

Are Pro-Productivity Policies Fit for Purpose?

Productivity Drivers and Policies in G-20 Economies

Authors:

Bart van Ark^x

The Productivity Institute

Klaas de Vries

The Conference Board

Dirk Pilat^y

The Productivity Institute

Date:

September 2023

The Productivity Institute

Working Paper No. 038

*University of Groningen

†Valencia Institute of Economic Research

Key words

productivity, G20, total factor productivity

Authors' contacts:

bart.vanark@manchester.ac.uk

Acknowledgements

We are grateful to Nick Crafts (University of Essex), Abdul Erumban (University of Groningen), Bishwanath Goldar (Delhi School of Economics) for helpful suggestions on our country studies, and to two anonymous referees and participants in the 6th Asia KLEMS conference (June 2023) in Lonavala (India) and the Arthur Lewis Lab/TPI Conference on Productivity Revolutions: Past and Future (June 2023) in Manchester (UK) for helpful suggestions.

Copyright

© B. van Ark, K. de Vries, D. Pilat (2023)

Suggested citation

B. van Ark, K. de Vries, D. Pilat (2023) *Are Pro-Productivity Policies Fit for Purpose?* Working Paper No. 038, The Productivity Institute.

The Productivity Institute is an organisation that works across academia, business and policy to better understand, measure and enable productivity across the UK. It is funded by the Economic and Social Research Council (grant number ES/V002740/1).

The Productivity Institute is headquartered at Alliance Manchester Business School, The University of Manchester, Booth Street West, Manchester, M15 6PB. More information can be found on [The Productivity Institute's website](https://www.productivityinstitute.com). Contact us at theproductivityinstitute@manchester.ac.uk

Abstract

In this paper we look at productivity trends, drivers of productivity growth and pro-productivity policies across G-20 economies since 1970. Our main question is whether pro-productivity policies as applied in previous decades are still applicable in the light of the slowdown in productivity across most of the G-20 since the 2010s.

The first part of the paper analyses the sources of labour productivity growth and suggests distinctly different productivity growth dynamics between three sub-groups of G-20 economies. These three subgroups include a “leading but slowing” group (mostly the most developed economies), a “lagging but growing” group (economies which have started from low productivity levels but have shown rapid growth) and a “muddling through” group (economies that have shown some but no sustained improvement in productivity performance).

Despite historical differences in growth paths, we observe a widespread slowdown in labour productivity growth across all three groups since the 2010s. The slowdown is underpinned by lower (or even negative) TFP growth. Moreover, the growth rate of capital deepening (capital per worker hour) has also begun to level off. These recent trends make it necessary to take a close look at whether the range and mix of policies that worked in the past are still the right ones to revert the current slowdown.

The second part of the paper therefore develops a typology of pro-productivity policies distinguishing four categories: the accumulation of the factors of production, markets and resource allocation, technological and structural change, and internationalisation. To better understand the diversity in policies and the underlying institutions across the G-20 economies, we provide a more detailed analysis of productivity and related policies for four countries: Brazil, India, South Korea and the UK.

The third part of the paper combines our insights from the first and second parts by answering our main question whether pro-productivity policies are still fit for purpose in the light of the recent slowdown in productivity growth. We argue that investment and technological change need strengthening to support a revival of productivity

growth. This requires (1) more focus on policies combining technological progress with knowledge diffusion and absorptive capacity of firms and ecosystems; (2) a strengthening of investment-related policies, focused notably on intangibles and public investment; and (3) human capital-related policies enabling workers to better adjust to the structural changes associated with technological change, especially in the context of an aging workforce in most G-20 economies.

We conclude with a plea for stronger institutions and capabilities that allow for continuous and dynamic learning about pro-productivity policies across countries and over time. In particular, future innovation and industrial policies should better support inclusive productivity and sustainable growth.

Table of Contents

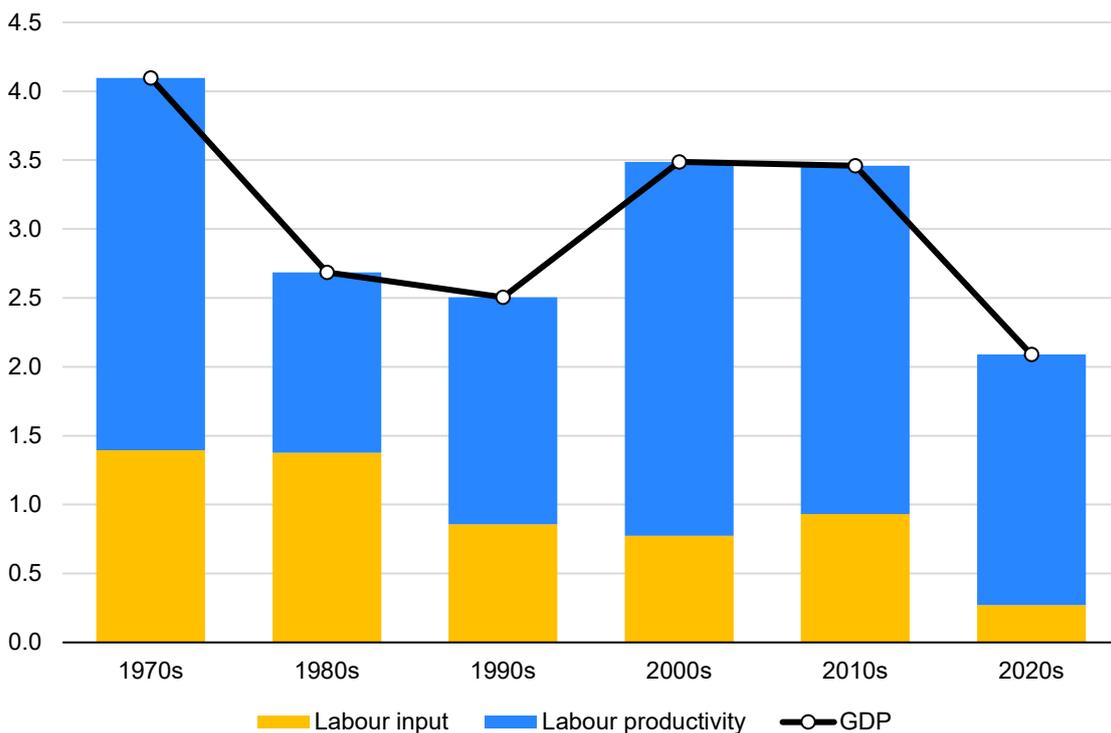
1. Introduction	2
2. Long-term productivity performance trends across the G-20 since the 1970s.....	5
3. The drivers of growth.....	10
Growth accounting: the role of capital deepening vis-à-vis total factor productivity	10
A brief digression of growth accounting.....	12
Growth regressions: exploring the underlying drivers of productivity growth	13
4. A Typology of Pro-Productivity Policies.....	17
Policies aimed at the accumulation of the factors of production.....	19
Policies aimed at technological and structural change.....	21
Policies aimed at markets and market functioning	22
Policies aimed at internationalisation	23
Policies aimed at institutions and frameworks: the foundations of productivity.....	24
5. Productivity and Pro-Productivity Policies: Four Case Studies.....	25
Brazil	27
India	30
South Korea.....	35
United Kingdom	39
Reflection on country experiences	43
6. Implications for the Productivity Slowdown since the 2010s	44
Technological change and diffusion.....	45
Investment – intangibles, public and green investment.....	45
Human capital.....	46
7. The future of pro-productivity policies.....	46
References.....	48
Appendix A – Comparing capital series across datasets	57
Appendix B – Background Tables	60

1. Introduction

The central role of productivity for economic growth has been recognised for many years. Labour productivity growth is the main determinant of growth in incomes and wages and over the past two centuries, strong productivity growth has helped to lift billions of people out of poverty. Productivity is also the only sustainable source of growth in the long run, as it refers to our ability to better combine available factors of production (capital, labour, resources, knowledge) and technology to produce output and income. Moreover, while productivity is not a direct measure of wellbeing, productivity growth reduces the constraints on scarce resources, including public finances, and thus facilitates government actions to enhance wellbeing.

Measuring and examining productivity growth is therefore important. Figure 1 depicts data from the 2023 release of The Conference Board's Total Economy Database. It decomposes the growth rate of global GDP (covering 131 countries) into the contributions of labour input growth (where possible measured as total hours worked or otherwise as persons employed) and labour productivity growth. The figure shows that productivity growth by far outstrips the growth rate of labour input growth, and that the latter's contribution has declined over time.

Figure 1: Decomposition of global GDP into the contributions of labour input and labour productivity growth, average annual growth rate, %

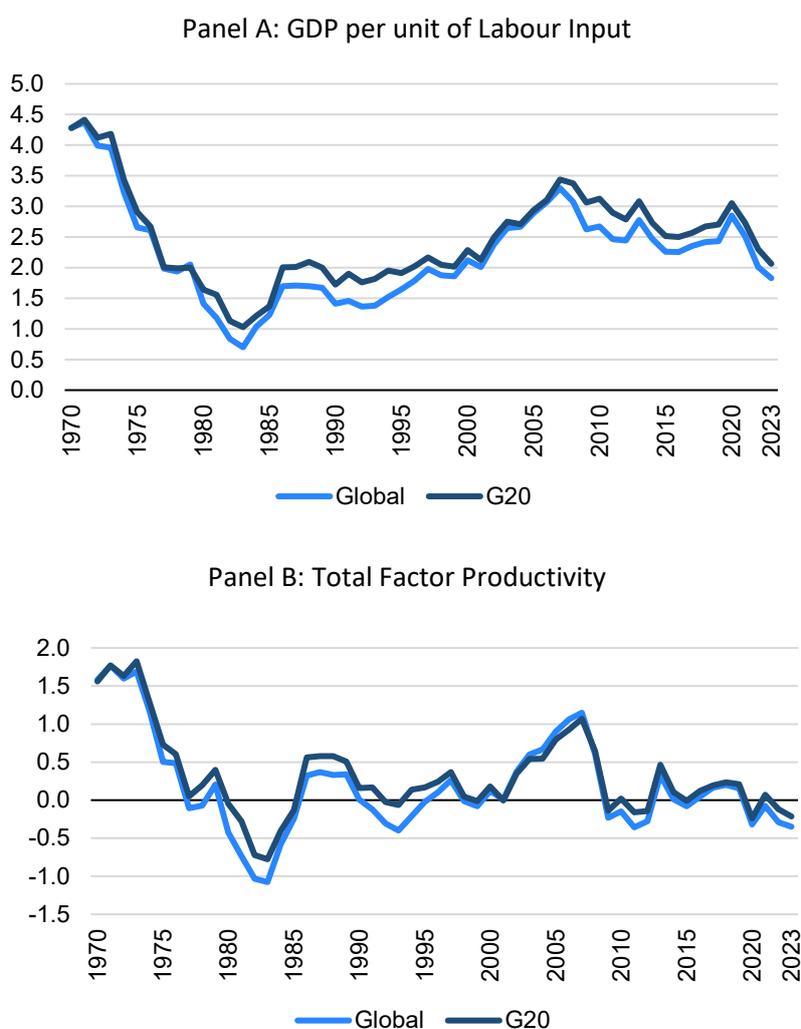


Note: Labour input growth refers to working hours wherever available, otherwise, persons employed). All figures are expressed as log growth rates. 2020s refer to 2020, 2021, 2022 and 2023 (projected). Source: The Conference Board Total Economy Database™, April 2023.

Figure 1 also shows that global growth of labour productivity was particularly strong during the 1970s and then again during the first decade of the 21st century. However, it was much weaker during the 1980s and 1990s, and showed signs of slowing since the 2010s. Panel A in Figure 2, which presents 4-year average growth rates, shows the latest slowdown started around 2008 and dipped

further during the early 2020s (2020-2023).¹ The COVID-19 pandemic obviously played a large role in recent years. In 2020, labour productivity growth picked up sharply as many governments mandated typically low productivity activities (mainly personal consumer services) to shut down temporarily. In 2021, when those sectors gradually reopened, there was a large negative adjustment to labour productivity (De Vries et al, 2021).

Figure 2: Growth of GDP per Unit of Labour Input and of Total Factor Productivity, Global Economy and G-20, 4-year trailing average % growth, 1970-2023



Note: G-20 refers to the 19 member countries of the G-20 excluding the EU as an entity (but including France, Germany and Italy). Labour input growth refers to working hours wherever available, otherwise, persons employed. All figures are expressed as log growth rates. 2020s refer to 2020, 2021, 2022 and 2023 (projected). *Source:* The Conference Board Total Economy Database™, April 2023

Panel B in Figure 2, which shows annual growth rates of total factor productivity, shows that productivity adjusted for the usage of labour and capital (machinery, equipment and structures) together stalled during the 2010s and was even weaker than during the 1980 and 1990s. Despite a short lived rebound in the early 2000s, TFP growth has hovered around zero since. In contrast to labour

¹ The Conference Board’s estimates of April 2023 include a projection for 2023.

productivity growth, growth in total factor productivity collapsed in 2020 due to much unused capital but then rebounded in 2021 though with no signs of a reversal in the long-term trend.

Our focus in this paper is on the drivers of productivity growth in the long-term in relation to the application (or lack of it) of pro-productivity policies since the 1970s. We tease out how the sources of productivity growth, notably the contributions of capital deepening and total factor productivity, have changed over time and between countries and regions at different levels of development. We then look at what kind of policies have been applied to influence those sources of growth. Our aim is to extract lessons from this analysis that can help shape a more adequate and consistent policy framework for tackling the global productivity slowdown we are facing today.

This paper covers the 19 countries which are member of the Group of 20 (G-20). Together these countries represent around 73% percent of global GDP and are therefore an adequate representation of global developments.² Given the large diversity of growth and policy experiences between countries, we divide the G-20 countries for our empirical analysis into three main groups, namely (1) a group of countries which are leading in terms of productivity levels but slowing in terms of growth (“leading but slowing”), which includes the most developed economies in the G-20 (Australia, Canada, France, Germany, Italy, Japan, UK and the USA), (2) a group of countries that has started from lower levels of productivity but has seen a rapid increase (“lagging but growing”) including China, India, Indonesia, South Korea and Turkey, and (3) a group of countries that has remained weak in terms of productivity levels and growth rates (“muddling through”), including Argentina, Brazil, Mexico, Russia, Saudi Arabia and South Africa.

The paper proceeds as follows. In Section 2 we describe labour productivity performance and its contribution to growth for the G-20 and the three groups just described. In Section 3, we turn to the drivers of productivity growth by first looking at the contributions of capital deepening and total factor productivity. We also assess the evidence on productivity drivers from how the results from these typical growth accounting exercises compare with evidence from growth regressions. The latter allows for a wider range of pro-productivity drivers to be analysed, including the role of innovation, trade, macro-policy factors, policies and regulations as well as structural and micro-economic factors.

Based on our empirical analysis in Sections 2 and 3 we find that in the “leading but slowing” group, capital deepening and TFP were joint drivers of labour productivity growth during the 1970s and 1980s. However, TFP started to weaken substantially as of the 1980s followed by less capital deepening during the 2010s. In the “lagging but growing” group, economies such as those of China, India and South Korea achieved some catch-up on levels of labour productivity in the “leading but slowing” group. The catch-up was initially mainly driven by faster capital accumulation even though faster TFP growth did eventually contribute as well during the 1990s and 2000s. While capital accumulation has remained strong in the “lagging but growing” group throughout the 2010s, TFP growth has much weakened recently. Finally, in the “muddling through” group initial growth through capital accumulation was not sustained and negative TFP growth was a major drag for most of the 50+ year period. Human capital made a small but positive contribution to labour productivity growth in all three groups.

Overall, it seems that the conventional mechanisms of technological change and innovation (either measured as being disembodied through TFP growth from scientific progress, new technologies or

² The official GDP share of the G-20 includes the European Union and amounts to almost 85% of global GDP, see: <https://www.g20.org/en/about-g20/>. Our focus is on the 19 G20 member countries as we exclude the European Union as an entity from our analysis, and only include the three EU member states which belong to the G-20, i.e., France, Germany and Italy.

better business practices, or as being embodied in capital through investment in machinery and equipment, ICT or R&D) as drivers of labour productivity growth have not been working as well since the 2010s. This raises the question whether pro-productivity policies as applied in previous decades are still applicable today.

Section 4 develops a typology of pro-productivity policies which have been widely accepted as supportive of either capital accumulation or total factor productivity (or both) over the past half century. We group those policies in four categories focused on the accumulation of the factors of production (e.g. policies focused on stimulating investment or strengthen education and skills); markets and resource allocation (e.g., policies focused on improving the functioning of product and labour markets); technological and structural change (e.g. policies focused on strengthening innovation); and internationalisation (e.g. policies to enhance openness to trade or foreign direct investment). We also recognise that those policy areas are built on a set of foundational policies linked to the establishment of institutions and frameworks for pro-productivity policies.

Section 5 proceeds with a more in-depth analysis of four case studies taken from the G-20 sample, namely Brazil, India, South Korea and the United Kingdom. These countries have had quite different growth experiences and, over time, adopted a rather idiosyncratic mix of policies with characteristics that are typical of low-, middle- and high-income economies. The four case studies suggest that there is no single pathway to productivity growth and countries need to develop their own strategies linked to their own starting points and economic structures.

In Section 6 we return to the topic of the slowdown in G-20 productivity growth over the past decade, and consider lessons learned from the long-term analysis of the sources of productivity growth and pro-productivity policies. We argue that policies for both investment and technological change need strengthening to support a revival of productivity growth. Firstly, science and technology policies should be more explicitly linked to the diffusion of knowledge and the strengthening of absorption capacity of companies. Secondly, investment-related policies should concentrate more on the productivity benefits from intangibles and public investment. And thirdly, policies to strengthen human capital remain crucial in enabling workers to adjust to the structural changes associated with rapid technological change, especially as the workforce in many G-20 countries is rapidly ageing.

In the concluding Section 7, we identify several steps for further research on productivity and pro-productivity policies. We note that the predominant thinking about pro-productivity has shifted away from the traditional “Washington consensus” to focus on improving and shaping the functioning of markets (nationally and globally). Markets and other mechanisms remain crucial to ensure an efficient allocation of what mostly are scarce resources, including skilled labour, sources of finance and organisational capabilities. We also stress the need for giving greater consideration to inclusive and sustainable aspects of productivity growth. Finally, we note the importance of institutions and capabilities for productivity growth and emphasize the need for further learning about pro-productivity policies across countries and over time.

2. Long-term productivity performance trends across the G-20 since the 1970s

Our quantitative and empirical analysis for the productivity performance of the G-20 is based on The Conference Board’s Total Economy Database. This database, which has been developed in the 1990s at the University of Groningen and has been continued by The Conference Board since 2008, covers measures of productivity growth and levels for 131 countries, as well as decompositions of output

growth in the contributions of labour quality, capital deepening and total factor productivity (see Section 3).

We focus our analysis on the 19 countries that are members of the G-20 (i.e., excluding the European Union as a single entity). We divide those countries into three groups based on their long-term productivity growth rates since 1970. There are eight developed G-20 members (Japan, US, UK, France, Germany, Italy and Canada – the G7 plus Australia) in the “leading levels but slowing growth”-group. Five G-20 members (China, India, Turkey, Indonesia, and South Korea) are in the “lagging levels but accelerating growth”-group, and the remaining six G-20 members (Russia, Brazil, South Africa, Mexico and Saudi Arabia) are in the “muddling through”-group not showing neither much growth in productivity and a divergence of productivity levels relative to the leading group.

Table 1 presents the growth rates and the relative levels of GDP per hour worked, which determined the grouping we chose.

Table 1: Growth in labour productivity (GDP per hour worked), annual average growth rates

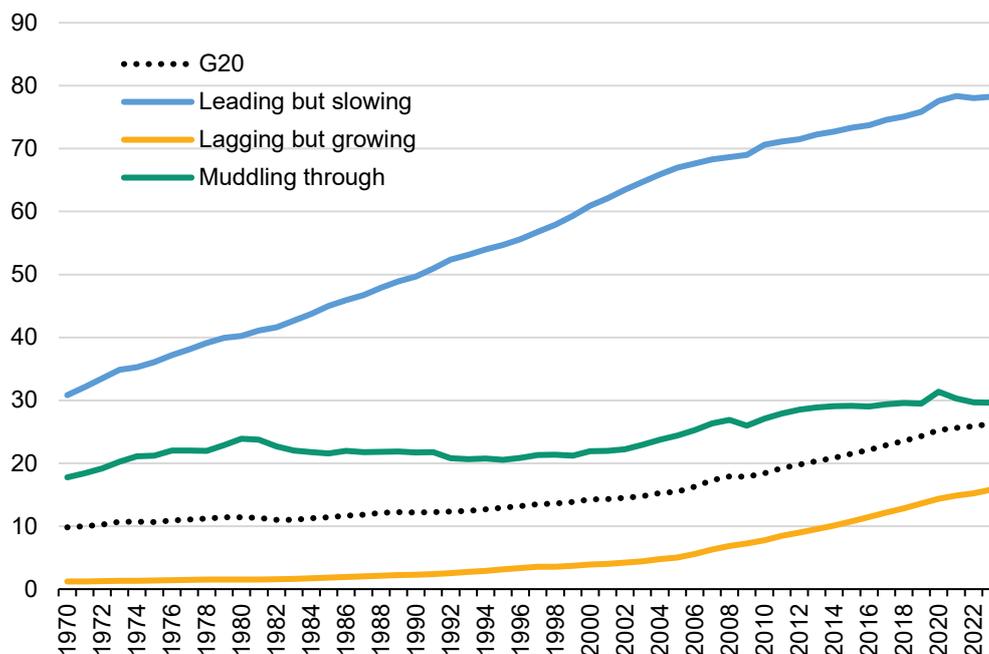
	Period average growth rates						GDP per hour worked, relative to the US (=100)	
	1970s	1980s	1990s	2000s	2010s	2020s	1970	2022
G-20 Total	2.8	1.6	1.9	2.9	2.8	2.1	25	29
Leading but slowing	2.9	2.0	1.9	1.5	0.9	0.7	78	89
Japan	4.7	3.6	2.3	1.0	1.1	0.9	42	62
United States	1.7	1.4	1.7	2.2	0.8	0.9	100	100
United Kingdom	3.0	2.0	2.0	1.3	0.6	0.2	81	85
France	4.1	2.9	1.8	1.0	0.9	-0.7	78	94
Germany	3.9	2.3	2.2	0.9	1.2	0.5	79	100
Australia	1.8	1.2	2.2	1.2	1.2	1.9	88	86
Italy	3.9	1.7	1.4	0.0	0.4	0.4	87	81
Canada	1.9	0.9	1.4	1.1	1.0	0.9	94	77
Lagging but growing	2.9	4.2	5.1	6.9	6.2	4.0	3	17
China	4.1	6.2	7.8	9.2	7.1	5.5	1	20
India	0.4	3.2	3.9	5.7	6.6	1.6	3	10
Turkey	4.1	3.3	1.7	3.5	3.4	3.0	30	74
Indonesia	3.6	2.4	1.7	3.1	3.4	1.6	10	17
South Korea	5.9	5.4	6.4	4.7	2.9	1.6	11	58
Muddling through	2.7	-0.6	-0.6	1.9	0.9	0.2	45	34
Russian Federation	2.5	0.9	-3.1	4.7	2.0	0.9	43	38
Brazil	4.7	0.1	0.5	1.1	0.9	-0.1	26	22
South Africa	2.4	-0.6	-0.7	2.7	0.5	1.4	45	32
Argentina	2.0	-1.8	2.1	1.1	0.9	0.7	60	41
Mexico	1.4	-1.5	0.6	0.3	0.7	-1.3	76	36
Saudi Arabia	2.8	-8.3	0.9	-0.6	-1.5	0.2	n.a.	69

Note: Productivity growth rates are indicated on a colour scale ranging from red (firmly negative) to green (firmly positive); Estimates of hours worked are not available for Russia, Saudi Arabia and South Africa for the period before 1992, 2005 and 2001 respectively, in which case the trend in persons employed is used. 2020s refer to 2020, 2021, 2022 and 2023 (projected).

Source: The Conference Board Total Economy Database™, April 2023.

Figure 3 shows the relative levels of labour productivity, showing the catching up of the “lagging but growing”-group, though coming from a very low level as this group mostly represents very labour intensive economies. In countries the “muddling through”-group has higher levels of labour productivity than the “lagging but growing”-group, as most countries in the former group are more capital intensive. But they also exhibits a divergence of productivity levels relative to the “leading but slowing” group.³

Figure 3: G-20 Labour Productivity Levels (US\$ per hour worked, in 2017 PPP terms)



Note: Data are in constant 2022 prices, with the 2022 price level converted using PPPs (updated from the ICP 2017 round). See also footnote 3. Economies are aggregated using data on nominal GDP in purchasing power parity terms.

Source: The Conference Board Total Economy Database™, April 2023.

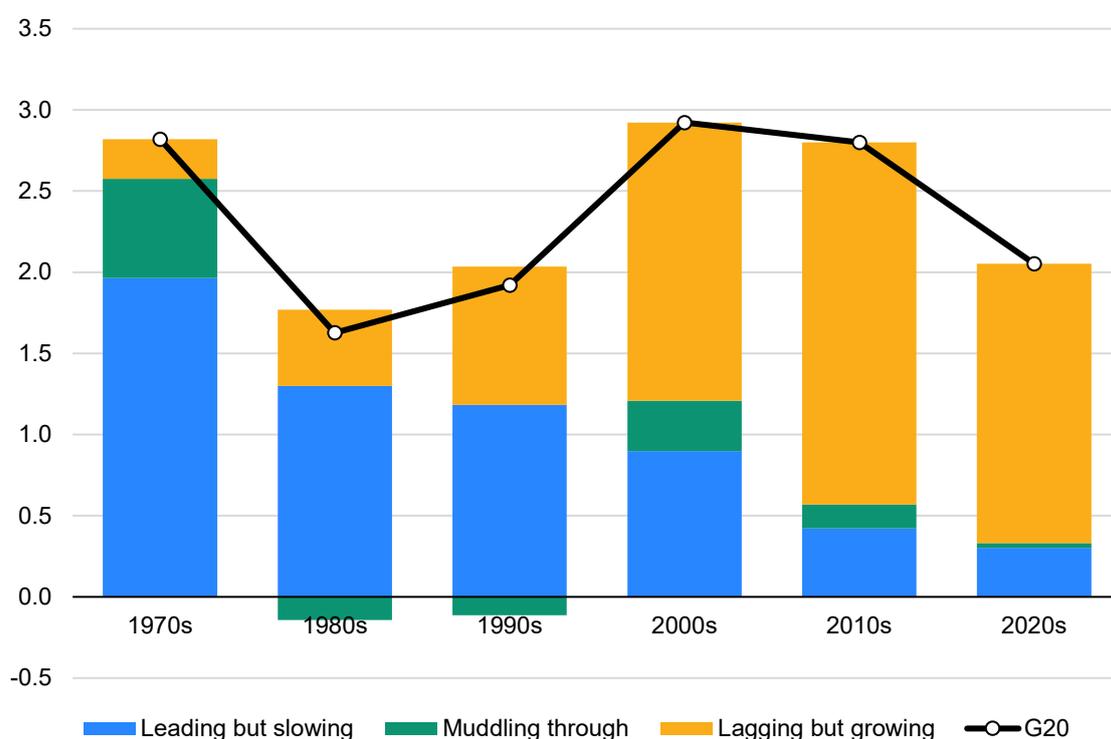
One can obviously debate whether the grouping of any country is characteristic of the actual situation at any point in time. For example, Japan and the UK are not leading in terms of productivity levels, but their levels are clearly higher than in those of the countries in the “lagging but growing”-group. Recently, South Korea might perhaps be seen as a member of the “leading but slowing”-group but, as we will argue later, it still has many characteristics of a typical “catching up”-economy. Finally, parts of the Mexican economy, notably the NAFTA-integrated part of manufacturing, could be characterized as “growing” rather than “muddling through”, but very large parts of its economy have shown little movement for decades. In Appendix B, Table 1 we present a comparison of productivity growth rates across three sub-periods (1970-89; 1990-2009; 2010-23) which shows a remarkable consistency in

³ The Conference Board Total Economy Database uses the latest benchmark of purchasing power parities available from the World Bank (in this case for 2017) to convert output to a common currency base, taking account of relative price differences in goods and services between countries (Table 1 and Figure 3). However, the extrapolation of benchmark levels using time series of real output or income in national currency can cause serious distortions to the comparative levels in earlier or later years, especially in countries that undergo rapid structural change. See, for example, Feenstra, Inklaar and Timmer (2015).

ranking, especially for the five countries in the “lagging but growing”-group which are systematically ranked as the top-5 growth economies.

Figure 4 further exhibits the changing contributions to G-20 labour productivity growth of the three groups across the decades. In the 1970s the eight developed economies in the “leading but slowing”-group, still accounted for 2 percentage points of the 2.8 percent annual productivity growth for the G-20. By the 2010s, this had fallen to only 0.4 percentage points of (almost the same) 2.8 percent. In contrast, the 0.2 percentage point contribution of the five economies in the “lagging but growing”-group during the 1970s increased to 2.2 percentage point during the 2010s. Finally, the productivity contribution of the muddling through-group was almost negligible throughout the 50+ years, except for the 1970s and early 2000s.

Figure 4: Contributions from country groups to total G-20 labour productivity growth, 1970s-2020s



Note: 2020s refer to 2020, 2021, 2022 and 2023 (projected).

Source: The Conference Board Total Economy Database™, April 2023.

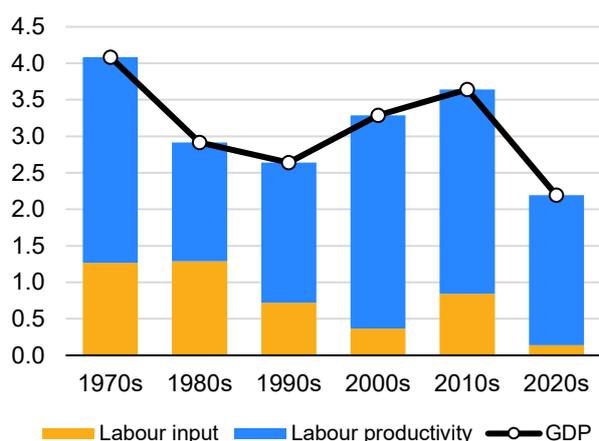
Figure 5 shows four panels decomposing GDP growth in the contribution of labour input (total hours worked) and labour productivity (GDP per hour) growth. While labour productivity growth has been the dominant driver of GDP growth for the aggregate G-20, the role of labour input has been relatively large during the 1970s, the 1980s, the 1990s and also during the 2010s (Panel A: G-20). The recovery in labour input growth during the 2010s is largely driven by the most advanced economies (Panel B: “leading but slowing”) due to an increase in the participation of women and older workers in the labour force.

The countries in the “lagging but growing” group have much contributed to the long-term decline in the contribution of labour input to growth as their initial demographic dividends have gradually waned and gradually been overtaken by falling fertility and longer schooling years (even though India remains a notable exception in this group). The largest contributions from labour input to GDP growth are

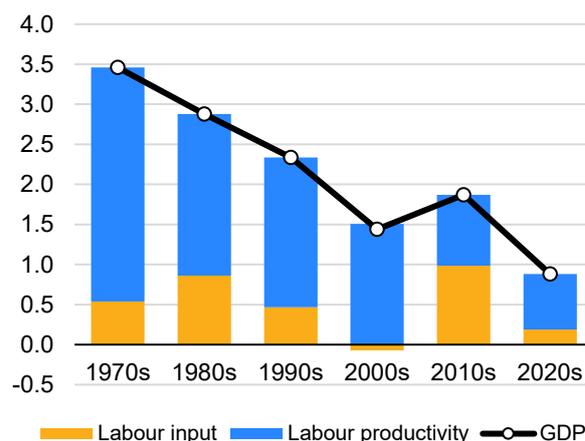
coming from countries in the “muddling through” group as the growth paths of those countries are based on the “low road” of weak productivity growth in combination with the creation of many low productive jobs. In contrast, countries in the “lagging but growing”-group have increasingly relied on the “high road” model of strengthening productivity growth while the increase in jobs gradually transitioned to fewer but higher-quality and more productive jobs.

Figure 5: Decomposition of GDP growth in contributions of labour inputs (total hours worked) and labour productivity (GDP per hour worked)

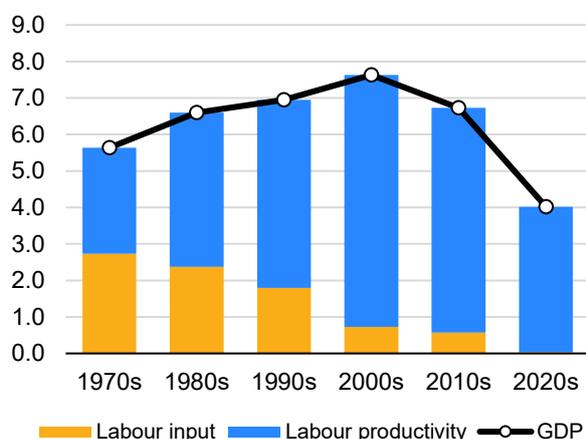
Panel A: All G-20 economies



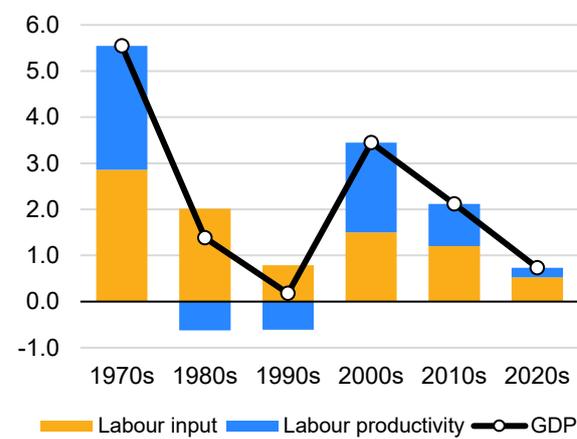
Panel B: “Leading but Slowing” Group



Panel C: “Lagging but growing” group



Panel D: “Muddling Through” Group



Note: For country grouping, see Table 1. 2020s refer to 2020, 2021, 2022 and 2023 (projected).

Source: The Conference Board Total Economy Database™, April 2023.

In the coming decades the contribution of labour input to GDP is projected to fall to levels well below what we have seen in recent decades, due to ageing populations and falling fertility rates creating labour shortages in many countries (OECD, 2021a). Investment in labour saving technologies will therefore be key to sustain future growth. The next section considers how the various drivers of productivity growth have changed over time across the G-20.

3. The drivers of growth

Growth accounting: the role of capital deepening vis-à-vis total factor productivity

We begin our analysis of sources of growth within the long tradition of growth accounting, which has provided an important foundation for the analysis of economic growth in attributing growth to the main factors of production (capital, labour and intermediate inputs – KLEMS) and to total productivity growth.⁴ Over time, growth accounts have been refined with more detailed analysis of the contribution of new capital assets, notably Information and Communication Technology (ICT) (Jorgenson and Stiroh, 1995; Fernald, 2015).

The growth accounts from The Conference Board measure the contribution of labour, capital and TFP to labour productivity growth.⁵ Firstly, labour quality refers to changes in the educational attainment of workers and is calculated using data on wages and employment by educational attainment. Secondly, capital deepening refers to the amount of capital (machinery, equipment including ICT, structures, etc.) which workers have at their disposal and is measured as the capital stock over the number of hours worked. And, thirdly, total factor productivity (TFP) refers to the ratio of output over the combined inputs of capital and labour, weighted at the income share of both factors of production.

Figure 6 provides a simplified growth decomposition of labour productivity growth into just three major growth sources in the G-20 and the three sub-groups as described in the previous section. Panel A provides the results for the G-20 aggregate, showing a large contribution of capital deepening to labour productivity growth compared to the contributions of labour quality and TFP, especially for the last three sub-periods (2000s, 2010s and early 2020s). While capital deepening is still accounting for the largest part of labour productivity growth for all G-20 economies together, the growth rate of capital deepening has begun to level off. Panel B, which shows the results for the “leading but slowing” group shows that capital deepening and TFP were joint drivers of labour productivity growth during the 1970s and 1980s. However, from the 1980s onwards TFP growth started to weaken substantially and the contribution of capital deepening slowed during the 2010s. Economies in the “lagging but growing” group (Panel C), such as those of China, India and South Korea, achieved some convergence with the first group. This was initially mainly driven by capital accumulation, even though eventually TFP growth contributed as well during the 1990s and 2000s, but has weakened since. Finally, in the “muddling through” group (Panel D) initial growth driven by capital accumulation was not sustained and negative TFP growth was a major drag for most of the 50+ year period.

Overall, it seems that the conventional mechanisms of technological change and innovation as drivers of labour productivity growth have not been working as well in recent decades. TFP growth, which represents disembodied technological change, as it originates from scientific progress, new technologies and better business practices, amongst others, has been virtually absent since the 2010s. We also observe weaker performance in technological change embodied in capital, as obtained through the separate measurement of capital services relative to stocks in machinery and equipment, structures, ICT hardware and software and telecommunications equipment.

⁴ For a review of the history of growth accounting in the long term, see Crafts and Woltjer (2021).

⁵ See De Vries and Erumban (2022) for a detailed description of sources and methods used in The Conference Board Total Economy Database, available at: <https://www.conference-board.org/data/economydatabase/total-economy-database-methodology>. In recent years, capital input in countries’ national accounts has been extended to include Research and Development and other Intellectual Property, which has been included in The Conference Board series as far back as official data were available.

The combined failure of slowing TFP and stagnant capital deepening to support aggregate labour productivity growth raises doubts about the current growth path for the global economy, and leads to the question whether the pro-productivity policies as they have emerged over time are still fit for purpose. However, on their own, growth accounts cannot say that much about the underlying drivers of growth, including the determinants of TFP growth. Indeed, the measure of total factor productivity, which is derived as a residual from the GDP growth measures minus the combined contributions of factors of productivity (and in some studies also intermediate) inputs, has been dubbed as “a measure of our ignorance” (Abramovitz, 1993). To better inform policy making and to learn more about the underlying drivers of productivity growth, complementary approaches are needed, such as cross-country growth regressions.

Figure 6: Decomposition of labour productivity (GDP per hour worked) growth into contributions of labour quality, capital deepening and total factor productivity.



Note: For country groupings, see Table 1. 2020s refers to 2020, 2021, 2022 and 2023 (projected).

Source: The Conference Board Total Economy Database™, April 2023

A brief digression of growth accounting

It should be noted that The Conference Board measures reflect relatively large contributions of capital deepening to productivity growth. This is mainly due to the use of harmonised price indices for ICT reflecting a larger adjustment for quality improvements than the official data (Corrado and Byrne, 2016). As a result, technological change embodied in ICT is more rigorously attributed to the measured capital deepening, thus reducing the growth of TFP reflecting disembodied technological change. Appendix A provides a discussion of how The Conference Board's capital series compare to other sources, such as Penn World Tables.

However, the use of alternative ICT price indices does not have a large impact on our observation that the role of TFP growth relative to capital deepening has fallen:

- First, the quality adjustment to the deflators of ICT investment in The Conference Board data account for a small part of the relatively large role of the overall growth in capital deepening. For example, the average annual contribution of capital deepening to labour productivity for the G-20 would have been 1.6 instead 1.8 percentage points for the entire period 1970-2023 in case we would not have adopted our preferred ICT deflator. Even for the countries in the “leading but slowing”-group during the period 1990-2006, for which the quality adjustment mattered most, the contribution of capital deepening, would only have come out at 1.1 instead of 1.5 percentage points.
- Our discussion of growth regression studies later in this section suggests that R&D, intangibles, human capital, and ICT capital have historically generated significant spillover effects, potentially making a positive contribution to aggregate TFP growth (see, for example, Bassanini, et al., 2001; Soete, et al., 2022; Cardona, et al., 2013). However, these positive spillover effects may have declined over the past few decades, limiting TFP growth. It is also important to recall that our GDP measures only include some intangible assets (notably software and R&D). So-called “missing capitals”, notably intangible assets which are not included in national accounts (such as financial product development, organisational capital, business training or marketing assets) might still provide a positive impetus to GDP growth and therefore end up in TFP (Martin, 2021; Corrado et al., 2022).⁶
- Third, embodied technological change (as measured in capital deepening) may have positive spillovers on TFP growth, but there could be other factors that have a negative impact on aggregate TFP growth, leading to a modest overall contribution of TFP. This could include, for example, variations in capacity utilisation (although this is unlikely to be an important factor over a long period), changes in the misallocation of capital and labour (Jones, 2022), as well as measurement errors.

Our conclusions on the declining role of TFP growth across the G-20 are also not in contradiction to the notion that TFP growth has become increasingly important in explaining differences in productivity levels across countries (Gallardo-Albarran and Inklaar, 2021). Similarly, work on growth accelerations allocate a larger role to TFP than to capital deepening (Hausmann et al., 2005; Koopman and Wacker, 2023). These studies make it all the more concerning that TFP has weakened across the board in recent decades and that capital deepening has not made up for it.

⁶ For the latest EUKLEMS-IntanProd data including intangibles, see <https://euklems-intanprod-lee.luiss.it/> and Bontandini (2023). Based on those data, Van Ark et al. (2022) finds that despite the decline in the absolute contribution of intangible capital to productivity growth, intangible assets keep providing a large contribution compared to tangible capital assets.

Growth regressions: exploring the underlying drivers of productivity growth

Growth regressions support the importance of factor accumulation, notably investment in capital and human resources, and point to some of the potential drivers of total factor productivity growth, such as investment in R&D. However, they also point to some of the underlying policies and conditions that support economic growth, such as macroeconomic stability; the development of financial markets that support capital accumulation and its allocation across the economy; openness to international trade and investment; and policies and regulations more generally.

Growth regressions were a particularly dynamic area of research in the 1990s and early 2000s, inspired by the new growth literature (Lucas, 1988; Romer, 1990) and the growing availability of large cross-country data sets, such as the Penn World Tables (Summers and Heston, 1988) that were subsequently expanded to include a range of structural and policy explanatory variables, e.g., by Barro (1991).⁷

While much of the original growth regressions literature has explored growth patterns across countries at all levels of economic development, others have mainly looked at the more advanced economies (Bassanini, et al., 2001; Bouis, et al., 2011) or specific regions of the world (for example, Batranca, et al., 2021, for Africa).⁸ Recently, most regression studies explore specific factors and policies that are considered to affect productivity growth. These studies also allow for the inclusion of industry and business dynamics and may also include aspects of the demand side.

Without reviewing the literature in extensive detail, the following results emerge from this work, distinguishing between some of the early cross-country analysis and the recent more specific work:⁹

- **(Conditional) convergence:**

- Cross-country growth regressions tend to find no evidence of absolute convergence – where countries experience higher growth if they have a lower starting point in terms of the level of GDP per capita. However, they do find evidence of so-called conditional convergence, where countries with lower starting points have higher growth rates if certain other variables – such as the initial level of human capital (Barro, 1991), the rate of capital accumulation (Mankiw, Romer and Weil, 1992), or the initial level of financial development (King and Levine, 1993) – are held constant (Barro, 2003).
- More recently, Rodrik (2013) finds that, unlike aggregate economies, (formal) manufacturing industries exhibit strong convergence in labour productivity, unconditional on the countries' institutions or policies. This has led to a new stream of thought on the importance of structural reallocation from non-convergence to convergence activities, and the critical requirement for countries to deploy policies that compensate for market and government failures that block growth enhancing structural transformation.

- **Investment:**

- The investment rate is one of the variables most significantly correlated with the rate of economic growth (Sala-i-Martin, 1994), which appears fully consistent with growth

⁷ Unlike growth accounting, regressions do not impose the national parameters (factor shares) of the factors of production in estimating their contribution but estimate these parameters by using cross-country variation in the data to better understand its determinants (Temple, 1999).

⁸ Bassanini, et al. (2001) review almost 30 such studies conducted for OECD countries from 1987 to 2000.

⁹ Several studies have gone beyond structural and policy variables and introduced other dimensions, such as religion or colonial history, in the growth analysis (Sala-i-Martin, 1997). Since such dimensions are not directly relevant for the policy-focused discussion in this paper, they are not considered here.

accounting studies. For OECD countries, the partial elasticity of output to (physical) capital is relatively consistent with the capital share in national accounts data, although it is considered on the low side (Bassanini, et al. 2001).

- Recent work has zoomed in more specifically on the role of ICT. For example, Cardona, et al. (2013) review some 30 studies undertaken between 1994 and 2011 that have estimated the elasticity of investment in ICT relative to labour productivity and find values of 0.05-0.06 on average, that increased over the review period. Another review by Biagi (2013) also finds that ICT capital is an important determinant of GDP and productivity growth, with some studies finding evidence of spill-over effects of ICT investment on TFP growth. Investment in broadband infrastructure is also found to have positive impacts on productivity growth, with some evidence of positive network externalities that could contribute to positive spillovers on TFP growth (Koutroumpis, 2009).

- **Human capital:**

- Human capital is another variable strongly correlated with economic growth; countries with a better educated work force tend to grow faster (Barro, 1991; Sala-i-Martin, 1994; Easterly and Levine, 2001). For OECD countries, this role of human capital accumulation is consistent with growth accounting studies, but human capital appears to have considerably higher returns than expected, which implies it may benefit from positive externalities, e.g., linked to its contribution to technological progress and innovation (Bassanini, et al., 2001, Bassanini and Scarpetta, 2002).
- More recently, the important role of human capital for growth and productivity was deepened in more specific studies (Männasoo, et al., 2018). However, the evidence from growth regressions is mixed, partly linked to measurement difficulties (Fuente and Domenech, 2006), and because of difficulties in measuring the quality of human capital rather than just the quantity, as measured by educational attainment (Islam, et al., 2014). Studies adjusting for the quality of educational attainment find robust evidence on the impact of human capital on productivity, however (Fuente and Domenech, 2006; Islam, et al., 2014), which aligns with the micro-economic evidence on the link between human capital and productivity (Criscuolo, et al., 2021). Recent work by Jedwab et al. (2023) finds work experience contributes equally to human capital accumulation and economic development than just education.

- **Investment in R&D:**

- For advanced economies, investment in R&D has been found to be a strong driver of productivity growth (Bassanini, et al., 2001; Bouis, et al., 2011). A wide range of studies have explored the impacts of business and public investment in R&D on productivity (Guellec and Van Pottelsberghe, 2004; Khan and Luintel, 2006, Haskel and Wallis, 2013). A comprehensive review (OECD, 2015b) found an average R&D output elasticity of about 0.1, gross rates of (private) returns to R&D of about 0.2 to 0.3, higher than most other capital, and significantly higher social returns, pointing to strong spillover effects of about three-fifths of the social return to R&D.
- The latest studies find that both business and public investment have positive impacts on productivity growth, where countries with strong complementarities between public and private R&D experience the largest impact of extra public R&D on TFP (Soete, et al., 2022). This study also found that countries with a relatively low share of foreign funding of R&D,

and a high share of basic R&D in business R&D combined with a higher public R&D intensity tended to have the highest spillover effects.

- **Intangible assets.**

- Several studies have also estimated the contribution of intangible assets, beyond R&D, to productivity growth (e.g., Chen, et al, 2016). Some studies find that these assets have important productivity spillovers and an estimated output elasticity that is larger than its factor share (Corrado, et al., 2017, 2021). Moreover, Corrado, et al. (2017) find strong complementarities between investment in ICT capital and investment in intangible assets.
- Most studies of intangibles and productivity have focused on advanced economies, raising some questions on the applicability of these results to all G20 countries. Available data for G20 countries suggests that the share of investment in intangibles in GDP differs by a ratio of 5 to 1 between top investors such as the US, France and UK, and low investors such as Mexico, Indonesia and Argentina (OECD, 2021b; Demmou and Franco, 2021).

- **Public investment and infrastructure.**

- Another category of investment that has been the subject of productivity analysis is public investment, notably investment in infrastructure. For example, a large cross-country study by Straub (2008) finds positive spillover effects of infrastructure on growth by stressing the complementary with private investment, e.g., in enabling firms to invest more in their own productive equipment, reducing commuting times and promoting health and education. Calderón, et al. (2015) estimate the contribution of infrastructure to output across a large cross-country data set and find a long-term output elasticity between 0.07 and 0.10.
- Other studies (Warner, 2014) do not find long-term positive effects of public investment and caution against generalising the evidence from successful experiences when public capital helped overcome critical bottlenecks. Many studies also emphasize the quality of investment in achieving positive returns and the need for sound management practices and governance frameworks, reflecting the risks of delays and cost overruns, amongst others (IMF, 2020).

- **Business dynamics, leaders and laggards.**

- Over the past decade, the analysis of business dynamism through microlevel firm data has provided major new insights into productivity growth, complementing growth accounting and growth regression studies (e.g., Decker, et al., 2016; Akcigit and Ates, 2019; Berlingieri, et al., 2020). This work has been difficult to capture in growth regressions.
- However, recent work has generated cross-country datasets of business dynamics, enabling regression analysis. Berlingieri, et al. (2020), for example, point to several structural characteristics and policy factors that affect the ability of lagging firms to improve productivity, including workers' skills, financial constraints and lack of absorptive capacity.

- **Policies and regulation:**

- Several policy variables have been found to be correlated with economic growth (Easterly and Levine, 2001). For OECD countries, where the relevant data are available, barriers to

entrepreneurship, barriers to trade and investment, and the strength of patents right protection have been found to affect economic growth (Bouis, et al., 2011).

- **Product market regulations:** Based on a comprehensive set of indicators on product market regulations in OECD countries, several studies have found that anti-competitive regulations reduce TFP levels (Egert, 2016), including in upstream sectors affected by these regulations (Bourlès, et al., 2010), also by their impact on firm churning (Anderton, et al., 2020).
- **Financial markets:** King and Levine (1993) and Levine and Zervos (1993) found that indicators of financial development are strongly associated with long-run growth. This result also appears to hold for more advanced economies (Bassanini, et al., 2001).
- **Trade and openness:** Variables linked to trade and openness have been found to affect economic growth in several studies (e.g., Easterly and Levine, 2001), including for OECD countries (Bouis, et al., 2011).
- **Macro-economic policy:** Several cross-country studies have found that macro-economic variables, such as the size of government (Easterly and Levine, 2001) or the inflation rate affect economic growth, including in OECD countries (Bassanini, et al., 2001; Bouis, et al., 2011). Indicators of fiscal policy were also found to affect growth rates, notably for lower-income countries (Minier, 2007).

As discussed above, growth accounting has its limitations in informing policy analysis. Growth regressions avoid making restrictive theoretical assumptions, notably perfect competition, constant returns to scale and the absence of externalities. Moreover, the residual TFP measure is not all that helpful from a policy perspective unless we better understand the underlying drivers of TFP growth, which growth regressions can help with.

At the same time, growth regressions cannot tell us the whole story of the causes of productivity booms and busts across different parts of the world either. Like growth accounting studies, they mainly provide a set of stylised facts on economic growth. While they help point to some of the policies affecting growth, they don't say much about the institutional frameworks and factors that underpin such policies (Durlauf, 2009).¹⁰ Growth regressions also suffer from well-known shortcomings of regression analysis in general, including model uncertainty, endogeneity, outliers, omitted variables and overall lack of robustness. As regards to endogeneity, Rodrik (2012) argues that an exogenous treatment of policies impacting on growth is problematic when governments are pursuing specific economic or political objectives.

In sum, we argue that a combination of growth accounting and growth regressions, is likely to provide the best insights in the determinants of growth and productivity. Country-specific studies of growth and productivity, e.g., as undertaken by national productivity commissions, often apply several complementary methodologies to examine the drivers of productivity in a specific country, including growth accounting, growth regressions, firm-level analysis, economic modelling and qualitative analysis, with the aim to provide a comprehensive assessment of the many dimensions of productivity and economic growth (Pilat, 2023).

Next, we will address how the combined results of growth accounting, growth regressions and specific country analysis has directly informed the direction of pro-productivity policy making across the G-20.

¹⁰ Durlauf (2009) provides a useful overview and critique of cross-country growth regressions.

4. A Typology of Pro-Productivity Policies

Given the importance of productivity for growth and development, governments have been exploring and implementing a wide range of policies to strengthen productivity growth. To further explore the link between productivity and policy, we develop a typology for pro-productivity policies and apply this to countries at different levels of economic development.¹¹ Our typology builds on work on productivity-related policies undertaken by the OECD, the World Bank, national productivity commissions and many others and covers policies that are typically used by governments to influence productivity growth (Albrizio and Nicoletti, 2016; Cusolito and Maloney, 2018; Pilat, 2023). As already discussed in the previous section, an empirical relationship between many of these policies and productivity growth has been established. However, some other policy areas (e.g., migration policies) are also included in our typology as they are part of the broader policy toolbox that countries have at their disposal to influence productivity and are often explored in national productivity-related studies.

We propose four categories of pro-productivity policies, where we distinguish between the direct and indirect drivers of productivity, and the policies related to those drivers (Pilat, 2023). Two of our categories are mainly aimed at the direct drivers of productivity and two mainly at the indirect drivers (Figure 7):

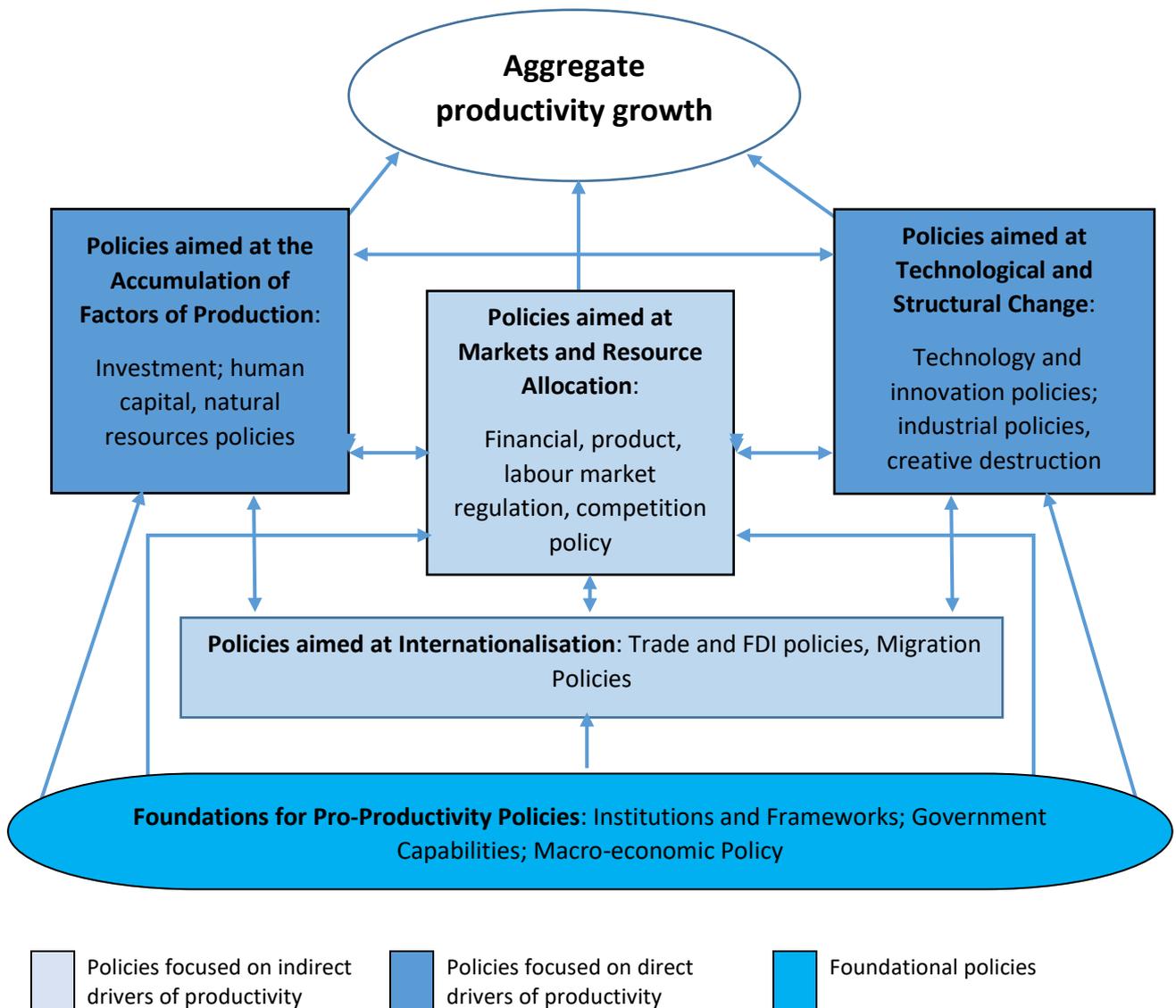
1. Policies aimed at the Accumulation of Factors of Production (primarily direct drivers)
2. Policies aimed at Markets and Resource Allocation (primarily indirect drivers)
3. Policies aimed at Technological and Structural Change (primarily direct drivers)
4. Policies aimed at Internationalisation (primarily indirect drivers)

Policies linked to factor accumulation and technological and structural change are directly aimed at the main drivers of economic and productivity growth, i.e., capital input, labour input and total factor productivity and thus correspond to the direct drivers of productivity. Policies linked to markets and resource allocation act more indirectly on productivity growth, as they influence the incentives for firms to increase productivity (e.g., through the pressure of competition) and because they affect the allocation of resources in the economy. Policies aimed at internationalisation also act more indirectly as they influence all other categories of pro-productivity policies, e.g., in facilitating the accumulation of the factors of production, notably investment, but also by supporting market development, fostering competition, and affecting technological and structural change.

The four policy categories are built on institutions and frameworks which are not pro-productivity policies per se, as they do not directly or indirectly influence the drivers of productivity growth. However, they provide the foundation for most other pro-productivity policies in creating the necessary frameworks for such policies. Sound institutional frameworks, for example, support transparency in policy design, the development of evidence-based policies, and coordination between different policies (Dutz, 2018). Capable governments are key to the design and implementation of policies, to ensuring their coherence, and to policy consistency and predictability over time (Cusolito and Maloney, 2018). And sound macroeconomic policies provide the stability and fiscal space upon which other productivity-enhancing policies can be built.

¹¹ Policy frameworks and typologies related to productivity were previously developed by OECD (2015a), Albrizio and Nicoletti (2016) and Cusolito and Maloney (2018), amongst others.

Figure 7: Framework for pro-productivity policies



Source: Authors elaboration.

There are many interactions between these categories of policy. For example, policies linked to factor accumulation are linked to policies influencing the markets for the factors of production, e.g., financial markets for investment, and labour markets for human capital, and to resource allocation, e.g., the impact of public investment in transport infrastructure. And policies linked to creative destruction (or business dynamics) are closely linked to regulatory and competition policies. These interactions are particularly important to consider when governments are considering specific combinations of policies to strengthen productivity, some examples of which are given in section 5 of this paper.

While this typology can be applied to all countries, we assume that as countries move to more advanced stages of production during the process of economic development, the mix of policies is likely to change and require more advanced capabilities to reflect changing drivers of productivity growth. For example, important drivers during the early phase of economic development, such as low labour costs, large shifts in economic structure from agriculture to industry and services, advantageous demographics, or FDI-led growth tend to wane over time (OECD, 2014). At the same time the mix of investment often shifts from tangible to intangible investment, and growth drivers

linked to human capital, innovation and internationalisation become more important and tend to become more complex.

This shift in policy mix can be illustrated by identifying key policies for three stylised countries:

- Country A: A low-income economy, in the early stages of economic development.
- Country B: A middle-income economy that has successfully managed to industrialise and increase income and productivity levels, e.g., through investment in fixed and human capital, but is now faced with the challenge of moving to a higher level of income and productivity.
- Country C: An advanced economy, at high levels of economic development and lower growth rates, faced with the challenge of adapting to the needs of a more complex, technologically advanced economy.

Obviously, these stylised examples don't depict stages that countries necessarily must go through in their process of economic development or the various phases of productivity growth. Our G-20 country grouping demonstrates countries undertake different growth journeys. The context for pro-productivity policies can also depend on the size of a country, its history, resource abundance etc. For example, some countries in the "lagging but growing" group have moved very quickly in the early stages of economic development, sometimes even by "leapfrogging" and "piggybacking" by adopting certain policies and practices that are also being used by the most advanced economies. For example, already in the 1960s, Korea was actively drawing on the skills and experience of its nationals living abroad, during a stage of its economic development when most countries still suffer from "brain drain". Or countries sometimes move from a cash economy straight to developing electronic banking systems instead of a costly network of physical banks. Other countries in the "muddle through" group have grown more slowly, sometimes being constrained by external factors such as their high dependence of natural resource exports or by political or macroeconomic instability.

In addition, the context for economic development has changed over time, and countries that start their process of economic development today face different challenges than those that industrialised early, such as new global rules, greater interdependence, new technologies, etc. (OECD, 2019a). This implies that the lessons learned from early industrialising countries in the 1960s and 1970s cannot be automatically applied to today's global environment.

Finally, we stress that policies for productivity are not quite the same as policies for economic development, although there is significant overlap. Development policies are broader and comprise policies to address poverty and inequality; increase people's quality of life and wellbeing; or improve social inclusiveness or environmental sustainability, for example (OECD, 2019b). However, strong productivity growth provides an important underpinning for these broader policies, as it generates the resources for public and private actions supporting broader economic and social development.

[Policies aimed at the accumulation of the factors of production](#)

Economic growth tends to be driven by the accumulation of the factors of production, notably tangible, intangible and human capital. The management of other productive factors, such as land and natural resources is also important, notably for countries with abundant or very limited natural resources, and even more in the context of climate change. Policies in this area may change as the economy develops and production becomes more advanced and complex. Key policies in this area include:

- **Investment policies.** Investment policies can focus on fostering business investment; public investment (e.g., in infrastructure); specific components of investment, e.g., intangible investment, investment in ICT capital or venture capital; or investment in specific firms, such as SMEs. As economies develop the mix of investment may change, with more focus on intangible investment, equity investment, and advanced public infrastructure. Policies to encourage the (re-)allocation of capital to its most productive uses may also become more important over time. Policies at the sub-national level play an important role too; in OECD countries, about 60% of public investment took place at the local and regional level in 2019 (OECD, 2021c).
- **Education and skills policies.** Human capital is central to productivity growth and helps in ensuring that its benefits are diffused to people. Human capital policies typically start with basic (primary) education and skills like literacy and numeracy, moving to secondary and tertiary education, to the development of non-cognitive and advanced skills and policies to foster like-long learning. The allocation of those skills across the economy, including by addressing skills mismatch, also tends to become more important over time as gains in educational attainment levels become smaller.
- **Energy, environmental and resource policies.** Energy and natural resources, including land, are important inputs for growth and productivity. Available natural resources within a country need to be carefully managed, notably as regards their sustainable use and environmental impacts. Countries will also need to develop these resources and gain access to resources abroad. Over the process of development, countries may try to add more value to natural resource extraction, enhance the productivity of natural capital and enhance the sustainability of its use.

Table 2 shows in a stylised way how policies in these three areas might change as countries move forward in the process of economic development.

Table 2: Applying the framework: Policies aimed at the accumulation of productive factors

	Country A (low-income, start of development process)	Country B (middle-income, overcoming middle-income trap)	Country C (highly developed and internationalised)
Investment	Increase Business Investment, Attract FDI, Infrastructure	Quality of Investment, Expansion of Infrastructure	Intangibles, Advanced Infrastructure, Equity Financing, Reallocation of Capital
Human capital	Primary, Secondary & Vocational Education, Basic Skills, Some Tertiary Education	Access to Education, Tertiary Education, More Advanced Skills	Quality of Education, Advanced Skills, Life-Long Learning, Skills Allocation & Mismatch
Energy, environment & resources	Development of Natural Resources and Energy Systems	Upgrading of Energy Systems; Value Added to Resource Extraction, Sustainability	Access to Materials, Decarbonisation of Energy Systems, Sustainability

Source: Authors elaboration.

Policies aimed at technological and structural change

Technological and structural change are core drivers of productivity, notably of total factor productivity growth, although technology is also embodied in capital input. Industrial policies can support new areas of competitive advantage or even accelerate structural change. The creation of new strengths may also require policies to facilitate creative destruction through the entry, growth and exit of firms. Some policies may be applied at the local or regional level to develop new sources of growth and competitive advantage drawing on local strengths, including industries and universities.

- **Innovation and technology policies.** Countries will need policies to gain access to technology and knowledge, enable its use in the economy and develop their own technological strengths and areas of competitive advantage. Policies in this area will tend to evolve from absorbing knowledge from abroad and building on local knowledge, to greater national and international collaboration the creation of an innovation system, and new strengths at national, regional and local levels.
- **Industrial policies.** Industrial policies may focus on developing potential high-growth areas, such as manufacturing to strengthen international competitiveness, e.g., through export promotion policies, and on facilitating structural change. These policies may change over time, as countries will move to more advanced stages of production and value chains and a greater focus on services rather than manufacturing. Policies may also focus on diversification, to increase resilience and reduce reliance on a few areas of strength (OECD, 2014), and on the creation of good jobs (Rodrik, 2022). Industrial policies typically require a close balance with competition policies.
- **Policies aimed at facilitating creative destruction.** Policies may be required to facilitate the entry, growth and exit of firms and industries, and support creative destruction. These may change over time; for example, the focus in OECD countries has moved over the past decade from a focus on barriers to entry, to a focus on barriers to growth and exit, e.g., bankruptcy legislation, and to addressing new growth barriers (e.g., permitting rules affecting investment).

Table 3 shows in a stylised way how policies in these three areas might change as countries move forward in the process of economic development.

Table 3: Applying the framework: Policies for technological and structural change

	Country A (low-income, start of development process)	Country B (middle-income, overcoming middle-income trap)	Country C (highly developed and internationalised)
Innovation & technology	Development of absorptive capacity, use of local knowledge, investment in public R&D, fostering private R&D	Development of own strengths, tapping into foreign knowledge, greater private and public investment in R&D, innovation system	Deepening of strengths, specialisation and greater regional, national and international collaboration in innovation system
Industrial policies	Support for potential high-growth areas, Industrialisation Policies, structural change, sector-specific policies	More advanced industrial policies, focused on more advanced stages of production & services, diversification	Facilitating structural change, foster new growth areas, balance with competition, sectoral policies, regional policy
Creative destruction and business dynamics	Improve relevant institutional frameworks, remove barriers to firm entry and growth	Remove barriers to firm entry, growth and exit	Facilitate growth and change, address new and unnecessary barriers to entry, exit and growth

Source: Authors elaboration.

Policies aimed at markets and market functioning

The Washington Consensus and related perspectives on economic development in the 1980s and 1990s put a strong emphasis on markets and “getting prices right” (Williamson, 2004). While current thinking about development places greater emphasis on institutions and human capital (Yusuf, 2009), making markets work in support of growth and productivity remains important. Policies in this area tend to evolve during the process of economic development as new and more complex barriers and regulatory issues emerge over time.

- **Financial markets policies and regulation.** Policies related to financial markets may evolve from the development of a banking system and financial regulation to policies linked to more complex financing, e.g., for intangible assets or venture capital.
- **Product markets policies and regulation.** Policies may evolve from the initial removal of unnecessary regulation to more complex regulatory issues, e.g., linked to innovation or new and digital markets. State ownership may also need to be addressed. Barriers and regulations at the local and regional level may also need to be addressed by policy.
- **Labour markets policies and regulation.** Policies may evolve from the building of systems and workers’ rights, to ensuring sufficient flexibility and addressing informality, to issues such as labour market mobility across firms, occupations and regions, and increasing labour market participation and migration to address skills shortages.
- **Competition policies.** Policies may evolve from the building of competition policy frameworks and capabilities to its implementation in key markets, to more complex questions, e.g., linked to digital and high-technology markets, or to the international dimensions of competition policy.

Table 4 shows in a stylised way how policies in these four areas might change as countries move forward in the process of economic development.

Table 4: Applying the framework: Policies for Markets

	Country A (low-income, start of development process)	Country B (middle-income, overcoming middle-income trap)	Country C (highly developed and internationalised)
Financial markets	Development financial and banking system, financial regulation, scope for e-banking	Evolution financial system, equity financing	Financing for intangible assets, VC financing, ESG financing
Product markets	Reduce regulatory and administrative barriers (e.g., red tape), assess state ownership	Reducing state ownership, removal of regulatory barriers, opening to (international) competition	Innovation-friendly regulation, regulation of new markets, local and regional barriers
Labour markets	Labour markets frameworks and regulations, workers' rights	Labour market regulation and flexibility, addressing informality	Labour market mobility, increase participation, migration policies
Competition	Assessing competition and domestic markets; basic competition policy	More advanced competition policy	Competition policy for digital markets, market assessments, international dimensions

Source: Authors elaboration.

Policies aimed at internationalisation

Internationalisation supports productivity in several ways. It provides access to foreign goods and services, direct investment, knowledge and technology; enables specialisation and economies of scale; and strengthens competition, amongst others. Policies in this area tend to become more sophisticated over time, as countries seek to upgrade their engagement in trade and global value chains and compete in segments that are more advanced and complex and that create more value added, including services. The internationalisation and the opening of economies are complex issues at the early stages of development, however, as countries seek to benefit from openness, but also build their own domestic capabilities.

- **Trade policies.** Trade policies may initially focus on the opening of the economy to foreign trade and the promotion of exports, sometimes combined with import substitution. They may evolve to a greater focus on engagement in global value chains, and the upgrading of such engagement to more complex and high-value forms of trade, including greater trade in services.
- **Foreign direct investment policies.** FDI policies may evolve in a similar way to trade policies, with an initial focus on attracting FDI and engaging in GVCs, to upgrading such FDI and building greater linkages with the domestic economy between the foreign and domestic sector, to becoming attractive for high-value FDI, e.g., innovation centres. Countries may also wish to encourage outward FDI. Regions and cities may also play a role in attracting FDI.
- **International migration policies.** Migration policies also play an important role where countries may see some of their home-grown talent leave in the early stages of development, with the implicit aim to have (many of) them return at a later stage with new skills and capabilities that may benefit the country. More advanced economies mostly tend to focus on high-end skills and skills gaps in their migration policies. Remittances from migrated nationals may provide a source of income during the development process.

Table 5 shows in a stylised way how policies in these four areas might change as countries move forward in the process of economic development.

Table 5: Applying the framework: Policies for internationalisation

	Country A (low-income, start of development process)	Country B (middle-income, overcoming middle-income trap)	Country C (highly developed and internationalised)
Trade policies	Trade Openness; Export Promotion (sometimes with import substitution)	Upgrading Engagement in GVCs, Trade in Services	Growing complexity of trade and engagement in GVCs; trade in services, digital trade
FDI	Attracting FDI for Export-led Growth, Engaging in GVCs	Upgrading FDI; Build Linkages Domestic and Foreign Sector	Attractiveness to Advanced FDI; Increasing Benefits of FDI, Outward FDI, Security and FDI
Immigration	Facilitate Migration, Remittances	Facilitate returnees and immigration, more advanced migration policy	Immigration aimed at attracting high-end skills and addressing skills gaps

Source: Authors elaboration.

Policies aimed at institutions and frameworks: the foundations of productivity

To enable growth and investment, countries will require an adequate level of political and economic stability, to instil trust and provide a suitable environment for investment. They will also need to build institutions to underpin economic growth and social development and develop capabilities for policy making and implementation within the government. Key areas of policies development include:

- **Institution building.** Building institutions, e.g., financial institutions or regulatory bodies, is a critical foundation for economic growth. Policies in this area may evolve as the economy becomes more complex over time and new institutions are needed, e.g., data protection authorities. Countries may also need to take action if their existing institutional frameworks are degrading or under threat, e.g., linked to political forces, global trends or rent-seeking behaviour.
- **The development of government capabilities.** Governments play an important role throughout the process of economic development, e.g., in designing and implementing policy, ensuring its coherence across policy areas, and achieving policy consistency and predictability (Cusolito and Maloney, 2018). However, governments will need to build their own internal capabilities to play this role. Policies in this area may require training of civil servants; sufficiently attractive salaries; and the development of guidance, oversight and processes, e.g., in addressing corruption or using public procurement. Such policies can move to more advanced forms of public governance over time, including the development of digital government.
- **Macro-economic policies.** Monetary and fiscal policies, including tax policies, are not only important to ensure macro-economic stability and limit inflationary pressures, but also to create sufficient fiscal space for supportive pro-productivity policies, e.g., investment in education, R&D or infrastructure.

Table 6 shows in a stylised way how policies in these three areas might change as countries move forward in the process of economic development.

Table 6: Applying the framework: Policies for Institutions and Frameworks

	Country A (low-income, start of development process)	Country B (middle-income, overcoming middle-income trap)	Country C (highly developed and internationalised)
Institutions	Institution building	Deepening of institutions	Advanced institutional frameworks, new institutions, protecting existing institutions
Government capabilities	Training of civil servants, development of frameworks and processes, salaries civil servants	Support for full policy cycle, including evaluation, policies to address corruption	More integrated policies, advanced skills and tools to support policy, e.g., procurement
Macroeconomic policy	Control of inflation, stability of exchange rates, budget stability	Extending tax base, stability of policies	Stable and well-established policies

Source: Authors elaboration.

Strengthening productivity growth is not the only goal of public policy and policies for productivity need to be adapted when governments are also seeking to achieve other key objectives, notably inclusive and sustainable growth. A focus on these objectives does not necessarily change the policy tools that governments use to strengthen productivity growth but may change how these tools are being applied and what additional tools are being used as complements. For example, a greater focus on more inclusive productivity growth will require greater emphasis on policy tools that encourage the involvement of underrepresented social groups and regions in the growth process, or that seek to address the gap between leading and lagging firms (OECD, 2018a). And a focus on sustainability will require greater emphasis on policies that improve the functioning of markets by getting “prices right” (D’Arcangelo, et al., 2022) or give greater directionality to innovation (Cervantes, et al., 2023). We will not elaborate these issues any further but will briefly return to them in the final sections.

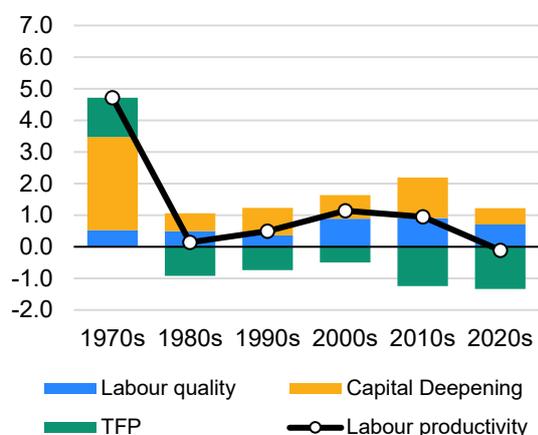
5. Productivity and Pro-Productivity Policies: Four Case Studies

To illustrate how the drivers of productivity set out in Sections 2 and 3 align with the typology for productivity-enhancing policies set out in Section 4, we provide a more detailed analysis for four G20 countries, i.e., Brazil, India, South Korea and the United Kingdom, based on historical and recent productivity studies for these countries. The discussion is not intended to explore the evolution of the productivity debate in these specific countries in great detail. Our aim is to illustrate the variety in pro-productivity policies across different countries, depending on specific contexts and levels of economic development, and explore to what extent countries’ policies conformed to the stylised policies set out in the previous section.

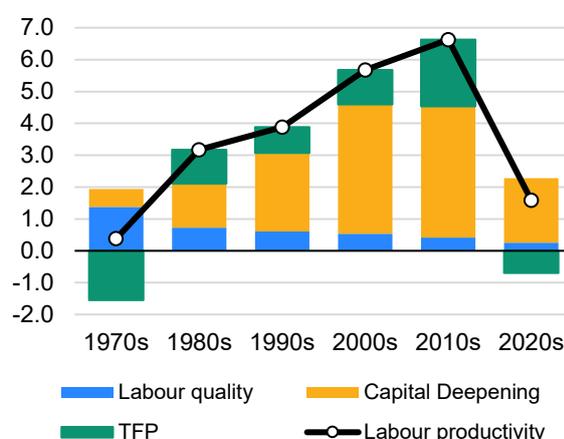
The development process of these countries represents rather different experiences. Brazil’s productivity level has stagnated since the 1950s, and the country only experienced strong productivity growth during the 1970s. It is therefore included in the “mudding through”-group. The United Kingdom is included in the “leading but slowing”-group of developed countries experiencing a gradual slowdown in productivity, while India and South Korea are included among the countries with strong productivity performance in the “lagging but growing”-group, with South Korea experiencing some slowdown in recent decades, and India strengthening its performance over the past four decades (Figure 8).

Figure 8: Decomposition of labour productivity growth in labour quality, capital deepening and TFP growth, Brazil, India, South Korea and the UK

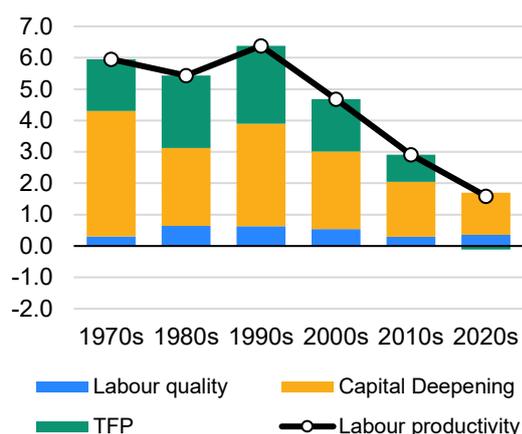
Panel A: Brazil



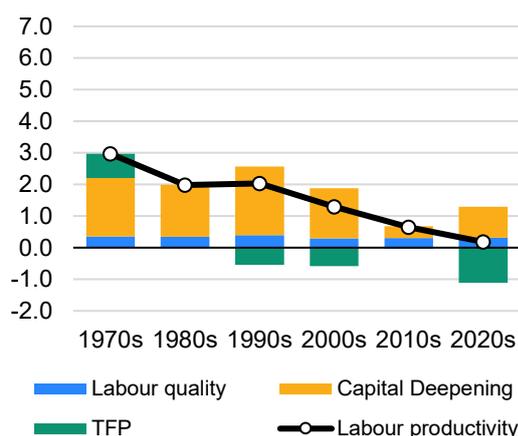
Panel B: India



Panel C: South Korea



Panel D: United Kingdom



Note: 2020s refers to 2020, 2021, 2022 and 2023 (projected).

Source: The Conference Board Total Economy Database™, April 2023

For each of the four countries, we examine the productivity policies that were recommended and (at least in part) implemented sometime during the 1960s/1970s (when most economies exited the early phase of post-war reconstruction or decolonisation), the late 1980s/early 2000s (when the Washington consensus took precedence), and the 2010s/2020s (following the global financial crises and the heydays of globalisation). For the latest policies in these countries, we obtained evidence from several comprehensive productivity assessments. We also consider whether the pro-productivity policies are typical for low-, middle- or high-income economies or deviate from the stylised policies at the relevant level of income, and look at possible countervailing effects on productivity, which might have either resulted from bad implementation of the pro-productivity policies or from the introduction of other policies with (potentially) negative consequences on productivity.

Brazil

Brazil has been the subject of many studies on growth and productivity, pointing to several phases in Brazil's process of economic development. For example, from 1918 to 1966 there was a strong focus on import-substituting industrialisation (Cardoso and Kuhl Teles, 2010). This initially included a strong anti-export bias linked, amongst others, to an overvaluation of the real exchange rate. From 1964 onwards, it involved a greater focus on export diversification. There was a period of significant structural reform from 1967 to 1979 which contributed to an acceleration in growth and productivity, including TFP growth. The period from 1980 to the early 2000s included a sharp slowdown in growth linked to high levels of external debt, very high inflation and great economic instability. This was accompanied by a falling contribution of capital deepening and a negative contribution of TFP growth. Since the early 2000s, GDP growth has benefited from increased labour input, linked to growing labour force participation, demographic change and improvements in human capital, with a limited role of capital input and negative TFP growth (Figure 8, Panel A; OECD, 2020a).

Several studies have also focused on the macroeconomic context for productivity growth in Brazil. For example, Nassif et al. (2020) find that the stagnation in productivity growth after 1980 was due to an overvaluation of the Brazilian currency; an excessive focus on primary products in the export basket; a low degree of trade openness and high real interest rates. They also note that, even during the earlier period of strong productivity growth, labour reallocation was oriented towards low skilled labour, and that Brazil's process of industrialisation did not reach the maturity to reap the benefits of more technologically advanced production.

Other studies on Brazil have focused more specifically on the drivers of productivity growth. For example, Bonelli (2005) points to several constraints on productivity growth, notably:

- Low levels of capital accumulation linked to high prices of capital goods and low capital productivity. Moreover, the sectoral composition of investment has played a role.
- "Institutional" constraints, notably high levels of regulation and a deficient infrastructure.
- Low quality of the labour force. For example, literacy improved from 74.5% of the population in 1980 to 91.7% in 2014. However, average years of schooling only reached 7.9 years in 2010, up from 3.9 years in 1985 (De Mello, et al., 2019).
- Limitations in technology transfer from abroad, with improvements only from the early 1990s.

Dutz (2018) points to a range of factors that have held back productivity in Brazil since the 1970s, most of which still constrain productivity growth today (Table 7). This includes a low level of opening of the economy to international trade and investment; excessive bureaucracy and regulatory barriers in the domestic market limiting entry and competition; distortions in financial markets that limit access to credit for innovators and young firms; and distortions in labour markets and social policies that protect incumbent formal workers and limit firm-specific investment in training. More recently, the OECD has also pointed to several remaining weaknesses in Brazil's pro-productivity policies, notably low levels of capital deepening and gaps in infrastructure; the relatively low and uneven quality of education; high trade barriers that affect Brazil's openness to the international economy; high remaining levels of regulation of product markets; as well as a complex and distortive tax system (OECD, 2020a).

De Mello, et al. (2019) find that low productivity is pervasive across all sectors of the economy and cannot be attributed to misallocation of the factors of production across industries. While Brazil's productivity would improve if labour was allocated to more productive sectors, notably certain manufacturing sectors, this effect would be much smaller than that of an improvement in productivity across all sectors to align productivity levels with those in comparator countries. This implies the need for productivity-enhancing actions across all industries to address inefficiency and spur innovation.

Table 7: Stylised pro-productivity policies for Brazil, mid-1960s, 1990s and late-2010s, early 2020s¹

	Mid 1960s	1990s	Late 2010s, early 2020s²
Institutions & frameworks			
Institution building	Creation central bank	Period of institutional change	Some reform, e.g., new and independent fiscal council
Government capabilities			Low judicial efficiency
Macroeconomic policy and taxation	Fiscal adjustment and tax reform	Macroeconomic stabilisation and reduced inflation through Real Plan (1994)	Complex, cumbersome and distortive tax system, though some proposals for reform
Factor Accumulation			
Investment		Attempted privatisation of public investment and reduced level of public investment	Investment partnership law (2017) Remaining large gaps in infrastructure; low quality of investment projects
Education & skills		Improvements in the education system	Improved access to education and greater flexibility in curriculum outside the core, Remaining educational quality deficiencies and low attainment levels
Resources			High levels of deforestation and air pollution, lack of enforcement
Technology			
Innovation & technology	Reduce dependencies on foreign technology, national content requirements	Introduction modern management and organisational techniques	
Industrial policy	Promotion of exports, promotion of export diversification		
Creative destruction	Protectionism reduced allocative efficiency, no selectivity	Restructuring and reallocation due to liberalisation and regulatory reform	
Markets			
Financial markets	Reform of financial markets and creation central bank	Privatisation of banking sector, Adjustment to low inflation following Real Plan (1994)	Financial market reform and regulatory changes enhancing competition
Product markets	Simplification of administrative procedures for exporters	Privatisation and regulatory reform	2020 law reducing bureaucracy and administrative regulations,

			Remaining high levels of bureaucracy
Labour markets		High informality, limiting incentives for productivity growth and rigid labour market regulations	2017 labour market reform increasing scope for firm-level agreements and reducing uncertainty
Competition policy	Survival of rent-seeking activities		
Internationalisation			
Trade	High tariffs, import licensing	Import liberalisation	Major trade agreements with EU and EFTA,
	Export subsidies and move to more stable exchange rate		Remaining high levels of trade protection, in particular manufacturing tariffs
FDI	Openness to FDI linked to import substitution	Opening up to direct and portfolio investment	Barriers to foreign entry
Migration			
Inclusion		Decrease in poverty linked to reduced inflation	

Notes: 1. The colours point to pro-productivity policies typical for different levels of economic development, as follows:

 Stylised policies low-income economy	 Stylised policy middle-income economy	 Stylised policy advanced economy	 Potential anti-productivity effects
--	---	--	---

2. The entries for the late-2010 to early 2020s period refer to the prevailing situation in Brazil on key dimensions of policy as assessed by the OECD, World Bank and IMF.

Sources: Mid 1960s based on Cardoso and Kuhl Teles (2010) and Nassif, et al. (2020). 1990s based on Bonelli (2002; 2005). Policy assessment for late 2010s and early 2020s based on Dutz (2018), De Mello, et al. (2019) and OECD (2017, 2019b, 2020a and 2021a).

Cardoso and Kuhl Teles (2010) and Nassif, et al. (2020) provide a helpful overview of the main characteristics of Brazil's policies in the mid-1960s, at the start of a period of structural reform. These policy characteristics are included in the second column of Table 7 that maps them to the productivity framework set out in section 4. Several of the policies being implemented by Brazil in the mid-1960s correspond to those typical for a low-income economy. However, some policies could be considered as anti-productivity policies, such as the lack of selectivity in industrial and export promotion strategies, the strong focus on national content requirements and import substitution in technology policies, and the lack of action to address rent-seeking behaviour in the economy.

During the 1990s, Brazil experienced another period of more modest economic reform involving privatisation, regulatory reform and the liberalisation of trade and FDI (Bonelli, 2002). This spurred strong productivity growth in the manufacturing sector (Bonelli, 2005). Moreover, macroeconomic stabilisation linked to the Real Plan (1994) helped reduce inflation, while ongoing improvements in the education system and the introduction of new management and organisational techniques supported productivity growth. However, this period of reform was more narrowly concentrated than the reforms in the mid-1960s, and only resulted in a small improvement in aggregate productivity growth (see Figure 8, Panel A). In addition, reduced public investment and the attempt to privatise of such investment limited necessary improvements in infrastructure, while inefficient and incomplete regulation also contributed to the modest results of the reforms (Bonelli, 2005). Moreover, despite improvements, the low quality of the labour force and the high level of informality in the economy continued to be a drag on productivity (Bonelli, 2005). Strikingly, the policies undertaken in this period are still mostly typical of those for a low-income economy.

Stagnant productivity growth, driven by small increases in capital deepening and negative TFP growth, have plagued Brazil's economy into the 21st century (Figure 8, Panel A). This stagnation occurred despite some further structural reforms, including educational reforms, regulatory reforms, reforms of financial markets, labour market reforms as well as the conclusion of major trade agreements (see the last column of Table 7; OECD, 2017; 2019b, 2020a, 2021a).

It seems clear that future growth in Brazil can no longer rely on substantial contributions from labour input as the country's demographic transition is reaching its conclusion (De Mello et al., 2019; OECD, 2020a). While there is still much scope to raise the quality of labour quality, capital deepening should play a larger role as the country has a poor public infrastructure and relatively low investment rates. Investment will need to rely more on private rather than public funding, given already high levels of indebtedness. Investment in intangible assets could be another source of further capital deepening, as it is still at modest levels in Brazil compared to advanced economies, although almost three times the levels observed in Mexico, Indonesia and Argentina (OECD, 2021b).

Dutz (2018) made extensive policy recommendations to address the challenges, which are reflected in Table 7. A first set of recommendations focus on improvements in institutions and capabilities to reduce fragmentation and change the relationship between business and the state. A second important area of focus concerns factor accumulation and technological change, including through improvements in connectivity; strengthening of the quality of education and more targeted training; a greater focus on sustainability and natural capital; as well as a strengthening of firm capabilities and the reform of support policies. Markets and internationalisation are a third major area for reform, including through further reform of credit markets, greater domestic market integration and improved enforcement of anti-trust policies; as well further trade policy reform. The study also noted the need to strengthen the inclusiveness of pro-productivity policies by facilitating firm entry and growth, investing in skills and job-search support, and providing more targeted social safety nets.

Most of these recommendations can be considered relatively typical for a middle-income country and go beyond the reforms undertaken over the past decades. They represent policies that could help Brazil move to a more advanced level of economic development. In some areas, such as institutional reforms, education and skills policies, as well as the policies focused on inclusion, the recommendations could even be considered those of a more advanced economy.

The recommendations by Dutz (2018) are echoed by De Mello et al. (2019) and OECD (2020a), who also argue for comprehensive policies to spur efficiency and encourage investment in innovation, including regulatory reforms to promote a pro-business institutional framework, the opening of Brazil's economy to international trade, improvements in the functioning of credit markets, improvements in education and training, and the removal of policies intended to promote specific industries and sectors.

India

The first few decades of economic growth of India after independence 1948 have been characterised by relatively slow growth compared to other countries such as Brazil and South Korea, even referred to as the “Hindu rate of growth” of 3.5 percent (Ray, 1984). One key aspect of this is that, despite significant policy focus on (re-)industrialisation (following deindustrialisation during the British colonial period), the manufacturing sector only accounted for 14.5% of gross value added from the 1950s to 1970s and 10 percent of the labour force throughout the 1960-1970s (Timmer et al. 2015). As summarised by Bhattacharjea (2022), the entire 1950s to 1970s may be summed up as “planning, protection, public sector, industrial licensing and price controls” (p. 567). Economic planning was characterised by a strong bias towards the development of the capital goods sector exercised through state-directed investment licensing, import restrictions and price and distribution controls. In practice though industrialisation was heavily dependent on imported machinery and equipment.

The “license-permit raj” had large negative implications on productivity due to inefficiencies, lack of sectoral reallocation and a decline in public investment (Bhattacharjea, 2022). While manufacturing labour productivity still increased at a decent rate of 2.9% per year during the 1960s and 1970s, the growth rate was well below that of Brazil (4.1%) and South Korea (6.5%) (Timmer et al. 2015). At the aggregate economy level, India's productivity increased at only 1.3% between 1960-80, compared to 4.0% in Brazil and 4.8% in South Korea (The Conference Board, 2023).

As of the early 1980s some signs of reform towards greater reliance on product, capital and financial markets became visible, partly through a more “pro-business” approach of government which strengthened incumbent firms (Rodrik and Subramanian, 2004) – a view which has been disputed by, among others, Balakrishnan (2010) arguing there was still considerable anti-business legislation in the early 1980s. However, more buoyant rural demand from strong harvests in the 1980s and a shift in appetite for public investment (to allow complementary investment from the private sector) also changed the need to release supply-side constraints on the economy (Bhattacharjea, 2022).

In the early 1990s, macroeconomic instability and a large devaluation of the Rupee in 1991 led to a stronger focus on fiscal and monetary discipline in part imposed through interventions and programmes by the IMF and the World Bank and in part motivated by the domestic change in economic policy thinking since the 1980s, away from government regulations of product- and capital markets and (to some extent) labour markets. The exchange rate regime was also liberalised with a more conventional role for the Reserve Bank of India to intervene.

Table 8: Stylised pro-productivity policies for India, 1960s, 1980s-1990s and 2020s

	1960s	1980s & 1990s	2020s
Institutions & frameworks			
Institution building		Greater pro-reform attitude (Rajiv Gandhi & Rao/Singh governments, CII)	
Government capabilities			
Macroeconomic policy		Liberalisation of exchange rate regime	
		Fiscal and monetary discipline	
Factor Accumulation			
Investment	State-directed (re-)industrialisation	Opening up of most industries for private investment	Special Economic Zones Act (2005)
	Discouragement of private investment	Shift to public investment to complement private investment (esp. infrastructure)	
Education & skills	Creation of public academic research and training institutes (Indian Institutes of Technology and Management)	Strengthening of Indian Institutes of Technology and Management	Expansion of higher education enrolment
	Failure to improve access basic education and health facilities		SSA Act (2001) and Right to Free Education Act (2010)
Resources			Greater policy focus on inclusive and sustainable growth
Technology			
Innovation & technology		Foreign technological collaboration schemes (1980s)	Integrated ecosystem approach to Science, Technology and Innovation (STIP)
		Integration of public and private sector research infrastructure (CSIR, NCL, IICT)	
		Modernization of ICT infrastructure (1980s) and New Telecom Policy (1999)	Patents Act amendments for licensing of foreign patents
Industrial policy	Investment licensing	Relaxation of investment licensing rules and price controls (1980s) and full delicensing (early 1990s)	Atmanirbhar Bharat Campaign (“self-reliant India”)

Creative destruction			Continued policy dichotomy and contradictions between supporting large business and SME-focus policies
Markets			
Financial markets		Liberalisation of capital markets	Demonetisation of large bank notes (2016)
			Introduction Goods and Services Tax (GST)
			Opening of equity market for private sector financing
			Insolvency and Bankruptcy Code (2016) reducing non-productive assets
Product markets	Price and distribution controls	Liberalisation of product markets	Make in India and Ease of Doing Business agenda aimed at reducing red tape
Labour markets		No significant liberalisation of labour markets	Industrial Disputes Act (2014) liberalised plant closures and layoffs
Competition policy	Price and distribution controls	Relaxation of government approval for expansion and mergers	New Competition Act (2009)
Internationalisation			
Trade	Import substitution policies, especially for capital goods	Liberalisation of capital and intermediate goods imports (1980s), full abolishment of government restrictions (1991)	Abolishment of import licenses and reduction in import tariffs for consumer goods
	Import licensing on all goods		Increases in import tariffs (2020s)
FDI	Strong restrictions of FDI	Gradual removal of FDI restrictions (1990s)	Accession to WTO (1995) and compliance with TRIPS
Migration			Increased control over FDI
Inclusion			

Notes: 1. The colours point to pro-productivity policies typical for different levels of economic development, as follows:

 Stylised policies low-income economy	 Stylised policy middle-income economy	 Stylised policy advanced economy	 Potential anti-productivity effects
--	---	--	---

Sources: 1960s-1990s based on Bhattacharjea (2022); more recent periods, see also Panagaryia (2021) and Forbes (2022).

During the 1990s and early 2000s, a string of pro-market reforms was ushered in, including full liberalisation of capital and intermediate goods imports (already started in the 1980s), a reduction in import tariffs for consumer goods, and a more gradual removal of restrictions on Foreign Direct Investment.

Between 1980 and 2000 the rate of productivity growth in the Indian economy almost doubled relative to 1960-1980, which mainly resulted from a structural change towards sectors with higher levels of productivity, away from agriculture to market services. Nevertheless, with some exceptions, within-sector productivity growth in India was still disappointing during the 1980s as the accumulation of various factors of production (notably human capital and the quality of the capita stock) and the diffusion of technologies across the economy was too slow to materially change productivity growth within many sectors and firms. In particular, total factor productivity growth was disappointing during the early reform period, except for manufacturing which saw rapid TFP growth but only accounted for just over 10% of total employment and therefore contributed little to the aggregate (Krishna et al., 2022).

Since the 1990s productivity has improved rapidly across manufacturing and services. Nevertheless, the manufacturing sector remained relatively small, plagued by a continued dichotomy between policy objectives to create a world leading manufacturing sector to step in China's footsteps especially on labour and skill intensive industries, and to support small medium manufacturing enterprise to cater for the abundant supply of low skilled labour (Panagariya, 2021).

While much of the reform agenda of the 1980s and 1990s was focused on manufacturing, the role of the services sector has hugely increased in importance (Gordon and Gupta, 2004; Banga and Goldar, 2004; Singh, 2006). Early upgrading of the ICT infrastructure in the 1990s, together with an abundant presence of technological skills among the relatively young workforce, may have sown the seeds for India's structural transition to a global player in the IT industry, especially in software.

One reason for India's slow productivity growth in manufacturing is that, despite an early policy commitment to government-led technological development, overall R&D intensity stayed relatively low, at only 0.66% of GDP in 2018 (UNESCO, 2021), compared with 2.14% for China in the same year, and 3% for the United States (OECD, 2023). Technological change and innovation have been constrained by the lack of an integrated national strategy for public research institutes, higher education and private sector innovation (Forbes, 2022). This inhibited a focus on diffusion of technology across the economy. In recent years the Indian government has developed a more robust Science, Technology, Innovation Policy (STIP) focused on knowledge diffusion and strengthening the absorptive capacity of firms and innovation ecosystems (Government of India, 2020).¹²

Despite India's long-term commitment to higher education, including the establishment of a wide range of IIT's (Indian Institute of Technology) and IIM's (Indian Institute of Management) across the nation, there has been concern about the growth in quantity of higher education output over quality as even the best schools are struggling with faculty shortages (Forbes, 2022). Moreover, in contrast to higher education, primary and secondary education did not receive the full attention it deserved until the Sarv Shiksha Abhiyan (SSA) programme and the Right to Free Education (RTE) act in 2010.

¹² The Science, Technology and Innovation Policy (STIP) explicitly addresses the need for a greater emphasis on "promoting traditional knowledge system, developing indigenous technologies and encouraging grass root innovation as a means to achieve a sustainable development pathway to economic development, social inclusion and environmental sustainability and create the Modi government aim for an "Atmanirbhar Bharat" (a "self-reliant" India).

Towards the end of the 2000s, as growth continued to accelerate and even overtook that of China, concerns about the quality of growth in India began to mount. In particular, the failure to raise the quality of human capital and innovation was seen a major constraint in strengthening competitiveness. With the first BJP government coming in office in 2014, policies focused more strongly on inclusive and sustainable growth, including health and education; improvements in the business climate; domestic investment; and improvements in the overall competitiveness of the India economy. During the second BJP government, the focus has changed more towards strengthening resilience and self-sufficiency, including an ambitious effort in creating a “self-reliant India” (Atmanirbhar Bharat Campaign) which has reinvigorated an integrative approach by government towards decentralised planning and the creation of hard and soft infrastructure. However, to some extent it has also led to a more restrictive approach towards internationalisation of the Indian economy, including a return of import substitution-like policies and controls over FDI.

In conclusion, while the overall tendency of India’s pro-productivity policies has been towards a greater reliance on market forces, this by no means implies that government has not continued to play an active role in development. Strikingly Table 8 shows a surprising mix of low-income, middle-income and high-income country policies, with important early strengths (e.g., public science and technology research) and ongoing weaknesses (e.g., slow improvements in the quality of education and lack of labour market reforms). While institutions and the legal framework around policy making have been strengthened, there is still much scope to better align pro-productivity policies, including investment strategies, market design and internationalisation.

South Korea

Like the other countries covered in this section, South Korea has been the subject of many studies on growth, development and productivity. These studies tend to show that Korea had a strong starting point prior to its growth acceleration in the 1960s and 1970s, despite very low levels of GDP per capita following the devastation caused by the Korean War. Elements of this strong starting point included relatively high levels of human capital, which increased rapidly from the 1960s onwards; a hard-working labour force with relatively low wages; high savings rates; relatively stable macroeconomic policy compared with many other developing countries at the time; and dynamic and highly trained entrepreneurs (Dornbusch and Park, 1987).

This strong foundation enabled the government to introduce an effective development strategy in the early 1960s characterised by outward-oriented growth (Dornbusch and Park, 1987), combining elements of import substitution and export promotion, but with a strong emphasis on export promotion. The government’s strategy also involved maintaining a stable macroeconomic environment, the fostering of the creation of general trading companies, and investment in infrastructure and the formation of human capital (Kim and Leipziger, 1993). It was also built on a range of institutional reforms, including the creation of new planning and implementation agencies, and the development of a professional and meritocratic civil service (Kim and Leipziger, 1993).

The second column of Table 9 shows the main characteristics of Korean policy in the 1960s and shows that most of these closely correspond to the stylised policies of a low-income country. Korea also introduced some policies that do not correspond to such a stylised case, however, e.g., its encouragement of the creation of large trading firms (the chaebol) and its encouragement of competition through its export promotion strategy. Moreover, already in the 1960s, the government actively tried to reverse the brain drain of US-based Korean nationals that could support the country’s development strategy (Kim and Leipziger, 1993), a policy that is more typical for a country at a higher level of economic development.

A second important phase of economic reform followed the Asian financial crisis that started in mid-1997, which was undertaken by the new civilian government that had taken office in 1993. Following the crisis, Korea launched a major restructuring programme to create a more market-based economy (OECD, 2003). The main features of these reforms are shown in the third column of Table 9. They included extensive reforms to corporate governance and financial markets; the privatisation of state-owned enterprises and commercial banks; liberalisation of trade and FDI; and the development and expansion of employment insurance and social welfare schemes to complement Korea's flexible labour market with a social safety net. This was also the period when Korea started to focus more on the development of a more knowledge-based economy, including the development of its information technology sector. Other reforms relevant to productivity growth include the development of a national planning and land-use system and the reform of bankruptcy legislation.

Korea has gone through several distinct phases in its development strategy since the 1960s and for much of the time has continued to experience very high rates of GDP and labour productivity growth (Figure 8), leading the IMF now to count Korea officially among the world's most advanced economies.¹³ While capital deepening has made the largest contributions to productivity growth over the period covered in this paper, TFP growth has made large contributions too, in particular in the 1980s and 1990s. Over the past decade, the contribution of TFP growth has declined, however.

In the process of economic development, Korea's economy has changed drastically and the required policies for productivity are now very different from those in the 1960s. Korea faces several challenges for future productivity growth. First, it is faced with a very rapid demographic transition, as birth rates have fallen drastically, and the population is ageing more rapidly than in any other OECD country (OECD, 2020b). This will imply a fall in labour input, requiring stronger labour productivity growth to mitigate. This will be particularly challenging given the very high working hours from Korean (mostly male) workers and low participation rates of women (OECD, 2012). Second, levels of educational attainment in Korea are already very high, with the highest share of young adults having completed tertiary education in the OECD, at 69% of all 25–34-year-olds (OECD, 2022a). Any further contribution from labour quality to productivity growth will likely be small and linked to improvements in the quality of education and the acquisition of specific skills.

Third, and perhaps most important, Korea continues to have a highly dual economy, characterised by a very productive outward-focused manufacturing sector – to some extent a legacy of its policies in the 1960s and 1970s (OECD, 2012) – and a relatively inefficient services sector with much lower productivity levels and a relatively small contribution to aggregate productivity growth. This productivity gap at the industry level is accompanied by a relatively large gap in productivity between large firms and SMEs (OECD, 2021d). According to OECD (2021d), past policies of specialisation and support for specific firms and industries may have weakened competition and protected incumbents, contributing to the strong productivity gaps between firms and sectors, and limiting aggregate productivity growth. Moreover, the spillover effects from the export-oriented industry to domestic demand and employment have weakened, as the large firms involved in these activities have become more internationalised and mainly focus on capital- and technology-intensive products (OECD, 2018b). In addition, the growing polarisation of the economy has contributed to a rise in relative poverty and income inequality in Korea (OECD, 2018b).

¹³ IMF (2022), World Economic Outlook Database, April 2022, <https://www.imf.org/en/Publications/WEO/weo-database/2022/April/select-aggr-data>

Table 9: Stylised pro-productivity policies for Korea, 1960s and 2020s

	1960s	Late 1990s to early 2000s	Late 2010 to early 2020s
Institutions & frameworks			
Institution building	Development of state institutions aimed at planning and implementation		Establishment of independent anti-corruption agency
Government capabilities	Development civil service as professional & meritocratic institution		
Macroeconomic policy	Stable macroeconomic policies		
Factor Accumulation			
Investment	Strong public investment in infrastructure	Reforms to corporate governance frameworks	Reforms to corporate governance, strategic investment in selected industries
Education & skills	Rapid expansion of secondary and tertiary education	Expansion of training following economic crisis	
Resources		Development of national planning and land-use system	Green New Deal with focus on transition to low-carbon and green economy
Technology			
Innovation & technology	Encouragement of up-to-date technology from abroad	Promotion of knowledge-based economy and information infrastructure, strengthening of R&D frameworks	Increase in R&D budget
Industrial policy	Aggressive export promotion combined with protection domestic market		Strategic investment in (4) strategic areas and support to (8) key industries
Creative destruction	Large enterprise (chaebol) creation encouraged by state, selection linked to export success	Significant corporate restructuring: reforms to bankruptcy system to facilitate exit; some reductions in protection of SMEs	Reform of SME support policies, tax reductions and exemptions for start-ups, creation of venture and start-up ecosystem
Markets			
Financial markets	State control of financial system with focus on risk sharing	Financial sector restructuring programme, including privatisation of commercial banks, range of other reforms to financial markets	Reforms of corporate governance
Product markets	Protection infant industries, promotion export industries	Privatisation, liberalisation of trade and FDI, range of regulatory reforms	Introduction of regulatory sandboxes and regulation-free special zones

Labour markets	Little labour unrest, low union activity	Expansion of employment insurance and social welfare schemes	Expansion of public employment, increase in minimum wage, focus on labour market participation under-represented groups, expansion of training and social insurance, reduction in working hours
Competition policy	Competition in context of export promotion strategy, but also focus on concentration	Privatisation programme of several state-owned enterprises, strengthening of competition	
Internationalisation			
Trade	Export promotion strategy	Trade liberalisation, including abolition of most quotas, first FTA (with Chile), No liberalisation in services and agriculture	Conclusion of Regional Comprehensive Economic Partnership
FDI	No liberalisation	Reduced barriers to FDI and incentives to encourage FDI inflows	
Migration	Policy of reverse brain drain from 1966		
Inclusion	Build on relatively egalitarian society, investment in education		Core focus of government policy from 2017-2022

Notes: 1. The colours point to pro-productivity policies typical for different levels of economic development, as follows:

 Stylised policies low-income economy	 Stylised policy middle-income economy	 Stylised policy advanced economy	 Potential anti-productivity effects
--	---	--	---

Sources: Dornbusch and Park (1987) and Leipziger and Kim for early 1960s; OECD (2003) for late 1990s and early 2000s; OECD (2018b, 2020b, 2021d and 2022b) for late 2010s and early 2020s.

More recent policy efforts, as undertaken by the Moon government from 2017 onwards in the context of its vision for an Inclusive and Innovative Nation, aimed at creating a fairer economy and involved reform of the large business groups and a greater focus on growth and innovation from start-ups and SMEs (OECD, 2018b). With the outbreak of the COVID-19 crisis in 2020, Korean economic policies went into crisis mode, with the government skill-fully managing the crisis, resulting in one of the smallest GDP contractions among OECD countries, followed by a strong export-led rebound in 2021 and 2022. The main features of government policies linked to the vision of inclusive and innovative nation from 2017 to 2022 are shown in the final column of Table 9. Most of these are policies that are characteristic of a medium-income economy, but several are closer to those of a more advanced economy.

Recently, OECD (2021d) provided a comprehensive assessment of Korea's policies for inclusive growth and made extensive recommendations linked to productivity and inclusive growth. The recommendations aim to address the disparities in productivity between different sectors and firms, promote competition and foster technology diffusion between leaders and laggards and are therefore closely linked to the government's aims from 2017 to 2022. However, they differ in several ways from the government's policies shown in Table 9, with a greater focus on institutional reform such as stronger policy coordination and more comprehensive evaluation; a greater focus on competition, regulatory reform and opening up of the economy; and further recommendations to address dualism in the Korean economy. Somewhat surprising given its relatively high level of income today, most of the OECD policy recommendations to enhance productivity in Korea can still be considered relatively typical for a middle-income country. In some areas, such as education and skills policies, labour markets, as well as the policies focused on inclusion, the recommendations could also reflect those for a more advanced economy, however.

Given Korea's status as an advanced economy according to the IMF, this policy focus may be considered surprising. However, Korea is the only advanced economy that is included in our "lagging but growing" group, which may help explain why policy recommendations for Korea still mostly resemble the policies of middle-income economies, though with an ongoing transition to the policies of more advanced economies. Moreover, while the IMF classifies Korea as an advanced economy, several private sources, e.g., JP Morgan and MSCI, still consider Korea an emerging economy reflecting its strong growth and highly dynamic nature.

However, the mix of policy recommendations may also reflect the high duality of the Korea economy, where Korea has not experienced the growth of a productive services sector that is typical of many of the most advanced economies. Moreover, compared to most other advanced G20 economies, Korea's economy remains relatively closed in areas such as FDI and migration.

United Kingdom

Compared to the other three case studies, the United Kingdom is obviously a different case as it was the first industrialised nation in the world rather than a latecomer. The first industrial revolution and its impact on UK economic growth during the 18th to 20th centuries has been extensively described elsewhere (Crafts 2002; Crafts and Woltjer, 2021). However, since the late 19th century, the British economy has struggled to adapt to subsequent industrial revolutions, even though it has undergone substantial structural change and reform in both the positive and negative sense. Compared to other advanced economies, Britain has experienced a relatively rapid de-industrialization during the 1950-1970s – seeds of which were already sown during the pre-war period when the UK lost industrial supremacy to the United States (Broadberry, 1997). More recently it has also struggled to keep up with the productivity performance of comparable economies across Europe (Bean and Crafts, 1996; Crafts, 2002, 2022).

Britain has struggled more than other European nations to recover from the ravage of the Second World War. Surrey (1982) identifies three sub-periods between 1950 and 1980, namely the “stop-go” cycle of demand-managed policies of the 1950s and early 1960s, growing incompatibility of macroeconomic and novel structural policies during the 1960s and early 1970s, and high inflation and energy crisis during the remainder of the 1970s. Severe balance-of-payments problems, lack of innovation and a shortage of skilled workers due to the lack of a vocational education system negatively impacted on productivity growth. The idiosyncratic British institutional structures in terms of corporate governance and industrial relations caused a retreat from global competition, which further undermined productivity growth during the 1960s and 1970s (Crafts, 2022).

During the 1980 and early 1990s subsequent governments, led by Prime Minister Margaret Thatcher, implemented large supply-side reforms. Some of those reforms were highly overdue as can be seen from Table 10, showing that many of them were more characteristic of middle economy countries (and in the case of macroeconomic stability, perhaps even a low-income countries) rather than a high-income economy which the UK really is. The reforms included the liberalisation of product and labour markets, as well as major privatisations of public services. Together, they caused a substantial shakeout of inefficiencies in the economy and created an opportunity for productivity catch-up with other leading nations in the OECD, especially in the business sector (Bean and Crafts, 1996). The impact was especially large in manufacturing even though the share of manufacturing in employment fell faster than in other countries.

In particular during the 1990, the gap in labour productivity between the UK and European nations (such as France and Germany) narrowed, but this was less visible for total productivity growth (The Conference Board, 2023). This suggests that direct drivers of productivity, such as a rise in investment and education and international trade and FDI, played a larger role in closing the gap relative to other nations during the 1990s and early 2000s, rather than the indirect effects of market or institutional reforms. Indeed, it has been argued that the free-market policies under Thatcher did not increase competition by as much as anticipated, because of an unwillingness to face up to the implications of market failures (Baily and Kirkegaard, 2004).

Since 2010, investment in the UK has fallen again relative to other countries. Indeed, Figure 8 points to a collapse in capital deepening in the UK during the 2010s. The underinvestment in capital appears chronic and broad-based, including slow investment in machinery and equipment (which accounts for an ever-smaller share of total investment), research and development, intellectual property, other intangible capital, human capital and public capital (Van Ark and Venables, 2020, Odamtten et al., 2023). This has led to a call for a renewed broad-based investment focus in the UK.

There has been no shortage of recommendations and initiatives that could potentially help raise investment and productivity in the UK (for example, LSE Growth Commission, 2013, 2017; Haldane, 2018; Brandily et al, 2023). In 2011, Catapult Centres were set up with the aim to create a new innovation infrastructure across the UK. In 2014 the British Business Bank was established to help improve access to finance for SMEs. In 2015, the National Infrastructure Commission started its work to strengthen long-term strategic planning and investment in infrastructure. In 2017 the May government introduced an Industrial Strategy Council (ISC) tasked to improve productivity and promote economic growth across the UK. However, in 2021, the Johnson government abolished the ISC and replaced it with the Plan for Growth coordinated by the Treasury Department. Separately, in 2002 the government released a White Paper on Levelling Up which aimed at a substantial investment in UK regions outside London and the Southeast, which were showing a large and persistent gap in productivity performance relative to the capital (McCann and Pei-Yung, 2022; Stansbury et al, 2023).

Table 10: Stylised pro-productivity policies for the UK, 1960s-1970s, 1980s-1990s and 2010s-2020s

	1960s-1970s	1980s-early 1990s	2010s-2020s
Institutions & frameworks			
Institution building			Fragmented institution building without joined up growth strategy
Government capabilities			Political instability, exacerbated by Brexit vote (2016)
Macroeconomic policy	Cycles of expansionary fiscal stance putting pressure on exchange rate causing monetary tightness	Restoration of macro-economic stability	Independence of Bank of England (2007)
Factor Accumulation			
Investment		Privatisation of public services to improve customer performance	National Infrastructure Commission (2015) to strengthen infrastructure
Education & skills	Failure to introduce adequate vocational training	Rapid expansion of higher education system	Introduction of Local Skills Improvement Plans (LSIPs) to better meet local skill needs
Resources			Implementation of Net-Zero Policy and Climate Change Commission
Technology			
Innovation & technology		Failure to modernise innovation policies (R&D and diffusion)	Introduction of R&D Tax Credit (2000) Introduction of Catapult Centres (2011) to accelerate diffusion
Industrial policy	National Economic Development Office to develop growth and investment strategy		Introduction of Industrial Strategy Council (2017)
	Attempts at state-led industrialisation stranded in lack of unity between government, unions and employers		Industrial Strategy Council abolished (2021)
Creative destruction		Reduction in inefficiencies through higher churning of inefficient firms	Creation of long tail of inefficient firms because of low wage levels relative to cost of investment

Markets			
Financial markets		Big Bang reforms (1986) deregulating the London Stock Exchange and	British Business Bank (2014) to facilitate SME finance
		Deregulation of financial services	Revision of Financial Services and Markets Bill to respond to new developments in financial markets, incl. fintech (2023)
Product markets		Product market deregulation	Failure of reform in land-use planning
		Rapid increase in ICT investment especially in services	
Labour markets	Rigidly demarcated labour market policies	Deregulation of labour markets and reform of industrial relations	
Competition policy		Privatisation of State-Owned Assets incl. utilities and transport	Establishment of Competition and Market Authority
Internationalisation			
Trade	Too slow reorientation of Commonwealth to EC trade		Brexit vote (2016)
	Entry into the EEC (1973)		EU-UK Trade and Cooperation Agreement (2021) complicating trade relationships
FDI	Failure to attract new FDI		
Migration			Expansion of liberal migration policy (as of 2004)
Inclusion			Levelling up of disadvantaged regions

Notes: 1. The colours point to pro-productivity policies typical for different levels of economic development, as follows:

	Stylised policies low-income economy		Stylised policy middle-income economy		Stylised policy advanced economy		Potential anti-productivity effects
---	--------------------------------------	---	---------------------------------------	---	----------------------------------	---	-------------------------------------

Sources: Surrey (1984), Bean and Crafts (1996), Crafts (2022).

The generally perceived problem with many of these new institutions is that, while they provide the building blocks for an improvement in the UK's productivity performance, much depends on how policy instruments are coordinated, implemented and sustained over time. All those aspects seem to fall short in the case of the UK and complicate the path to recovery because of short-termism, lack of institutional stability, and policy churning (Coyle and Muthar, 2022; Brandily et al, 2023). Indeed, there is a strong need for better coordination of pro-productivity policies as the UK remains among the countries in the OECD that do not have a government-mandated productivity commission (Pilat, 2023).

Reflection on country experiences

Our case study analysis of Brazil, India, South Korea and the United Kingdom shows that pro-productivity policies tend to change over the course of economic development, as the economic structure of a country evolves and becomes more complex. Policies also change as economies mature and become more reliant on technological change, either embodied in intangible capital and digital equipment or in TFP, rather than capital accumulation as such. However, we also find that capital accumulation (although it will certainly have changed in terms of its composition between physical, human and intangible capital)¹⁴ has remained the main source of growth, even as countries become more developed while TFP growth has become less of a driver of productivity growth than was historically the case.

While certain stylised policies are characteristic for a certain level of economic development, we also find that there is no single pathway to economic growth and productivity. Countries develop their own strategies linked to their own initial conditions, economic structure and the predominant mode of thinking on economic policy. Interestingly, some highly successful economies, like Korea, deviated in several ways from the stylised policies for their level of economic development, benefitting from strong foundations and institutions that enabled more advanced and ambitious policies at the early stages of economic development, such as the development of a highly competent bureaucracy and specialised institutions. India, while gradually reforming its economy since the 1980s, leapfrogged in terms of the early creation of a strong ICT sector allowing it to build a global software industry building on a strong technical and management school system created decades earlier.

Pro-productivity policies also change over time as governments' capability to develop and implement policies increases and institutions evolve. However, the foundations for the development of pro-productivity policies can sometimes be inadequate. These include a lack of strong institutions, government capabilities and stable macroeconomic policies. Korea's strong productivity growth in the 1960s and 1970s was built on strengths in all these areas, whereas Brazil and India were found lacking in several of these dimensions, holding back the development of suitable pro-productivity policies and limiting productivity growth. In the UK, government capabilities and institutions failed to avoid rapid deindustrialization despite a productivity improvement in terms of what remained of its manufacturing sector after the 1990s. While it did facilitate the promotion of a highly productive business and financial services sector during the 1990s and early 2000s, the productivity gains in those sectors were insufficient to diffuse across the economy as policies and institutions tended to be fragmented and uncoordinated reflecting bad implementation and policy churning which was exacerbated by political instability especially in the past decade.

¹⁴ See, for example, Van Ark et al. (2023).

6. Implications for the Productivity Slowdown since the 2010s

In Sections 2 and 3 we found that the slowdown in TFP growth has become a widespread phenomenon across the G-20 since the 2010s, whilst the growth rate of capital deepening has begun to level off (see Appendix B for the country-specific results).¹⁵ While the accumulation of physical and human capital has continued to make a positive contribution to labour productivity growth across all country groupings, the lack of TFP growth is concerning. Long-term modelling studies suggest that the sources of growth in both advanced and emerging economies would move gradually from growth, mainly based on capital accumulation, to growth primarily based on knowledge and technological change, eventually resulting in a growing contribution of TFP to aggregate growth and productivity (Braconier, et al., 2014). TFP growth is also the key explanatory variable in explaining differences in productivity levels between countries (Gallardo-Albarran and Inklaar, 2021) and it is a critical driver of growth accelerations (Hausmann et al, 2005; Koopman and Wacker, 2023). The need for strong TFP growth is reinforced by the ageing of populations around the world which is reducing the role of labour input in GDP growth. In addition, there may be diminishing returns to further education in many countries as well as to further capital deepening in general. Our results suggest that the transition to a greater role of TFP growth is not happening at this stage.

The reasons for the global productivity slowdown are in part specific to certain countries and country groupings (for example, the different impacts of the global financial crisis between advanced and emerging economies, or the weakening catch up potential for emerging markets). However, in part they are also global and structural in nature (for example the reduced potential for structural change, or the slowdown in the pace of technological change) which may sometimes even have reinforced the slowdown between countries (for example, the defragmentation of global value chains or weakening of global capital flows).

The global slowdown in productivity growth is even more concerning given the abundance of new technologies that have emerged over the past few decades, providing ample opportunity for a productivity revival. Despite a temporary surge in productivity growth between 1995 and 2005 in advanced economies which has been widely attributed to the rise of the personal computer and the internet (the “old digital economy”), more recent digital technologies such as the move to mobile ICT, the use of cloud services, data analytics and artificial intelligence (the “new digital economy”) have not (yet) seen a major positive productivity effect, at least not at macroeconomic or even sectoral level, while firm-level analysis finds that users of technologies such as artificial intelligence are more productive than other firms (Van Ark et al., 2021; Calvino and Fontanelli, 2023). An extensive literature has emerged on explanations for the slowdown and the limited impact (thus far) of new technologies on productivity growth.¹⁶ In response to these factors and to address the slowdown, governments are applying a wide range of policies to strengthen productivity growth, both within the OECD area (Pilat, 2023) and beyond (Cusolito and Maloney, 2018; Dieppe ed., 2020).

As regards the direct drivers of productivity, we argue that policy action is required in three areas, i.e., technological change, investment (especially intangibles, public and green), and human capital.

¹⁵ The small role of TFP growth in our estimates is somewhat below that found in other recent studies – which may partly reflect methodological differences (see Section 3), but all show that TFP has not been a major driver of labour productivity growth, even in the most advanced economies (Dieppe, 2020; Goldin, forthcoming). Incorporating intangible assets not included in official GDP statistics in the analysis does not change this finding in any significant way (Van Ark, et al., 2022).

¹⁶ See Goldin, et al. (forthcoming) for a recent review of the literature for advanced economies; Dieppe ed, (2020) for a global overview.

Technological change and diffusion

Frist, despite the low contribution of TFP to productivity growth, the apparent global slowdown in the pace of technological change does not appear to be a subject of (global) policy action. Many countries do have policies to increase investment in R&D and achieve higher R&D intensity and global R&D investment has increased considerably over the past few decades (OECD, 2023, UNESCO, 2021). However, Jones (2022) shows that the growth rate of global research efforts has slowed over the past decades, whereas maintaining a steady growth rate of knowledge will require that research continues to grow at its historic rate. This is complemented by concerns about the growing costs and declining productivity of R&D and the risk of “running out of ideas” (Bloom, et al., 2020). At the same time, there is some hope that artificial intelligence might boost future research productivity (Jones, 2022).

Concerns about the pace of technological progress are exacerbated by the apparent slow pace of technology diffusion, in particular between leading and lagging firms (OECD, 2015a). While many countries provide incentives to encourage the uptake of technology, e.g., for digital and low-carbon technologies, accelerating technology diffusion does not seem to be an important focus of policy, at least in many advanced countries (Pilat, 2023). Moreover, diffusion is not just a question of technology, but a process that relies on several complementary factors related to innovation, such as skills, management and the uptake of intangible assets (Calvino, et al., 2022). In addition, there are many competitive barriers that slow down technology diffusion, such as the growing use of complex software and proprietary information technologies benefiting large firms (Bessen, 2022), that remain to be addressed by G20 countries.

Investment – intangibles, public and green investment

Second, given the central role of investment and capital accumulation to growth and productivity, there are good arguments that more should be done to strengthen investment that is also aligned with more sustainable productivity growth. A key issue is the extent to which G20 countries have adjusted their investment-related policies to the growing role of intangible assets. While investment in intangibles has grown rapidly in many advanced economies, there are large cross-country differences in such investment across G20 countries, suggesting scope for further growth (OECD, 2021b). Difficulties with the financing of such investments, linked to their specific characteristics, could hold back investment and could therefore be a focus of policy (Haskel and Westlake, 2022).

Another issue concerns public investment, including its role in addressing climate change. While there is good evidence about the productivity-enhancing effects of public investment (see Section 3 and Fournier, 2016), the share of public investment in GDP has remained flat (or declined) in many G20 countries following the 2008 economic crisis (IMF, 2020; OECD, 2021c). Recent policy initiatives in some G20 countries, such as the US Inflation Reduction Act, provide interesting examples of what could be done as regards stronger public investment that is also aligned with more sustainable growth.

Strengthening investment is particularly important to address climate change, for example in building the new energy infrastructure that can deliver and distribute low-carbon electricity, developing more sustainable transport systems and cleaner industrial processes, or low-carbon housing stocks. There are obvious concerns that tackling climate change would increase cost and hurt productivity (Gillingham and Stock (2018), and that the related investments would take time and involve high adjustment costs to generate returns. However, recent cross-country work on 3 million firms in 32 countries finds only limited effects of higher carbon costs on the performance of industrial firms (Trinks and Hille, 2023). Moreover, Stern and Stiglitz (2023) argue that investments in actions to address climate change could contribute to a new growth narrative that would support productivity, including through improvements in resource efficiency; increased returns to scale and learning by

doing effects; improvements in the productivity of key systems, such as energy, transport and cities; as well as rapid improvements in knowledge and innovation.¹⁷ While most of the necessary investment will have to come from private sources, governments can play a crucial role in de-risking such investment and addressing critical bottlenecks that are unlikely to be met by private capital.

Human capital

Third, although human capital does not make a very large contribution to productivity in growth accounting studies, a broader analysis of human capital as discussed in section 3 justifies why many economies place a strong emphasis on human capital in their productivity-related policies (Pilat, 2023). While increasingly marginal improvements in the quality of human capital should not be expected to make large contributions to productivity growth in most G20 countries, policies related to human capital are important due to their complementarity with investment in fixed and intangible assets, and because of the crucial role of human capital in enabling workers to adjust to the structural changes associated with productivity growth. Moreover, given rapidly ageing populations in many G20 countries, countries will increasingly be forced to use their available human resources as productively as possible, including through further improvements in the quality of that human capital.

7. The future of pro-productivity policies

To conclude, the discussion in this paper also raises some broader questions about the future of pro-productivity policies, which go beyond the need to tackle the global productivity slowdown we are currently experiencing. First, our country studies show that there is an increased demand for more inclusive productivity growth by improving access to the sources of productivity growth and by broadening the distribution of the gains. Second, climate change requires new investments and innovations focused on more sustainable productivity growth. It is therefore important to be aware of some key factors influencing pro-productivity policies:

- **Markets, competition and resource allocation:** Well-functioning, competitive markets that facilitate the efficient allocation of scarce resources are central drivers of productivity and will be of critical importance if countries seek to boost investment and increase TFP growth. Market-related policies should move from liberalisation and deregulation to policies that aim at improving and shaping the functioning of markets. For example, investment-related policies in support of climate change will greatly benefit from better price signals by policies that “get prices right” and adjust for the negative environmental externalities related to climate change. Moreover, ensuring strong competition will be central to policies to encourage innovation and technology diffusion.
- **Innovation and industrial policies:** While the thinking on productivity-enhancing policies has moved on from the “Washington Consensus”, policy makers in many countries still seem reluctant to embrace certain policies that could help strengthen productivity growth, notably innovation and industrial policies (see for example, Rodrik, 2022). These seem particularly important in the current context of interconnected crises where critical challenges like climate change urgently need to be addressed and innovation and structural change will need to be key drivers of change. A new approach to such policies should be built on policy learnings over many decades. This includes the key role of competition and trade, and the importance of policy design and evaluation (Criscuolo, et al., 2022).

¹⁷ Stern and Stiglitz (2023) also note the counterfactual – not addressing climate change will cause growing damage and threat to lives, which will require growing expenditures to address, that will detract from growth and productivity in any case.

- **Institutions and capabilities:** The case of Korea, in particular, points to the central role of foundational policies linked to the development of institutions and capabilities for strong productivity growth. Such policies remain relevant today, even for more advanced countries. To strengthen the development and delivery of pro-productivity policies, many advanced countries have recently developed new capabilities, including dedicated pro-productivity institutions as well as a stronger evidence base, drawing on comprehensive microdata. Countries that have not yet established such institutions should consider doing so (Pilat, 2023), as suggested also by Dutz et al. (2018) for Brazil and by Brandily et al. (2023) for the UK.
- **Measurement and evidence building:** Better measurement and further evidence building remains crucial for the study of economic growth and productivity, including more detailed growth accounting (Jones, 2022), a closer integration of growth accounting and growth regressions studies, more work on the determinants of TFP growth, and more comprehensive national and cross-country studies of growth and productivity, benefiting from the many approaches that are available, including studies based on firm-level data.
- **Learning about policies:** We believe there is value in examining pro-productivity policies in more detail, including across different countries, levels of economic development and different periods. It can provide ideas for possible “leapfrogging” and “piggybacking”, i.e., policies and strategies that are currently being applied by high-income economies, but that might be relevant also for countries at lower levels of economic development, or vice-versa. For example, the development of management skills is increasingly regarded as important for the success of firms and within-firm productivity growth in high-income economies (Bloom and Van Reenen, 2010). However, greater attention for such skills is also important for countries at lower levels of economic development and should therefore be considered in the context of development strategies more generally. Likewise, there are opportunities for policy learning in advanced economies from the experiences of middle- or low-income economies, e.g., the use of mobile technologies for policy development and delivery.
- **The need for policy coordination:** Finally, this paper has pointed to the many drivers and policies that affect productivity and their interactions, including in the typology we presented. Alignment and coordination between these policies is crucial, and lack of alignment can sometimes be a major draw on productivity growth. For example, in the UK, there is a strong need for joining up pro-productivity policies, both horizontally across policy domains as well as vertically between national, regional and local governments. Alignment and coordination also play an increasingly important role at the global level, as the slowdown in productivity is now a global phenomenon. Coordination and joint policy action to support and sustain key drivers of productivity growth, such as sustainable investment, technological progress and diffusion, or trade openness, are important actions that policy makers can take. The decline in multilateralism at the global level is a major concern for such action, however, and is an important risk to any possible resurgence in productivity growth.

This paper has started to address some of the questions linked to the productivity slowdown and the role of pro-productivity policies for countries at different stages of economic development. An extension of traditional tangible capital (machinery, buildings and ICT and non-ICT equipment) to a broader range of intangible assets could be helpful for our growth accounting analysis. This could shed more light on the underlying dynamics of recent trends in productivity (Van Ark et al, 2022), although it is unlikely to change the picture of the productivity slowdown in a big way. Moreover, and as noted earlier in this paper, extending our policy framework and typologies towards inclusive and sustainable productivity growth is also an important and necessary step that we aim to undertake next.

References

- Abramovitz, M. (1993), "[The search for the sources of growth: areas of ignorance, old and new](#)", *Journal of Economic History*, Vol. 53, pp. 217– 243, <https://www.jstor.org/stable/2122171>.
- Akcigit, U. and S. T. Ates (2019a), "Ten Facts on Declining Business Dynamism and Lessons from Endogenous Growth Theory", *NBER Working Papers* No. 25755, National Bureau of Economic Research. <http://doi.org/10.3386/w25755>
- Albrizio, S. and G. Nicoletti (2016), "Boosting Productivity: A Framework for Analysis and a Checklist for Policy", Background Paper, Global Forum on Productivity, Lisbon, <https://www.oecd.org/global-forum-productivity/events/Boosting%20Productivity.pdf>
- Anderton, R., B. Di Lupidio and B. Jarmulska (2020), "The impact of product market regulation through firm churning: Evidence from European countries", *Economic Modelling*, Vol. 91, pp. 487-501, <https://doi.org/10.1016/j.econmod.2020.02.039>
- D’Arcangelo, F.M., I. Levin, A. Pagani, M. Pisu and Å. Johansson (2022), *A Framework to Decarbonise the Economy*, Paris, OECD. <https://doi.org/10.1787/4e4d973d-en>
- Baily, M.N. and J.F. Kirkegaard (2004), *Transforming the European Economy*, Institute for International Economics, Washington D.C.
- Balakrishnan, P. (2010), *Economic growth in India: History & Prospect*. Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780198065470.001.0001>
- Banga, R. and B. Goldar (2004), "[Contribution of services to output growth and productivity in Indian manufacturing: Pre and post reforms](#)", Working Paper No. 139, ICRIER, Delhi.
- Barro, R. (1991), "Economic Growth in a Cross Section of Countries", *Quarterly Journal of Economics*, Vol. 106, pp. 407-501, <https://doi.org/10.2307/2937943>.
- Barro, R. (2003), "Determinants of Economic Growth in a Panel of Countries", *Annals of Economics and Finance*, Vol. 4, pp. 231-274. <http://down.aefweb.net/AefArticles/aef040202.pdf>
- Bassanini, A., S. Scarpetta and P. Hemmings (2001), "Economic Growth: The Role of Policies and Institutions. Panel Data Evidence from OECD Countries", *Economics Department Working Papers*, No. 283, OECD, Paris. <https://doi.org/10.1787/722675213381>
- Bassanini, A. and S. Scarpetta (2002), "Does human capital matter for growth in OECD countries? A pooled mean-group approach", *Economics Letters*, Vol. 74, pp. 399-405. [https://doi.org/10.1016/S0165-1765\(01\)00569-9](https://doi.org/10.1016/S0165-1765(01)00569-9)
- Batranca, L., M.M. Rathnaswamy and I. Batrancea (2021), "A Panel Data Analysis of Economic Growth Determinants in 34 African Countries", *Journal of Risk and Financial Management*, Vol. 14, No. 260, <https://doi.org/10.3390/jrfm14060260>
- Bean, C.R. and Crafts, N. (1996), "British Economic Growth Since 1945: Relative Economic Decline and Renaissance?", in N.F.R. Crafts and G. Toniolo, eds., *Economic Growth in Europe Since 1945*, Cambridge University Press, 131-172.
- Berlingieri, G., S. Calligaris, C. Criscuolo and R. Verlhac (2020), "Laggard firms, technology diffusion and its structural and policy determinants", *STI Policy Paper*, No. 86, OECD, Paris, <https://doi.org/10.1787/281bd7a9-en>
- Bessen, J. (2022), [The New Goliaths: How Corporations Use Software to Dominate Industries, Kill Innovation and Undermine Regulation](#), Yale University Press, New Haven, CT.
- Bhattacharjea, A. (2022), "[Industrial policy in India since independence](#)", *Indian Economic Review* Vol. 57, pp. 565–598. <https://doi.org/10.1007/s41775-022-00154-9>

- Biagi, F. (2013), ICT and Productivity: A Review of the Literature, *Institute for Prospective Technological Studies Digital Economy Working Paper*, No. 2013/09, ISBN 978-92-79-33678-2, European Commission, Joint Research Centre (JRC), Seville, <https://doi.org/10.2788/32940>
- Bloom, N., and J. Van Reenen (2010), “Why Do Management Practices Differ across Firms and Countries?”, *Journal of Economic Perspectives*, Vol. 24, No. 1, Winter, pp. 203-224. <http://doi.org/10.1257/jep.24.1.203>
- Bloom, N., C.I. Jones, J. Van Reenen and M. Webb (2020), “Are Ideas Getting Harder to Find”, *American Economic Review*, Vol. 110, No. 4, pp. 1104-1144, <https://doi.org/10.1257/aer.20180338>
- Bonelli, R. (2002), “Labor Productivity in Brazil during the 1990s”, *Texto para Discussão No. 906*, Instituto Futuro Brasil, Rio de Janeiro, September.
- Bonelli, R. (2005), “[Economic Growth and Productivity Change in Brazil](#)”, paper prepared for the World Bank’s Brazil Investment Climate Assessment, June.
- Bontandini, F. C. Corrado., J. Haskel., M. Iommi., and C. Jona-Lasinio (2023), [EUKLEMS & INTANProd: industry productivity accounts with intangibles. Sources of growth and productivity trends: methods and main measurement challenges](#), LUISS Lab of European Economics, Rome.
- Bouis, R., R. Duval and F. Murtin (2011), “The Policy and Institutional Drivers of Economic Growth: New Evidence from Growth Regressions”, *Economics Department Working Papers*, No. 843, OECD, Paris. <https://doi.org/10.1787/5kghwnhxwkhj-en>
- Bourlès, R., G. Clette, J. Lopez, J. Mairesse and G. Nicoletti (2010), “Do Product Market Regulations in Upstream Sectors Curb Productivity Growth? Panel Data Evidence for OECD Countries”, *NBER Working Paper*, No. 16520, NBER, Cambridge, MA, <http://doi.org/10.3386/w16520>
- Braconier, H., G. Nicoletti and B. Westmore (2014), “Policy Challenges for the Next 50 Years”, *OECD Economics Department Policy Papers*, No. 9, <http://doi.org/10.1787/2226583X>
- Brandily, P., M. Distefano, K. Shah, G. Thwaites and A. Valero (2023), [Beyond Boosterism. Realigning the policy ecosystem to unleash private investment for sustainable growth](#), The Economy 2030 Inquiry, Resolution Foundation, London.
- Broadberry, S.N. (1997), *The Productivity Race. British Manufacturing in International Perspective, 1850-1990*, Cambridge University Press. <https://doi.org/10.1017/CBO9780511584770>
- Byrne, D. and C. Corrado (2016), “[ICT Asset Prices: Marshaling Evidence into New Measures](#)”, *Economics Working Program Working Paper Series*, EPWP #16-6, The Conference Board, New York.
- Calderón, C., E. Moral-Benito and L. Servén (2015), “Is Infrastructure Capital Productive? A Dynamic Heterogeneous Approach”, *Journal of Applied Econometrics*, Vol. 30, No. 2 (March), pp. 177-198, <https://www.jstor.org/stable/10.2307/26609027>
- Calvino, F., S. DeSantis, I. Desnoyer-James, S. Formai, I. Goretti, S. Lombardi, F. Manaresi and G. Perani (2022), “Closing the Italian Digital Gap: The Role of Skills, Intangibles and Policies”, *OECD Science, Technology and Industry Policy Papers*, No. 126, OECD, Paris, <https://doi.org/10.1787/e33c281e-en>
- Calvino, F. and L. Fontanelli (2023), “A portrait of AI adopters across countries: Firm characteristics, assets’ complementarities and productivity”, *OECD Science, Technology and Industry Working Papers*, 2023/02, OECD, Paris. <https://doi.org/10.1787/0fb79bb9-en>
- Cardona, M., T. Kretschmer and T. Strobel (2013), “ICT and Productivity: Conclusions from the Empirical Literature”, *Information Economics and Policy*, Vol. 25, Issue 3, September, pp. 109-125, <https://doi.org/10.1016/j.infoecopol.2012.12.002>

- Cardoso, E. and V. Kuhl Teles (2010), "A brief history of Brazil's growth", in Luiz de Mello (ed.), *Growth and Sustainability in Brazil, China, India, Indonesia and South Africa*, OECD, Paris, <https://doi.org/10.1787/9789264090200-en>.
- Cervantes, M., C. Criscuolo, A. Dechezleprêtre and D. Pilat (2023), "Driving low-carbon innovations for climate neutrality", *OECD Science, Technology and Industry Policy Papers*, No. 143, OECD, Paris, <https://doi.org/10.1787/8e6ae16b-en>.
- Chen, W. T. Niebel and M. Saam (2016), "Are intangibles more productive in ICT-intensive industries? Evidence from EU countries", *Telecommunications Policy*, Vol. 40, pp. 471-484. <http://dx.doi.org/10.1016/j.telpol.2015.09.010en>
- Colecchia, A. and P. Schreyer (2002), "The Contribution of Information and Communication Technologies to Economic Growth in Nine OECD Countries", *OECD Economic Studies*, May, pp. 153-171, https://doi.org/10.1787/eco_studies-v2002-art5-en
- Corrado, C., J. Haskel and C. Jona-Lasinio (2017), "Knowledge Spillovers, ICT and Productivity Growth", *Oxford Bulletin of Economics and Statistics*, Vol. 79, Issue 4, August, pp. 592-618, <https://doi.org/10.1111/obes.12171>
- Corrado, C., J. Haskel, C. Jona-Lasinio and M. Iommi (2021), "[Intangible Capital and Modern Economies](https://doi.org/10.1257/jep.36.3.3)", *Journal of Economic Perspectives*, Vol. 36, No. 3, Summer, pp. 3-28, <https://doi.org/10.1257/jep.36.3.3>
- Coyle, D. and A. Muthar (2022), "[UK's Industrial Policy: Learning from the past?](https://doi.org/10.1016/j.telpol.2022.09.002)", Productivity Insights Paper No. 002, The Productivity Institute.
- Crafts, N.F.R. (1998), "[East Asian Growth Before and After the Crisis](https://doi.org/10.5089/9781451855883.001)", *IMF Working Paper No. 1998/137*, IMF, Washington, D.C., September. <https://doi.org/10.5089/9781451855883.001>
- Crafts, N.F.R. (2002), [Britain's Relative Economic Performance 1870-1999](https://doi.org/10.1017/C097805218042424), The Institute of Economic Affairs, London.
- Crafts, N.F.R. (2022), [Adapting Well to New Circumstances? UK Experience in Changing Times](https://doi.org/10.1017/C0978101710171017), The Economy 2030 Inquiry, Resolution Foundation, London.
- Crafts, N.F.R. and Woltjer, P. (2021), "[Growth Accounting in Economic History: Findings, Lessons and New Directions](https://doi.org/10.1017/S0950080421000001)", *Journal of Economic Surveys*, Vol. 35, Issue 3, pp. 670-696. <https://doi.org/10.1111/joes.12348>
- Criscuolo C., Gal P., Leidecker T. and Nicoletti G. (2021), "The Human Side of Productivity: Uncovering the role of skills and diversity for firm productivity", *OECD Productivity Working Papers*, OECD, Paris, No 29, December, <https://doi.org/10.1787/5f391ba9-en>
- Criscuolo, C., N. Gonne, K. Kitazawa and G. Lalanne (2022), "Are Industrial Policy Instruments Effective? A Review of Evidence in OECD Countries", *OECD Science, Technology and Industry Policy Papers*, No. 128, May, <http://doi.org/10.1787/57b3dae2-en>
- Cusolito, A.P. and W.F. Maloney (2018), *Productivity Revisited: Shifting Paradigms in Analysis and Policy*, World Bank, Washington, DC. <http://hdl.handle.net/10986/30588>
- Decker, R. A., J. Haltiwanger, R. S. Jarmin, and J. Miranda (2016b), "Declining Business Dynamism: What We Know and the Way Forward", *American Economic Review*, Vol. 106, No. 5, pp. 203–07, <https://doi.org/10.1257/aer.p20161050>.
- De Mello, J.M.P, I. Duarte and M. Dutz (2019), "[Brazil's Productivity Challenge: Structural Change versus Economy-Wide Innovation-Based Improvements](https://doi.org/10.5089/9781484339749.071)", in A. Spilimbergo and K. Srinivasan (2019), *Brazil: Boom, Bust, and the Road to Recovery*, IMF, Washington, D.C. <https://doi.org/10.5089/9781484339749.071>

- Demmou, L. and G. Franco (2021), "Mind the Financing Gap: Enhancing the Contribution of Intangibles to Productivity", OECD Economics Department Working Papers, No. 1681, OECD, Paris. <https://doi.org/10.1787/7aefd0d9-en>
- De Vries, K. and Erumban, A. A. (2022), [Total Economy Database. A Detailed Guide to Its Sources and Methods](#), The Conference Board.
- De Vries, K., A.A. Erumban and B. van Ark (2021), "[Productivity and the pandemic: short-term disruptions and long-term implications](#)", *International Economics and Economic Policy*, 18, pp. 541-570. <https://doi.org/10.1007/s10368-021-00515-4>
- Dieppe, A. (ed.) (2020), *Global Productivity: Trends, Drivers, and Policies*, Washington, DC: World Bank. <http://hdl.handle.net/10986/34015>
- Dornbusch, R. and Y.C. Park (1987), "[Korean Growth Policy](#)", *Brookings Papers on Economic Activity*, Vol. 2, pp. 389-444.
- Dougherty, S.M., R. Herd and T. Chalaux (2009), "[What is Holding Back Productivity Growth in India? Recent Microevidence](#)", OECD Journal: Economic Studies, Paris. <https://doi.org/10.1787/eco-studies-v2009-1-en>
- Durlauf, S.N. (2009), "[The Rise and Fall of Cross-Country Growth Regressions](#)", *History of Political Economy*, Vol. 41 (Suppl_1), pp. 315-333. <https://doi.org/10.1215/00182702-2009-030>
- Dutz, M. (2018), *Jobs and Growth: Brazil's Productivity Agenda*, International Development in Focus, World Bank, Washington D.C. <https://doi.org/10.1596/978-1-4648-1320-7>
- Easterly, W. and R. Levine (2001), "[It's not Factor Accumulation: Stylized Facts and Growth Models](#)", *The World Bank Economic Review*, Vol. 15, No. 2, pp. 177-219.
- Egert, B. (2016), "Regulation, Institutions and Productivity: New Macroeconomic Evidence for OECD countries", *American Economic Review*, Vol. 106, No. 5, May, pp. 109-13, <http://doi.org/10.1257/aer.p20161026>
- Feenstra, R.C., R.C. Inklaar and M. P. Timmer (2015), "The Next Generation of the Penn World Table" *American Economic Review*, 105(10), pp. 3150-3182. <http://doi.org/10.1257/aer.20130954>
- Fernald, J. (2015), "Productivity and Potential Output before, during, and after the Great Recession", *NBER Macroeconomics Annual 2014*, NBER. <https://doi.org/10.1086/680580>.
- Forbes, N. (2022), *The Struggle and the Promise - Restoring India's Potential*, Harper Business
- Fournier, J.M. (2016), "The Positive Effect of Public Investment on Potential Growth", *OECD Economics Department Working Papers*, No. 1347, OECD, Paris, <https://doi.org/10.1787/15e400d4-en>
- Fuente, A. de la, and R. Doménech (2006), "Human Capital in Growth Regressions: How Much Difference does Data Quality make?", *Journal of the European Economic Association*, March, Vol. 4(1), pp. 1-36. <https://doi.org/10.1162/jeea.2006.4.1.1>
- Gallardo-Albarrán, D. and R.C. Inklaar (2021), "The Role of Capital and Productivity in Accounting for Income Differences Since 1913", *Journal of Economic Surveys*, 35(3), 952-974. <https://doi.org/10.1111/joes.12374>
- Gillingham, K. and J.H. Stock (2018), "The Cost of Reducing Greenhouse Gas Emissions", *Journal of Economic Perspectives*, Vol. 32, No. 4, pp. 53-72. <https://doi.org/10.1257/jep.32.4.53>
- Goldin, I., P. Koutroumpis, F. Lafond and J. Winkler (forthcoming), "Why is Productivity Slowing Down", *Journal of Economic Literature*.

- Goodridge, P., J. Haskel and H. Edquist (2019), “The Economic Contribution of the “C” in ICT: Evidence from OECD Countries”, *Journal of Comparative Economics*, Vol. 47, Issue 4, December, pp. 867-880, <https://doi.org/10.1016/j.jce.2019.07.001>
- Gordon, J. and P. Gupta (2004), “[Understanding India’s Service Revolution](#)”, *IMF Working Paper, WP/04/171*, Washington DC.
- Gouma, R. and R.C. Inklaar (2023), “[Capital Measurement and Productivity Growth Across International Databases](#)”, *International Productivity Monitor*, No. 43, pp. 67-88.
- Government of India (2020), [Science, Technology and Innovation Policy](#), Ministry of Science and Technology, December.
- Guellec, D. and B. van Pottelsberghe (2004), ‘From R&D to productivity growth: do the institutional settings and the source of funds matter?’ *Oxford Bulletin of Economics and Statistics*, 66, 353–78, <https://doi.org/10.1111/j.1468-0084.2004.00083.x>
- Haldane, A., (2018), “[The UK’s Productivity Problem: Hub No Spokes](#)”, Academy of Social Sciences Annual Lecture, London.
- Haskel, J. and G. Wallis (2013), ‘Public support for innovation, intangible investment and productivity growth in the UK market sector,’ *Economics Letters*, 119, 195–8. <https://doi.org/10.1016/j.econlet.2013.02.011>
- Haskel, J. and S. Westlake (2022), *Restarting the Future: How to Fix the Intangible Economy*, Princeton University Press
- Hausmann, R., L. Pritchett and D. Rodrik (2005), “Growth Accelerations”, *Journal of Economic Growth*, Vol. 10, 303–329. <https://doi.org/10.1007/s10887-005-4712-0>
- Hsieh, C.T. (1997), “What Explains the Industrial Revolution in East Asia? Evidence from Factor Markets,” *American Economic Review*, Vol. 92, No. 3, June, pp. 502-526. <https://www.aeaweb.org/articles?id=10.1257/00028280260136372>
- International Monetary Fund (IMF) (2020), *Fiscal Monitor – Policies for the Recovery*, IMF, Washington, D.C., October.
- IMF (2022), World Economic Outlook Database, April 2022, <https://www.imf.org/en/Publications/WEO/weo-database/2022/April/select-aggr-data>, IMF, Washington, D.C.
- Islam, M.R., J.B. Ang and J.B. Madsen (2014), “Quality-adjusted Human Capital and Productivity Growth”, *Economic Inquiry*, Vol. 52, No. 2, April, pp. 757-777, <https://doi.org/10.1111/ecin.12052>
- Jedwab, R., P. Romer, A. M. Islam and R. Samaniego (2023), “[Human Capital Accumulation at Work: Estimates for the World and Implications for Development](#)”, *American Economic Journal: Macroeconomics*, Vol. 15 No. 3 (July), pp. 191-223. <http://doi.org/10.1257/mac20210002>
- Jones, C.I. (2022), “The Past and Future of Economic Growth: A Semi-Endogenous Perspective”, *Annual Review of Economics*, Vol. 14, pp. 125-152, <https://doi.org/10.1146/annurev-economics-080521-012458>
- Jorgenson, D., F.M. Gollop and B. Fraumeni (1987), *Productivity and U.S. Economic Growth*, Cambridge, MA: Harvard Economic Studies.
- Jorgenson, D. and K. Stiroh (1995), “[Computers and Economic Growth](#)”, *Economics of Innovation and New Technology*, Vol. 3, 3, no. 3-4, pp. 295-316. <https://doi.org/10.1080/10438599500000008>
- Jourard, I., H. Morgavi and H. Bourrouse (2017), [Achieving strong and balanced regional development in India](#), OECD Economics Department Working Papers No. 1412, OECD, Paris <https://doi.org/10.1787/92fd16d9-en>

- Khan, M. and K. B. Luintel (2006), 'Sources of knowledge and productivity: how robust is the relationship?' *STI Working Paper 2006/6*, OECD, Paris. <https://doi.org/10.1787/18151965>
- Kim, K. and D.M. Leipziger (1993), *Korea – A Case of Government-Led Development*, World Bank, Washington, D.C.
- King, R.G. and R. Levine (1993), "Finance and Growth: Schumpeter might be Right", *Quarterly Journal of Economics*, August, pp. 717-737. <https://doi.org/10.2307/2118406>
- Koopman, E. and K.M. Wacker (2023), "Drivers of growth accelerations: What role for capital accumulation?", *World Development*, Vol. 169. <https://doi.org/10.1016/j.worlddev.2023.106297>.
- Koutroumpis P. (2009), "The Economic Impact of Broadband on Growth: A Simultaneous Approach", *Telecommunications Policy*, 33 (2009), 471-485. <https://doi.org/10.1016/j.telpol.2009.07.004>
- Krishna, K. L., Goldar, B., Das, D. K., Aggarwal, S. C., Erumban, A. A. & Das, P. C. (2022). [India Productivity Report](#). Centre for Development Economics, Delhi
- Kumar, N. (2000), "Economic Reforms and Their Macro-Economic Impact", *Economic and Political Weekly*, Vol. 35, No. 10, pp. 803-812, <https://jstor.org/stable/4408992>
- Levine, R. and S.J. Zervos (1993), "What have we Learned about Policy and Growth from Cross-Country Regressions", *American Economic Review*, Vol. 83, No. 2, pp. 426-430. <https://www.jstor.org/stable/2117702>
- LSE Growth Commission (2013), [Investing for Prosperity: Skills, Infrastructure and Innovation](#), London School of Economics and Political Science, London, UK.
- LSE Growth Commission (2017), [UK Growth. A New Chapter](#), London School of Economics and Political Science, London, UK.
- Lucas, R.E. (1988), "[On the Mechanics of Economic Development](#)", *Journal of Monetary Economics*, Vol. 22, Issue 1, July, pp. 3-42. [https://doi.org/10.1016/0304-3932\(88\)90168-7](https://doi.org/10.1016/0304-3932(88)90168-7)
- Mankiw, N.G., D. Romer and D.N. Weil (1992), "A Contribution to the Empirics of Economic Growth", *Quarterly Journal of Economics*, May, pp. 407-437. <https://doi.org/10.2307/2118477>
- Martin, J. (2021), "Finding the missing capitals: Sources of growth redefined", ESCoE, <https://www.escoe.ac.uk/finding-the-missing-capitals-sources-of-growth-redefined/>
- Männasoo, K., H. Hein and R. Ruubel (2018) The contributions of human capital, R&D spending and convergence to total factor productivity growth, *Regional Studies*, 52:12, 1598-1611, <http://doi.org/10.1080/00343404.2018.1445848>
- McCann, P. and P-Y ,Yuan (2022), "[The Productivity Performance Of Different Types Of Uk Regions And The Challenges Of Levelling Up](#)", *National Institute Economic Review*, vol. 261, pages 79-98, August. <https://doi.org/10.1017/nie.2022.24>
- McKinsey Global Institute (2020), [India's turning point: An economic agenda to spur growth and jobs](#), McKinsey & Co.
- Minier, J. (2007), "Nonlinearities and Robustness in Growth Regressions", *AEA Papers and Proceedings*, May, pp. 388-392. <https://doi.org/10.1257/aer.97.2.388>
- Nassif, A., L. Morandi, E. Araújo and C. Feijó (2020), "Economic Development and Stagnation in Brazil (1950-2011)", *Structural Change and Economic Dynamics*, Vol. 53, pp. 1-15. <https://doi.org/10.1016/j.strueco.2020.01.005>
- Odamtten, F. and J. Smith (2023), [Cutting the cuts. How the public sector can play its part in ending the UK's low-investment rut](#), The Economy 2030 Inquiry, Resolution Foundation, London.

- OECD (2001), *Measuring Productivity – OECD Manual*, OECD, Paris. <https://doi.org/10.1787/9789264194519-en>
- OECD (2003), *OECD Economic Surveys – Korea*, OECD, Paris. https://doi.org/10.1787/eco_surveys-kor-2003-en
- OECD (2012), *OECD Economic Surveys – Korea*, OECD, Paris, https://doi.org/10.1787/eco_surveys-kor-2012-en
- OECD (2014), *Perspectives on Global Development 2014 – Boosting Productivity to meet the Middle-Income Challenge*, OECD, Paris, https://doi.org/10.1787/persp_glob_dev-2014-en
- OECD (2015a), *The Future of Productivity*, OECD, Paris. <https://doi.org/10.1787/9789264248533-en>
- OECD (2015b), “The Impact of R&D Investment on Economic Performance: A Review of the Econometric Evidence”, DSTI/EAS/STP/NESTI(2015)8, OECD, Paris, April.
- OECD (2017), *Going for Growth – Economic Policy Reforms 2017*, OECD, Paris. <https://doi.org/10.1787/growth-2017-en>
- OECD (2018a), *The Productivity-Inclusiveness Nexus*, OECD, Paris. <https://doi.org/10.1787/9789264292932-en>
- OECD (2018b), *OECD Economic Surveys – Korea*, OECD, Paris. https://doi.org/10.1787/eco_surveys-kor-2018-en
- OECD (2019a), *Perspectives on Global Development 2019 – Rethinking Development Strategies*, OECD, Paris. https://doi.org/10.1787/persp_glob_dev-2019-en
- OECD (2019b), *Going for Growth – Economic Policy Reforms 2019*, OECD, Paris. <https://doi.org/10.1787/aec5b059-en>
- OECD (2020a), *OECD Economic Surveys – Brazil*, OECD, Paris, December. <https://doi.org/10.1787/250240ad-en>
- OECD (2020b), *OECD Economic Surveys – Korea*, OECD, Paris. <https://doi.org/10.1787/2dde9480-en>
- OECD (2021a), *Going for Growth: Shaping a Vibrant Recovery – Economic Policy Reforms 2021*, OECD, Paris. <https://doi.org/10.1787/3c796721-en>
- OECD (2021b), *Bridging the Gap in the Financing of Intangibles to Support Productivity: Background Paper*, OECD contribution to the G20 Italian Presidency 2021, OECD, Paris.
- OECD (2021c), *Government at a Glance 2021*, OECD, Paris, <https://doi.org/10.1787/22214399>
- OECD (2021d), *Inclusive Growth Review of Korea – Creating Opportunities for All*, OECD, Paris. <https://doi.org/10.1787/4f713390-en>
- OECD (2022a), *Education at a Glance 2022*, OECD, Paris, <https://doi.org/10.1787/3197152b-en>
- OECD (2022b), *OECD Economic Surveys – Korea*, OECD, Paris. <https://doi.org/10.1787/20bf3d6e-en>
- OECD (2023), *Main Science and Technology Indicators*, March, OECD, Paris, <https://www.oecd.org/sti/msti.htm>
- Panagariya, A. (2021), *New India, Reclaiming the Lost Glory*, Oxford University Press.
- Pilat, D. (2023), “[Pro-Productivity Institutions: A Review of Analysis and Policy Recommendations](#)”, *TPI Insights Paper No. 15*, The Productivity Institute, Manchester, March.
- Ray, K.N. (1984), “Some Observations on Economic Growth in India over the Period 1952-53 to 1982-83”, *Economic and Political Weekly*, October 13, pp. 1801-1804.

- Rodrik, D. (2012), [“Why We Learn Nothing from Regressing Economic Growth on Policies”](#), *Seoul Journal of Economics*, Vol. 25, No. 2, pp.137-151.
- Rodrik, D. (2013), “Unconditional Convergence in Manufacturing”, *The Quarterly Journal of Economics*, Vol. 128, Issue 1, February, pp. 165-204, <https://doi.org/10.1093/qje/qjs047>
- Rodrik D. (2022), [An Industrial Policy for Good Jobs](#). The Hamilton Project, Brookings. <https://tinyurl.com/2qovrmdv>
- Rodrik, D. and A. Subramanian (2004), [From “Hindu Growth” to Productivity Surge: The Mystery of the Indian Growth Transition](#), *IMF Working Paper WP/04/77*
- Romer, P.M. (1990), “[Endogenous Technological Change](#)”, *Journal of Political Economy*, Vol. 98, No.5, Part 2, pp. S71-S102. <https://doi.org/10.1086/261725>
- Sala-i-Martin, X. (1994), “Cross-sectional Regressions and the Empirics of Economic Growth”, *European Economic Review*, Vol. 38, pp. 739-747. [https://doi.org/10.1016/0014-2921\(94\)90109-0](https://doi.org/10.1016/0014-2921(94)90109-0)
- Sala-i-Martin, X. (1997), “I just ran four million regressions”, *NBER Working Paper Series*, NBER, Cambridge, MA. <https://doi.org/10.3386/w6252>
- Singh, N. (2006), “Services-led industrialization in India: Assessment and lessons”, University of California, Santa Cruz. <http://dx.doi.org/10.2139/ssrn.951735>
- Soete, L., B. Verspagen and T.H.W. Ziesemer (2022), “Economic Impact of Public R&D: An International Perspective”, *Industrial and Corporate Change*, Vol. 31, pp. 1-18. <https://doi.org/10.1093/icc/dtab066>
- Stansbury, A, D Turner, and E Balls (2023), [“Tackling the UK’s Regional Economic Inequality: Binding Constraints and Avenues for Policy Intervention”](#), HKS MRCBG Working Paper, Harvard.
- Stern, N. and J. Stiglitz (2023), “Climate Change and Growth”, *Industrial and Corporate Change*, Vol. 32, pp. 277-303, <https://doi.org/10.1093/icc/dtad008>
- Straub, S. (2008), “Infrastructure and Growth in Developing Countries: Recent Advances and Research Challenges.” *World Bank Policy Research Working Paper*, No. 4460, World Bank, Washington, D.C., <https://doi.org/10.1596/1813-9450-4460>
- Summers, R. and A. Heston (1988), “A New Set of International Comparisons of Real Product and Price Levels: Estimates for 130 Countries, 1950-1985”, *Review of Income and Wealth*, Vol. 34, March, pp. 1-25. <https://doi.org/10.1111/j.1475-4991.1988.tb00558.x>
- Surrey, M. (1982), “United Kingdom.” in A. Boltho, ed., *The European Economy: Growth and Crisis*, Oxford University Press.
- Temple, J. (1999), “The New Growth Evidence”, *Journal of Economic Literature*, Vol. XXXVII, March, pp. 112-156, <https://doi.org/10.1257/jel.37.1.112>
- The Conference Board (2023), Total Economy Database™, April. <https://www.conference-board.org/data/economydatabase>
- Timmer, M., G. de Vries, G. And K. de Vries, K. (2015), “Patterns of structural Change in Developing Countries”, In J. Weiss, & M. Tribe (Eds.), *Routledge Handbook of Industry and Development* (pp. 65-83), Routledge.
- Trinks, A. and E. Hille (2023), “Carbon cost and industrial firm performance: Evidence from international microdata”, *CPB Discussion Paper*, CPB Netherlands Bureau of Economic Policy Analysis, April, <https://doi.org/10.34932/e4j6-sg87>
- UNCTAD/WTO (2012), [Twenty Years of India’s Liberalization. Experiences and Lessons](#), United Nations.

- UNESCO (2021), [*UNESCO Science Report – The Race Against Time for Smarter Development*](#), UNESCO, Paris.
- Van Ark, B. and A. Venables (2020), [*“A Concerted Effort to Tackle the UK Productivity Puzzle”*](#), *International Productivity Monitor*, 2020, vol. 39, 3-15
- Van Ark, B., K. de Vries and A.A. Erumban (2021), [*“How to Not Miss a Productivity Revival Once Again”*](#), *National Institute Economic Review*, 255:1, pp. 9-24 <https://doi.org/10.1017/nie.2020.49>
- Van Ark, B., K. de Vries and A.A. Erumban (2022), [*Are Intangibles Running out of Steam?*](#), paper presented at the World KLEMS conference, Manchester, October.
- Warner, A.W. (2014), *“Public Investment as an Engine of Growth”*, *IMF Working Paper*, WP/14/148, IMF, Washington, D.C.
- Williamson, J. (2004), *The Washington Consensus as Policy Description for Development*, Lecture for the series “Practitioners of Development”, The World Bank, Washington, D.C. <https://www.piie.com/sites/default/files/publications/papers/williamson0204.pdf>
- Young, A. (1994), *“The Tyranny of Numbers: Confronting the Statistical Realities of the East Asian Growth Experience,”* *Quarterly Journal of Economics*, Vol. 110 (August), pp. 641–80. <https://doi.org/10.2307/2946695>
- Yusuf, S. (2009), *Development Economics through the Decades – A Critical Look at 30 Years of the World Development Report*, The World Bank, Washington D.C. https://doi.org/10.1111/j.1746-1049.2010.00113_1.x

Appendix A – Comparing capital series across datasets

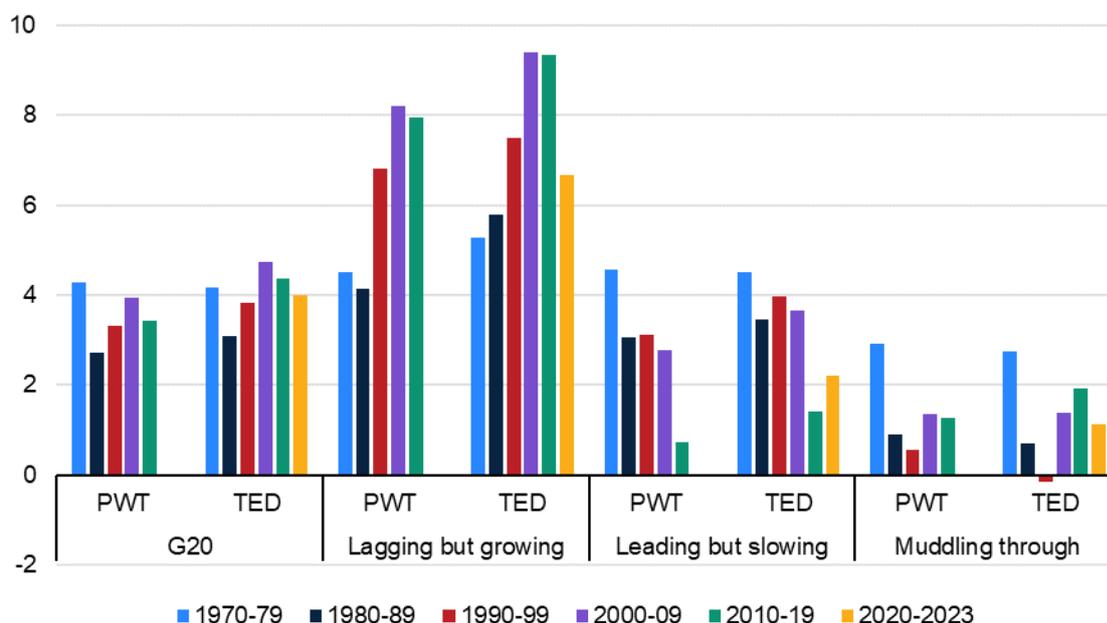
The way capital input is measured has a substantial impact on growth accounts, in particular on TFP growth, which is measured as a residual after accounting for input contributions to output growth.

The measurement of capital starts with the construction of capital stocks. Although the perpetual inventory method is the standard approach followed by most researchers in constructing capital stocks, the choices regarding the initial stocks, investment deflators, and depreciation rates can lead to substantial differences in the estimates. Similarly, estimates of capital services depend on the degree of detail of asset composition (such as separating out measures for different types of ICT) and the choice of rates of return. Inklaar and Gouma (2023) show considerable differences between aggregate capital service measures used by various cross-country productivity databases, and attribute those differences to the (initial) capital stocks, depreciation rates and the factor income shares used.

To illustrate the sensitivity of capital estimates to various methodological choices, Figure A.1 shows the growth of rates of capital deepening (capital services per hour worked) for the G20 and the three sub-groups that we identify in this paper. We compare data from the Penn World Tables (PWT) and The Conference Board’s Total Economy Database (TED), which are the only two datasets covering all G-20 economies for the entire period. While the underlying source data and methodology between PWT and TED are not very different, the results are nonetheless somewhat dissimilar.

Figure A.1

Capital deepening growth (period averages, % change)



Note: PWT = Penn World Tables; TED = Total Economy Database (The Conference Board). 2020-23 is only for TED, as PWT runs until 2019. 2023 in TED is a projected estimate.

Source: Author's calculations using data from Penn World Table and The Conference Board's Total Economy Database.

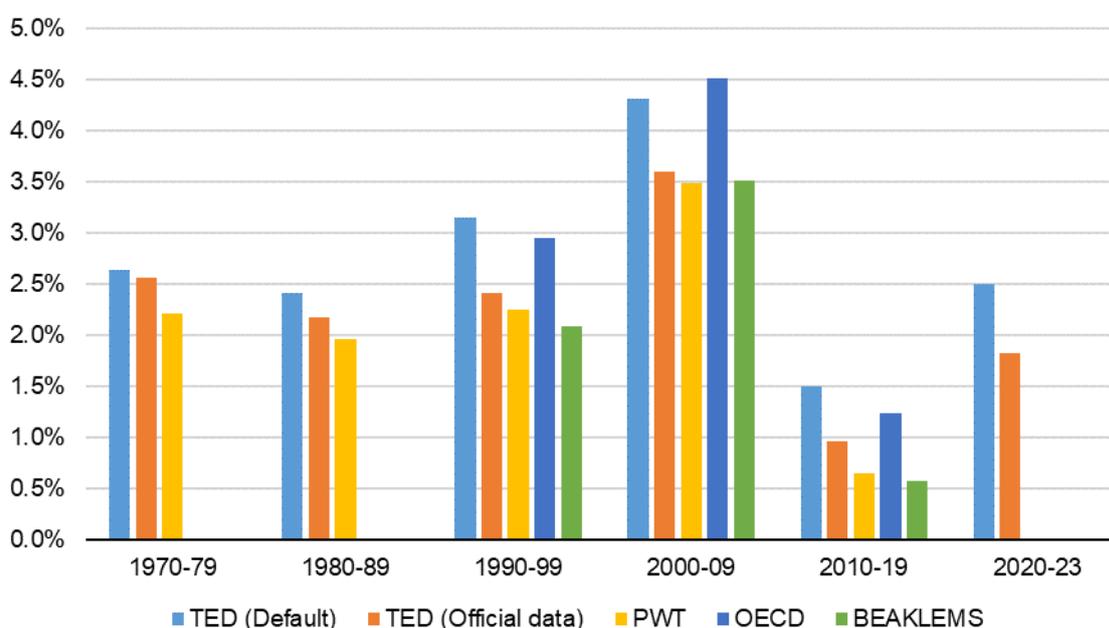
Overall, TED shows a slightly higher capital deepening growth rate for most periods and groupings, but the effects seem especially large since 2000 and are especially large for the “lagging but growing”-group of countries. However, the other hand, the overall trend in both datasets seems to be relatively similar, and especially the leveling off in capital deepening since the 2010s.

An important in capital estimates between different datasets which Inklaar and Gouma (2023) do not explicitly consider refers to the harmonisation of price indices for ICT investment which are used to obtain estimates of capital in real terms. Over time the price indices of ICT goods and services, after being adjusted for vast improvements in their quality, have been declining rapidly. The adjustments for those quality improvements are often not adequately reflected in official estimates of investment and capital.

While The Conference Board’s TED relies on official investment deflators for non-ICT assets (machines, equipment and structures), those for ICT assets (including hardware, communication equipment and software) are based on alternative series which better reflect quality improvements. Alternative ICT deflators were originally developed by Byrne and Corrado (2016) and have since 2014 been extrapolated using a multi-year bias adjustment to the official ICT deflators. The net impact of those adjustments are a faster growth in real investment in ICT assets (as their prices are falling more rapidly) which, together with an increased share of ICT in total capital, raises the contribution of capital deepening to productivity growth. The use of appropriate ICT prices helps attribute the technology embodied in ICT rigorously to the measured capital, thus reducing the contribution of TFP as reflecting disembodied technological change.

Figure A.2

**US: Average annual capital deepening growth
(period averages, % change)**



Source: Author's calculations using data from Penn World Table, The Conference Board's Total Economy Database, OECD Productivity Database and the BEA's Integrated Industry-Level Production Account (KLEMS).

The impact of the measurement of using different ICT price indices is demonstrated in Figure A.2, which shows the capital deepening contribution to U.S. labour productivity growth from various datasets. We focus on the U.S. because it is meant to be at the technological frontier and therefore likely to show the biggest impact of different ICT price indices. The U.S. data also has the greatest availability of good quality data across different data sources, including those from The Conference Board (TED), PWT, the OECD and the official KLEMS data for the Bureau of Economic Analysis (BEA).

The TED data distinguishes between two series, the TED (Default) which is based on alternative ICT deflators from Byrne and Corrado and the TED (Official) which uses the official (BEA) data. The TED (Default) clearly yields a larger role for capital deepening than the official data, particularly since the 1990s when investment in ICT assets really took off in the U.S. Capital deepening series from PWT are fairly comparable to the KLEMS data from the BEA since the 1990s. However capital deepening measures from the OECD come out higher and are more comparable to TED (Default).

In sum, regardless of the use of ICT deflators, capital estimates can vary widely across datasets, echoing the other points raised by Inklaar and Gouma (2023). However, despite differences in magnitude, all datasets suggest capital deepening in the U.S. has slowed dramatically in the 2010-2019 period, particularly versus the 2000-2009 surge but also compared to the longer-term trend. Since 2020 capital deepening shows an increase, which is strongly influenced by the pandemic which saw (at least in the United States) a decline in working hours.

Appendix B – Background Tables

Appendix Table B.1: Aggregate Growth in GDP per hour by period (in %)

			1970	Ranked	1990	Ranked	2010	Ranked
Lagging but growing	1	China	3324%	1	1277%	1	142%	1
Lagging but growing	2	South Korea	1131%	2	297%	3	35%	5
Lagging but growing	3	India	634%	3	422%	2	85%	2
Lagging but growing	4	Turkey	442%	4	146%	4	54%	3
Lagging but growing	5	Indonesia	309%	5	134%	5	46%	4
Leading but slowing	6	Japan	234%	6	54%	10	13%	9
Leading but slowing	7	Germany	181%	7	58%	8	12%	10
Leading but slowing	8	France	168%	8	38%	15	5%	13
Leading but slowing	9	United Kingdom	133%	9	49%	12	6%	12
Leading but slowing	10	Australia	122%	10	69%	6	18%	7
Leading but slowing	11	United States	121%	11	64%	7	10%	11
Leading but slowing	12	Italy	107%	12	21%	17	4%	16
Muddling through	13	Russia	97%	13	53%	11	23%	6
Muddling through	14	Brazil	95%	14	33%	16	3%	17
Leading but slowing	15	Canada	87%	15	46%	13	13%	8
Muddling through	16	South Africa	57%	16	41%	14	4%	15
Muddling through	17	Argentina	52%	17	57%	9	5%	14
Muddling through	18	Mexico	7%	18	14%	18	-1%	18
Muddling through	19	Saudi Arabia	-51%	19	-20%	19	-9%	19

Source: The Conference Board, Total Economy Database, April 2023

Appendix Table B.2: GDP growth (period averages, in %)

Source: The Conference Board, Total Economy Database, April 2023

	1970s	1980s	1990s	2000s	2010s	2020s
G20	4.1	2.9	2.6	3.3	3.6	2.2
Lagging but growing	5.6	6.6	6.9	7.6	6.7	4.0
China	7.0	9.2	9.5	9.8	7.4	4.5
South Korea	9.2	7.5	6.9	4.8	3.3	1.8
India	3.1	5.3	5.6	6.6	7.0	3.4
Turkey	5.5	4.3	3.8	3.8	5.6	4.9
Indonesia	7.1	5.5	4.5	5.0	5.3	2.7
Leading but slowing	3.5	2.9	2.3	1.4	1.9	0.9
Japan	5.1	4.2	1.4	0.4	1.2	-0.1
Germany	3.0	1.8	1.3	0.7	1.9	0.2
France	3.7	2.3	2.0	1.4	1.4	0.4
United Kingdom	2.6	2.3	1.9	1.6	2.0	-0.1
Australia	3.2	3.3	3.2	3.1	2.5	2.3
United States	3.4	2.3	1.5	0.5	0.3	0.3
Italy	3.4	2.3	1.5	0.5	0.3	0.3
Canada	4.0	2.8	2.3	2.0	2.2	1.2
Muddling through	5.5	1.4	0.2	3.4	2.1	0.7
Russia	3.9	1.4	-5.2	5.2	2.0	0.1
Brazil	8.4	2.9	1.7	3.3	1.4	1.2
South Africa	3.2	2.2	1.4	3.5	1.7	0.2
Argentina	3.2	-0.8	4.2	2.3	1.3	0.6
Mexico	6.2	2.1	3.4	1.4	2.6	0.2
Saudi Arabia	10.5	-2.8	3.4	3.4	3.8	2.1

Appendix Table B.3: Labour input growth (period averages, in %)

	1970s	1980s	1990s	2000s	2010s	2020s
G20	1.3	1.3	0.7	0.4	0.8	0.1
Lagging but growing	2.7	2.4	1.8	0.7	0.6	0.0
China	2.9	3.0	1.7	0.6	0.3	-1.0
South Korea	3.2	2.1	0.5	0.1	0.4	0.2
India	2.8	2.2	1.8	0.9	0.3	1.8
Turkey	1.5	1.0	2.2	0.3	2.3	1.9
Indonesia	3.9	3.1	2.8	1.9	1.9	1.1
Leading but slowing	0.5	0.9	0.5	-0.1	1.0	0.2
Japan	0.4	0.6	-0.8	-0.5	0.1	-1.0
Germany	-0.9	-0.6	-0.9	-0.2	0.8	-0.3
France	-0.3	-0.6	0.2	0.4	0.5	1.1
United Kingdom	-0.4	0.3	-0.1	0.3	1.4	-0.3
Australia	1.4	2.2	1.0	1.9	1.4	0.4
United States	1.5	1.7	1.5	-0.3	1.4	0.5
Italy	-0.5	0.7	0.1	0.5	-0.2	-0.1
Canada						
Muddling through	2.9	2.0	0.8	1.5	1.2	0.5
Russia	1.4	0.4	-2.1	0.5	0.0	-0.8
Brazil	3.7	2.7	1.2	2.2	0.4	1.3
South Africa	0.8	2.8	2.0	0.9	1.2	-1.2
Argentina	1.2	1.0	2.2	1.2	0.4	-0.1
Mexico	4.8	3.6	2.9	1.1	1.9	1.5
Saudi Arabia	7.6	5.5	2.6	4.0	5.2	1.9

Appendix Table B.4: Labour Productivity growth (period averages, in %)

	1970s	1980s	1990s	2000s	2010s	2020s
G20	2.8	1.6	1.9	2.9	2.8	2.1
Lagging but growing	2.9	4.2	5.1	6.9	6.2	4.0
China	4.1	6.2	7.8	9.2	7.1	5.5
South Korea	5.9	5.4	6.4	4.7	2.9	1.6
India	0.4	3.2	3.9	5.7	6.6	1.6
Turkey	4.1	3.3	1.7	3.5	3.4	3.0
Indonesia	3.6	2.4	1.7	3.1	3.4	1.6
Leading but slowing	2.9	2.0	1.9	1.5	0.9	0.7
Japan	4.7	3.6	2.3	1.0	1.1	0.9
Germany	3.9	2.3	2.2	0.9	1.2	0.5
France	4.1	2.9	1.8	1.0	0.9	-0.7
United Kingdom	3.0	2.0	2.0	1.3	0.6	0.2
Australia	1.8	1.2	2.2	1.2	1.2	1.9
United States	1.7	1.4	1.7	2.2	0.8	0.9
Italy	3.9	1.7	1.4	0.0	0.4	0.4
Canada	1.9	0.9	1.4	1.1	1.0	0.9
Muddling through	2.7	-0.6	-0.6	1.9	0.9	0.2
Russia	2.5	0.9	-3.1	4.7	2.0	0.9
Brazil	4.7	0.1	0.5	1.1	0.9	-0.1
South Africa	2.4	-0.6	-0.7	2.7	0.5	1.4
Argentina	2.0	-1.8	2.1	1.1	0.9	0.7
Mexico	1.4	-1.5	0.6	0.3	0.7	-1.3
Saudi Arabia	2.8	-8.3	0.9	-0.6	-1.5	0.2

Appendix Table B.5: Labour Quality Growth (period averages, in %)

	1970s	1980s	1990s	2000s	2010s	2020s
G20	0.7	0.7	0.6	0.7	0.5	0.5
Lagging but growing	1.2	0.8	0.8	0.8	0.7	0.5
China	0.5	0.5	0.4	0.7	0.6	0.5
South Korea	0.4	0.9	0.9	0.8	0.5	0.6
India	2.5	1.3	1.2	1.1	0.8	0.5
Turkey	0.6	0.8	0.9	1.1	1.0	0.8
Indonesia	0.3	0.5	0.8	0.5	0.8	0.2
Leading but slowing	0.4	0.5	0.5	0.5	0.5	0.4
Japan	0.5	0.9	0.6	0.7	0.3	0.4
Germany	0.2	0.4	0.2	0.4	0.2	0.4
France	0.7	0.6	0.7	0.6	0.6	0.5
United Kingdom	0.6	0.6	0.8	0.5	0.5	0.6
Australia	0.7	0.5	0.4	0.5	0.6	0.5
United States	0.4	0.3	0.4	0.4	0.3	0.4
Italy	0.2	0.2	0.2	0.6	0.5	0.3
Canada	0.5	0.2	0.3	0.3	0.4	0.4
Muddling through	1.5	1.3	0.9	1.1	0.8	0.7
Russia	1.6	1.1	0.8	0.6	0.5	0.0
Brazil	1.1	1.0	0.7	1.9	1.8	1.4
South Africa	0.8	1.1	0.0	1.0	0.4	0.4
Argentina	0.9	0.9	0.8	0.5	0.4	0.5
Mexico	2.0	1.9	0.8	0.5	0.0	0.2
Saudi Arabia	1.5	2.3	2.1	1.7	1.4	2.2

Appendix Table B.6: Capital Deepening Growth (period averages, in %)

	1970s	1980s	1990s	2000s	2010s	2020s
G20	4.2	3.1	3.8	4.7	4.4	4.0
Lagging but growing	5.3	5.8	7.5	9.4	9.3	6.7
China	5.5	6.4	8.7	12.5	11.5	8.4
South Korea	14.2	8.8	11.5	7.1	4.5	3.7
India	1.2	3.0	5.1	7.8	8.3	4.2
Turkey	6.8	4.4	4.8	6.2	4.4	3.4
Indonesia	7.5	8.7	7.0	2.9	5.6	5.6
Leading but slowing	4.5	3.5	4.0	3.7	1.4	2.2
Japan	7.3	5.9	6.4	3.4	1.3	2.3
Germany	5.5	3.9	4.8	2.7	1.2	1.8
France	6.8	4.1	3.1	2.7	1.7	1.2
United Kingdom	4.9	3.7	4.6	3.5	0.8	2.2
Australia	3.4	2.6	3.1	3.9	2.5	2.4
United States	2.6	2.4	3.1	4.3	1.5	2.5
Italy	5.6	3.2	2.7	2.2	0.8	1.4
Canada	2.9	2.8	3.8	4.5	2.1	2.5
Muddling through	2.7	0.7	-0.2	1.4	1.9	1.1
Russia	1.7	1.0	-2.1	0.3	2.2	1.8
Brazil	5.9	1.1	1.7	1.3	2.6	1.1
South Africa	5.5	0.6	0.5	3.4	2.2	2.2
Argentina	3.5	0.1	0.0	0.9	2.1	1.1
Mexico	2.2	0.7	-0.3	1.6	0.5	-0.8
Saudi Arabia	0.0	-1.3	0.3	3.0	1.7	1.9

Appendix Table B.7: Total Factor Productivity Growth (period averages, in %)

	1970s	1980s	1990s	2000s	2010s	2020s
G20	0.8	0.0	0.0	0.4	0.3	-0.2
Lagging but growing	0.2	1.1	1.2	1.5	0.9	0.1
China	1.5	3.1	3.0	1.8	0.6	0.5
South Korea	0.8	0.0	-0.5	-0.6	0.0	-1.1
India	-1.6	1.1	0.8	1.1	2.1	-0.7
Turkey	2.5	0.9	-0.8	-0.2	0.6	0.9
Indonesia	-1.3	-2.9	-2.4	1.2	-0.3	-1.3
Leading but slowing	1.1	0.5	0.1	-0.2	0.1	-0.4
Japan	1.4	0.8	-0.8	-0.9	0.4	-0.3
Germany	2.0	0.8	0.4	-0.4	0.6	-0.4
France	1.2	1.0	0.1	-0.5	-0.1	-1.5
United Kingdom	0.8	0.0	-0.5	-0.6	0.0	-1.1
Australia	0.3	-0.1	0.7	-0.8	-0.3	0.5
United States	0.6	0.3	0.3	0.5	0.1	-0.2
Italy	1.8	0.4	0.2	-1.3	-0.2	-0.4
Canada	0.7	-0.2	-0.1	-0.8	-0.1	-0.3
Muddling through	0.5	-1.6	-0.9	0.7	-0.5	-0.7
Russia	0.2	-0.1	-2.3	4.3	0.6	0.0
Brazil	1.2	-0.9	-0.7	-0.5	-1.2	-1.3
South Africa	-0.6	-1.5	-0.9	0.4	-0.8	0.1
Argentina	-0.3	-2.2	1.8	0.5	-0.4	-0.1
Mexico	-0.7	-2.8	0.4	-0.7	0.5	-0.9
Saudi Arabia	1.6	-8.4	-0.1	-3.3	-3.1	-1.8