Total factor productivity development more important than ever for Finland's long-term economic growth

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Many researchers and institutions have comprehensively examined the factors that affect long-term economic growth (Brynjolfsson and McAfee 2014 the EU Commission 2015; Gordon 2012 and 2014; Bergeaud et al. 2015; Jones, 2015). In this regard, there is not much to add and there is no value in repeating what has already been written. I will limit myself here to presenting my own views. Due to the prolonged recession of recent years and the macroeconomic pressures that have built up to adjust, my forecasts for the first ten-year period in particular are lower than those of 2012 (Kotilainen, 2012). This is mostly a matter of views and assumptions, taking into account key trends such as the growth of the population, labour force and productivity.

1.   What is assessed and how?

The organizers of the seminar asked for estimates of the following phenomena:

1) How much will gross domestic product (GDP) per capita grow in real terms during 2015–2025 and 2025–2035?

2) How fast will labour productivity (GDP / hours worked) increase on average in the aforementioned periods (total economy)?

3) How much research and development (R & D) will be carried out in Finland on average in relation to GDP in the periods in question?

The first two questions are closely linked to one another. GDP growth depends on the growth of labour inputs and labour productivity.

The amount of labour input, in turn, depends on the development of the working-age population, the labour force participation rate and the employment rate. In long-term forecasts the normal assumption is that the economy is in state of equilibrium and unemployment is at its structural rate.

Labour productivity, in turn, can be broken down into three components, which are: 1) capital deepening, 2) structural change in labour inputs, and 3) total productivity (residual). Rough assumptions have to be

made on the effects of capital deepening in particular. Even more detailed breakdowns are possible, but here we limit ourselves to the above-mentioned components.

The adjacent table shows GDP per capita and its components as well as research and development expenditure relative to GDP in 1995-2013 and in the forecast periods examined. The year 2014 is excluded from the analysis because only preliminary data is available for it.

During 2000-2008 GDP growth averaged 3.2 per cent. The contribution of hours worked was very small at the beginning of the period, but it rose towards the end. The contribution of labour productivity changed in the opposite direction. In 2009-2013, GDP contracted by an average of over one per cent per annum. Contributions of both hours worked and labour productivity were negative. The change in GDP per capita was 2.9 per cent on average in 2000-2008 and -1.6 per cent in 2009-2013.

Research and development expenditures averaged 3.5 per cent relative to GDP during 2005–2013. The ratio showed a downward trend and in 2014 it was 3.1 per cent. R & D expenditure has a significant impact on Finland's overall productivity development, but the effect is not direct because research and development activities conducted in Finland are also utilized in the foreign operations of Finnish-owned enterprises. Similarly, technology developed abroad is utilized in Finland.

Table 1. Growth of GDP components (contributions) calculated per capita in Finland and share of R & D expenditure relative to GDP, average annual %

	1995–1999	2000–2004	2005–2008	2009–2013	2015–2025[F]	2026–2035[F]
Hours worked	1.5	0.4	1.0	-0.7	0.1	0.1
Labour productivity	2.4	2.4	1.8	-0.4	1.4	1.6
-Total factor productivity	1.6	1.3	1.0	-1.4	0.8	1.0
-Contribution of deepening of capital	0.0	0.9	0.7	0.9	0.5	0.5
-Contribution of structural change in labour inputs	0.8	0.2	0.1	0.1	0.1	0.1
GDP volume growth	4.8	3.2	3.2	-1.1	1.5	1.7
Population growth	0.3	0.2	0.4	0.5	0.5	0.3
Growth of GDP volume per capita	4.5	2.9	2.8	-1.6	1.0	1.4
R&D relative to GDP, % share	2.7	3.4	3.4	3.6	3.4	3.5

Source: Historical data for productivity calculations: Statistics Finland (2013); forecast: own estimates.

2. The years 2015-2025: the challenge is to restore competitiveness and promote fiscal adjustment

In the first forecast period of 2015-2025 total production (GDP) is estimated to grow by an average of 1.5 per cent a year. With an assumed inflation rate of less than 2 per cent, the value of GDP is projected to grow at a rate of almost 3.5 per cent per annum. Growth is slowed by fiscal adjustment in the first half of the period. ETLA assumed in the scenarios presented in its forecast "Suhdanne 1/2015" that the public fiscal deficit would be cut by a total of 4 billion euros during the legislative term of 2015-2019. The adjustment measures were assumed to be implemented at a steady pace of about 1 billion euros per year. The effect of these measures on economic growth cannot be accurately estimated since it depends on the size of the so-called fiscal multiplier. We calculated the impact of the adjustment based on two assumptions: 1) GDP growth will slow down during 2016-2019 by an average of 0.2 percentage points per year compared to the baseline scenario and 2) GDP growth will slow by an average of 0.4 percentage points per year during the period in question. In the former case, the so-called fiscal multiplier is about 0.4 and in the latter case about 0.8. In this estimate I use the latter assumption. This assumption is consistent with the estimates used in different studies (e.g. Mendoza et al. 2009; Ramey et al. 2015). Table 2 presents GDP growth and public debt/GDP in different scenarios.

Because of the adaptation measures, Finland's GDP will grow an average of only 1.2 per cent per annum during 2015-2019. The figure is low due to weak growth in 2015. Growth within the period could be somewhat higher if the economy's productive base and competitiveness can be rapidly improved through e.g. measures such as the social contract envisaged by the Sipilä government. Between 2020-2025 growth will accelerate to an average of 1.8 per cent per annum. Again, this acceleration requires that the competitiveness of Finland's export production can be improved through moderate wage increases as well as active development of new products and an increase in productivity. Despite positive long-term effects, moderate wage increases will contribute to slower growth of domestic demand in the short and medium term.

Table 2. Public debt / GDP in the baseline scenario and in two adjustment alternatives in which public spending is reduced by 1 billion euros per year in 2016-2019. %

	2016	2017	2018	2019	2023	2025
Baseline scenario with no public sector adjustment	**64.1**	**65.5**	**66.5**	**67.3**	**71.0**	**72.5**
GDP volume growth in baseline scenario	1.6	1.8	1.8	2.0	1.5[1]	1.5[1]
Adjustment scenario 1:	**64.1**	**64.9**	**64.9**	**64.4**	**62.2**	**60.8**
Growth slows by 0.2 percentage points GDP growth rate	1.4	1.6	1.6	1.8	1.7[1]	1.7[1]
Adjustment scenario 2:	**64.6**	**65.7**	**66.2**	**66.1**	**64.3**	**62.3**
Growth slows by 0.4 percentage points GDP growth rate	1.2	1.4	1.4	1.6	1.8[1]	1.8[1]

[1] Average annual growth rate in 2020-2025.

During 2015-2025 the impact of hours worked on real GDP growth is 0.1 percentage points. Although the number of persons aged 15-64 will decrease sharply in this period as the baby boomers and other large age groups subsequently retire, Finland's available labour force will be large enough as a result of the prolonged recession. However, employment will not begin to improve until 2020 onwards. Hours worked will increase thanks to both improving demand and prolonged careers due to the pension reform. The employment rate (ages 15-64 years) will rise to 71 per cent by 2025. In 2014, the employment rate was 68.3 per cent. The unemployment rate in 2025 will still be about 8 per cent. The labour force participation rate (15-74 years) is estimated to rise from the current figure by more than half a percentage point to 66 per cent by 2025. The unemployment rate will be lower than the above-mentioned figure if the labour force participation rate increases less than expected.

Labour productivity fell by an average of 0.4 per cent during 2009-2013 driven by the deep recession and the downturns in the electronics and paper industries in particular. During 2015-2025, 1.4 percentage points of the 1.5 per cent GDP growth will be derived from the increase in labour productivity. This is an improvement over recent years, but the figure is still much lower than before the recession that began in

the aftermath of the financial crisis. The emphasis of production shifting in the direction of services will act as a dampening mechanism for production growth. However, the Finnish economy still has plenty of potential for productivity growth, e.g. in the form of wider utilization of information technology. The improvement of the capacity utilization rate will boost productivity in the coming years. However, the development and introduction of new products and production processes takes time. Some 0.8 percentage points of labour productivity growth will come from the increase in total productivity, 0.5 percentage points from capital deepening and 0.1 percentage points from improvement of the quality of the labour force.

Total factor productivity growth reflects both international and Finnish-specific technology development. According to several forecasts, aggregate productivity growth has slowed, and it will remain sluggish. New technological breakthroughs are not expected to be realized as much as during the prime years of the so-called ICT revolution (Gordon 2014). On the other hand, it can be argued that there are still a lot of possibilities for ICT applications. The gradual impact of the spreading use of electricity on other production can be used as a case in point. In this respect my estimate is probably rather conservative.

In Finland the recovery from the collapse of Nokia and the entire ICT cluster will take time and is a problem all of its own. However, our country still has expertise and technology that can be utilized in many industries. There are opportunities and a need for productivity growth in both the public and private services. The public sector aims at improving productivity e.g. by enhancing the operations of the social and health sectors as well as general administration. The central government also has some instruments at its disposal to bolster research and development, which are presumed to be utilized. Efforts will also be made to keep the standards of Finnish universities' education and research among the highest in the world. On an international level, further liberalization of trade and investment and the strengthening the internal markets of the EU still have the potential to boost productivity.

I have assumed that capital deepening will increase labour productivity by an average of 0.5 percentage points. This roughly corresponds to the realized long-term average.

The contribution of the structural change of labour input on labour productivity is growing more slowly than in previous years because the proportion of the highly educated population will not be increasing very much anymore. The presumed 0.1 percentage point contribution arises mainly from an improvement in the general level of education. The increase of the average age of the work force may have a negative effect on the quality of labour, unless adult education and on-the-job training are sufficiently effective.

The population is expected to grow by an average of 0.5 per cent per annum during 2015-2025. In 2015, the size of the Finnish population is estimated to be about 5.8 million people. Population growth is caused by immigration and the fact that the elderly population is living longer than earlier generations did. In this period a significant proportion of the post-war baby-boomers will still be still alive. Due to the rather substantial population increase and slow growth in production in the first half of the period, GDP per capita will grow an average of only 1 per cent annually.

Research and development expenditure in relation to gross domestic product has declined in recent years due to Nokia's collapse. Expenditure will begin to grow gradually as a new production base is being built. However, its share of GDP will remain at an average of 3.4 per cent in the next ten-year period.

3. **The years 2025-2035: labour input will grow slightly thanks to pension reform and immigration, technological advances are nevertheless of crucial importance**

In the period 2025-2035 the volume of total production is expected to grow by an average 1.7 per cent a year. Providing inflation remains at less than two per cent, the value of GDP will increase by about 3.7 per cent a year. This is slightly higher than the average of the previous ten-year period. I assume that the macroeconomic and fiscal adjustment process has been carried out and growth takes place in a balanced manner. The amount of labour input will increase an average of 0.1 per cent per year. The retirement of baby boomers and other rather large age groups has already occurred in the previous ten-year period. The slight increase in labour input is due to net immigration. The positive trend of labour input requires that the em-

ployment rate of immigrants rises from the current level. The prolonging effect of the pension reform decreases toward the end of the period when the reform has been carried out.

Labour productivity is expected to grow by an average of 1.6 per cent per annum, slightly more than in the previous ten-year period. This is due to the fact that total factor productivity growth is expected to accelerate slightly due to the maturing of new technologies and their wider deployment.

The contributions of capital deepening and the structural change of the labour force are assumed to be the same as in the previous period. The growth of the relative contribution of capital deepening is curbed by the fact that production is expected to become less capital-intensive as a result of the economy becoming more service-oriented.

Population growth will slow to 0.3 per cent per annum on average, as the number of births exceeds the number of deaths by the 2030s. The population of Finland in 2035 will be slightly less than 6 million people. A significant portion of this will begin to be of foreign descent as a result of decades of immigration. However, significant uncertainty is associated with the size of the population (Alho et al., 2008). The volume of GDP per capita will grow an average of 1.5 per cent per annum between 2026-2035. The more rapid growth than in previous decades is due to both slightly faster GDP growth and a slightly slower pace of population growth. If population growth is faster than estimated because of immigration, the labour supply and, correspondingly, GDP would also grow faster than expected.

Research and development spending is projected to be 3.5 per cent of GDP on average. The figure is slightly higher than in the years of structural change in the previous period, but otherwise the same in proportion to the average over several decades.

4. Forecasts entail many elements of uncertainty

Long-term forecasts entail significant uncertainties regarding both the trends of key variables as well as the timing of the various developments. In the first ten-year period of 2015-2025 the timeframe and success of restoring the export industry's real competitiveness and cost competitiveness in addition to the adjustments in the public economy will have a significant impact on growth. The second ten-year period of 2026-2035 is subject to numerous uncertainties due to the lengthening time horizon associated with demographic changes, technological development, climate change, etc. Policy actions targeting these negative development trends may also be implemented, the success of which depends on the decision-making ability of the national and international political system.

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