The power sector is by far the biggest source of emissions. A sectoral breakdown of emissions reveals that the power sector is both the driver of the improvement noted above and, nevertheless, still the main source of high carbon intensity of the Polish economy. Heavy reliance on coal is responsible for emissions intensity being almost three times above the EU average. After an initial plan to build a nuclear power plant was abandoned in 1990, there has been little progress in development of alternative sources of electricity until recently. Coal remains the mainstay of the power sector, only gradually supplemented with gas and renewable sources. Decarbonization of the power sector is the key to reducing emissions in the economy, including in other sectors. Electrification will play a big part in reducing the carbon footprint in transport, heating, and industry.

[2] See ND-GAIN index by the University of Notre Dame or ESPON (2012), "Climate Change and Europe's Regions."

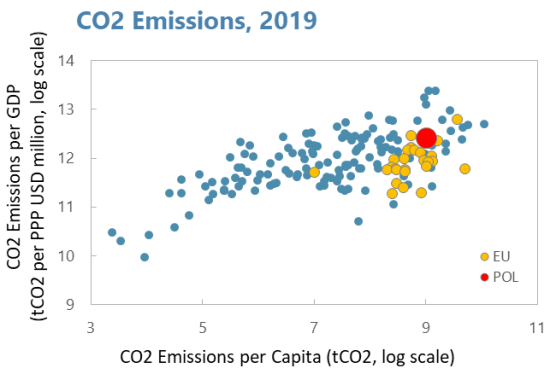
[3] Strategic adaptation plan (Ministry of Environment, 2013) provides an overview of main risks and adaptation measures.

Figure 1. GHG Emissions in Poland

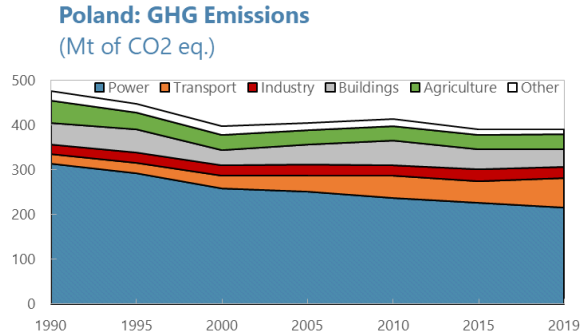
Following a decline in the 1990s, GHG emissions in Poland have been stable over the last two decades.



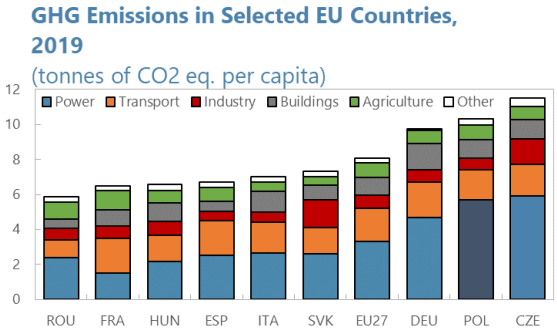
Poland's emissions remain one of highest in the EU compared to both population and economic output.



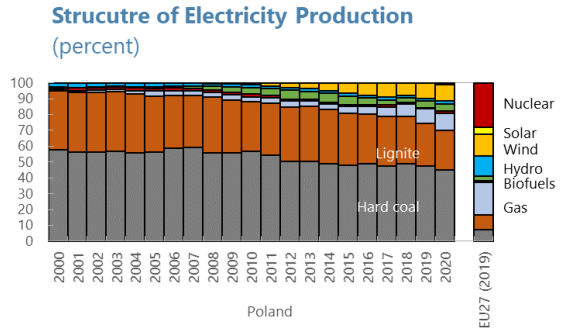
Power sector was the main driver of the improvement but still accounts for majority of emissions…



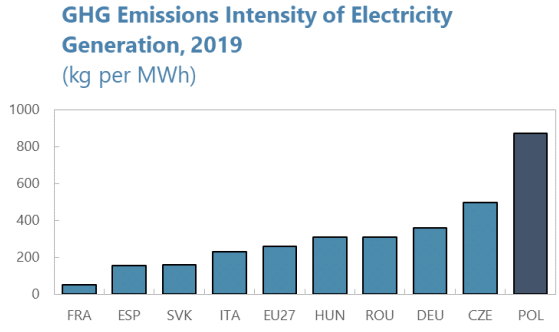
…in contrast to some other European countries.



Electricity generation is heavily reliant on hard coal and lignite…



…resulting in high emissions intensity of electricity generation.



Sources: Eurostat, European Environmental Agency, EDGAR, and IMF staff calculations.

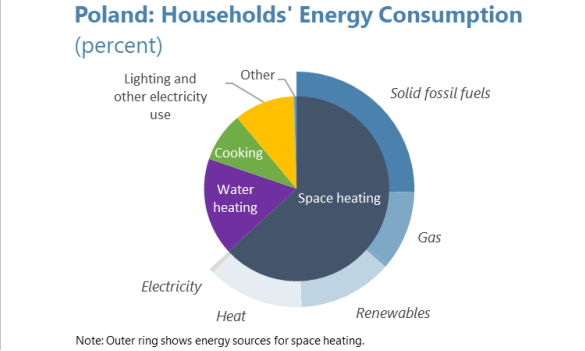
8. Coal dependency is also common in the household sector. The structure of energy consumption by households is not dissimilar to other EU countries, but the differences lie in how energy is produced. Coal heating remains popular because of its still low cost to the household, both of fuel and of initial investment. Despite the growth in the use of renewable energy in the last several years, coal heating accounts for a quarter of total energy consumption by Polish households, while other EU countries rely to a much larger extent on gas and renewable sources. This results not only in higher GHG emissions (coal is twice as emissions intensive as natural gas), but also in local air pollution.

9. The transport sector has been the only one consistently increasing emissions. Besides growing freight transport linked to strong economic growth, the uptrend in transports emissions reflects mostly the increased mobility of people. The number of passenger cars has been increasing rapidly over the last two decades, pushed by two related factors – imports of used cars and deficient public transport. Following EU accession, used foreign cars became an affordable and convenient mode of transport, particularly in remote areas. The motorization rate increased to one of the highest in the EU, and so has the average age of cars, exacerbating emissions problems. Not only were older cars built according to less stringent emissions standards, but also engine performance deteriorates over the life of a vehicle.

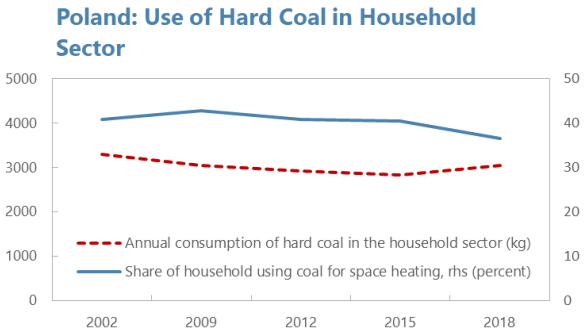
10. GHG emissions in industry and agriculture remain flat, although for different reasons. Manufacturing share in Poland's GDP has been stable and relatively high, accounting for nearly a fifth of gross value added. Despite growing output, emissions have been roughly stable, yielding 37 percent reduction in emissions intensity of output from 2010. This was a result of both improving technology and reallocation from high-emitting activity. Still, the share of emissions-intensive industries is significantly larger in Poland compared to EU average, making Poland vulnerable to carbon leakage. While the main trend in agriculture emissions is similar, the causes are different. Output growth has been modest over the last two decades (1 percent y/y on average) and was largely offset by modest improvements in emissions intensity.

Figure 2. Drivers of GHG Emissions Outside Energy Sector

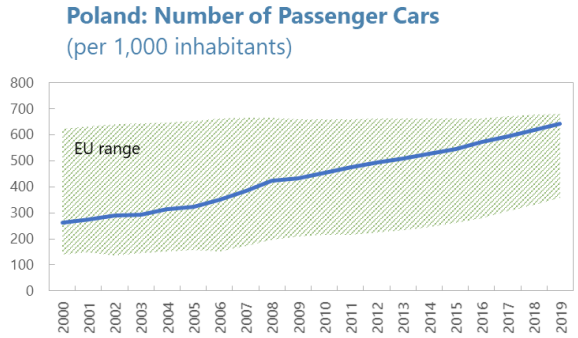
Coal heating accounts for more than a quarter of households' energy consumption…



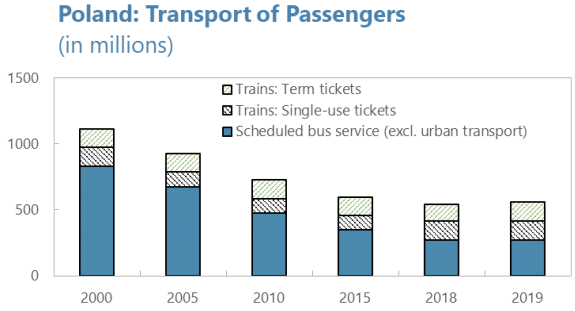
…and there has been little progress in reducing coal dependency.



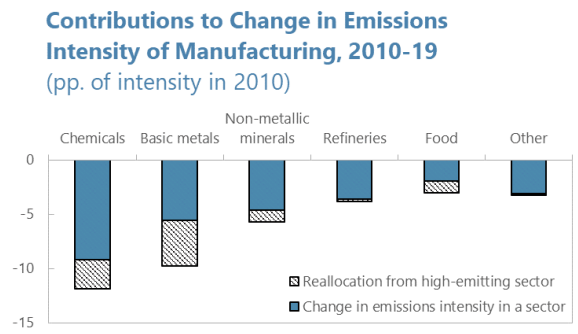
Number of passenger cars increased sharply…



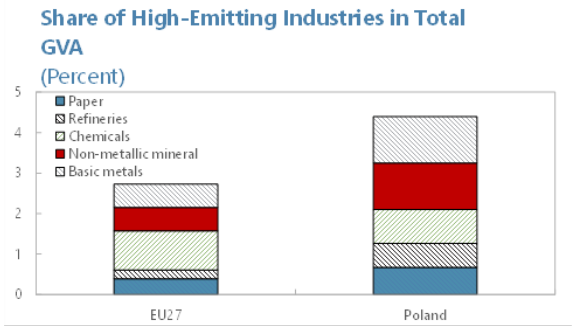
…as bus service was scaled down.



Manufacturing emissions intensity declined, driven by technology improvements and reallocation from high-emitting industries



Relatively high share of high-emitting industries makes Poland vulnerable to carbon leakage.



Sources: Eurostat, European Environmental Agency, Statistics Poland, and IMF staff calculations.

Box 1. Implications of "Fit for 55" for Poland

In July 2021, the European Commission unveiled a comprehensive legislative package that aims to tighten policies to meet the EU's pledge of greenhouse gas emissions reduction by at least 55 percent by 2030 compared to 1990 levels. Discussions on the proposals are ongoing, with final approval expected by end-2022. The main proposed changes include:

- **Review of the ETS system:** The pace of emissions allowances reduction would be accelerated, from an annual rate of 1.74 percent to 2.2 percent. Free allocation for industries vulnerable to carbon leakage would be phased out after 2026 and replaced by a Carbon Border Adjustment Mechanism—a tax on carbon footprint of selected imported goods insufficiently taxed at their point of origin. Additional financing from the Modernization Fund would boost resources available to ten lower-income states, including Poland, to support decarbonization.
- **Establishing a new ETS system for buildings and road transport:** This scheme aims to achieve faster progress in transformation of sectors currently outside the ETS system. Its significant social implications would be mitigated by the Social Climate Fund's support for green investment and vulnerable population groups.
- **Updating the Effort Sharing Regulation** governing emissions reduction targets for sectors currently outside the ETS. An increase in the EU-wide target of GHG reduction in these sectors from 29 to 40 percent by 2030 compared to 2005 levels would require a revision of national targets.
- **Tightening targets for renewable energy share in consumption and for energy efficiency:** Current EU target of 32 percent of renewable energy by 2030 would be increased to 40 percent. Setting sectoral sub-targets would encourage adoption of renewables in non-energy sectors. The Commission also proposed more ambitious energy consumption reduction targets.
- **Phase-out of fossil-fueled powered vehicles:** Sale of new internal combustion engines (ICE) powered vehicles would be banned from 2035.

Proposed changes in the ETS system would push CO2 prices higher, with immediate effect on the energy market in Poland. At the same time, the resources to finance energy transformation would increase, both due to higher prices of allowances auctioned by the government, and through reallocation via the Modernization Fund and the Innovation Fund.

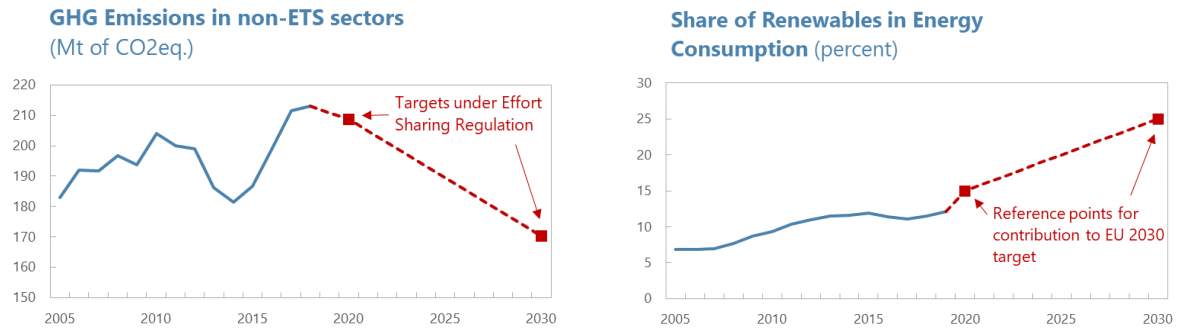
Poland would be strongly affected by the new ETS system for buildings and road transport. The system would cover currently exempted small heat generators, the vast majority of which rely on coal. Similarly, a large fleet of relatively old and less efficient passenger cars will make a new carbon pricing scheme costly for citizens.

The phase-out of ICE cars would also create an opportunity for Poland, as it is already a part of the electromobility supply chain. From the consumer perspective, the adoption of electric vehicles would take time, given the pattern of importing used cars.

C. Selected Policy Considerations[4]

11. As an EU member, Poland is a signatory of the Paris Agreement, contributing to the EU's ambitious decarbonization effort. In late 2020, Poland committed to participate in the EU's goal of reducing GHG emissions by at least 55 percent by 2030, although individual countries' contributions will vary, taking into account their different starting points, specific national circumstances, and emission reduction potential.[5] In line with already binding EU climate policies, there are interim targets for member states, covering emissions in non-ETS sectors, the share of renewable energy, and energy consumption. Poland is expected to have complied with targets for 2020, not least as energy demand plummeted due to the pandemic (the final EC's assessment is expected in Q1:2022). Meeting 2030 targets, however, will require additional policy efforts, particularly in non-ETS sectors (Figure 3.). The "Fit for 55" legislative package proposed by the European Commission would stipulate an even sharper reduction in GHG emissions via steepening the path of ETS allowances reductions and creating separate ETS system for buildings and road transport (see Box 1).

Figure 3. Interim Targets for Poland under Current EU Climate Policy



Sources: European Commission, Eurostat, and IMF staff calculations.

12. The adoption of *Energy Policy 2040* strategy marks a turning point in Poland's approach to climate mitigation. The comprehensive document approved in February 2021 defines three main policy areas: GHG emissions in the energy sector, good air quality and just transition. It stipulates cutting GHG emissions by at least 30 percent and reducing the share of coal-fueled electricity to below 56 percent by 2030. The decarbonization of the power sector will be initially based on developing renewable energy, mostly wind farms, supplemented with gas-fueled power. The subsequent and gradual introduction of nuclear power will offset the coal phase-down in the 2040s.

[4] See IMF (2020a) and IMF (2020b) for discussion of climate policies in EU countries.

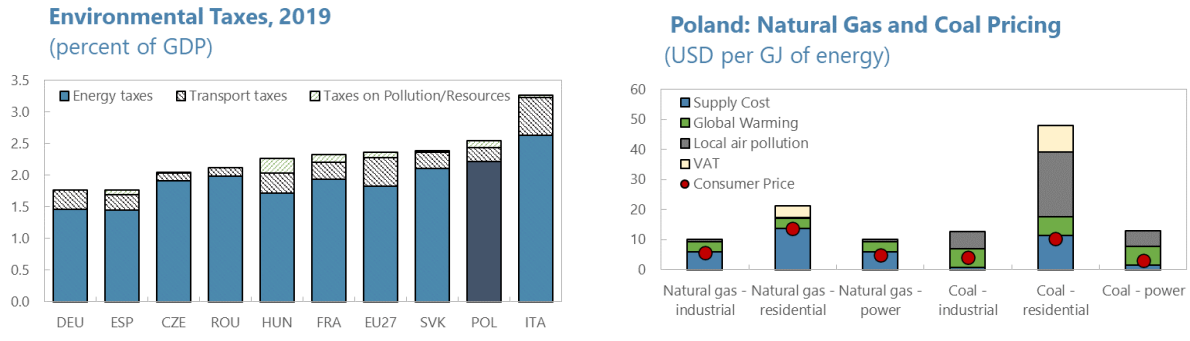
[5] Conclusions from European Council meeting on December 11, 2020

13. The strategy goes far beyond climate policies and emphasizes the importance of energy security, energy markets, and counteracting energy poverty. Energy security will be improved by new investment, including in new gas and oil storage, new pipelines, and enhancing LNG imports capacity. Ensuring a reliable electricity supply requires the construction of new gas-fueled power blocks, although the strategy underscores transitional character of fossil-fuel-based energy. Market-based solutions are seen as an answer to challenges created by the higher share of renewables. The strategy envisages the development of tools to manage power demand (e.g., through dynamic energy pricing), and a bigger role for distribution system operators. Retail consumers will become more active market participants, as power meters are replaced with devices integrated with smart grids and the number of individual power sources increases. The strategy acknowledges a link between energy poverty and high reliance on coal for heating. The share of people affected by energy poverty is expected to decline from 9.3 percent in 2019 to 6 percent by 2030, although specific measures have not been proposed.

14. Subsidized climate policy instruments are highly popular. Poland has a good track record of state programs supporting decarbonization, such as subsidies for building insulation. More recent programs, among others, finance the replacement of coal furnaces and promote green public transport. Subsidies to individual photovoltaic (PV) installations supported the rapid expansion of installed capacity, mitigating the problem of summer peak demand. The electromobility scheme has been less successful so far; however, this may change as the benefit has been extended to firms and institutions, which account for the vast majority of new vehicle purchases.

15. Tax policy is an underutilized tool. The overall burden of "environmental taxes" is comparable to that of other EU countries; however, taking into account the cost of externalities, the implicit subsidies to fossil fuels are sizable, particularly in residential use (Figure 4). A more climate-friendly incentive structure within the tax system could encourage the use of cleaner fuels and technologies without significant increases in overall taxation. A carbon tax could eliminate part of the implicit subsidy, with proceeds used to support a switch by the most vulnerable households to less-carbon intensive energy sources.

Figure 4. Environmental Taxation and Implicit Fossil Fuel Subsidies



Sources: Eurostat, and IMF staff estimates.

16. The EU ETS provides a strong incentive to reduce emissions. The ETS system remains the most impactful decarbonization mechanism in Poland. It provides a direct financial incentive to reduce emissions in the energy and industrial sectors, encouraging the transition to cleaner technologies. It is set to play an even larger role, as freely allocated emission allowances in manufacturing are phased out and prices of carbon emissions increase. The sale of allowances allocated to Poland generates sizable fiscal revenues. In 2021, it generated over 1 percent of GDP, boosted by sales of allowances carried over from ETS Phase III (2013–20). In the past, Poland spent about half of the proceeds from ETS auctions on climate action, in line with the minimum requirements established in the ETS directive. A proposed Fund for Energy Transformation financed from ETS proceeds is expected to increase that share and support transition in the power sector, including financing of nuclear power.

17. The cost of decarbonization will be significant, but partial support is available. The cost estimates vary significantly, depending on assumptions, scope, and horizon. The *Energy Policy 2040* strategy envisages investment outlays equivalent to nearly 35 percent of 2021 GDP spread over the present decade, with almost one half of these outlays in the energy sector. Some investments are not strictly linked to decarbonization; for example, outlays on fossil fuel infrastructure and terminals will support energy security. The EU can provide sizable support within the multiannual EU funds framework (3 percent of 2021 GDP), Next Generation EU funds (2½ percent), and the redistribution of ETS revenues (1½ percent), on top of domestic ETS revenues (4½ percent). Poland can also tap additional financing through other EU-wide programs, such as Horizon Europe or InvestEU. Access to these EU resources presents a valuable opportunity to mitigate the decarbonization's impact on fiscal and external balances. Multiple financing sources and mechanisms will require skillful management to cover all priority areas while avoiding overlaps. Some investment outlays may not be eligible for preferential financing (e.g., replacement investment in coal sector), and some will involve state participation (e.g., long-term projects, such as nuclear power plant), requiring a comprehensive financial strategy.

18. Investment needs will be substantial in any scenario, so the *additional* cost of a green strategy is moderate. Irrespective of decarbonization ambition, large expenditures will be needed in the energy sector to ensure stability of supply (Box 2 describes energy security challenges in Poland). The *Plan for Energy and Climate*, a document associated with *Energy Policy 2040*, estimated that in the business as usual (BAU) scenario, investment outlays in the decade of the 2020s would still be large, at 30 percent of 2021 GDP—that is, not much lower than the 35 percent in the energy transition scenario. At the same time, a less ambitious BAU scenario would also mean that support from the EU would be lower. Due to lower investment in renewable energy and higher energy demand in BAU scenario, GHG emissions would increase by 2 percent this decade, falling short of EU targets.

Box 2. Challenges for the Energy Sector

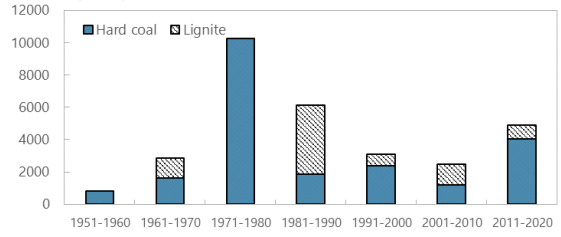
The Polish Energy sector faces a difficult decade. Ageing power plants and infrastructure increase the risk of outages. The investment plans of energy companies imply a sharp decline in domestically produced electricity, while regulatory changes, including in capacity market,[1] create risks for the economic viability of coal-fueled power generation.

Information provided by the Energy Regulator (URE) suggests that the effective capacity of the main producers will drop by 20 percent by the end of the 2020s. The grid operator has warned that, compared to current plans, some 4GW of additional capacity will be needed to ensure reliability of electricity supply in the latter part of this decade.

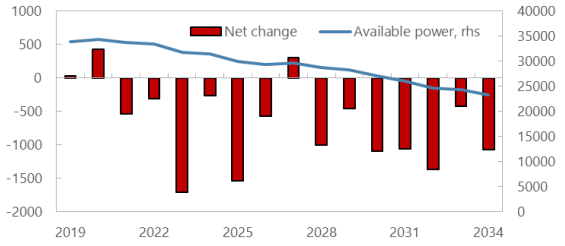
One reason for planned decommissioning is wear and tear and low efficiency, as most power plants were built almost 40 years ago. Changes in the regulatory environment will accelerate this process. CO2 emissions prices render coal-fueled generation increasingly costly. This is partly offset by proceeds from the capacity market. Pursuant to EU regulations, high-emitting plants will no longer be able to participate in this market from 2026 putting their financial viability in question.

As the nuclear power development plan envisages the first block to be connected only in 2033, the government is considering new support scheme for coal power. Acceleration in renewable energy capacity will also be needed. Investment in the grid allowing demand management (dynamic pricing) and higher import capacity would further mitigate the supply constraints.

Power of Coal and Lignite Power Plants by Year of Comissioning and Fuel
(MW)



Planned Changes in Effective Disposable Power 1/ (MW)

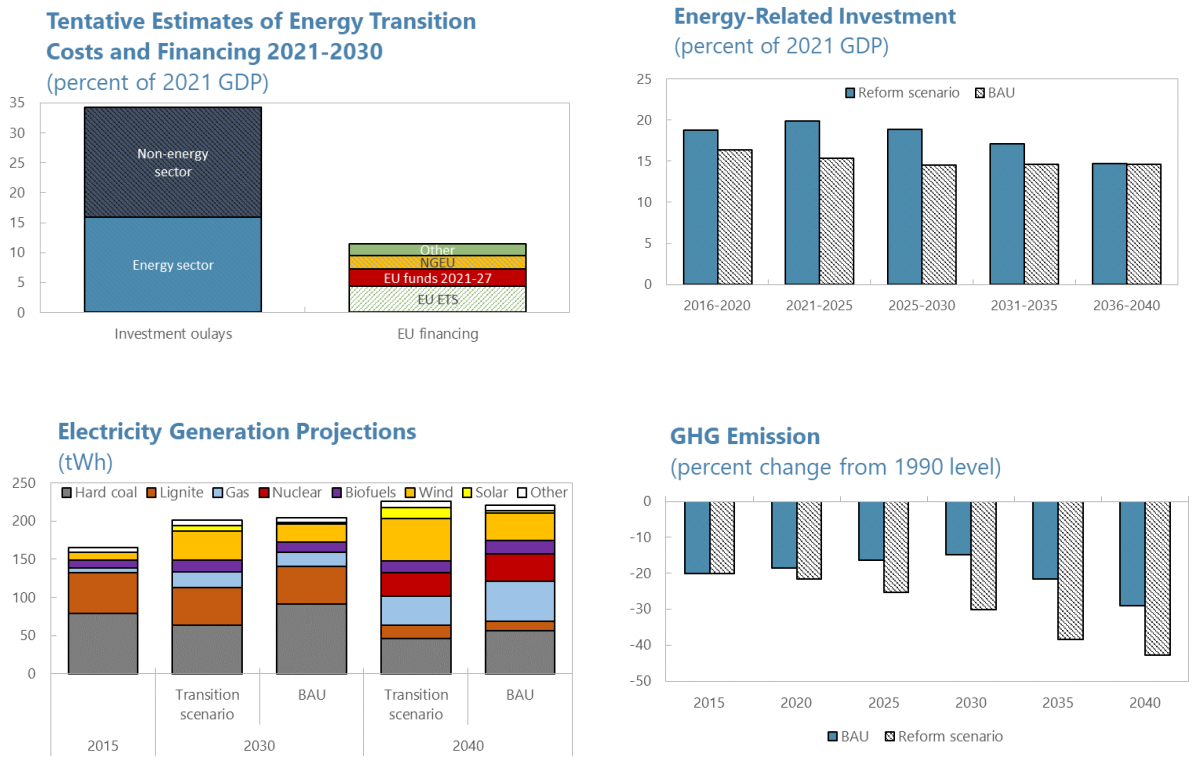


1/ according to energy producers' investment plans submitted to Energy Regulator

Sources: Instrat Energy, Energy Regulator (URE), and IMF staff calculations.

[1] The capacity market is a mechanism reducing mismatch between electricity supply and demand. Market participants are rewarded by the grid operator for the readiness to generate additional power or to reduce demand on request.

Figure 5. Tentative Estimates of Energy Transition Costs



Sources: Ministry of State Assets, Forum Energii, and IMF staff calculations.

19. The regulatory framework needs to support the transition and ensure a level-playing field for private investors. Decarbonization will affect multiple areas of social and economic life and requires a predictable regulatory environment that considers the interests of the various stakeholders. Unexpected regulatory obstacles should be avoided to allow long-term planning and strengthening confidence in the state as impartial regulator.[6] Government control over the majority of energy companies and coal mines could in principle facilitate implementation of energy transition plans, however it could also give rise to conflicts of interest. Transparency and appropriate consultation will be key to ensure a credible process of regulatory change.

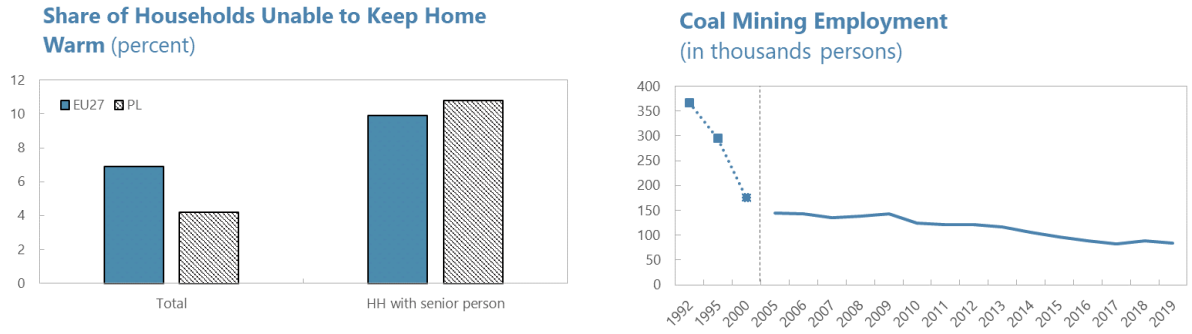
20. The design of climate policies needs to take into account their social impact. The social dimension of decarbonization is particularly important due to high incidence of energy poverty, especially among older people. Less affluent households, living in older buildings heated with coal, will face higher costs of the transition. Expense on a new heat source and insulation improvement, as well as the increase in running cost of traditional heating, may be prohibitive for many. Financial support for the most vulnerable households and development of district heating need to play a role

[6] Introduction of so-called 10H rule, limiting land suitable for construction of wind farms, and changes in the Law on Renewable Energy stopped the expansion of this fast-growing sector in 2016. As a result, foreign investors sued Poland in arbitration, while banks active in renewable financing were forced to significantly increase provisioning.

in the energy transformation. In a similar vein, the reach and reliability of clean public transportation will be key to reducing private car use. Subsidies to electric vehicles, while conducive to the adoption of a new technology, will benefit those who can afford a new car.

21. Transition in the mining regions requires support, but it should be less painful than in the 1990s. The government signed a memorandum with coal mining trade unions in April 2021. Besides provisions regarding financing of mines and wage indexation, it also stipulates coal phase-down by 2049. Conditions to mitigate the transition of coal regions are far better than they were three decades ago, when traumatizing massive layoffs took place. The tight labor market, high FDI penetration and a small share of mining in total employment will facilitate labor reabsorption. Additionally, there are resources and policies to mitigate the impact. Local authorities have prepared just transition plans that outlay strategies to manage the process, with the support from the EU. Still, there are regions that face difficult challenges. Lignite mining areas are much less diversified and offer less employment alternatives, requiring special attention of policymakers. Poland committed to phase-down coal mining by the 2040s,[7] but such a remote date implies continued fiscal support for an increasingly unprofitable sector and seems at odds with the EU's net-zero target. A firmer date for the phase-out of coal would facilitate proper planning for coal mining transition.

Figure 6. Social Dimension of Energy Transition



Sources: Eurostat, Statistics Poland, and IMF staff calculations.

D. Conclusions

22. Poland has embarked on a path to decarbonization. The new energy policy strategy represents a high level of political support for the process. Moreover, the ongoing reorientation of energy sector investments away from coal shows that the change is already taking place, in part owing to the prospects of rising carbon prices in the ETS system. Going forward, the authorities should consider setting a carbon neutrality target date. The decarbonization strategy will require amendments reflecting evolving EU climate policy and carbon market prospects. Given that the state owns most coal mines and energy producers, the government will need to act, as ageing production

[7] Global Coal to Clean Power Transition Statement signed during UN Climate Change Conference in Glasgow in 2021.

capacity and infrastructure and the deteriorating financial viability of coal-powered generation create risks for the stability of energy supply. The authorities should also review the regulatory framework for investment in energy as a level playing field between state-owned companies and private investors needs to be ensured to boost investment.

23. Decarbonization will be costly but it will be increasingly important for competitiveness. The authorities estimated that the energy transition will be costly at about 35 percent of 2021 GDP in 2020s. This is higher than an investment program for the energy sector that conforms with a "business as usual" model, but not by a very large margin. On the other hand, EU financing will support an emissions-reducing approach to the energy investment process. But large fiscal spending and state guarantees may be necessary, underscoring the need for a long-term financing strategy. Carbon tax and rebates should be considered to further incentivize private sector decarbonization while seeking to protect the most vulnerable households. But access to clean and reliable energy is an increasingly important factor for investment decisions, by both domestic and foreign firms, making decarbonization a relevant factor for the sustained competitiveness of Polish economy.

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