



IMF POLICY PAPER

May 2021

2021 COMPREHENSIVE SURVEILLANCE REVIEW— BACKGROUND PAPER ON THE SURVEILLANCE PRIORITY ENSURING ECONOMIC SUSTAINABILITY

IMF staff regularly produces papers proposing new IMF policies, exploring options for reform, or reviewing existing IMF policies and operations. The following documents have been released and are included in this package:

- The **Staff Report**, prepared by IMF staff and completed on March 19, 2021 for the Executive Board's consideration on May 10, 2021.

The IMF's transparency policy allows for the deletion of market-sensitive information and premature disclosure of the authorities' policy intentions in published staff reports and other documents.

Electronic copies of IMF Policy Papers
are available to the public from
<http://www.imf.org/external/pp/ppindex.aspx>

International Monetary Fund
Washington, D.C.



March 19, 2021

2021 COMPREHENSIVE SURVEILLANCE REVIEW— BACKGROUND PAPER ON THE SURVEILLANCE PRIORITY ENSURING ECONOMIC SUSTAINABILITY

EXECUTIVE SUMMARY

Ongoing developments in demographics, technological changes, inequality, socio-political and geopolitical factors, and climate change can affect economic sustainability in a material way under certain circumstances. Economic sustainability cannot be maintained without macroeconomic and financial stability over time. Conversely, short-term macroeconomic stability does not necessarily ensure economic sustainability, as sustainability also depends, among other factors, on distribution and inclusiveness, health and education, environment and climate, and socio-political aspects. The COVID crisis has exacerbated pre-existing trends that pose risks to economic sustainability, and it has been a wakeup call for not waiting any longer.

Ensuring economic sustainability is key to achieving the IMF's surveillance mandate of maintaining present and prospective balance of payments and domestic stability, assuring orderly exchange arrangements, and promoting a stable system of exchange rates. A good understanding of issues related to economic sustainability is thus essential for the IMF to provide effective surveillance and policy advice, while it requires a broad perspective and a long time horizon. With respect to the IMF's surveillance mandate, the principle of macro-criticality, which guides the IMF's engagement with its members, is sufficiently flexible and broad, allowing the IMF to cover issues related to economic sustainability. At the same time, given the wide range of issues that are related to economic sustainability, IMF surveillance needs to be selective and focused, with the choice of issues made on a case-by-case basis, considering country circumstances. It also needs to leverage the expertise of other institutions when necessary. The IMF and other institutions have advanced work to enhance analytical frameworks and indicators related to economic sustainability, and this should continue.

Approved By
Ceyla Pazarbasioglu

Prepared by a team from the Strategy, Policy, and Review Department led by Masashi Saito and comprising Murad Omoev, Johanna Schauer, and Alexander Skinner under the guidance of Rupa Duttagupta and Sanjaya Panth. The paper benefitted from comments from Ashvin Ahuja and Johannes Wiegand, contributions from Christina Kolerus, and an early work on data needs with the staff at the Statistics Department.

CONTENTS

INTRODUCTION	4
MACRO-CRITICALITY OF KEY TRENDS	5
A. Demographics	6
B. Technological Change	8
C. Inequality	12
D. Socio-Political and Geopolitical Developments	17
E. Climate Change	20
OPERATIONAL IMPLICATIONS	23
BOXES	
1. Relationship Between Inequality of Opportunity and Total Factor Productivity	15
2. Examples of Indicators Related to Economic Sustainability	24
FIGURES	
1. Trends and Channels to Economic Sustainability	4
2. Demographic Projection: 2020–30	6
3. Demographics: Channels to Economic Sustainability	6
4. Aging-Related Public Spending by Income Group	7
5. Technological Change: Channels to Economic Sustainability	9
6. Labor Share of Income	9
7. Intangible and Tangible Investment	10
8. Global Lending Flows by FinTech and BigTech Firms	10
9. Stock Prices	11
10. Real Weekly Earnings of U.S. Working Age Males	12
11. Impact of Pandemics on Inequality	12
12. Inequality: Channels to Economic Sustainability	13
13. Absolute Upward Mobility and TFP	14
14. Intergenerational Persistence and TFP	14
15. Income Inequality and Current Account Balance in Germany	16
16. Socio-Political and Geopolitical Developments: Channels to Economic Sustainability	17

17. Trust in Government (U.S.)	17
18. Trust in Government (Europe)	18
19. Political Polarization and Fractionalization in Advanced Economies	18
20. Average Global Temperature	20
21. Natural Catastrophe Events	20
22. Uncertainty around Global Temperature Projection	20
23. Climate Change: Channels to Economic Sustainability	21
24. Estimated Global CO2 Emissions in 2020	21
References	27

INTRODUCTION

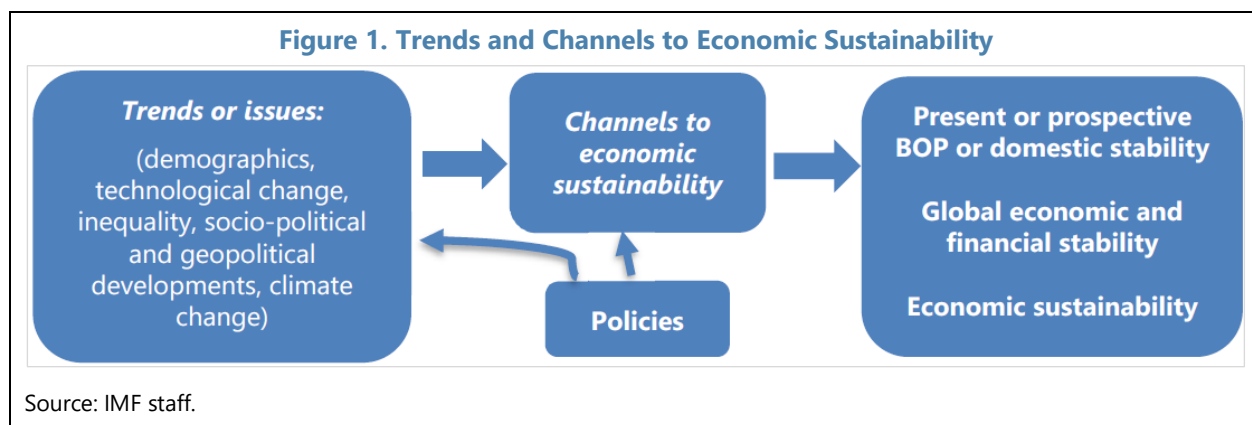
1. Trends in demographics, technological change, inequality, socio-political and geopolitical developments, and climate change can pose challenges to economic sustainability.

Economic sustainability is achieved with an allocation of economic resources over time that is consistent with sustained, balanced, and inclusive growth. The trends mentioned above influence economic sustainability through various channels as indicated in this paper. The Comprehensive Surveillance Review (CSR) survey to the authorities and the Executive Directors confirmed that these trends will shape the IMF's surveillance landscape over the next 5 to 10 years.

2. Economic sustainability is closely linked to, but not always the same as, economic stability. Economic sustainability cannot be usually achieved without macroeconomic and financial stability over time. Conversely, short- to medium-term macroeconomic stability does not necessarily ensure sustainability, as sustainability also depends, among other things, on distribution and inclusiveness, health and education, environment and climate, and socio-political and geopolitical factors.

3. The COVID crisis has reinforced the importance of the trends and issues related to economic sustainability. The crisis has exacerbated some pre-existing trends, such as rising inequality and the growing influence of socio-political factors. The crisis has also made painfully clearer the issues that need closer attention and urgent resolution.

4. For surveillance on issues related to sustainability, identifying the channels through which trends or issues impact stability and sustainability is key (Figure 1). As the next section explains with examples, the channels can include non-economic factors and sometimes go beyond IMF's standard surveillance horizon of five years.



5. A good understanding of the trends and the channels is also critical for IMF advice to be effective and tailored to country circumstances. As the schematic above illustrates, some policies would work through "channels" to prevent or reduce disruptive impact on stability and sustainability. For example, climate adaptation policies help reduce the adverse impact of climate

change on economic stability and sustainability. Yet other policies could have a direct impact on “trends or issues” For example, some climate mitigation policies help reduce CO2 emissions and stem the rise in temperature, thus addressing the problem at the source, rather than reducing the consequences. In view of this, identification and understanding of different trends and channels is a precondition for an effective policy advice in a given country-specific context.

6. While the issues and channels related to economic sustainability may be broad, those are relevant for the IMF’s surveillance to the extent that economic policies to address those influence members’ balance-of-payments (BOP) or domestic stability. The IMF’s engagement with its members is guided by the principle of macro-criticality. The concept of macro-criticality is sufficiently broad, allowing IMF surveillance to cover many issues related to economic sustainability.

- In *bilateral surveillance*, the Integrated Surveillance Decision (ISD) clarifies that the IMF focuses on those policies of members that can significantly influence present or prospective BOP or domestic stability (IMF 2012).¹
- In *multilateral surveillance*, the ISD indicates that the IMF focuses on issues that may affect the effective operation of the international monetary system, including spillovers arising from policies of individual members that may significantly influence the effective operation of the international monetary system, for example by undermining global economic and financial stability.

7. This paper is structured as follows. Section II explains, with examples, why the trends and issues covered in this paper can be macro-critical and through which channels. It also describes IMF work on those issues. Section III briefly discusses operational implications of this surveillance priority, including data needs.

MACRO-CRITICALITY OF KEY TRENDS

8. Trends in demographics, technological change, inequality, socio-political and geopolitical developments, and climate change—can be macro-critical under certain conditions. This section discusses these conditions, as well as some channels through which these trends and issues can impact BOP or domestic stability or global economic and financial stability. While these trends do not represent the universe of all trends that can impact the IMF’s stability mandate, they represent salient ones based on Fund surveillance experience. While this section mainly considers each trend one by one, there are interplays between these trends, as we note below.

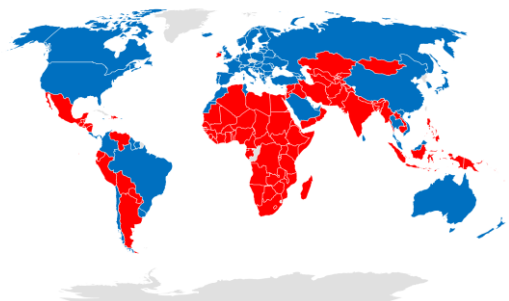
¹ These policies are often referred to as “macro-critical”. Macro-criticality of certain key trends is discussed in this context in this paper.

A. Demographics

9. Fund members are expected to face different demographic challenges over the next ten years (Figure 2). Most advanced economies and some emerging markets economies (EMs), such as China and some countries in emerging Europe, are expected to continue experiencing rapid aging and a shrinking working-age population. Improvements in health in these countries mean higher average life expectancy with effectively a longer life horizon for the retired. Conversely, low-income countries and some EMs, such as India, are still expected to see their working-age population increase.

Figure 2. Demographic Projection: 2020–30

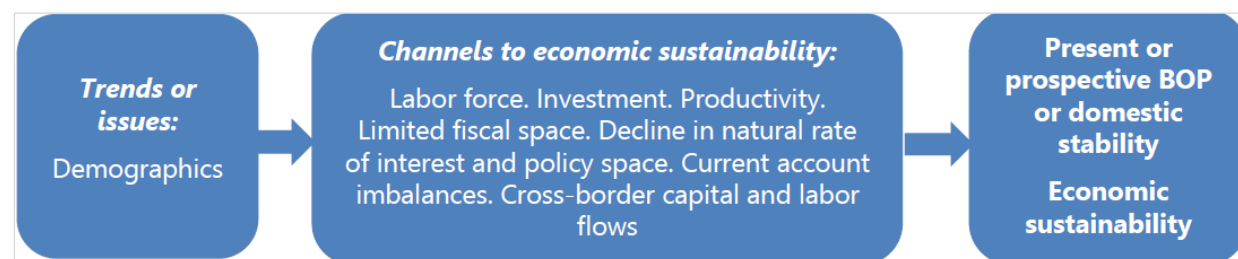
Red: Working-age population ratio expected to increase
Blue: Working-age population ratio expected to decrease



Sources: UN World Population Prospects and IMF staff calculations.

Channels to Growth, Stability, and Sustainability

Figure 3. Demographics: Channels to Economic Sustainability



Source: IMF staff.

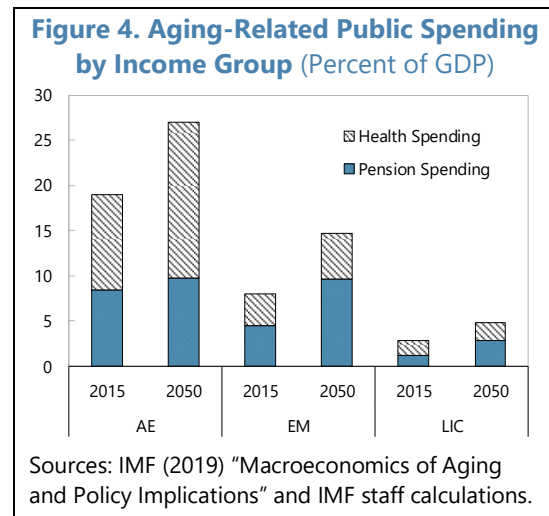
10. Demographic patterns will impact countries' economic prospects differently depending on their position in the demographic spectrum.

- *For relatively young economies*, growing working-age population can raise potential growth, through expanding the labor force and providing large incentives for capital accumulation to complement increasing labor. It could also strengthen entrepreneurship among the growing youth. However, if fiscal policies and structural reforms are not implemented to broaden access to health, education, and other opportunities to raise skills and employability of the growing population, growth would be elusive. This would be particularly challenging for countries with spending constraints, insufficient revenue, and scarce financing. Policymakers will also face challenges where automation and re-shoring of aging economies reduce opportunities for labor-intensive growth models (IMF 2018a).

- For aging economies, demographics will pose a drag on growth, as the labor force shrinks with a declining working-age population. Incentive for investment and capital accumulation could also weaken, as the rate of return on capital declines. While adoption of automation technologies may offset some of the adverse effects on investment, whether it is enough to reverse the downward pressures on overall investment and productivity would depend on country circumstances (Acemoglu and Restrepo 2021). Aging can be also associated with lower entrepreneurship rates (Liang et al., 2018, Karahan et al., 2019, IMF 2019a) and lower labor mobility across jobs and thereby lower TFP growth (Engbom 2019, Aiyar et al. 2016).

11. Either way, demographics can raise economic vulnerability by straining policy space.

For younger economies, if the youth are not gainfully employed, fiscal policy will be faced with costs from unemployment, underemployment, and attendant social pressures. In aging economies, pension and health care spending was expected to rise significantly even before the COVID-19 pandemic (IMF 2018b, IMF 2019b) (Figure 4). Also, in the context of increasing life expectancy, increase in savings to meet a more extended retirement period may depress the natural rate of interest, reducing monetary policy space.² Further, aging economies may face deflationary pressures, as an increasing population of older workers with fewer outside options leads to weaker wage bargaining power (Mojon and Ragot 2019).



12. Demographics can also impact BOP stability through the impact on current account balances and international capital and labor flows. Aging economies tend to save more in anticipation of a longer retirement period and invest less due to a lower rate of return, leading to current account surpluses (IMF 2019a). As for capital flows, the decline in the natural rate of interest in aging economies may induce capital to flow from aging economies to younger economies, including FDI flows (Backus et al. 2014, Donaldson et al. 2014). As for labor flows, labor abundance in young economies and labor shortage in aging economies may induce labor to flow to aging economies. Such migration flows can improve global resource allocations (IMF 2020a) and can benefit source countries through remittances. At the same time, social tensions in the receiving countries may increase, posing risks to their domestic stability, while brain drain in source countries may arise.

13. The COVID crisis has exacerbated the effect of demographics on economic sustainability. The crisis may have strengthened the negative impact of aging on growth, as the elderly would be more vulnerable to the virus. It can also have disproportionate impacts on the

² While the impact of demographics on the natural rate of interest depends on the relative impact on investment and savings, empirical studies tend to find that the natural rate falls with aging (Gagnon et al. 2016, Neri et al. 2019). Separately, the resulting decline in interest rates can reduce profitability of the financial sector.

young and a lasting impact on growth, particularly in low-income countries without adequate access to distance learning. Pandemics can also increase forced migration from relatively poor and vulnerable regions, while lockdowns and other containment policies may restrict cross-border labor flows. Trends in within-country population movements, in particular urbanization, may have worked to increase viral spread and highlighted an important tradeoff: while urbanization could improve resource allocation and be beneficial for growth and development, it could weaken resilience.

14. Policy challenges vary across countries.

- *For the economies that have yet to age*, it will be important to undertake reforms that allow them to take full advantage of the remaining demographic dividend. They should facilitate the capacity to absorb and channel capital inflows and to ensure the efficient deployment of resources. Education and training to increase human capital and labor productivity, as well as structural reforms, are key to securing high-quality jobs for the young population and taking maximum advantage of their remaining demographic dividend (IMF 2019b).
- *For aging economies*, raising labor force participation rates and productivity to offset the negative impact of a declining working-age population on potential growth, while ensuring fiscal sustainability with fiscal and pension reforms, would be critical to maintain economic sustainability (McGrattan et al. 2018). In this context, while labor force participation rates above age 55 have inched up, there is further room for improvement (IMF 2019b). Automation may help raise productivity and compensate for a shrinking labor force (IMF 2019c). Existing restrictions on labor mobility and migration could be reassessed (Clemens and Pritchett 2019).

IMF Work

15. The IMF has developed analytical frameworks on demographics issues. IMF staff have developed dynamic general equilibrium models that incorporate demographics (Anderson et al. 2013, Carton et al. 2020) and a framework to quantify the effects of aging on fiscal balances and to evaluate the impact of pension reforms (Amaglobeli and Wei 2016). Public debt sustainability assessments typically consider additional fiscal pressures from demographics. The external sector assessments with the EBA and EBA-lite methodologies consider demographics in evaluating current account imbalances by capturing the demographic impact on the savings-investment balance.

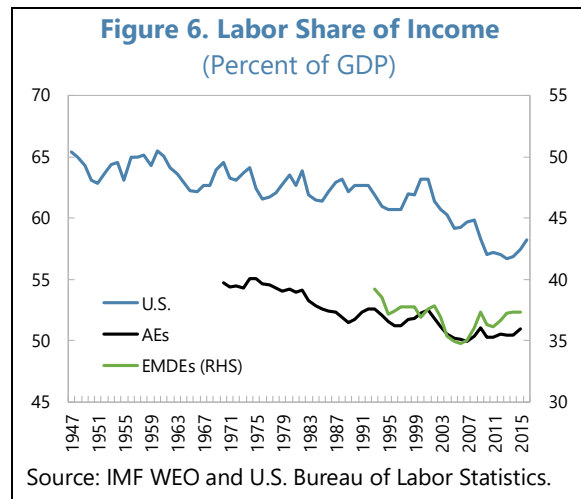
B. Technological Change

16. Technological change, such as digitalization and automation, can have positive or negative implications for economic sustainability. Technological innovation and diffusion are typically a key driver for long-term growth, manifesting through higher productivity, higher quality and more variety of goods and services, and greater means to enhance inclusiveness. At the same time, technological advances can have adverse distributional effects, which, left unchecked, may eventually reduce growth and stability. There are various channels through which technology impact stability and sustainability (Figure 5).

Channels to Growth, Stability, and Sustainability



17. Technological advances can raise productivity and growth. Automation and on-line outsourcing can alleviate the labor shortage in aging economies, and digitalization can allow firms to grow rapidly with fewer employees, a smaller amount of tangible capital, and a limited geographical footprint (Praet 2018). Digitalization also enables firms to utilize economies of scale based on data and network externalities—the largest public companies are artificial intelligence (AI) intensive (Goldfarb and Trefler 2018). However, automation can generate downward pressures on the labor share of income when it replaces labor and reduces labor demand (Acemoglu and Restrepo 2019, IMF 2017a) (Figure 6).³ Also, productivity disappointments in some countries despite technological progress imply that there may be time lags between technological advances and productivity improvement: investments in intangible and organizational capital as well as human capital that are complementary to the new technology are necessary to start benefitting from the technology (Brynjolfsson et al. 2017).



18. The ongoing shift from tangible to intangible capital, supported by technological changes, can also support growth, while the rise in corporate market power may pose risks to sustainable growth when it becomes persistent and broad-based. There has been an upward trend in intangible investment in the U.S. and Europe (Figure 7). An increase in intangible capital can raise productivity (Corrado et al. 2016), while it can lead to larger corporate savings and cash holdings, as it makes profit-shifting from high to low tax jurisdictions easier (Faulkender et al. 2019), or as intangibles may not be pledged as collateral for borrowing and this encourages saving (Falato et al. 2021). In addition, price-cost markups in some segments of firms, mainly in advanced economies, have increased as a trend since the early 2000s. So far, the rise in markups has been

³ While automation could in principle raise the labor share of income and labor demand if it “reinstates” new tasks, recent work suggests that automation has reduced the labor share of income (Acemoglu and Restrepo 2019).

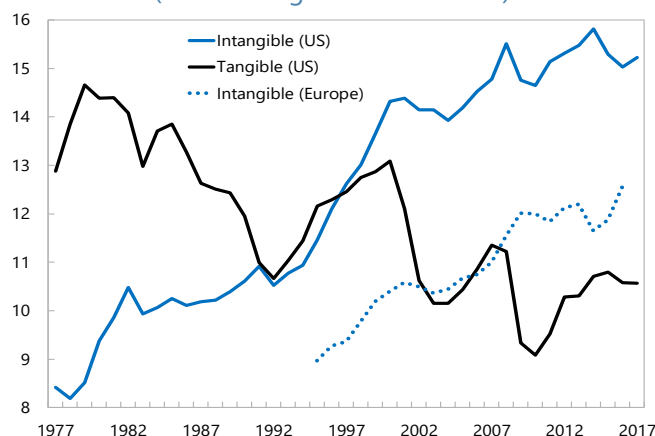
concentrated in firms with high productivity, and thus it is not expected to have had an adverse impact on growth and consumer welfare (2019d). Once it becomes persistent, however, it can reduce growth and consumer welfare through less competition and higher rents.⁴ Higher market power can also reduce the effectiveness of macroeconomic policies, for example by reducing fiscal multipliers (Kopp et al. 2019).

19. Fintech can raise growth, while it can also increase risks to financial stability. FinTech credit and BigTech credit are growing rapidly, albeit still being a small share of total credit (Figure 8).⁵ Fintech may enhance competition and improve the

efficiency of the financial sector. It may also promote financial inclusion, providing financial services to customers previously unserved. At the same time, network effects and economies of scale facilitated by fintech may lead to greater concentration and market power, reducing consumer welfare and making financial risks more systemic (IMF 2018c). These may introduce complications to financial regulation and consumer protection. Despite technological advances, limited access

to and literacy in technology may hamper financial inclusion, and investment in digital infrastructure and education would be important (Sahay et al. 2020).

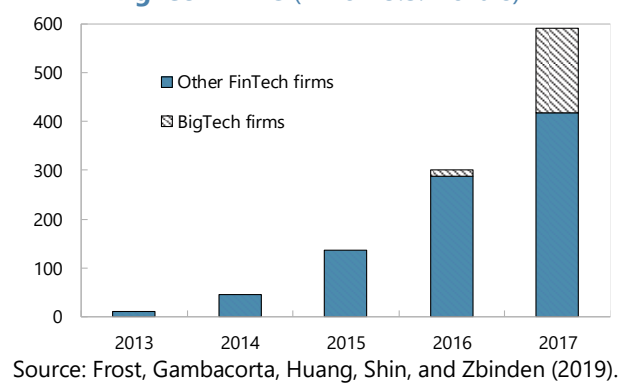
Figure 7. Intangible and Tangible Investment
(Percent of gross value added)



Sources: Corrado et al. (2016) and unpublished update to Corrado and Hulten (2010).

Notes: Intangible assets include computer software and databases, intellectual property, economic competencies, entertainment, artistic and literary originals, mineral explorations, design, new product development costs in the financial industry, R&D, brand, organizational capital, and training.

Figure 8. Global Lending Flows by FinTech and BigTech Firms
(Billion U.S. Dollars)

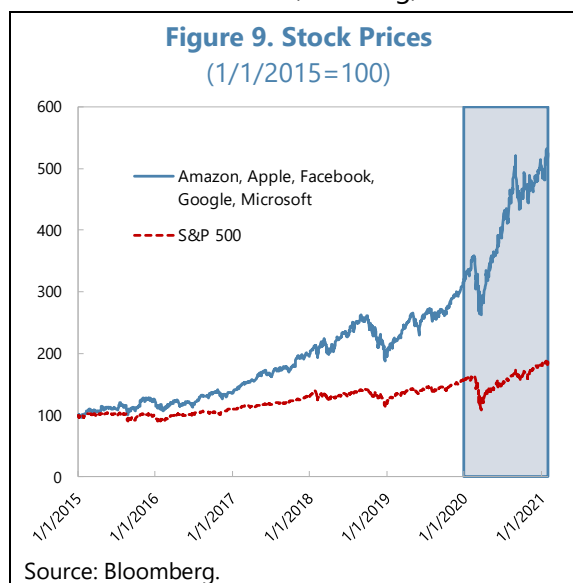


Source: Frost, Gambacorta, Huang, Shin, and Zbinden (2019).

⁴ While a rise in market power may incentivize innovation, it may over time increase firms' capacity to exert political pressure and have a less desirable economic impact (Praet 2018).

⁵ FinTech is technology-enabled innovation in financial services, and BigTech companies are large companies that primarily provide digital services but also offer financial services (Frost et al. 2019).

20. The COVID crisis may have accelerated the pace of technological change in some areas and reinforced the channels through which economic sustainability is influenced. The COVID outbreak may have stimulated technology adoption in automation and digitalization and encouraged innovation, which in some cases supported continuation of work, learning, firm operations, and government services. At the same time, the pandemic may have widened the gap between those with access to digital infrastructure and those without. The pandemic may have also reinforced pre-existing trends in rising corporate market power, with BigTech companies attracting more demand (Figure 9). Relatedly, the increasing spread of remote work and virtual environments may have made it easier for firms to attract workers globally, leading to the concentration of talent. Meanwhile, the geographic dispersion of workers enabled by remote work may have reduced the bargaining power of workers, reinforcing the existing trends of declining labor share of income and rising income inequality (see below).



21. Policies should aim at reducing gaps in access and containing unfavorable impacts of technological changes. For example, competition policies could ensure level playing fields in the face of greater concentration and rising market power. Education spending and retraining are effective in mitigating distributional impact of technological changes, while enhancing growth (IMF 2018d). Also, policies to direct technological change itself may be considered, so the benefits of innovation are shared broadly (Acemoglu 2020). Financial regulations need to adapt to the new technology and financial environment. Tax policies need to consider digital technologies that may enable economic actors to operate in ways that avoid or reduce their tax liability (OECD 2014). Fiscal and social spending policies can benefit from digitalization to improve efficiency and transparency.

IMF Work

22. The IMF is advancing work on issues related to technological changes.

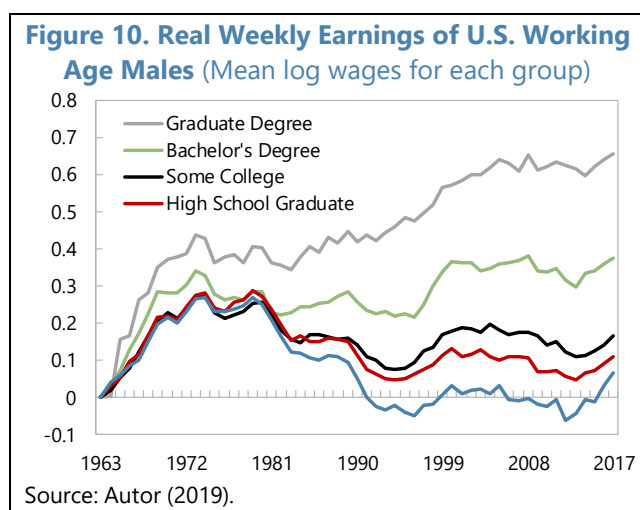
- *Growth, distribution, and policy.* The IMF has been analyzing how technological changes impact the nature of work and what policies are needed to ensure inclusive growth (IMF 2018d). Recent work also considered the cause and implications of the rise in corporate market power (IMF 2019d). Going forward, it is important to consider how the digital advancement can support an inclusive and sustainable post-pandemic recovery. The IMF also considered the impact of digitalization on tax administration, spending efficiency, and fiscal management (IMF 2018b).
- *Macrofinancial.* The IMF's analysis has expanded its coverage to include assessment of risks from technological innovation (IMF 2017b). The IMF is serving as a platform for collaboration and knowledge sharing on fintech, building on the Bali Fintech Agenda (IMF 2018c, IMF 2019e). The

IMF is also advancing work on central bank digital currencies and “global stablecoins,” including macrofinancial and policy implications (Adrian and Griffoli 2019, IMF 2020b). The IMF’s Financial Access Survey collects data on the use of digital financial services. More generally, with the rapid expansion in the use of digital money worldwide, the Fund’s work in this area is set to grow further, focusing on helping the membership address the profound implications of digital transformation of finance on domestic and international monetary systems.

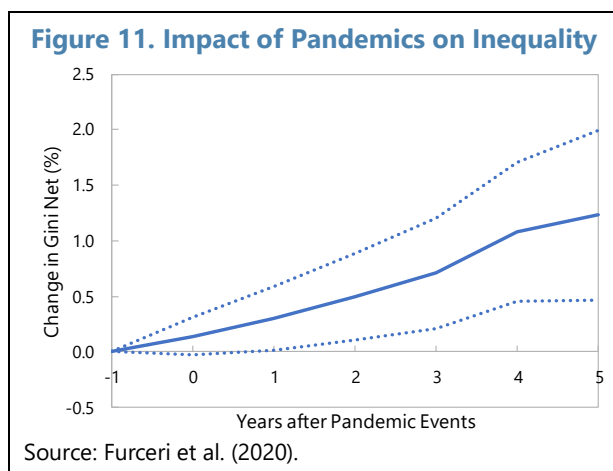
C. Inequality

23. Income inequalities within countries have been on a rising trend in many countries.

While various factors influence income inequality (e.g., labor market institutions), technological changes can increase wage inequality by rewarding high-skilled workers more than low-skilled workers (Autor 2019, Goldin and Katz 2008) and can exacerbate the hollowing out of the middle class (Alichii et al. 2016) (Figure 10). Also, a rise in intangible capital mentioned earlier may have increased inequality, as intangible capital tends to have a stronger complementarity with higher skills and education (Haskel and Westlake 2018). In addition to these trends, past recessions may have had persistent and cumulative impacts on the income gap, as low-skilled workers are more likely to lose jobs in recessions and they lose their skills while being unemployed (Heathcote et al. 2020). Meanwhile, many advanced economies have seen the share of high capital-income earners (who are also at the high end of labor income distribution) increase dramatically (Berman and Milanovic 2020). At the same time, some countries, in particular in Latin America and Africa, have seen a decline in income inequality, albeit from high levels (United Nations 2020a).

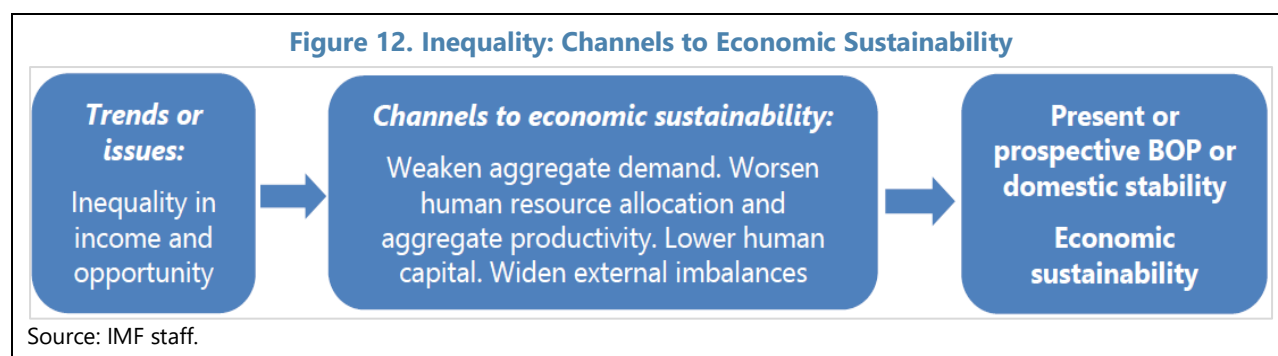


24. The COVID crisis has exacerbated inequality. Pandemics can lead to higher inequality of opportunity and wider skill gaps through uneven access to education, jobs, and healthcare, as well as uneven exposure risk. In regular times, schools play a “great equalizer” role by providing a learning environment where children from different socio-economic background learn together. However, school closures and a decrease in in-school learning could have put this role at risk, widening educational gap and having a lasting impact on



human capital (Agostinello et al. 2020). Lockdowns imposed to contain the spread of the pandemic have a particularly adverse impact on persons without “teleworkable” jobs, such as those working in hospitality, food services, construction, and transportation sectors, where the workers tend to be less-educated (Brussevich et al. 2020), and Job losses have been concentrated among low-income workers (IMF 2020c). Further, the COVID pandemic may have reversed a decades-long declining trend in poverty, pushing many to extreme poverty in South Asia and Sub-Saharan Africa (Lakner et al. 2021). More generally, evidence from past pandemics—SARS, H1N1, MERS, Ebola, and Zika—suggests that pandemics tend to have a lasting impact on inequality and employment prospects for the less-educated (Furceri et al. 2020) (Figure 11). The severity of this effect will also depend on the demographic and technological trends mentioned earlier.

Channels to Growth, Stability, and Sustainability

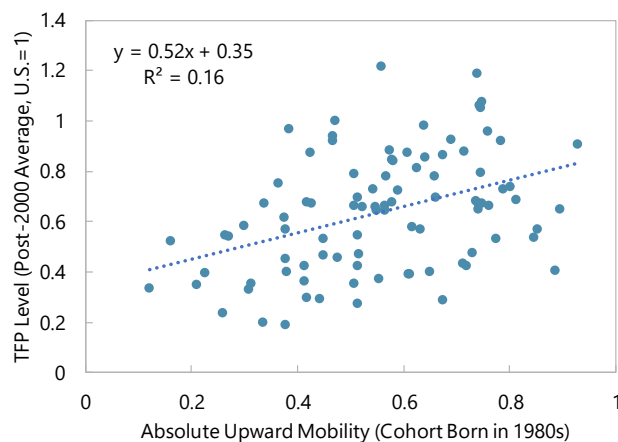


25. Income inequality can reduce growth through various channels. Sustained income inequality can reduce growth by (i) shifting income in favor of the top earners that have relatively low spending propensities, (ii) hampering human capital accumulation of the poor and reducing entrepreneurial investment, and (iii) reducing social and political stability and thus weakening business environment and investment. Some studies indicate that income inequality tends to reduce medium-term growth (Ostry et al. 2014, Ostry et al. 2019, Dabla-Norris et al. 2015).

26. Inequality of opportunity tends to have a clearer, negative impact on growth. Income inequality could be influenced by several factors, and recent studies indicate that the impact of income inequality on growth depends on the underlying sources of inequality. For example, the empirical evidence in Marrero and Rodriguez (2013) suggests that inequality of “opportunity”—inequality in circumstances beyond the scope of individual responsibility, such as race and socio-economic background like parental education or wealth—tends to have a negative impact on growth, while inequality of “efforts”—inequality caused by individual responsible choices, such as the number of hours worked or the occupational and education choice—tends to have a positive impact on growth, possibly because it reflects incentives for doing better. Similarly, Aiyar and Ebeke (2020) find that income inequality has a negative impact on growth especially in countries with high inequality of opportunity. We should note, however, that income inequality and inequality of opportunity may interact with each other when we interpret these results (Covac 2013, IMF 2021a).

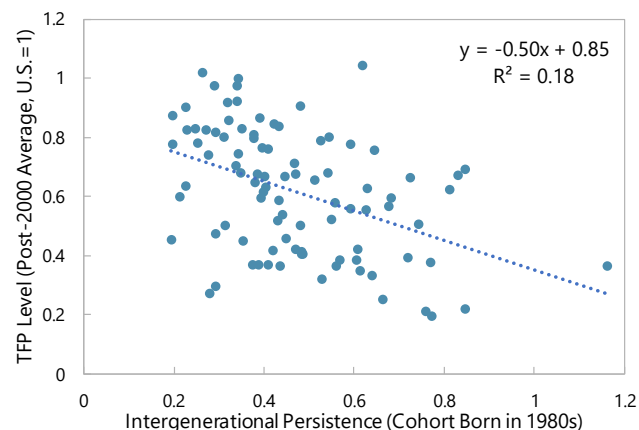
27. Further, our empirical analysis suggests that higher inequality of opportunity is associated with lower aggregate efficiency of the economy, implying that it can be detrimental to sustained growth. Conceptually, inequality of opportunity prevents individuals from living up to their potential and pursuing their comparative advantage. This, in turn, makes the allocation of talent and human resources suboptimal, and reduces the aggregate efficiency of the economy (Bourguignon 2018, Hsieh et al. 2019). We consider two measures of inequality of opportunity. The first measure proxies absolute upward mobility in educational attainment, as given by the share of a cohort that attains a higher education level than their parents.⁶ Our cross-country analysis implies that this measure has a positive association with total factor productivity (TFP), a measure of aggregate efficiency in the economy (Figure 13). The second measure captures inter-generational persistence in educational attainment.⁷ This measure has a negative association with TFP (Figure 14). These results suggest that countries with relatively high inequality of opportunity tend to have relatively low aggregate efficiency. This in turn implies that inequality of opportunity is detrimental to sustained growth (see also Box 1). Relatedly, Bertay et al. (2019) find that gender inequality—another form of inequality of opportunity—is detrimental to sustained growth. This calls for policies to provide more equal opportunities (IMF 2019f, IMF 2021a, Fabrizio et al. 2020).

Figure 13. Absolute Upward Mobility and TFP



Sources: Penn World Tables, World Bank Global Database on Intergenerational Mobility, and IMF staff calculations.

Figure 14. Intergenerational Persistence and TFP



Sources: Penn World Tables, World Bank Global Database on Intergenerational Mobility, and IMF staff calculations.

⁶ In the U.S., absolute upward mobility in income (the fraction of children earning more than their parents) has fallen from around 90 percent for children born in 1940 to 50 for children born in the 1980s (Chetty et al. 2017).

⁷ It is the coefficient from regressing child's years of schooling on the highest years of schooling of her/his parents.

Box 1. Relationship Between Inequality of Opportunity and Total Factor Productivity

While the empirical evidence on the impact of income inequality on growth is mixed, some studies argue that inequality of opportunity has a clearer negative impact on long-term growth. Relatedly, the analysis in this Box suggests that high inequality of opportunity is associated with low total factor productivity (TFP)—a measure of aggregate efficiency of the economy—and the relationship is stronger when income inequality is high.

One proxy for the availability of opportunity in a society is upward mobility across generations. The World Bank’s Global Database on Intergenerational Mobility provides cross-country estimates of absolute upward mobility (Narayan et al. 2018). It is defined as the share of children that achieve higher educational levels than their parents, given that the parent is not in the top educational category (tertiary education).

To uncover the relationship between inequality of opportunity and economic growth, we focus on the long-term relationship between absolute upward mobility and total factor productivity (TFP). The empirical specification is a cross-section OLS regression of the post-2000 average level of TFP (relative to the U.S. level) on the initial inequality of opportunity proxied by upward mobility for the population born in the 1980s (1980s cohort).

Assuming that the 1980s cohort enters the labor force and leverages its educational endowments after 2000, this specification helps address endogeneity concerns. The regression controls for the post-2000 average level of income inequality (the Gini coefficient before taxes and transfers). Also, as in Aiyar and Ebeke (2020), the regression includes an interaction term between upward mobility and income inequality, which captures how the effect of inequality of opportunity on TFP depends on the level of income inequality. The regression also controls for GDP per capita in the 1980s.

The regression result suggests that upward mobility has a statistically significant positive impact on TFP, and this impact is weaker when income inequality is high (the table on regression result). The figure presents the result graphically by showing the average marginal effects of absolute upward mobility on TFP at a given level of income inequality. For example, in countries with the Gini coefficient of 30 percent, one percentage-point increase in upward mobility is associated with a statistically significant 0.2 percentage-point increase in TFP, while the impact of upward mobility on TFP is not significant for countries with high income inequality (countries with the Gini coefficient over 35 percent).

Regression Result ¹

(Dependent Variable: post-2000 TFP, in percent of U.S. level)

Interaction (Abs. Upward Mobility * Income Gini)	-0.000164*** (6.11e-05)
Abs. Upward Mobility of the 1980's generation ²	0.000539 (0.000537)
Pre-tax Income Gini, post-2000 average ³	-0.000643 (0.00207)
Log Real GDP per Capita ⁴	1.555*** (0.194)
Constant	-0.000675 (0.0170)
Observations	75
R-squared	0.596

Source: IMF staff calculations.

Standard errors in parentheses.

1/ *** Indicates 1 percent statistical significance. Standard errors are in parentheses. Sample of 75 countries: high income (28); middle income (38); low income (9).

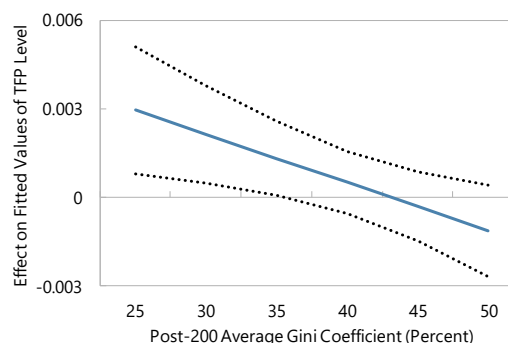
2/ Measures the share of 1980 cohort (child’s generation) that achieved a higher educational level than his/her parent, given that the parent is not in the top category (tertiary education). Data from World Bank Global Database on Intergenerational Mobility.

3/ Average for 2000-17. Data from Branko L Milanovic, All the Ginis Dataset, World Bank Group.

4/ Data from Penn World Table version 9.1.

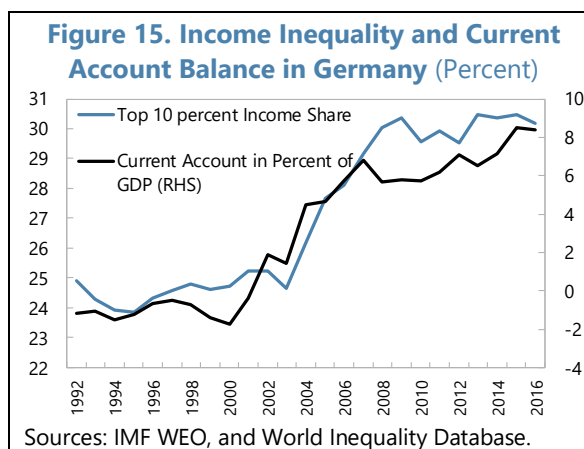
Average Marginal Effects of Absolute Upward Mobility on TFP

(With 95 Percent confidence intervals)



Source: IMF staff calculations.

28. Beyond its impact on growth, income inequality can worsen external balances. For example, a rise in income inequality coincided with an increase in current account surplus in Germany (Figure 15): concentration of income to the richer households with a relatively low propensity to spend can increase aggregate savings and current account surplus (IMF 2019g). Similarly, a rise in wealth inequality may also widen external imbalances (IMF 2019h).



29. Policies can be designed to address inequality while strengthening growth. Enhancing access to opportunities by investing in education and health, broadening access to finance (Cihak and Sahay 2020), and reforming labor and product markets can help mitigate inequality, while enhancing growth. Appropriate policies could differ across countries, reflecting social preferences, administrative capacity, and fiscal space.

IMF Work

30. The IMF has been advancing analytical and policy work on inequality and distributional issues. In addition to those mentioned above, initiatives and work at the IMF include:

- *Inequality, gender, and macrostructural Issues.* The IMF's macrostructural pilot initiative has facilitated integration of structural issues, including inequality, into macroeconomic analysis, and improved the depth and granularity of coverage in country papers (IMF 2015, Fabrizio et al. 2017). The pilot programs on gender and inequality provided guidance on integration of these topics in IMF surveillance (IMF 2018e, IMF 2018f). The IMF has developed strategies for enhanced engagement on governance and social spending (IMF 2018g, IMF 2019i, IMF 2020d). The IMF has also provided capacity development on gender budgeting (Fabrizio et al. 2020).
- *Distributional impact of macroeconomic policies.* The IMF has considered the role of tax policies and tax capacities in addressing income and wealth inequality (IMF 2021a). A dynamic general equilibrium model to analyze the welfare effects of fiscal reforms was developed, and it was used to simulate the macroeconomic and distributional impact of fiscal reforms in low-income and developing countries (Peralta-Alva et al. 2018). Similar models have been used in IMF bilateral surveillance. For example, the 2017 Article IV staff report for the U.S. showed that, while tax cuts to the high-income group can stimulate growth more than tax cuts to the middle-income group, the former can worsen income inequality. The 2015 Article IV staff report for Ethiopia indicated that, while financial sector reform can stimulate growth, it can worsen inequality. Some IMF analyses used a fiscal incidence analysis tool developed by the Commitment to Equity Project to analyze distributional impact of fiscal reforms and social spending. For example, the 2017 Article IV staff report for Swaziland analyzed the role of means-tested cash transfers in reducing poverty and income inequality. The 2018 Article IV staff report for South Africa assessed how taxes and social spending redistribute income.

D. Socio-Political and Geopolitical Developments

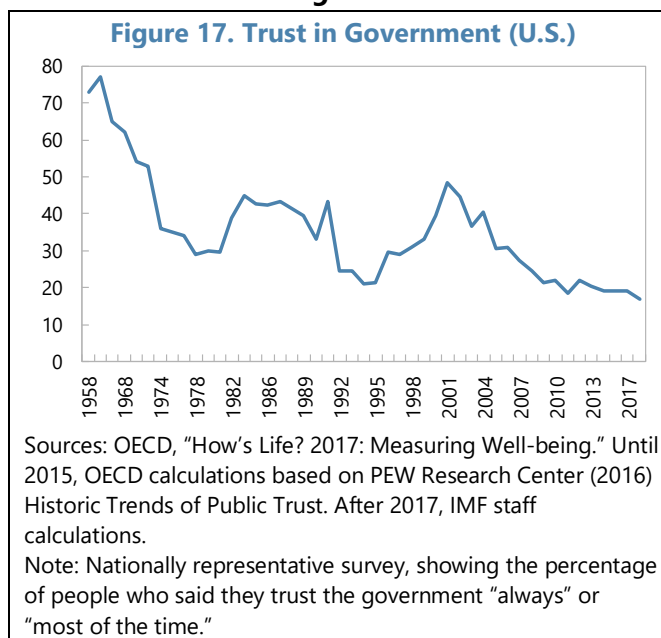
31. Socio-political factors—including from domestic political systems and social movements—and geopolitical developments can have salient effects on sustainability.

- At the *domestic* level, political fragmentation and polarization can have social and economic consequences. While some of the socio-political developments may result from a rise in within-country inequality discussed earlier, some developments may need to be looked at separately from pure socio-political angles. Understanding socio-political context is also crucial to the scope and realization of reforms (Ciminelli et al. 2019).
- At the *global* level, geopolitical developments such as rising tensions among countries can affect macroeconomic stability and limit the scope for sustained growth. Geopolitical tensions also undermine economic and financial relationships among countries, resulting in suboptimal outcomes for all countries involved.

Channels to Growth, Stability, and Sustainability



32. Trust and social capital are important factors for sustained growth. Trust can be defined as a person's belief that another person or institution will act consistently with their expectations of positive behavior (OECD 2017). There has been a downward trend in trust in government in some countries (Figures 17, 18). Some studies find that higher levels of trust tend to result in better economic performance. Specifically, trust is positively associated with per-capita income, and the causality could be running from trust to per-capita income (Algan and Cahuc 2014, Algan 2018). This could be for two reasons.



First, trust can act as a lubricant to economic exchange.⁸ Second, trust in institutions can make it easier for government to implement necessary policies and reforms that may involve difficult tradeoffs.

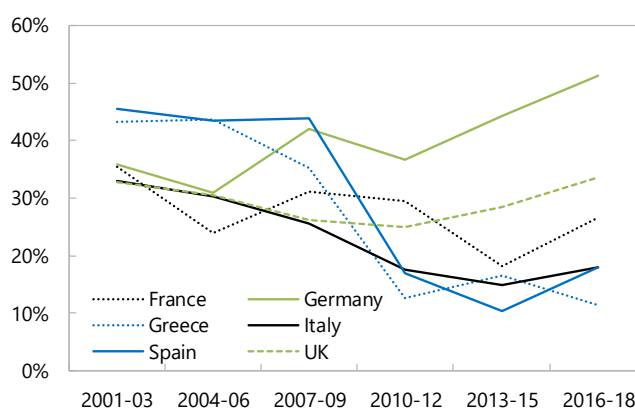
33. Conversely, a decline in trust and social capital may lead to a disruption in domestic stability and pose sustainability issues.

For example, in the run-up to the Arab Spring, there was increasing discontent among the population, due to fraying social contracts between government and the population, growing dissatisfaction with limited voice and accountability, and squeeze in the middle class (Ianchovichina 2018). Although standard macroeconomic indicators such as GDP growth did not initially reveal the discontent, the decline in trust and social capital eventually led to domestic instability, culminating with low growth.

34. Political fragmentation and polarization and a rise of populism could also threaten domestic stability and sustained growth.

Political fragmentation and polarization are on a rise in some advanced economies (Figure 19). This could reinforce time-inconsistent preferences of the government, as well as a resulting bias toward present rather than sustained consumption, possibly impacting public debt sustainability (Yared 2019). Similarly, a rise of populism can weaken governance and political institutions and worsen macroeconomic management, leading to larger fiscal and external imbalances (Edwards 2019, Magud et al. 2019). Some of

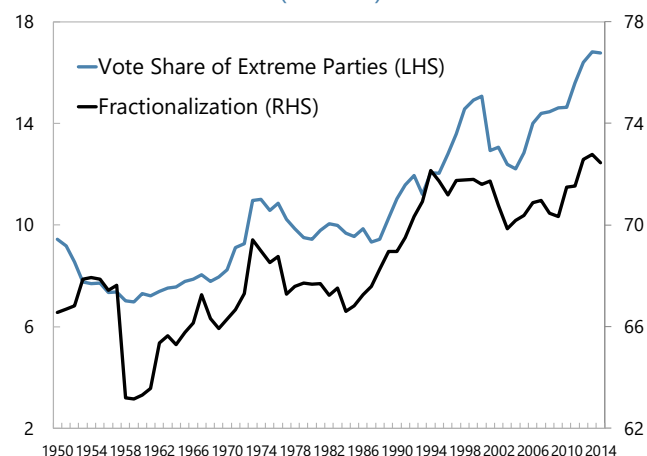
Figure 18. Trust in Government (Europe)



Source: European Commission Eurobarometer Interactive.

Note: Nationally representative surveys, showing the percentage of people who said they “tend to trust” the government.

Figure 19. Political Polarization and Fractionalization in Advanced Economies (Percent)



Sources: Yared (2019). Data from Funke, Schularick, and Trebesch (2016).

Notes: Sample includes Austria, Australia, Belgium, Canada, Switzerland, Germany, Denmark, Finland, France, U.K., Ireland, Italy, Japan, the Netherlands, Norway, Sweden, and the U.S. Vote share of extreme parties is the percent of the popular vote for extreme parties on the far right or the far left for the most recent election in the lower legislature. Fractionalization is the probability that two members of the lower legislature are from different political parties.

⁸ In a similar context, Rajan (2019) argues that communities or inclusive localism can fill holes left by markets and the state through relationship and trust, rather than through contract, and that this is important for capitalism to work.

these political developments could be traced to a rise in inequality discussed earlier. For example, a lack of social mobility and the resulting frustration among the population over unfairness may be associated with the political upheaval and the rise of populism in some advanced economies in recent years (Protzer 2019). In addition, a loss of trust in traditional parties may lead to a rise of populism that offers quick solutions (Guiso et al. 2018).

35. The COVID crisis has reinforced the importance of trust. Higher inequality following the COVID crisis may reduce trust in government. This may increase political fragmentation and polarization, and hinder effective action against the pandemic. More generally, some studies find that an exposure to pandemics in an individuals' impressionable years (late-adolescent and early-adult years) tends to have lasting impact on trust in government and political leaders (Aksoy et al. 2020).

36. Geopolitical factors can stretch into the realm of pandemics and vaccines, as well as technology. There would be an incentive for some leaders to demonstrate that their citizens come first, which may cause delayed vaccine delivery to areas where it may be more critical, such as low-income countries with pre-existing health vulnerabilities. Further, differential access to vaccines may result in an uneven recovery process across countries, making sustained recovery at the global level more difficult. Vaccine nationalism may also impede international cooperation in other policy areas (e.g., international regulation and taxation), and the confluence of these factors may exacerbate social tensions and political polarization. Geopolitical factors can also affect technological advances. For example, tensions over cyber security could fuel technology export restrictions and lead to broader technological decoupling (Garcia-Macia and Goyal 2020).

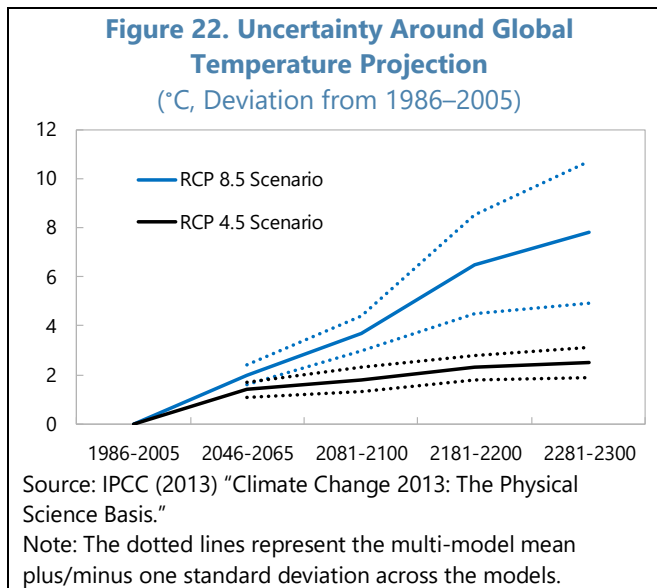
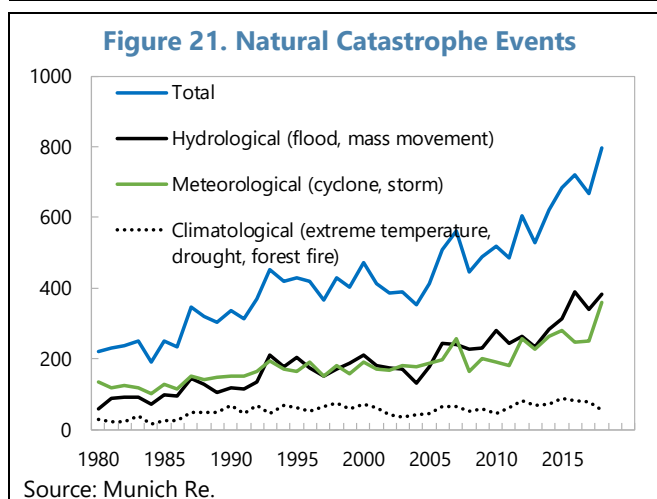
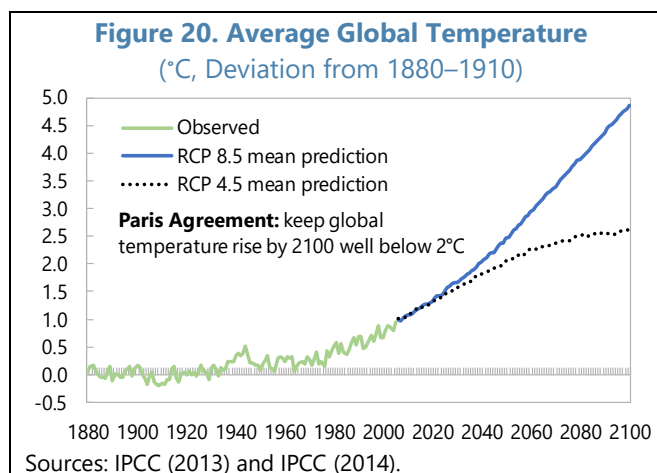
IMF Work

37. In the context of declining trust, governance and institutional issues will be more critical in ensuring sound economic policies and economic sustainability. The IMF is helping members strengthen governance through policy and technical advice and capacity development activities (IMF 2018g). Relatedly, since the beginning of the COVID crisis, the IMF has published many guidance notes on issues related to fiscal transparency and accountability, including those in pandemic spending ([IMF's Special Series on COVID-19](#)). IMF work has also emphasized the importance of socio-political context in implementing reforms (Ciminelli et al. 2019).

E. Climate Change⁹

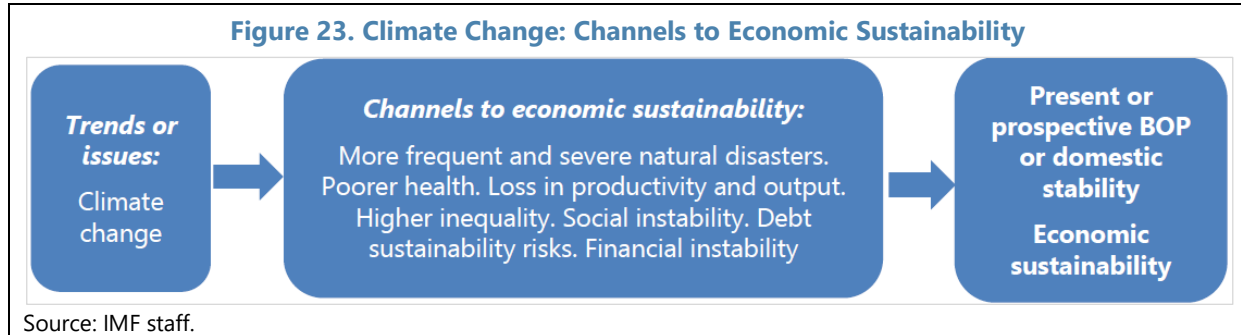
38. Climate change is an existential threat to the global economy. The Paris Agreement aims to keep a global temperature rise by 2100 well below 2°C above pre-industrial levels. However, under the “intermediate scenario” (RCP 4.5 scenario) by the Intergovernmental Panel on Climate Change (IPCC), for example, the global temperature would rise by more than 2°C by 2100 relative to the 1880–1910 average level (IPCC 2013, IPCC 2014) (Figure 20). This means that the Paris Agreement would not be met. Even worse, under an “unmitigated scenario” (RCP 8.5 scenario) by the IPCC, the average global temperature could rise by 4°C by 2100, and by 8°C by the end of the 23rd century. The latter scenario corresponds to a pace of temperature increase that is twice as fast as the average over the last half century. In the same “unmitigated” scenario, the average global sea level could rise by close to 1 meter by the end of the 21st century (IPCC 2019). As a result, natural disasters, which have been more regular, are expected to become more frequent still and severe (Figure 21).

39. Immediate action to mitigate and adapt to climate change is critical. Studies find that if no sufficient action is taken, uncertainty over future climate outcomes becomes larger. Specifically, uncertainty over future global temperatures is substantially larger under the “unmitigated scenario” (RCP 8.5) than under the “intermediate scenario” (RCP 4.5) (Figure 22). Thus, immediate action is necessary for a better and less uncertain future.



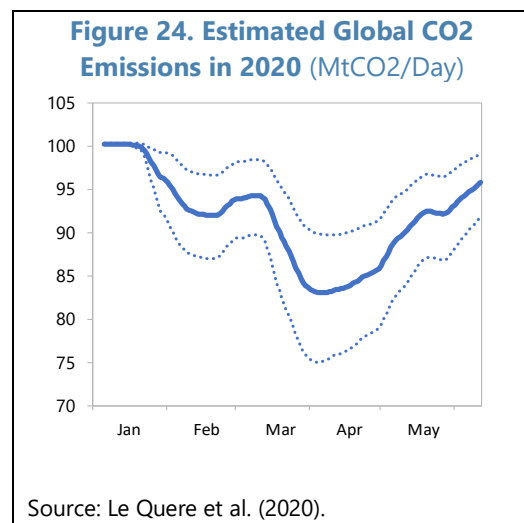
⁹ See IMF (2021b) for more details on climate change in Fund surveillance.

Channels to Growth, Stability, and Sustainability



40. Climate developments will pose threats to economic sustainability, with differential impacts across countries. In the “unmitigated scenario” where the average global temperature could rise by 4°C by 2100, the per-capita GDP of a representative low-income country would be 9 percent lower and the public debt as a ratio of GDP 5 percentage point higher by 2100, than in the absence of temperature increases (IMF 2017c). Some studies estimate an even larger economic impact.¹⁰ The impact of temperature rise differs across countries, larger for countries with relatively high average temperatures to start with. The impact on growth can arise through various channels, including reduced agricultural output, lower labor supply, productivity, and investment, deterioration in human health, and destruction of capital. In addition, income inequality may increase, as the poor living in vulnerable areas with fewer resources to cope with climate change would be particularly hard hit. Social instability may rise as resources become scarce, and climate migration may increase (World Bank 2018). Financial and fiscal instability would arise, with economic disruption, repricing of assets, and loan losses (IMF 2019j). Irrespective of the success of mitigation efforts, resource-rich countries could face transition risks during the shift to a low-carbon economy, and macroeconomic and structural policies could help manage the transition.

41. While the COVID crisis led to a temporary drop in CO₂ emissions, the impact is likely to be negligible without sustained mitigation efforts. Global CO₂ emissions decreased temporarily in April 2020, but containing climate change requires a sustained change in emissions (United Nations 2020b, Le Quere et al. 2020) (Figure 24). In this context, behavioral changes such as less travel and commuting, as well as more digitalization, could have a lasting impact on emissions. There is also an opportunity for a “green recovery” from the crisis if green investment is prioritized. However, some countries may retreat from



¹⁰ For example, Burke et al. (2015). With a larger country coverage including advanced economies, Khan et al. (2019) estimate that global real GDP per capita would fall by more than 7 percent by 2100 under the unmitigated scenario.

climate commitments to help quell the immediate crisis. Other economies may face limited fiscal space to implement policies to contain emissions.

42. There are a variety of policies to mitigate and adapt to climate change. Mitigation strategies, such as carbon pricing and alternative instruments to reduce CO₂ emissions, help contain the extent of climate change and facilitate a shift to a low-carbon economy. Adaptation strategies, such as building fiscal buffers and having resilient infrastructure, and developing markets and safety nets to share or transfer climate-related risks, help reduce the economic impact of climate change. An emergency response plan and social protection system should be established to mobilize resources efficiently against a natural disaster (IMF 2019k). Many policies fall under the IMF's areas of expertise, such as fiscal, financial, and structural policies.

43. There is a strong case for immediate action and a combination of policies that help reduce costs of climate policies. While mitigation and adaptation policies can be costly in terms of public finances in the short term, economic benefits of such policies over the long term may outweigh the costs (IMF 2017c, IMF 2019k, Marto et al. 2018). Complementary policies can help reduce the costs of climate policies (IMF 2019l). For example, a broadly adopted mitigation package, combining increasing carbon prices, green infrastructure investment and subsidy to renewables production, and compensation for households, can help reach net zero emissions by 2050, while boosting growth during the post-pandemic recovery (IMF 2020e). Also, mitigation policies may bring immediate co-benefits in terms of lower pollution and better health outcomes. Finally, standard cost-benefit analysis of climate policies may be insufficient in the face of a significant and fat-tailed uncertainty around future climate outcomes, including a catastrophe, and that may strengthen the case for early action (Weitzman 2009).

IMF Work

44. The IMF is working towards further integrating climate issues in macroeconomic and financial surveillance. A separate background paper for the Comprehensive Surveillance Review summarizes conceptual and strategic issues related to this (IMF 2021b). The WEO, the GFSR, the Fiscal Monitor, and Article IV consultations (e.g., the 2020 U.S. Article IV) increasingly cover climate issues. All ongoing Financial Sector Assessment Programs (FSAPs) would cover climate-related risks in their overall risk assessments and climate stress testing. Climate Change Policy Assessments (CCPAs) conducted jointly with the World Bank, inform Article IV consultation reports for some countries most vulnerable to climate change. Models to analyze macroeconomic and distributional implications of climate-related policies are in development. Approaches to climate risk stress testing and assessment of the financial regulations and supervision of climate risks are also in development. Work on international carbon price floors and border carbon adjustments is in progress. The debt sustainability framework for low-income countries includes stress tests to evaluate natural disaster risks (IMF 2017d). The EBA-lite methodology also considers natural disasters in the assessment of external positions (IMF 2019m). The IMF is also developing Climate Change Indicators Dashboard to improve availability of climate change data, and considering the integration of climate change data under a new Data Gaps Initiative. In some areas, collaboration with other organizations is important.

OPERATIONAL IMPLICATIONS¹¹

45. The above discussions suggest that having a broad perspective and a long-term surveillance horizon helps understand key trends and their impact on economic sustainability.

- A *broad perspective* is necessary, as issues such as inequality and socio-political developments sometimes involve non-economic factors. Also, the distributional implications of issues and policies are important in many cases.
- Key trends discussed in the previous section may have *interaction* with each other, and being aware of such an interaction would be key to policy considerations. For example, labor-saving effects of automation and digitalization may partly offset labor shortages due to aging, or trends in inequality may be influenced by technological changes when new technologies reward high-skilled workers more than low-skilled workers.
- A *long-term surveillance horizon* (longer than the standard surveillance horizon of five years and few years back) is useful when discussing economic sustainability, as some trends or issues are slow-moving (e.g., demographics, inequality) and some policies may involve inter-temporal tradeoffs that span medium- to long-term (e.g., climate policies).

46. Still, IMF surveillance should continue to be selective and focused. While there may be many macro-critical issues, the choice of an issue and the depth and timing of the coverage should reflect their relevance and urgency relative to others, considering country circumstances.¹² This is important also to avoid duplicating efforts with other organizations and overstressing the IMF's surveillance mandate. In this context, leveraging expertise of other institutions plays an important role in some cases, where the Fund lacks sufficient in-house expertise.

47. Having indicators related to economic sustainability would be key for the identification of macro-critical trends and issues and the analysis of their impacts on economic sustainability. The previous section discussed possible channels through which key trends and issues can influence growth, stability, and economic sustainability. Indicators on economic sustainability help understand these channels and reach well-informed policy advice. Since the indicators related to economic sustainability tend to be slow-moving, having a long time-series helps understand turning points.¹³

48. Judgement is required in identifying relevant indicators on a case-by-case basis, considering country circumstances. As in the choice of issues for IMF surveillance, the choice of

¹¹ Further operational implications will be considered in an updated guidance note for surveillance that staff will prepare to reflect the outcome of the CSR.

¹² As indicated in the ISD, exchange rate, monetary, fiscal, and financial sector policies will always be the subject of the IMF's bilateral surveillance.

¹³ At the same time, given the relatively long time lag for some data (e.g., indicators on income inequality), some private-sector data available more readily and at a high frequency could be useful in some cases.

indicators continues to reflect macro-criticality of the issues. Indicators available from other institutions and national authorities should continue to be utilized, including those contained in the Sustainable Development Goal (SDG) indicators (Box 2).¹⁴ Since relevant indicators are likely to differ across countries, requiring all IMF members to provide the same set of indicators to the IMF would not be practical at this point. At the same time, the Fund has launched initiatives to improve data availability in some areas, including the work on Climate Change Indicator Dashboard. Use of external data remains guided by the IMF's policy on the Third Party Indicators. Guidance on the use of indicators related to economic sustainability, in line with these policies, will be strengthened in the updated guidance note on surveillance.

Box 2. Examples of Indicators Related to Economic Sustainability

As discussed in the previous section, understanding the channels through which key trends and issues impact economic sustainability is important. This box describes examples of indicators that may be useful. The examples are not exhaustive, and relevant indicators may differ across countries.

1. Demographics	
Examples of Indicators	Examples of Data Sources
Population growth	UN World Population Prospects , 235 countries or areas, 1950-2100
Per-capita real GDP growth (real GDP growth minus population growth)	Real GDP per capita: IMF WEO Database Population growth: UN World Population Prospects UN Global SDG Indicators Database
Working-age population ratio, dependency ratio (elderly, child)	UN World Population Prospects , 235 countries or areas, 1950-2100
Labor force participation rate	ILO modelled estimates, by gender, 176 countries, since 2000
Life expectancy at birth	UN World Population Prospects , 235 countries or areas, 1950-2100
Infant mortality rate	UN World Population Prospects , 235 countries or areas, 1950-2100 UN Global SDG Indicators Database
2. Technological Change	
Examples of Indicators	Examples of Data Sources
Innovation	OECD Innovation Indicators UN Global SDG Indicators Database (R&D expenditure/GDP, medium and high-tech industry value added)
Automation	International Federation of Robotics (industrial robots and service robots)
Internet penetration rate	World Development Indicators , 207 jurisdictions, since 1990 UN Global SDG Indicators Database
Digital financial services	IMF Financial Access Survey , since 2007 (10 indicators on mobile money for 78 economies, 2 indicators on mobile and internet banking for 83 economies, 2 indicators on credit or debit cards for 130 economies) UN Global SDG Indicators Database

¹⁴ Many IMF reports already use the indicators listed in Box 2. For example, the 2019 U.S. Article IV report used social indicators to document high inequality and poverty rates, declining social mobility, and discouraging education and health outcomes (IMF 2019n). Many Article IV reports used indicators on inequality (IMF 2018f). Since some indicators are available with a long lag, complementing with other indicators with shorter lags could be considered.

Box 2. Examples of Indicators Related to Economic Sustainability (Continued)

Examples of Indicators	Examples of Data Sources
Financial inclusion	IMF Financial Access Survey , 189 jurisdictions, since 2004 (70 indicators on access to and use of financial services including gender-disaggregated data) UN Global SDG Indicators Database (accounts at financial institutions)
3. Inequality	
Examples of Indicators	Examples of Data Sources
Labor share of income	IMF WEO (April 2017), about 50 countries OECD Structural Analysis Database UN Global SDG Indicators Database
Per-capita disposable income, per-capita consumption	OECD Database , 37 OECD countries World Bank Adjusted Net National Income Per Capita World Bank Global Consumption Database Eurostat Database (per-capita consumption)
Income inequality	World Development Indicators , 217 jurisdictions, since 1979 World Bank, Poverty and Equity Data Portal , 169 economies, since 1974 World Inequality Database , since 1980 (longer for some countries) Standardized World Income Inequality Database , 196 economies, since 1960 OECD, Income Distribution Database , OECD countries, since 1974 UN Global SDG Indicators Database (people below 50% of median income)
Inequality of opportunity or social mobility	World Bank, Global Database on Intergenerational Mobility , 148 economies, 1940–89 cohort (absolute upward mobility, inter-generational persistence)
Gender inequality	OECD gender wage gap database, OECD countries, since 1970 World Economic Forum , Gender Gap Report, 144 countries, since 2006 UN Global SDG Indicators Database (hourly earnings and unemployment rate by gender, women in management positions or in national parliaments, government spending to sectors that disproportionately benefit women, the poor, and vulnerable groups)
Youth unemployment	OECD , OECD countries, since 1955 ILO , 176 countries, since 1991 UN Global SDG Indicators Database
Poverty rate	World Development Indicators , 217 jurisdictions, since 1979 World Bank, Poverty and Equity Data Portal , 169 economies, since 1974 OECD, Income Distribution Database , OECD countries, since 1974 UN Global SDG Indicators Database (population below poverty line)
Education, health, social protection	World Bank Human Capital Index , 157 countries, since 2017 World Development Indicators , 217 jurisdictions, since 1960 UN Global SDG Indicators Database (education, health, social protection spending)
Housing affordability	OECD Affordable Housing Database , OECD countries, since 2000
4. Climate Change	
<i>The IMF is developing Climate Change Indicators Dashboard, which covers many indicators below and more. See a separate CSR background paper for more details on climate change in Fund surveillance.</i>	
Indicators	Examples of Data Sources
Emissions of CO ₂ and other greenhouse gases	European Commission, Emission Database for Global Atmospheric Research , 209 jurisdictions, since 1970 UN Global SDG Indicators Database

Box 2. Examples of Indicators Related to Economic Sustainability (Concluded)

Indicators	Examples of Data Sources
Fossil fuel energy consumption, material footprint	World Development Indicators , 217 jurisdictions, since 1960 UN Global SDG Indicators Database
Carbon pricing, fossil fuel subsidies	World Bank, Carbon Pricing Dashboard UN Global SDG Indicators Database (fossil fuel subsidies)
Air quality	World Development Indicators (air pollution) UN Global SDG Indicators Database (mortality due to air pollution)
Natural disasters	UN Global SDG Indicators Database (direct economic loss, number of deaths) EM-DAT International Disaster Database
Green investment	UN Global SDG Indicators Database (investment in energy efficiency, related FDI)
Green bonds	Environmental Finance Bond Database
5. Composite Indicators	
Examples of Indicators	Descriptions of Indicators
UN Development Program, Human Development Index	A summary measure of human development, based life expectancy at birth, mean years of schooling, expected years of schooling, and gross national income per capita. 189 economies, since 1990
World Bank, Human Capital Index	A measure of human capital of the next generation, based on under-five mortality rate, expected years of schooling, and health
UN Environment Program, Inclusive Wealth Report: Measuring Sustainability and Well-being	A measure of country's inclusive wealth, based on the social value of natural capital, human capital, and produced capital. 140 countries, 1990-2014
World Bank, The Changing Wealth of Nations	Estimates of national wealth to monitor whether countries are on a sustainable growth path, based on produced capital, natural capital, human capital, and net foreign assets. 141 countries, 1995-2014
Jones, C. and P. Klenow, 2016, "Beyond GDP? Welfare across Countries and Time," American Economic Review	Measure of country-level economic welfare, based on a weighted average of consumption, within-country income inequality (proxy for uncertainty), leisure, and life expectancy (proxy for health). Used in IMF reports to advise rebalancing from investment to consumption in China (IMF 2019o) and structural reforms for sustainable and inclusive growth in Laos (IMF 2018h). See also Bannister and Mourmouras (2017)

References

- Acemoglu, D., 2020, "Antitrust Alone Won't Fix the Innovation Problem," *Project Syndicate*.
- Acemoglu, D. and P. Restrepo, 2019, "Automation and New Tasks: How Technology Displaces and Reinstates Labor," *Journal of Economic Perspectives*, Vol. 33, No. 2, p. 3-30.
- Acemoglu, D. and P. Restrepo, 2021, "Demographics and Automation," *Review of Economic Studies*.
- Adrian, T. and T. Griffoli, 2019, "The Rise of Digital Money," IMF FinTech Notes No. 19/001.
- Agostinelli, F., M. Doepke, G. Sorrenti, and F. Zilibotti, 2020, "When the Great Equalizer Shuts Down: Schools, Peers, and Parents in Pandemic Times," NBER WP 28264.
- Aiyar, S. and C. Ebeke, 2020, "Inequality of Opportunity, Inequality of Income, and Growth," *World Development*, 136, p. 1-10.
- Aiyar, S., C. Ebeke, and X. Shao, 2016, "The Impact of Workforce Aging on European Productivity," IMF WP/16/238.
- Aksoy, C., B. Eichengreen, and O. Saka, 2020, "The Political Scar of Epidemics," NBER WP 27401.
- Algan, Y., 2018, "Trust and Social Capital," in *For Good Measure: Advancing Research on Well-being Metrics beyond GDP*, OECD.
- Algan, Y. and P. Cahuc, 2014, "Trust, Growth, and Well-being: New Evidence and Policy Implications," in Aghion, P. and S. Durlauf (eds.), *Handbook of Economic Growth*, Vol. 2, Elsevier, North Holland, Amsterdam, p. 49-120.
- Alichì, A., K. Kantenga, and J. Sole, 2016, "Income Polarization in the United States," IMF WP/16/121.
- Amaglobeli, D. and S. Wei, 2016, "How to Assess Fiscal Implications of Demographic Shifts: A Granular Approach," IMF How to Notes.
- Anderson, D., B. Hunt, M. Kortelainen, M. Kumhof, D. Laxton, D. Muir, S. Mursula, and S. Snudden, 2013, "Getting to Know GIMF: The Simulation Properties of the Global Integrated Monetary and Fiscal Model," IMF WP/13/55.
- Autor, D., 2019, "Work of the Past, Work of the Future," *American Economic Review*, 109, p. 1-32.
- Backus, D., T. Cooley, and E. Henriksen, 2014, "Demography and Low-frequency Capital Flows," *Journal of International Economics*, 92, p. 94-102.
- Bannister, G. and A. Mourmouras, 2017, "Welfare vs. Income Convergence and Environmental Externalities," IMF WP/17/271.
- Berman, Y. and B. Milanovic, "Homoploutia: Top Labor and Capital Incomes in the United States, 1950-2020," World Inequality Lab Working Paper 2020/27.
- Bertay, A., L. Dordevic, and C. Sever, 2019, "Gender Inequality and Economic Growth: Evidence from Industry-level Data," IMF WP/20/119.

- Bourguignon, F., 2018, "Inequality of Opportunity," in *For Good Measure: Advancing Research on Well-being Metrics Beyond GDP*, OECD.
- Brussevich, M., E. Dabla-Norris, and S. Khalid, 2020, "Who will Bear the Brunt of Lockdown Policies? Evidence from Tele-workability Measures Across Countries," IMF WP/20/88.
- Brynjolfsson, E., D. Rock, and C. Syverson, 2017, "Artificial Intelligence and the Modern Productivity Paradox: A Clash of Expectations and Statistics," NBER WP 24001.
- Burke, M., S. Hsiang, and E. Miguel, 2015, "Global Non-linear Effect of Temperature on Economic Production," *Nature* 527, p. 235-239.
- Carton, B., E. Fernandez-Corugero, B. Hunt, and S. Voigts, 2020, "Demographic Transition and Pension Reforms: Adding Demographics to GIMF," IMF WP/20/153.
- Chetty, R., D. Grusky, M. Hell, N. Hendren, R. Manduca, and J. Narang, 2017, "The Fading American Dream: Trends in Absolute Income Mobility since 1940," *Science* 356 (6336), p. 398-406.
- Cihak, M. and R. Sahay, 2020, "Finance and Inequality," IMF SDN/20/01.
- Ciminelli, G., D. Fuceri, J. Ge, J. Ostry, and C. Papageorgiou, 2019, "Political Cost of Reforms: Fear or Reality?" IMF SDN/19/08.
- Clemens, M. and L. Pritchett, 2019, "The New Economic Case for Migration Restrictions: An Assessment," *Journal of Development Economics* 138, p. 153-164.
- Corrado, C., J. Haskel, C. Jona-Lasinio, and M. Iommi, 2016, "Intangible Investment in the EU and US before and since the Great Recession and its Contribution to Productivity Growth," in *Investment and Investment Finance in Europe*, Chapter 2, p. 73-102.
- Covac, M., 2013, "Income Inequality, Equality of Opportunity, and Intergenerational Mobility," *Journal of Economic Perspectives*, Vol. 27, No. 3, p. 79-102.
- Dabla-Norris, E., K. Kochhar, N. Suphaphiphat, F. Ricka, and E. Tsounta, 2015, "Causes and Consequences of Income Inequality: A Global Perspective," IMF SDN/15/13.
- Donaldson, J., C. Koulovatianos, J. Li, and R. Mehra, 2018, "Demographics and FDI: Lessons from China's One-child Policy" NBER WP 24256.
- Edwards, S., 2019, "On Latin American Populism, and Its Echoes Around the World," *Journal of Economic Perspectives*, Vol. 33, No. 4.
- Engbom, N., 2019, "Firm and Worker Dynamics in an Aging Labor Market," Federal Reserve Bank of Minneapolis Working Paper 756.
- Fabrizio, S., D. Furceri, R. Garcia-Verdu, B. Li, S. Lizarazo, M. Tavares, F. Narita, and A. Peralta-Alva, 2017, "Macroeconomic Structural Policies and Income Inequality in Low-Income Developing Countries," IMF SDN/17/01.
- Fabrizio, A., A. Fruttero, D. Gurara, L. Kolovich, V. Malta, M. Tavares, and N. Tchelishvili, "Women in the Labor Force: The Role of Fiscal Policies," IMF SDN/20/03, February 2020.

- Falato, A., D. Kadyrzhanova, J. Sim, and R. Steri, 2021, "Rising Intangible Capital, Shrinking Debt Capacity, and the U.S. Corporate Savings Glut," *Journal of Finance*.
- Faulkender, M., K. Hankins, and M. Petersen, 2019, "Understanding the Rise in Corporate Cash: Precautionary Savings or Foreign Taxes," *Review of Financial Studies*, Vol. 32, p. 3299–3334.
- Frost, J., L. Gambacorta, Y. Huang, H. Shin, and P. Zbinden, 2019, "Big Tech and the Changing Structure of Financial Intermediation," BIS WP No 779.
- Furceri, D., P. Loungani, J. Ostry, and P. Pizzuto, 2020, "Will Covid-19 Affect Inequality? Evidence from Past Pandemics," *Covid Economics* 12, p. 138-57.
- Gagnon, E., B.K. Johansson, and D. Lopez-Salido, 2016, "Understanding the New Normal: The Role of Demographics," Federal Reserve Board Finance and Economics Discussion Series.
- Garcia-Macia, D. and R. Goyal, 2020, "Technological and Economic Decoupling in the Cyber Era" IMF WP/20/257.
- Goldfarb, A. and D. Trefler, 2018, "AI and International Trade," NBER WP 24254.
- Goldin, C. and L. Katz, 2008, *The Race between Education and Technology*, Harvard University Press.
- Guiso, L., H. Herrera, M. Morelli, and T. Sanno, 2018, "Populism: Demand and Supply," CEPR DP 11871.
- Haskel, J. and S. Westlake, 2018, *Capitalism without Capital: The Rise of the Intangible Economy*, Princeton University Press.
- Heathcote, J., F. Perri, and G. Violante, 2020, "The Rise in Earnings Inequality: Does the Cycle Drive the Trend?" NBER WP 27345.
- Hsieh, C., E. Hurst, C. Jones, and P. Klenow, "The Allocation of Talent and U.S. Economic Growth," *Econometrica*, Vol. 87, No. 5, p. 1439-1474.
- Ianchovichina, E., 2018, "Eruptions of Popular Anger: The Economics of the Arab Spring and its Aftermath," World Bank MENA Development Report.
- Intergovernmental Panel on Climate Change (IPCC), 2013, "Climate Change 2013: The Physical Science Basis," Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.
- , 2014, "Climate Change 2014: Impact, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects," The Fifth Assessment Report.
- , 2019, *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate*.
- International Monetary Fund, 2012, "Decision on Bilateral and Multilateral Surveillance," July 2012.
- , 2015, "Structural Reforms and Macroeconomic Performance: Initial Considerations for the Fund" IMF Policy Papers.

- , 2017a, “Understanding the Downward Trend in Labor Income Shares,” *World Economic Outlook*, Chapter 3, April 2017.
- , 2017b, “Approaches to Macroeconomic Surveillance in Article IV Reports,” IMF Policy Papers, March 2017.
- , 2017c, “The Effects of Weather Shocks on Economic Activity: How Can Low-income Countries Cope?” *World Economic Outlook*, Chapter 3, October 2017.
- , 2017d, “Review of the Debt Sustainability Framework in Low-income Countries: Proposed Reforms,” IMF Policy Papers, September 2017.
- , 2018a, “The Future of Work in Sub-Saharan Africa,” *Regional Economic Outlook Sub-Saharan Africa*, Chapter 3, October 2018.
- , 2018b, *Fiscal Monitor*, April 2018.
- , 2018c, “The Bali Fintech Agenda,” IMF Policy Papers, October 2018.
- , 2018d, “Future of Work: Measurement and Policy Challenges,” Note to Group of Twenty
- , 2018e, “How to Operationalize Gender Issues in Country Work,” IMF Policy Paper, 2018.
- , 2018f, “How to Operationalize Inequality Issues in Country Work,” IMF Policy Papers, 2018.
- , 2018g, “Review of 1997 Guidance Note on Governance—A Proposed Framework for Enhanced Fund Engagement,” IMF Policy Papers, April 2018.
- , 2018h, “Lao People’s Democratic Republic: 2017 Article IV Consultation,” March 2018.
- , 2019a, “Demographic Headwinds in Central and Eastern Europe,” EUR Departmental Paper.
- , 2019b, “Macroeconomics of Aging and Policy Implications,” IMF Staff Note to the G20.
- , 2019c, “Japan: 2019 Article IV Consultation,” February 2020.
- , 2019d, “The Rise of Corporate Market Power and its Macroeconomic Effects,” *World Economic Outlook*, Chapter 2, April 2019.
- , 2019e, “Fintech: The Experience So Far,” IMF Policy Paper, June 2019.
- , 2019f, “G20 Report on Strong, Sustainable, Balanced, and Inclusive Growth.”
- , 2019g, “Germany: 2019 Article IV Consultation,” July 2019.
- , 2019h, *External Sector Report*, July 2019.
- , 2019i, “A Strategy for IMF Engagement on Social Spending,” IMF Policy Paper, June 2019.
- , 2019j, “Sustainable Finance,” *Global Financial Stability Report*, Chapter 6, October 2019.
- , 2019k, “Building Resilience in Developing Countries Vulnerable to Large Natural Disasters,” IMF Policy Papers, June 2019.
- , 2019l, “How to Mitigate Climate Change,” *Fiscal Monitor*, October 2019.

- , 2019m, “The Revised EBA-Lite Methodology,” IMF Policy Papers, May 2019.
- , 2019n, “United States: 2019 Article IV Consultation,” June 2019.
- , 2019o, “People’s Republic of China: 2019 Article IV Consultation,” August 2019.
- , 2020a, “The Macroeconomic Effects of Global Migration,” *World Economic Outlook*, Chapter 4, April 2020.
- , 2020b, “Digital Money Across Borders: Macro-Financial Implications,” IMF Policy Papers, October 2020.
- , 2020c, *Regional Economic Outlook: Asia and Pacific*, October 2020.
- , 2020d, “How to Operationalize IMF Engagement on Social Spending during and in the Aftermath of the COVID-19 Crisis,” IMF How to Notes 20/02.
- , 2020e, “Mitigating Climate Change—Growth and Distribution-friendly Strategies,” *World Economic Outlook*, Chapter 3, October 2020.
- , 2021a, “A Fair Shot,” *Fiscal Monitor*, Chapter 2, April 2021.
- , 2021b, “Integrating Climate Change into Article IV Reports: Conceptual and Strategic Issues,” Background Paper for the Comprehensive Surveillance Review.
- Jones, C. and P. Klenow, 2016, “Beyond GDP? Welfare across Countries and Time,” *American Economic Review*, Vol. 106, No. 9, p. 2426-2457.
- Kahn, M., K. Mohaddes, R. Ng, H. Pesaran, M. Raissi, and J. Yang, 2019, “Long-Term Macroeconomic Effects of Climate Change: A Cross-Country Analysis,” IMF WP/19/215.
- Karahan, F., B. Pugsley, and A. Sahin, 2019, “Demographic Origin of the Startup Deficit,” NBER WP 25874.
- Kopp, E., D. Leigh, S. Mursula, and S. Tambunlertchai, 2019, “U.S. Investment Since the Tax Cuts and Jobs Act of 2017,” IMF WP/19/120.
- Lakner, C., N. Yonzan, D. Mahler, R. Aguilar, and H. Wu, 2021, “Updated Estimates of the Impact of COVID-19 on Global Poverty: Looking Back at 2020 and the Outlook for 2021,” World Bank.
- Le Quere, C., R. Jackson, M. Jones, A. Smith, S. Abernethy, R. Andrew, A. De-Gol, D. Willis, Y. Shan, J. Canadell, P. Friedlingsten, F. Creutzig, and G. Peters, 2020, “Temporary Reduction in Daily Global CO₂ Emissions During the COVID-19 Forced Confinement,” *Nature Climate Change*, 10, 647-654.
- Liang, J., H. Wang, and E. Lazear, 2018, “Demographics and Entrepreneurship,” *Journal of Political Economy*, 126, p. 140-196.
- Magud, N., A. Spilimbergo, and A. Werner, 2019, “Populism in Latin America: Economic and Institutional Effects,” IMF WP.

- Marrero, G. and J. Rodriguez, 2013, "Inequality of Opportunity and Growth," *Journal of Development Economics*, 104, p. 107-122.
- Marto, R., C. Papageorgiou, and V. Klyuev, 2018, "Building Resilience to Natural Disasters: An Application to Small Developing States," *Journal of Development Economics*, 135, p. 575-586.
- McGrattan, E., K. Miyachi, and A. Peralta-Alva, 2018, "On Financing Retirement, Health, and Long-term Care in Japan," IMF WP/18/249.
- Mojon B. and X. Ragot, 2019, "Can an Ageing Workforce Explain Low Inflation?" BIS WP No. 776.
- Narayan, A., R. Van der Weide, A. Cojocaru, C. Lakner, S. Redaelli, D. Mahler, R. Ramasubbaiah, S. Thewissen, 2018. *Fair Progress?: Economic Mobility Across Generations Around the World*, World Bank.
- Neri, G., M. Gross, and S. Neri, 2019, "On Secular Stagnation and Low Interest Rates: Demography Matters," *International Finance*, Vol. 22, Issue 3.
- Organisation for Economic Co-operation and Development (OECD), 2014, "Addressing the Tax Challenges of the Digital Economy," OECD/G20 Base Erosion and Profit Shifting Project.
- , 2017, "OECD Guidelines on Measuring Trust."
- Ostry, J., A. Berg, and C. Tsangarides, 2014, "Redistribution, Inequality, and Growth" IMF SDN/14/02.
- Ostry, J., R. Loungani, and A. Berg, 2019, *Confronting Inequality*, Columbia University Press.
- Peralta-Alva, A., X. Tam, X. Tang, and M. Tavares, 2018, "The Welfare Implications of Fiscal Consolidations in Low-income Countries," IMF WP/18/146.
- Praet, P., 2019, "Market Power: A Complex Reality," Remarks, European Central Bank, March 2019.
- Protzer, E., 2019, "Social Mobility Explains Populism, Not Inequality or Culture," Harvard University Center for International Development Working Paper No. 118.
- Rajan, R., 2019, *The Third Pillar: How Markets and the State Leave the Community Behind*, Penguin Press.
- Sahay, R., U. Allmen, A. Lahreche-Revil, P. Khera, S. Ogawa, M. Bazarbash, and K. Beaton, 2020, "The Promise of Fintech: Financial Inclusion in the Post Covid-19 Era," IMF Departmental Paper.
- United Nations, 2020a, *World Social Report 2020*.
- , 2020b, *United in Science 2020*.
- Weitzman, M., 2009, "On Modeling and Interpreting the Economics of Catastrophic Climate Change," *Review of Economics and Statistics*, Vol. 91, Issue 1, p. 1-19.
- World Bank, 2018, "Groundswell: Preparing for Internal Climate Migration."
- Yared, P., 2019, "Rising Government Debt: Causes and Solutions for a Decades-Old Trend", *Journal of Economic Perspectives*, Vol. 33, No. 2, p. 115-140.