Analysis

The output gap has closed; Finland's economy at cyclical peak

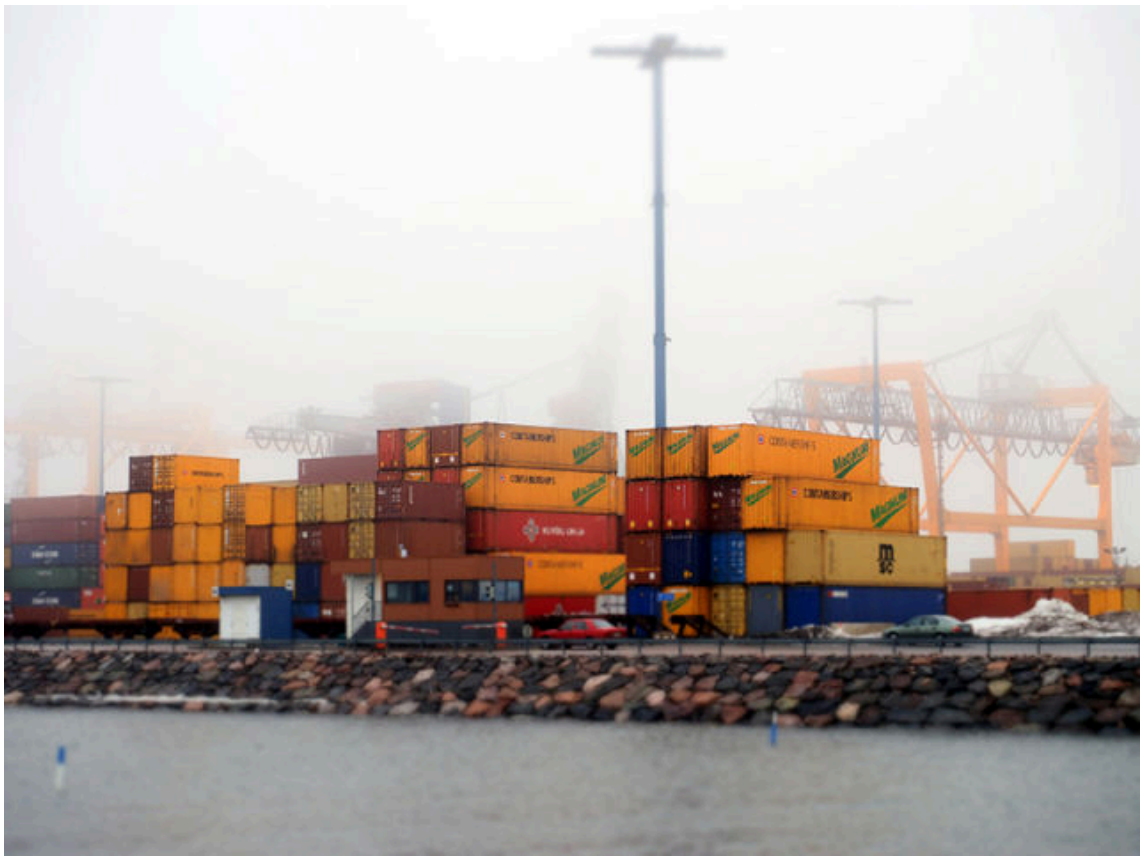
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Potential output is defined as the volume of GDP where all of the economy's factors of production are fully and efficiently utilised. Estimates show that Finland's output gap remained negative for nine consecutive years leading up to 2017, indicating that the country's volume of real GDP underperformed its potential during this period. The output gap has finally closed on the back of Finland's economic boom which is expected to last throughout 2018–2020. Over the medium term, however, potential growth is likely to remain considerably slower than before the financial crisis.



Potential growth rate weakened by recession

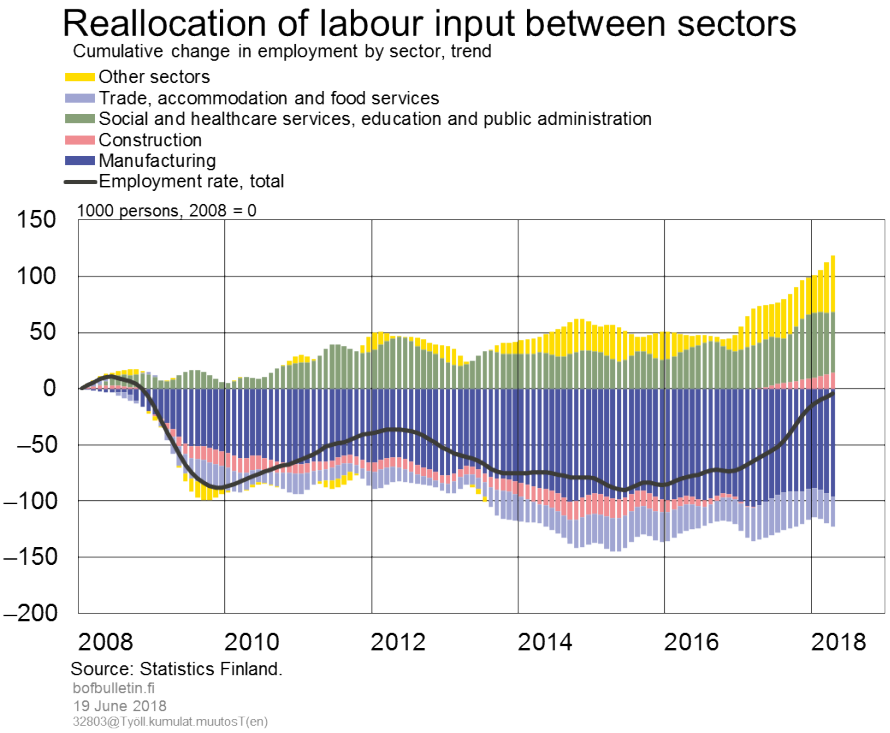
Growth in Finland's potential GDP volume is estimated by way of econometric analysis of the economy's supply-side factors. Calculating potential output in this manner makes use of what is known as an 'unobservable components model'[1], an econometric framework where key macroeconomic variables, such as gross domestic product and unemployment, are decomposed into trend and cyclical components.

The unobservable trend components[2] of total factor productivity and factor inputs (i.e. labour and the capital stock) are inserted into a production function, which then provides a representation of potential output.[3, 4]

While cyclical factors may well explain why economic growth has deviated from its trend, they alone do not account for the prolonged recession which followed the financial crisis. Moreover, Finland's long-term growth trend itself, i.e. the growth rate of potential output, ebbed considerably during the recession (Chart 1). Indeed, the prolonged economic slowdown seems to have eroded the economy's growth potential by impacting all of its supply factors, wherein the largest negative effect has resulted from weakened total factor productivity growth. While the potential growth rate has begun to strengthen in recent years, it still remains a far cry from its pre-

crisis level.

Chart 1.



One advantage of using a production function to estimate potential output is that it can determine whether differential growth stems from productivity, labour or capital. Yet while helpful, this does not offer insight as to why total factor productivity growth has remained decidedly subdued.

Slowdown in total factor productivity growth

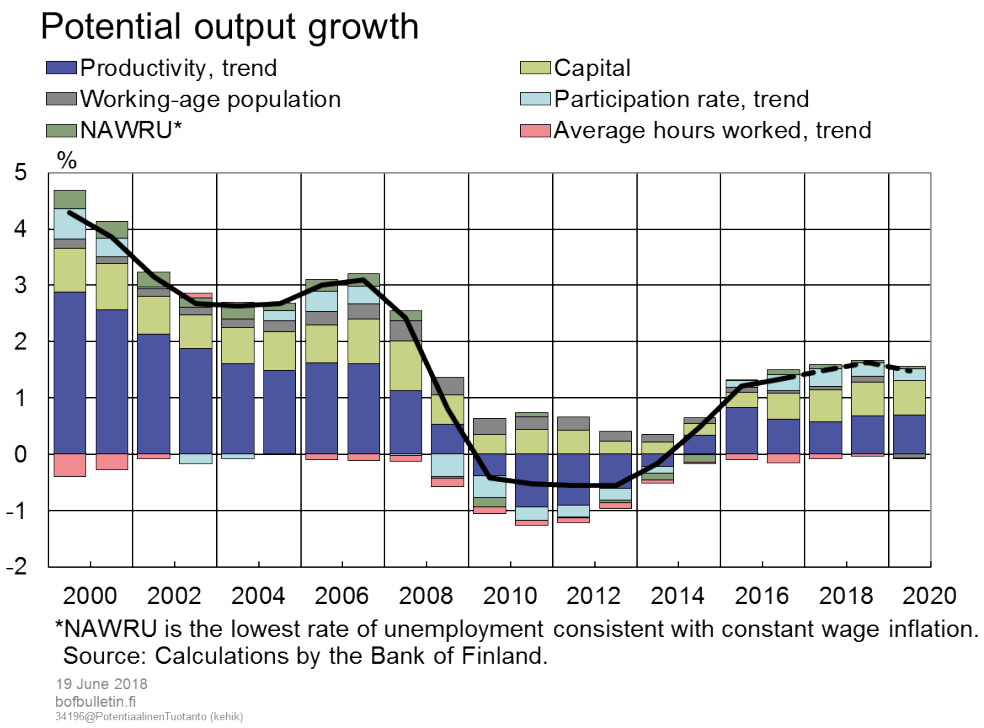
In the early 2000s, potential output reached a peak growth rate of over 3% on the back of strong growth in total factor productivity. The opposite effect can be observed during the prolonged recession: at worst the decline in productivity contributed negatively to potential growth. While potential growth has gathered strength in recent years, it remains considerably below its peak.

Finland's economic growth has been hampered by the shrinking labour share in high-productivity manufacturing. Since 2008, manufacturing has lost almost 100,000 jobs. Together, manufacturing and trade[5] have seen approximately 110,000 jobs disappear, although a similar amount has been added in other areas of the service sector (Chart 2).

Meanwhile, the highly productive ICT-sector's share of total output has declined sharply since the turn of the millennium. Electrical engineering and electronics accounted for 8% of Finland's GDP

at its peak in the year 2000. By 2016, this figure had dropped to 3%, roughly equalling the primary sector (2.7%) in their respective shares of total output.

Chart 2.



According to Professor Matti Pohjola, the decline in total factor productivity can be observed in manufacturing as well as services, implying a trend whose effects cannot solely be attributed to changes within the economy's production structure. Discussion continues over what possible factors might have contributed to the stagnation in productivity growth[6].

In times of severe economic crisis, firms may be tempted to cut back on research and development spending, weakening conditions for innovation and subsequently limiting potential for productivity growth. Indeed, investment into research and development[7] seems to have diminished significantly in Finland: R&D expenditure stood at 5.2% of GDP in 2007–2010 but fell to 4.2% during 2015–2017. The export share of high technology exports has also shrunk.

An economy's aggregate productivity[8] is also determined by the decomposition of firms who utilise its resources. Consequently, it can be misleading to evaluate productivity growth by simply inspecting the means of the economy's different sectors. Because the size and productivity distributions of firms are typically skewed, measures of central tendency will be especially influenced by values in the extrema (see Nurmi, Virén and Vanhala 2017, 2018).

At first glance, looking at figures representing the aggregate economy, it might seem that most Finnish firms are characterised by weak productivity. Instead, a closer analysis of different sectors reveals that highly productive of firms have been able to maintain robust productivity growth throughout most of the 2000s, while a large share of firms have seen their productivity stagnate. This gap between firms who are growing and those who are not widened during the 2000s.[9] A firm's productivity growth is not entirely dictated by its own success or failure to innovate outright but is also bolstered by the diffusion of innovations and technologies between companies. The growing lead of many frontrunner businesses might well suggest that meandering productivity growth is not so much an issue of a lack of ideas but is instead caused by the slow diffusion and uptake of new technologies.

In the low-end of the productivity spectrum, one especially troubling phenomenon can be found in the rise of so-called 'zombie firms' in the 2000s (see Nurmi, Virén and Vanhala 2018). Not only do these maladroit corporate entities display below-average productivity in and of themselves[10], but they weaken growth conditions for other firms, increase barriers-to-entry, compromise the economy's ability to renew itself and dampen productivity growth.

International studies also demonstrate that total factor productivity growth may suffer if risk financing is no longer allocated towards high-risk but potentially high-reward projects as it once was.[11]

Growth of capital stock hindered by recession

Growth in the capital stock[12] contributed favourably to the potential growth rate throughout 2000–2017, despite the subdued level of investment seen during the recession. The expansion of the economy's capital base has accounted for almost up to 1 percentage point of the potential growth rate. Changes in the capital base happen slowly, as new fixed capital investments are slightly offset by the rate of capital depreciation.

The capital stock's relative contribution to the potential growth rate did decline quite significantly during the recession. The increased uncertainty and weakening of corporate profitability which both followed the financial crisis do well to explain the low level of investment activity seen in Finland and the other advanced economies, in spite of accommodative financing conditions.[13] Investments have since picked up after the recession, which in turn has strengthened the capital base (Chart 1).

According to Maliranta, Kuusi and Ali-Jyrkkö (2017)[14], Finland's relative dearth of manufacturing investments is largely caused by subdued expectations concerning future productivity growth.

That is to say, investment growth in Finland has not been hindered by a lack of finance.

Recessions can also restrict growth in the capital stock when failed businesses are left with previously implemented productive investments, effectively rendering productive capital obsolete. Indeed, the resolution of Finland's mobile phone industry and subsequent contraction of the entire electrical engineering and electronics industry is undoubtedly part of the reason for the capital base's weaker growth since 2011.

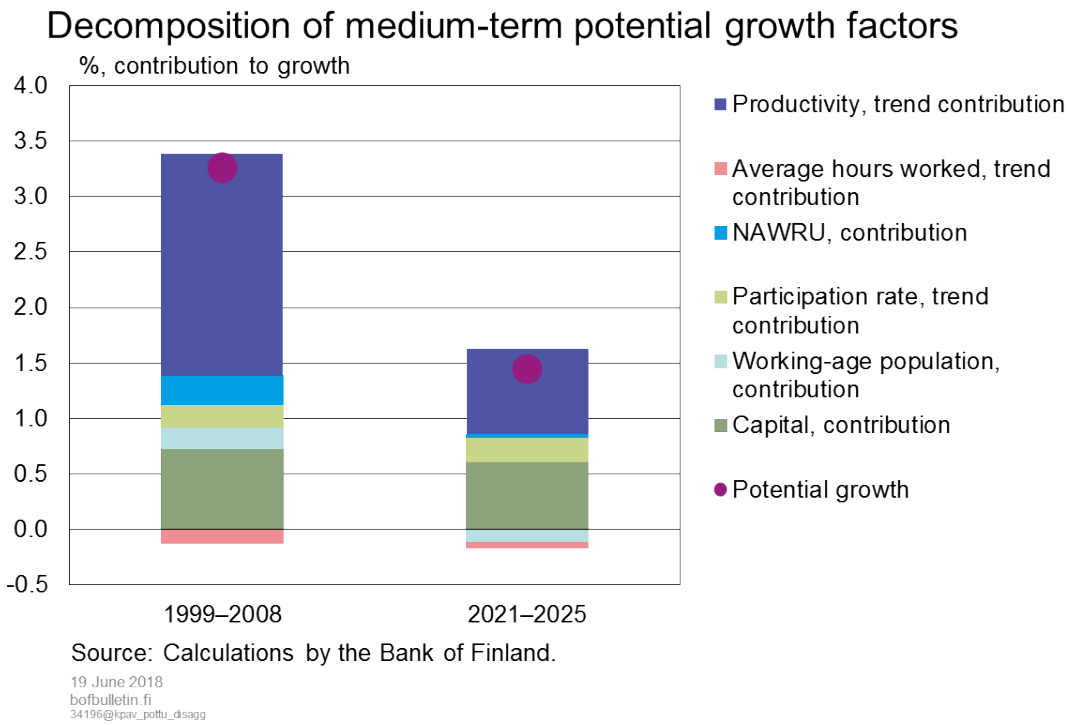
Labour input impacted by recession

The labour input's contribution to potential growth has been negative, albeit at a lesser degree than that of total factor productivity. During the recession, the decline in the labour trend weakened potential output. Quite recently, however, labour has once again started to support potential growth (Chart 3).

The aggregate contribution of the labour input[15] can be decomposed into changes in population trend, participation rate, average hours worked and unemployment (NAWRU[16]).

Long-term trends can be identified in the performance of the labour input. The consistent decline in the average amount of hours worked per employee has reduced the potential growth rate. Meanwhile, the 15–74-year-old working-age population, i.e. the potential pool of labour, has expanded and contributed to the volume of potential output. The decline in the participation rate has especially weakened potential growth since 2008; contraction in the labour force is both a consequence of the economy's double-dip recession and a natural result of population ageing.

Chart 3.



Structural unemployment (NAWRU) has also increased slightly and weighed on the potential growth rate during the financial crisis (Chart 3). Finland's rate of structural unemployment is estimated to be large (see Uneployment rate in Finland close to structural level) A prolonged recession can result in the long-term displacement of portion of the labour force. Extensive periods of unemployment can erode workers' skills and turn cyclical unemployment into a more persistent variety, raising the NAWRU (hysteresis[17]). Skills mismatch in the labour market or weakened incentives to work can also contribute to structural unemployment.

Potential output growth during 2018–2020

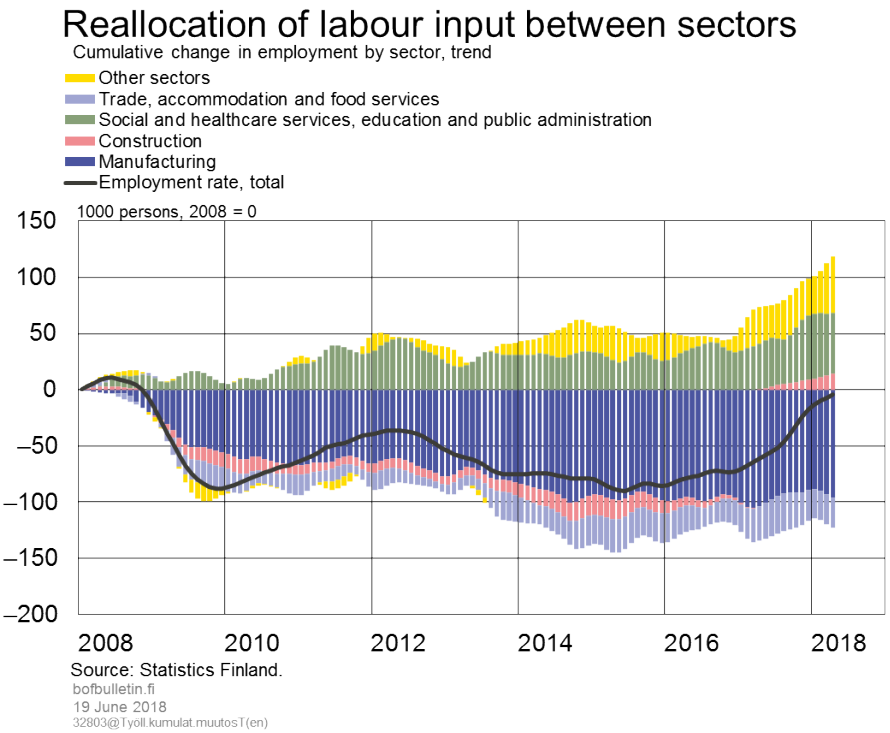
The estimate of potential output over the forecast period (2018–2020) is based on the same framework used to analyse Finland's production factors and calculate past potential growth.

Finland's economy transitioned from recovery to peak

Finland's economy has transitioned from recovery to peak: GDP growth is forecast to surpass the potential growth rate over 2018–2020, and the volume of actual GDP will also exceed its potential.[18] Potential growth is estimated at settle at approximately 1.5% during the forecast period, which ultimately means that it will remain slower than before the recession. In the

immediate years ahead, potential output growth will be mainly supported by growth in the capital stock and total factor productivity (Chart 4).

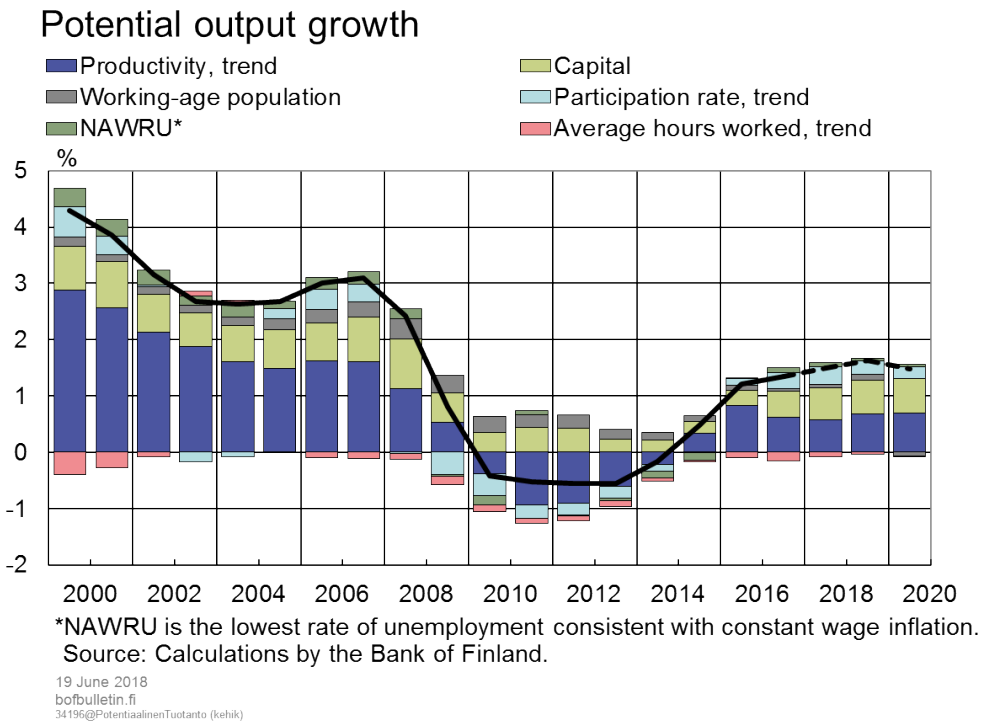
Chart 4.



The Finnish economy has undergone strong cyclical fluctuations in the 2000s. A survey of the time period included in the forecast, i.e. 2000–2020, reveals that the business cycle began to strengthen in 2003 and peaked in 2007. During the onset of the global financial crisis, GDP collapsed and the output gap[19] – the difference between GDP and potential output – recoiled sharply. Following this, the output gap remained negative for nine years all the way up to 2017. Should the pace of economic growth continue as forecast, the output gap will turn slightly positive and remain so throughout 2018–2020.

Chart 5 denotes various other institutions' estimates of Finland's output gap. Although there is consensus over the direction of the business cycle, the estimates of the output gap vary and especially so concerning recent years.

Chart 5.



A degree of uncertainty is inherent in estimates of potential output and the output gap. Because both of these variables are unobservable, they cannot be given precise values retroactively.[20]

Potential output over the medium term

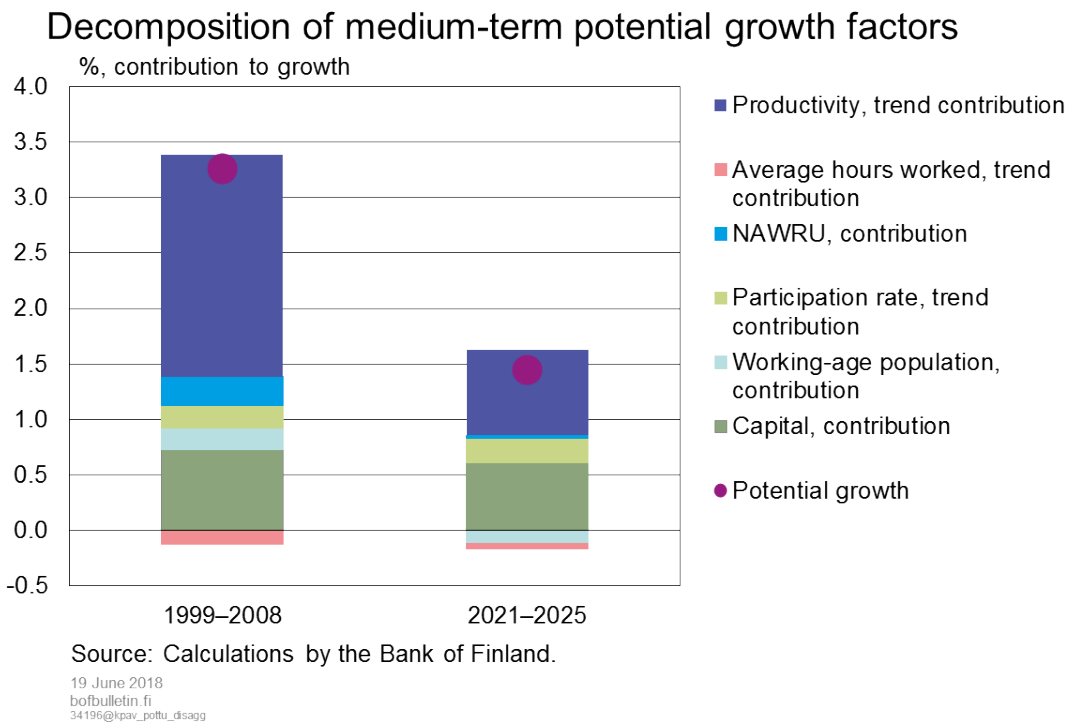
The potential growth rate will remain considerably slower than its pre-crisis level over the medium term during 2021–2025. Potential output will be mainly supported by growth in productivity and the capital stock (Chart 6). The labour input's contribution to potential growth looks to remain especially subdued. Prior to the financial crisis, labour[21] contributed significantly to potential output growth. During 2012–2025, the continued decline in the working-age population and the reduction in average hours worked will both weaken the economy's potential growth. A rise in the participation rate will contribute to potential output. Consequently, the labour input will not contract in terms of total hours worked.

The medium-term estimate is based on the following assumptions: the rate of potential growth in 2025 represents the Bank of Finland's long-term estimate (); the working-age population will develop as according to Statistics Finland's Population projection over 2021-2025; average hours worked per employee will continue a slight downwards trend (0.1% per annum); the participation rate is forecast to strengthen to approximately 67.4% over 2021–2025[22], when it is assumed that

the participation rate for elderly people will slightly improve and respective rate for younger people will return roughly to its pre-crisis level.

The rise in the participation rate might turn out to be weaker than forecast, in which case the labour input's contribution to potential growth could remain negative over the medium term. The development of the capital stock is based on the assumption of 'balanced growth', i.e. growth in the capital base is determined by labour and productivity growth. Indeed, productivity growth should be viewed as a pressure gauge of sorts, which denotes the level of total factor productivity needed by 2025 to reach the long-term growth forecast for that very year.

Chart 6.



Notes

1. For a general overview of unobserved components models, see e.g.: Hamilton, J. (1994): Time Series Analysis. Princeton University Press, New Jersey; Andrle, M: What Is In Your Output Gap? Unified Framework & Decomposition Into Observables. IMF Working paper WP /13/105, 2013; Durbin, J., Koopman, J: Time Series Analysis by State Space Methods. Oxford University, 2012. ↑
2. The trend component is thought to represent each variable's prevailing level, or growth, when the economy is operating under normal conditions. In a one-sector model, a production function is used to combine the trend components of factor inputs into an estimate of potential output and its growth rate. Therefore, potential output growth is ↑

determined by growth in the labour and total factor productivity trends as well as growth in the capital stock.

3. Code written by Máté Tóthin (Mate.Toth@ecb.int) has been used in the calculation of potential output. Publication: Szörfi, B., Tóth, M. (2018): An Unobserved Components Model for Estimating Potential Output in the Euro Area (ECB, forthcoming). The model has been estimated using Bayesian methods. ↑
4. The model makes use of the following univariate time series, either directly or by deriving parameters therefrom: real GDP, labour, hours worked, employment, capacity utilisation in manufacturing, working-age population (aged 15-74), total real capital stock, unemployment, labour-force share of the long-term unemployed (unemployed for over 12 months), underlying inflation (HICP excl. energy and food), wage and salary earnings index. ↑
5. Trade also includes hospitality services. ↑
6. According to Professor Pohjola, at least the following reasons have been proposed to explain the laggard productivity growth also seen in other countries: slowing scientific progress and technological change, obstacles to the spread of innovation, measurement errors, and various structural changes. ↑
7. Research and development investments are detailed in Statistic Finland's Quarterly National Accounts under the time series titled 'Cultivated assets and intellectual property products'. ↑
8. According to Professor Maliranta (Innovointi ja luova tuho – erot maiden, toimialojen ja yritysryhmien välillä, Kansantaloudellinen aikakauskirja 1/2014, Finnish only), an economy's productivity growth is not only determined by technological change and economies of scale but also by the process of 'creative destruction' (the reallocation of inputs between firms) and the fact that the latter's impact is most significant in R&D-intensive fields. ↑
9. Various estimates exist concerning the magnitude of this phenomenon. Staff turnover is generally higher among growth firms, so it is improbable that some firms should remain permanently more productive than others. ↑
10. See e.g. Caballero et al 2008, Adalet McGowan et al 2017. ↑
11. Benes, J., Clinton, K., Garcia-Saltos, R., Johnson, M., Laxton, D., Manchev P. ja Matheson T: Estimating Potential Output with a Multivariate Filter. IMF working paper WP/10/285, December 2010. What's the Damage? Medium-Term Output Dynamics after Financial Crises. IMF World Economic Outlook, October 2009, ch 4. ↑
12. The capital stock denotes the real value of the economy's fixed assets, including public and housing investments. ↑
13. Benes, J., Clinton, K., Garcia-Saltos, R., Johnson, M., Laxton, D., Manchev, P. and Matheson, T: Estimating Potential Output with a Multivariate Filter. IMF working paper WP/10/285, December 2010. What's the Damage? Medium-Term Output Dynamics after Financial Crises. IMF World Economic Outlook, October 2009, ch 4. ↑
14. Ali-Yrkkö, Jyrki, Kuusi, Tero and Maliranta, Mika (2017): Why Have Business Investments Decreased? ETLA Reports 70. ↑

15. The estimate is solely based on the volume, not quality, of labour. ↑
16. Non-accelerating wage rate of unemployment. NAWRU is the rate of unemployment consistent with constant wage inflation. ↑
17. Blanchard and Summers (1986) identified the phenomenon of hysteresis, where a rise in the unemployment rate may also increase structural unemployment. Blanchard, O., Summers, L: Hysteresis and the European Unemployment Problem. NBER Macroeconomics Annual 1986, Volume 1. ↑
18. For the years 2018–2020, the unobserved components model relies on data from The Bank of Finland's Economic Forecast. ↑
19. The difference between real GDP and potential output is referred to as the output gap and is typically denoted as a percentage of potential output. A positive output gap cannot be sustained without inflationary pressures in wages and prices. ↑
20. When reviewing econometric research results, it is important to be aware of the uncertainties that stem from a model's variables or specification, as economic models are always constructed on the basis of assumptions and arbitrary choices. Ambiguity in existing results are subject to increase if historic time series data are later revised. ↑
21. Before the financial crisis, the participation rate stood at approximately 66.5% over 1999–2008. ↑

Keywords

forecast, gross domestic product, medium term, output gap, potential output