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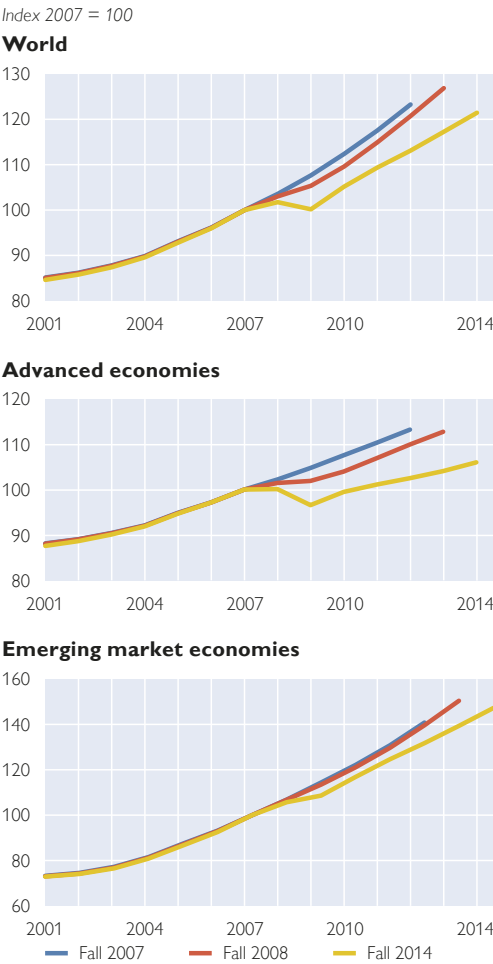
Perspectives on potential output after the Global Financial Crisis¹

1 Introduction

Output in most advanced and many emerging market economies remains much lower than it was projected before the Global Financial Crisis of 2008–09 (chart 1). In the immediate aftermath of the crisis, the damage was expected to be limited to downshifts in the paths of output, while growth would return to pre-crisis rates.² Some six years later, it appears increasingly certain that these expectations will be disappointed. There have been serial downward revisions to near- and medium-term growth projections in both advanced and emerging market economies. This protracted period of lower growth suggests that a discussion of economic prospects after the crisis must involve prospects for potential output. Growth is unlikely to have remained so low without potential output having declined as well.

The proposition that potential output growth is lower relative to expectations a few years ago is probably uncontroversial at this point. However, there is less consensus on the reasons and their importance. To gauge the impact of the Global Financial Crisis, it is therefore important to understand both, the channels through which it has affected potential output and the quantitative aspects. There is also a risk of spuriously associating lower potential output with the crisis since it could reflect other factors. Demographic change, for example, is unrelated to the crisis but occurred in parallel. Similarly, as is well known, concerns about slowing productivity growth predate the crisis.

Chart 1
Output compared to pre-crisis expectations



Source: IMF, April 2015 World Economic Outlook, Chapter 3.
Note: The index is created using real GDP growth rates and its forecasts with 2007=100.

It is therefore important to analyze potential output developments before and after the crisis to allow for the possibility of non-crisis factors having contributed to recent growth disappointments. Understanding the recent changes in potential output is obviously impor-

¹ This paper draws heavily on the analysis in Chapter 3 of the IMF's April 2015 World Economic Outlook and the author gratefully acknowledges the inputs from the chapter team.
² See, among others, Chapter 4 on What is the Damage? Medium-term Output Dynamics after Financial Crises in the IMF's October 2009 World Economic Outlook.

tant, given the implications for macro-economic policies. This paper seeks to answer three sets of related questions, highlighting the essential findings from the more detailed analysis of the subject in Chapter 3 in the April 2015 *World Economic Outlook (WEO)*.³

- How has the Global Financial Crisis affected potential output? What is the evidence on level versus growth effects?
- What will be the effects from slowing population growth and population aging on potential output?
- Did productivity growth start slowing before the crisis?

As in the WEO Chapter, the analysis in this paper focuses on 16 economies of the G-20, including both major advanced and emerging market economies, for the period 1996–2014.⁴ Together, these economies accounted for about three-fourths of global GDP in 2014. The choice of the sample period reflects data availability.

An important premise running through some of the narrative in this chapter is that the direction of causality runs from financial crises to potential output.⁵ Conceptually, factors such as hysteresis in labor markets or impaired financial intermediation would inflict damage to potential output. However, as noted by Blanchard, Cerutti, and Summers (2015), reverse causality is a possibility. Supply shocks could lead to lower potential output, which, in turn, could precipitate a financial crisis, due to financial sector stress after actual or expected defaults on loans and debt made before the shocks materialized. The fact that some slowing of potential output growth was observed already

before the crisis would argue in favor of such reverse causality. Nevertheless, it is not clear that these factors could have triggered the financial crisis. Moreover it seems implausible that the Global Financial Crisis would not have had any effects on potential output of its own, through the channels noted before. Since much of the empirical analysis is descriptive or does not depend on the direction of causality, the paper mostly asserts causality with plausibility arguments for advanced economies. The issue of causality is much more difficult to resolve for the emerging G-20 economies where key crisis mechanisms do not appear to have played out in the usual fashion.

The structure of the paper is the following. First, it discusses the concept of potential output and how it relates to other concepts used in the context. Second, it presents an overview of developments in potential output over 1996–2014. It then discusses the evidence on the effects of the crisis on potential output, followed by the effects of demographic change. Subsequently, it reviews the evidence on total factor productivity. The final section discusses the implications for prospects for potential output in the 16 economies in the sample.

2 Potential output – a conceptual framework

The paper is based on the traditional view of potential output: the level of output that is consistent with stable inflation. To put it simply, this is the sticky price and wage view of the world. Shocks lead to temporary deviations of

³ Readers who are interested in the details of the analysis should consult the chapter. Technical details are discussed in the annexes.

⁴ The set of countries include the following advanced economies: Australia, Canada, France, Germany, Italy, Japan, Korea, Spain, the United Kingdom, and the United States; and the following emerging market economies are: Brazil, China, India, Mexico, Russia and Turkey.

⁵ Hall (2014) also uses this assumption.

actual from potential output because of the slow adjustment in prices and wages.

There are other related output concepts. One is that of *sustainable output*, the level of output consistent with external and financial balance. Imbalances along these dimensions may lead to situations where potential output may not be sustainable even if inflation remains broadly at target. Corrections of such imbalances may subsequently coincide with sharp corrections in output, including potential output. The proposition that financial crises can inflict damage to potential output is plausible and indeed one of the subjects of this paper. The issue is whether one should adjust measures of potential output ex ante because of external and financial imbalances. In the WEO chapter, we take the view that such corrections are likely to be more problematic than helpful. Likelihood and depth of crises depend on many factors, and both dimensions are difficult to predict with estimates of imbalances. Uncertainty about the extent of damage to potential adds yet another layer of complexity.

A second, related concept is that of the *flex-price (flex-wage) output* in dynamic stochastic general equilibrium (DSGE) models. It is closely related to the potential output concept, but, as usual, depends on the underlying model. A critical issue is whether the implied potential output is based on the actual capital stock, or on the counterfactual capital stock that would materialize if prices had been flexible throughout – a potential capital stock of sorts. If it is the latter, the practical relevance is more limited. If the actual output is used, then the traditional and the DSGE concept are the same.

In sum, the New Keynesian approach provides the macroeconomic backdrop to the estimation of potential output in this paper (and in the WEO chapter on which it is based). In this approach, a demand shock would lead to a situation where current inflation is below medium-term inflation expectations while unemployment is above the natural rate of unemployment (specifically the non-accelerating inflation rate of unemployment or NAIRU). The flipside is that the constellation of inflation relative to expectations and unemployment relative to NAIRU also allow inference about underlying shocks.



In this spirit, the empirical analysis in the WEO chapter estimates potential output using a New Keynesian model with a Phillips curve and an Okun relationship between cyclical unemployment and the output gap.⁶ The model is cast in a state space format where potential output and the NAIRU are latent variables, with some restrictions on the variances of the shocks to these variables. It is estimated using Bayesian techniques.

Macroeconomic conditions are essential for identifying and estimating potential output, but to understand its fluctuations and its prospects, the most

⁶ See Blagrove and others (2015).

intuitive way is to understand the supply side of it. To this end, the analysis also uses growth accounting, where the growth of the estimated potential output is decomposed into the changes of the underlying factors of production and total factor productivity (TFP). The latter is a residual, given that actual data are used for employment and capital, while potential output is estimated with a New Keynesian approach.

As is well known, annual employment, capital utilization, and TFP growth tend to be highly procyclical if not filtered, and we look at average



growth and contributions over several years to reduce the cyclical influences. We will distinguish three periods. The first one is that of 1996–2000, the years of the IT revolution in the advanced economies; the second one is 2001–07, the period of rapid global growth after the 2000 recession; and third one is the period after the Global Financial Crisis, 2008–14. To examine the impact of the Global Financial Crisis, the paper mainly looks at the changes between the second and the third period.

Besides the usual growth accounting decomposition, the analysis also employs cohort models of labor force

participation to account for shifts in trend labor force participation rates, the second key demographic variable besides the size and growth of working age population.⁷ In this approach, aggregate participation rates are influenced by demographics (e.g. changing shares of younger versus older cohorts) as well as other factors, such as gender-specific and birth year-specific factors (e.g. changes in educational attainments across cohorts).

3 Potential output in 16 major economies from 1996 to 2014

As a start, it is helpful to compare actual growth and the estimates of potential output growth in the 16 economies under consideration (chart 2). Two features stand out.

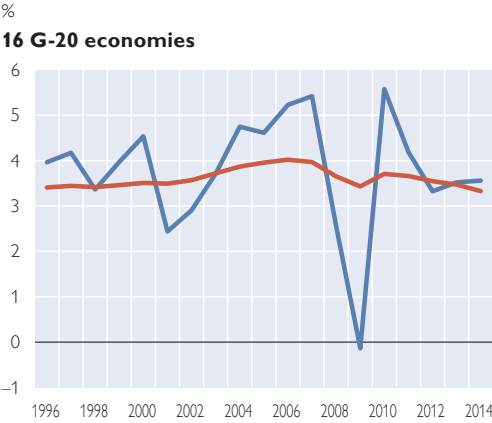
- Potential output growth in the 10 major advanced economies already started to decline in the early 2000s. It reached a low point in 2009, and has recovered slightly since. Compared to the second half of the 1990s, potential output growth was still noticeably lower in 2014 despite some rebound after the crisis. The decline was broad-based and is not driven by one or two economies.
- Potential output growth in the 6 major emerging market economies increased by about 1½ percentage points between the late 1990s and the eve of the Global Financial Crisis. Since then it has declined, and at around 5¼%, it was lower in 2014 than it was in the mid-1990s. As with advanced economies, magnitudes of decline differed across countries, but the decline was universal.

Reflecting the opposite directions of change in potential output growth before and after the crisis between advanced and emerging market econo-

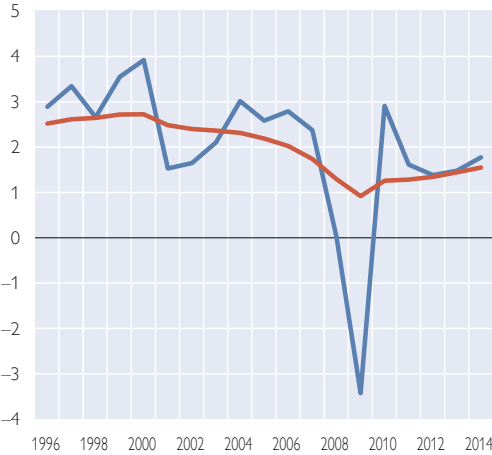
⁷ See, among others, Balleer et al. (2014) for an empirical application based on this class of models.

Chart 2

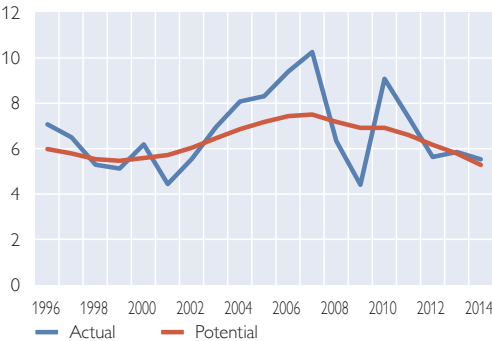
GDP growth



Advanced G-20 economies



Emerging G-20 economies



Source: IMF, April 2015 World Economic Outlook, Chapter 3.
Note: Aggregations are based on standard WEO PPP weights.

mies, potential output growth for all 16 economies has been relatively more stable. Nevertheless, on the basis of purchasing power parity weights, it increased from about 3¼% in the mid-

1990s to about 4% in 2007 and has decreased back to around 3¼% since. The broad picture, therefore, is one of slowing or relatively lower potential output growth in the major economies.

4 Dissecting potential output developments in advanced G-20 economies

Turning to the factors influencing fluctuations in potential output, analyzing the supply side provides for an intuitive approach to answering the questions set out in the beginning of the paper. Specifically, we now turn to analyzing growth in capital and labor, the factors of production, and TFP. This section focuses on the advanced economies, where it seems safe to assume a causal effect from the global financial crisis to potential output since these economies were either directly in the epicenter of the crisis or had very strong financial linkages. For emerging market economies, the causal link is more tenuous, and the paper will look at the supply side in these economies in the next section.

4.1 Capital

Starting with capital, financial crises can lower potential output relative to pre-crisis trends through their negative effects on investment and thus capital growth. These effects operate through standard accelerator effects but also financial channels, including the negative effects of debt and capacity overhangs and the related impairment in financial intermediation, and uncertainty.

Formally, growth in the capital stock K can be expressed as:

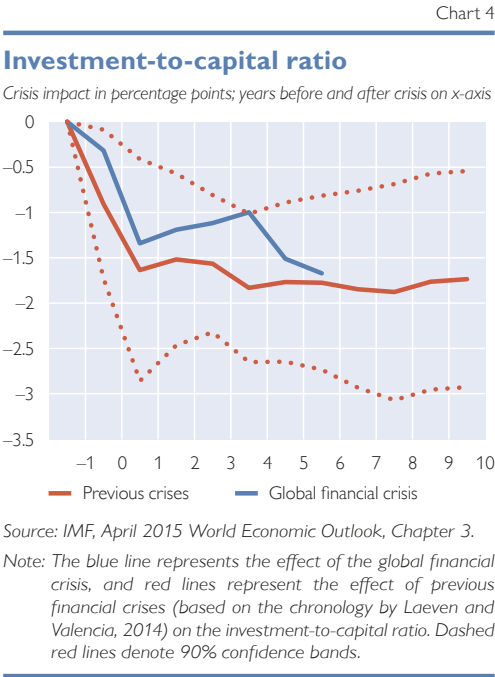
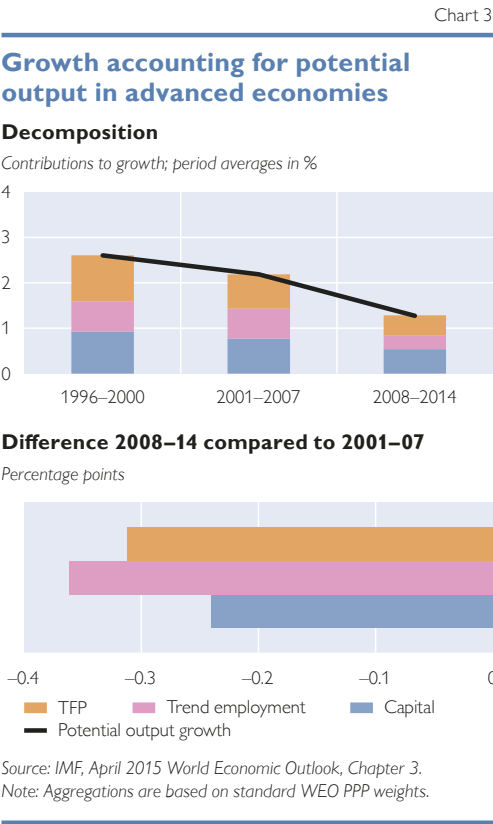
$$\hat{K}_t = \frac{\Delta K_t}{K_{t-1}} = \frac{I_t}{K_{t-1}} - \delta = (1 + g_I) \frac{I_{t-1}}{K_{t-1}} - \delta = (1 + g_I) \frac{I_{t-1}}{Y_{t-1}} \frac{Y_{t-1}}{K_{t-1}} - \delta \tag{1.1}$$

where the notation is standard.⁸ The third term highlights that current capital stock growth does not only depend on current investment growth, but also on the investment-to-capital ratio in the previous period. The final term highlights how both, a lower investment ratio and a capital overhang (in the sense of the capital output ratio being above average) will lower this ratio. On both fronts, there can be protracted crisis-related effects on current capital growth even after investment growth rebounds. As noted by Hall (2014), this reflects of the fact that capital is a slow-moving variable.

Looking at the contribution of capital to slowing potential output growth, chart 3 shows that lower capital growth was indeed an important factor in ad-

vanced economies between 2008 and 2014, the crisis and post-crisis period. Specifically, it contributed some ¼ percentage point to the average decline in potential output of around 0.8 percentage points between 2001–07 and 2008–14.

This decline in capital growth after the Global Financial Crisis is consistent with evidence from past financial crises, which suggests that after a crisis, the investment-to-capital ratio stays much lower for at least a decade (chart 4).⁹ This evidence is based on applying local projection methods to a cross-section of past crises. Applying the same approach to the advanced economies after the global financial crisis suggests the estimated average decline during 2008 to 2014 was well within the 90% confidence interval. Ignoring potential changes in depreciation rates, the estimated average decline in the ratio of around 1½ percentage points should



⁸ I stands for gross fixed capital formation, δ for the (fixed) depreciation rate, and g_I for growth in gross fixed capital formation.

⁹ See Furceri and Mourougane (2012) for a related analysis.

translate into lower capital stock growth of roughly the same magnitude.¹⁰

This evidence of persistent crisis effects on investment matches evidence based on other approaches.¹¹ Hall (2014), for example, showed that in the case of the USA, the correction to a capital overhang is protracted. Nevertheless, it is difficult to draw strong conclusions about level versus growth effects based on the evidence presented here. While protracted, the effects could still be temporary in the longer run. For a firm assessment of the effects beyond a 5 or 6-year horizon, one would need to control for other factors that could potentially affect investment. Indeed, the substantial cross-country differences, in previous financial crises as well as in the Global Financial Crisis, suggest that the post-crisis response of investment and capital growth also depends on other factors, such as initial conditions or policy responses.

A final observation concerning capital growth is that it already decline in the early 2000s after the information and communication technology revolution (ICT) revolution from the mid to late 1990s. This decline in investment was widely discussed before the crisis. It highlights that a decline in potential output growth in advanced economies has not just been a phenomenon since the Global Financial Crisis. Its beginning predates the crisis.

4.2 Employment

Turning to the labor, we can decompose growth in trend employment \bar{E} as follows:

$$\hat{\bar{E}}_t = \hat{P}_t + \frac{\Delta \overline{LFPR}_t}{\overline{LFPR}_{t-1}} - \Delta \bar{U}_t \quad (1.2)$$

where P denotes working age population, \overline{LFPR} the trend labor force participation rate, and \bar{U} the nonaccelerating inflation rate of unemployment (or the structural unemployment rate for short).¹² We can distinguish two different possible level effects from financial crises when it comes to the trend employment. Such level effects will only have temporary growth effects.

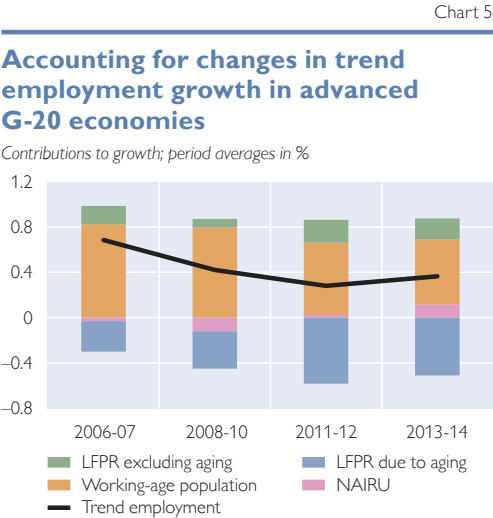
- *Structural unemployment.* Severe recessions, such as the ones after the Global Financial Crisis, can lead to higher structural unemployment because of hysteresis (Blanchard and Summers, 1986). Such effects should be particularly important in economies with rigid labor market institutions (e.g. Blanchard and Wolfers, 2000).
- *Discouraged workers.* High unemployment can also discourage workers from searching for jobs. They will eventually drop out of the labor force, which lowers the trend labor force participation rate. This effect may be particularly relevant when social systems provide incentives for early retirement and older cohorts make up for a sizeable share of the labor force.

Perhaps surprisingly, the decomposition of trend employment suggests that,

¹⁰ The reason that the implied decline in capital stock growth relative to the average in 2001–07 is somewhat lower than the 1½ percentage points noted above is that the contributions in the chart 4 are GDP-weighted, whereas the average effect shown in chart 3 is not weighted. This matters because the decline in capital growth in some of the larger major economies was more modest than in some of the smaller economies.

¹¹ Chapter 4 of the April 2015 World Economic Outlook presents evidence of protracted accelerator effects in investment after the crisis.

¹² The cohort models control for cyclical fluctuations in activity to account for the short-term fluctuations in labor force participation.



on average across advanced economies, the crisis appears to have virtually no important lasting effects (chart 5). As expected, structural unemployment increased during and immediately after the crisis, as shown by the small negative NAIRU effects. However, these effects were subsequently mostly reversed. Similarly, there was a small negative impact on labor force participation (excluding aging) initially, consistent with the discouraged worker effect, but this impact was soon reversed.

Within this general picture, there are important differences across countries. Negative effects from increased structural unemployment, for example, were larger and more persistent in some euro area economies, as it was to be expected. On the other hand, in commodity exporters, there is little change in the NAIRU. Discouraged worker effects seem most relevant for the United States, partly due to the structure of the unemployment insurance system.

The conclusion is that much of the decline in trend employment after the Global Financial Crisis was due to demographics. Annual working age population growth declined, on average, by

about $\frac{1}{4}$ percentage point between 2001–07 and 2008–14. In addition, the aggregate labor force participation rate decreased markedly because of the strong increase in older cohorts. As a caveat, it should be mentioned that there is again considerable cross-country variation. In euro area economies, for example, the negative effects from aging on aggregate labor force participation rates are offset by increasing trend female labor force participation rates.

4.3 Total factor productivity

The effects of financial crises on TFP are ambiguous. On the one hand, investment in research and development is likely to be lower after crises (these expenditures tend to be pro-cyclical), which could contribute to slowing technological progress. Similarly, to the extent that innovation and technological changes are embodied in new capital, lower investment growth could also lead to lower TFP growth. On the other hand, crises might accelerate the Schumpeterian process of creative destruction and provide incentives for firms to improve their productivity.

The empirical evidence unambiguously suggests that the Global Financial Crisis has had a negative effect on TFP growth in advanced economies. As shown in chart 3, on average, TFP growth was about a $\frac{1}{2}\%$ in 2008–14, a 0.3 percentage point decline relative to 2001–07. Spain and Japan are the only advanced economies that did not register a decline in TFP growth.

While we attribute the decline in TFP growth in 2008–14 to the Global Financial Crisis, it should be noted that the decline could also partly reflect a continuation of developments that were already in train before the crisis. In particular, as noted by Fernald (2014) and others, the exceptional productiv-

ity growth effects of the ICT revolution have been waning since the early 2000s. Indeed, average TFP growth in 2001–07 was already lower than it was in 1996–2000. Besides fading productivity effects from the ICT revolution, the shift from manufacturing and other industries to services might also have contributed to the decline.

4.4 Other considerations

Financial crises can also lead to sectoral reallocation. The shift away from housing and construction after real estate busts is just one example. Such reallocation may affect potential output if productivity levels are very different between sectors or if capital and labor are sector-specific. When changing sectors, these factors of production may thus be less productive, at least initially, depending on whether sector specificity is mostly a short-term friction or a more permanent friction. In any case, this can have negative productivity effects temporarily.

Data availability precludes an analysis of the productivity impact of sectoral reallocation after the Global Financial Crisis. But evidence from past crises suggests that such reallocation explains about half of the observed decline in aggregate labor productivity after crises. Sector-specificity appears to be only one reason for the productivity declines after crises. Another reason appears the sectoral shifts from high productivity sectors such as manufacturing or finance to lower productivity sector, especially in the services sector.

What have we learned about the impact of the Global Financial Crisis on potential output growth in the advanced G-20 economies? Two lessons stand out.

First, the evidence from the growth accounting exercise and the decomposition of trend employment suggests

that the crisis has indeed been an important contributing factor. Lower investment and capital growth explains not quite one third of the decline of the average growth in potential output between 2008-14 and 2001-07. If one attributes the entire decline in TFP growth to the crisis, the total contribution rises to more than one half. While one can plausibly argue that part of the TFP growth decline could reflect the



continuation of pre-crisis developments, one would still conclude that the crisis has likely been the most important factor behind the decline in potential output.

Second, most of the decline in average trend employment growth since the crisis is related to demographic factors. Crisis-related factor such as increases in structural unemployment have in general played a surprisingly small and temporary role.

5 Understanding potential output developments in emerging G-20 economies

This section turns to potential output in the major emerging markets economies in the G-20. For these economies, the supply side analysis only starts in 2001, due to data availability issues.

Chart 6 shows the growth accounting exercise for emerging market econ-

omies. The most striking feature of the decomposition is that most of the decline in potential output growth in 2008-14 relative to 2001-07 is due to a decline in TFP growth. In the aggregate, TFP was virtually stagnant in the period after the Global Financial Crisis. The second noteworthy feature of this decomposition is that the contribution of capital was increasing. Unlike in the advanced G-20 economies, there was no apparent crisis-related setback. That said, there only was a strong increase in capital growth in 2001-07. Since 2007, capital growth has been broadly stable at around 8½%. The difference in the average contribution from capital growth in the two periods under consideration thus partly reflects base effects from the increases in the second half of the first period.

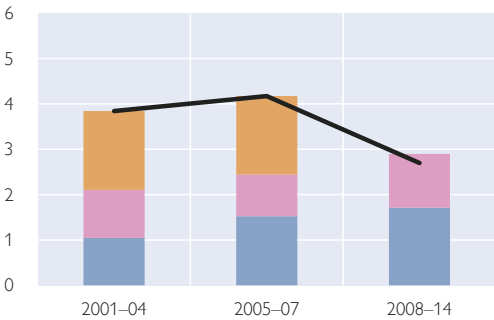
The third noteworthy feature is that the contribution from lower trend employment has been relatively stable. This, however, masks important differences across the G-20 emerging market economies in the sample. In China, the growth rate of the working age population slowed markedly in 2008-14 compared to 2001-07, from about 1.8% to 0.8%. In other emerging economies, the growth of the working age population also slowed, but to a lesser extent than in China.

Overall, potential output growth in the emerging G-20 economies has thus become more extensive since the Global Financial Crisis. This pattern of change in the growth accounting for the emerging G-20 economies between 2001-07 and 2008-14 does not lend itself to a standard crisis narrative. Unlike in advanced economies, capital growth did not contract. The hypothesis of investment-embodied technical change would thus not apply either. A gradual decline in TFP growth would, however, be consistent with the con-

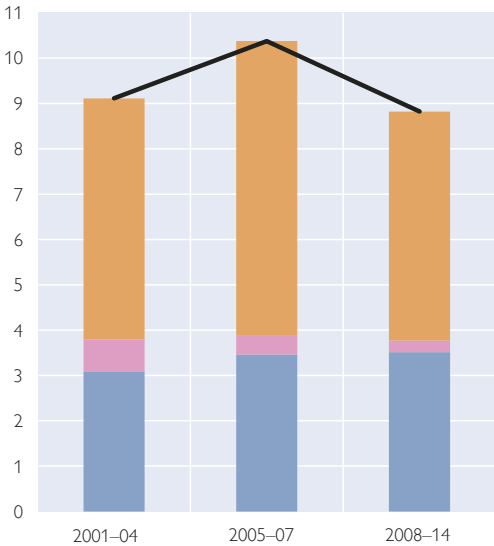
Chart 6
Growth accounting for potential output in emerging G-20 economies

Contributions to growth; period averages in %

Emerging G-20 economies excluding China



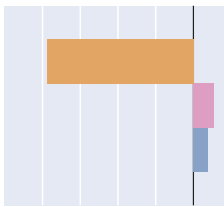
China



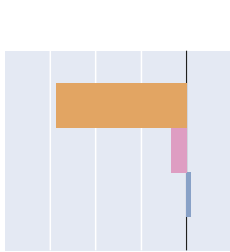
Differences 2008-14 compared to 2005-07

Other G-20 emerging market economies

percentage points



China



Source: IMF, April 2015 World Economic Outlook, Chapter 3.
Note: Aggregations are based on standard WEO PPP weights.

vergence hypothesis after a period of rapid growth and catching up or the tendency for regression to the historical

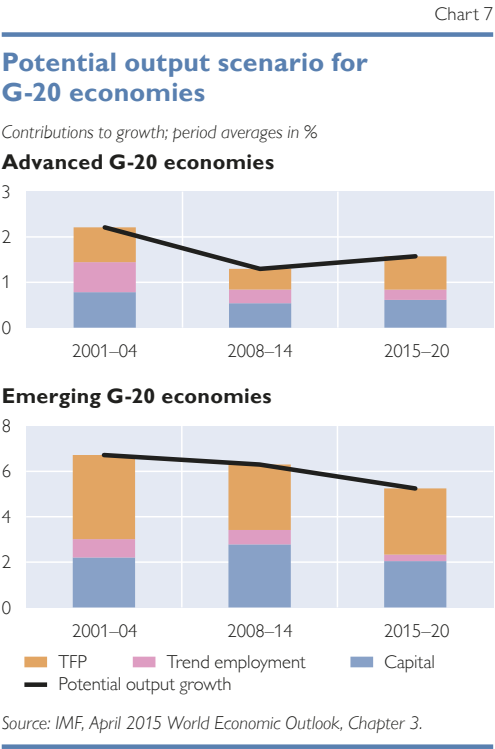
mean after growth spurts (e.g. Pritchett and Summers, 2014).

6 Prospects for potential output

Looking ahead, the main question is whether potential output growth in the 16 G-20 economies considered in the chapter is likely to slow further from the average rates recorded in 2008–14 or not. In the April 2015 WEO chapter, IMF staff takes the view that a further slowing is likely in the emerging economies among them, while in the advanced economies potential output growth will, on average, likely pick up slightly in 2015–20 (chart 7). It should be noted that the specific figures presented below are illustrative scenarios. They are essentially based on the “known” inputs (e.g. demographics) or recent WEO projections (e.g., investment). One caveat is that there is considerable uncertainty, not just around potential output, but also around projections of

the inputs, including demographics (for example, because of changes in migration patterns). Moreover, the scenarios assume that current policies remain in place.

Starting with advanced economies, the expectation is that potential output growth will increase slightly from the lows reached in 2008–14, from about 1.3% to 1.6%. Still, this is considerably below the 2¼% recorded during 2001–07. A first reason for the expected increase relative to the post-crisis low is a rebound in TFP, as crisis-legacies wear off and investment recovers. As shown in Chapter 3 of the April 2015 WEO, this recovery in TFP could already be observed in some economies in 2013–14. That said, TFP is only assumed to return to rates seen in 2006–07, when the exceptional growth effects from the information technology and communication revolution of the late 1990s had already worn off. A second reason is that investment ratios (investment as a percent of the capital stock of the previous period) is expected to increase as the global economy improves (as discussed in Chapter 1 of the April 2015 WEO). These ratios are, however, expected to remain below pre-crisis levels, consistent with the evidence of protracted crisis effects from previous financial crises. A further decline in trend employment will partly offset the expected positive effects from TFP and investment on potential output growth. Both working age population growth and labor force participation rates are expected to decline further, the latter because of population aging.¹³ In Germany and Japan, the working age population is expected to shrink over 2015–20. If it were not due to labor force participation rates increasing for other reasons (e.g., female labor force partici-



¹³ The United Nation’s Population and Development Database is used for projections of demographic variables.

pation rates), trend employment growth would, on average, be close to zero, rather than the one third of a percent shown in chart 6.

In the emerging market economies of the G-20, potential output growth is, on average, expected to decline further in 2015-20 for three reasons. First, capital growth is expected to slow further temporarily, reflecting higher costs of capital with tighter external financial conditions since the “taper tantrum” in 2013, lower commodity prices (for the commodity exporters among these economies), as well as recent

structural constraints (e.g. infrastructure, education and human capital accumulation). Second, IMF staff assumes that TFP growth will not return to exceptional rates recorded before the Global Financial Crisis, reflecting regression toward the historical mean. Regression to the mean in TFP growth, to the extent that it was not fully expected, will likely feed back into lower investment. Third, growth in the working age population will likely slow further and some decrease in labor force participation rates due to aging, notably in China.

References

- Balleer, A., R. Gomez-Salvador and J. Turunen. 2014.** Labour Force Participation across Europe: A Cohort-Based Analysis. In: *Empirical Economics* 46 (4). 1385–1415.
- Blagrove, P., R. Garcia-Saltos, D. Laxton and F. Zhang. 2015.** A Simple Multivariate Filter for Estimating Potential Output. IMF Working Paper. International Monetary Fund. Washington. Forthcoming.
- Blanchard, O. J., E. Cerutti and L. Summers. 2015.** Inflation and Activity: Two Explorations and their Monetary Policy Implications. Paper presented at the ECB Forum on Central Banking. Sintra. Portugal. May 18.
- Blanchard, O. J. and L. Summers. 1986.** Hysteresis and the European Unemployment Problem. In: Fischer, S. (ed.). *NBER Macroeconomics Annual 1986. Volume 1*. Cambridge, Massachusetts: MIT Press.
- Blanchard, O. J. and J. Wolfers. 2000.** The Role of Shocks and Institutions in the Rise of European Unemployment: The Aggregate Evidence. In: *Economic Journal* 110 (462). 1–33.
- Fernald, J. 2014.** Productivity and Potential Output before, during, and after the Great Recession. In: *NBER Macroeconomics Annual 2014. Volume 29*. Chicago. University of Chicago Press.
- Furceri, D. and A. Mourougane. 2012.** The Effect of Financial Crises on Potential Output: New Empirical Evidence from OECD Countries. In: *Journal of Macroeconomics* 34 (3). 822–832.
- Hall, R. E. 2014.** Quantifying the Lasting Harm to the U.S. Economy from the Financial Crisis. NBER Working Paper 20183. National Bureau of Economic Research. Cambridge. Massachusetts.
- Laeven, L. and F. Valencia. 2014.** Systemic Banking Crises. In: Stijn, M., A. Kose, L. Laeven and F. Valencia. (eds.). *Financial Crises: Causes, Consequences, and Policy Responses*. Washington. International Monetary Fund.
- Pritchett, L. and H. L. Summers. 2014.** Asiaphoria Meets Regression to the Mean. NBER Working Paper 20573. National Bureau of Economic Research. Cambridge. Massachusetts.