Background Memo - Economic Policy Council

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Fiscal effects of employment growth

In its programme the government of Antti Rinne places a strong emphasis on employment growth as a means of improving fiscal sustainability. This memo discusses the fiscal effects of employment growth. The question is approached by contrasting three approaches: i) a simple back-of-the-envelope calculation, ii) the sustainability gap model and iii) the SISU microsimulation model. The latter two are models which are commonly used to support policymaking. The models could be described as non-behavioural in the sense that they do not explicitly model decisions of individuals or firms, although some of their assumptions can be thought of as making implicit behavioural assumptions. The microsimulation model only includes certain tax-and-transfer items, and to obtain a more general fiscal effect some extrapolation is required. The back-of-the-envelope calculation is used in this memo as a contrasting device to highlight key mechanism, and to provide a sanity check to the more complicated calculations.

Despite the strong link between employment growth and fiscal sustainability in the government programme, the government has not explicitly stated what its own view of the magnitude of this link is. The government programme's employment target implies an increase in employment rate of 1.7 percentage points by 2023 relative to the Ministry of Finance (MoF) Summer forecast which was the last forecast that did not yet take into account the new government's actions. Simultaneously the government is aiming for a zero net lending position by 2023, while the corresponding summer forecast was -0.7 percent of GDP. Combined with the government's permanent fiscal measures, which on net increase the deficit by 0.1 percent of GDP, these figures imply a ratio $0.8/1.7 \approx 0.47$. This can be interpreted as an implicit assumption that a one percentage point increase in the employment rate would decrease the deficit by 0.47 % of GDP.

In its alternative scenarios for the sustainability gap the MoF has indicated that a one percentage point increase in the employment rate would decrease the sustainability gap by 0.4 percent of GDP, which is relatively close to the implicit figure in the government programme. The microsimulation-extrapolation approach produces a very similar result in the preferred specification. This is somewhat surprising as there are significant differences in the two models.

Overall the government's implicit assumption of the aggregate fiscal effect of employment growth seems quite realistic. The key caveats are that if employment growth is disproportionately part-time or it is financed by the government through public employment or wage subsidies, the fiscal benefit of added jobs is smaller.

[1] I thank Jukka Mattila, Jaakko Nelimarkka, Seppo Orjasniemi and Jukka Pirttilä for helpful comments. The views represented here do not necessarily represent the views of the Economic Policy Council. All the remaining errors are my own.

The memo proceeds as follows. The first section presents the very crude back-of-the-envelope calculation. Then the microsimulation approach and its results are presented, along with an extrapolation concerning other tax revenue. After this the workings of the sustainability gap model are illustrated. The memo concludes by comparing the different approaches and highlighting some key findings and caveats.

The calculations presented in this memo are available as a separate attachment. It should be emphasized that although simulation results are here presented in quite exact terms, for example up to two decimal points of GDP, the calculations contain numerous uncertainties. The purpose of this memo is not so much to produce exact figures, but to evaluate how realistic the government's implicit assumption is, and to discuss different mechanisms which are at play and are varyingly taken into account by different approaches.

In many calculations presented here it is assumed that all employment growth comes from the ranks of the unemployed, i.e. not from outside the labour force or through migration. This assumption is largely in line with the government's targets (see Appendix), and this assumption is also briefly discussed on the section on the sustainability gap.

A back-of-the envelope calculation

For illustrative purposes, let us make a crude back-of-the-envelope calculation on the expected fiscal benefits of increased employment. The fiscal variable examined is the deficit-to-GDP ratio. The calculation proceeds in three steps. First, increased employment is translated into an increase in GDP. Second, increased GDP is translated into increased tax revenue. Third, the reduction in unemployment is translated into reduced expenditure.

An increase in the employment rate by one percentage point translates into an increase in employment by about 1.4 percent. Assume, then, that this translates into an increase of 1.4 % in GDP. It is worthwhile to discuss the assumptions underlying this simple mapping. First, average hours worked should not change. This would be violated if, say, the new jobs are more-often-than-average part-time jobs. This is in part a policy assumption. Second, labour productivity should not change. On the one hand, this requires that the quality of labour input does not change, and on the other, that investments will increase so that the capital input will increase with the labour input. The capital stock should adjust over some number of years, but it is clear that the average quality of labour input may change as the newly-employed are likely to have lower-than-average levels of education. This issue is discussed further in the section on microsimulation. For now, it suffices to make the assumptions explicit.

What is the effect of increased GDP on tax revenue? For lack of a better estimate, let's assume that the current aggregate tax rate (about 42 %) is also the marginal aggregate tax rate. This means that as GDP grows by one euro, tax revenue is increased by 42 cents.

Finally, let's look at the expenditure side. To simplify, let's assume all increase in employment comes through a decrease in unemployment. This assumption is discussed a bit more in the last section. Let us assume that a decrease in unemployment directly translates into a decrease in unemployment benefit and unemployment insurance expenditure. This is likely to somewhat underestimate the fiscal effect as the unemployed often receive other benefits as well, mainly the general housing allowance and social assistance.

Adding up all these effects results in a ratio of 0.75. This means that the simple back-of-the-envelope calculation suggests that an increase in the employment rate by one percentage point

would reduce the deficit-to-GDP ratio by 0.75 percentage points. The implicit government ratio of 0.47 seems quite pessimistic compared to this.

To a limited extent this ratio depends on the year used. The aforementioned figure is obtained when using data (projections and extrapolations) for 2023. Using data from 2017, which is also the year used in the microsimulation analysis, results in a ratio of 0.78. This figure is marginally higher than that obtained using 2023 data because the employment rate was lower in 2017, which in turn means that a given increase in the employment rate has a larger relative effect on employment. To take an extreme example, if the employment rate was 1 %, a 1 %-point increase in the employment rate would double employment in the economy.

The SISU microsimulation model

The microsimulation approach has several potential benefits compared to the simple calculation on sums in the previous section. First, the micro data allows us to at least partially take into account the issue of labour quality by controlling for observables such as education when predicting the employment wages of the newly-employed. Second, the model takes into account the fact that due to the progressivity of the income tax system tax revenue may change at different rate as the wage sum. Third, the microsimulation approach should also give us a more accurate picture of the expenditure side as we can also include for example general housing allowance in the analysis. A key limitation of the approach is that while it should give an accurate picture of the components it models, it does not model all tax and expenditure items. To get comparable figures on the effects of employment growth on the deficit-to-GDP ratio, some (back-of-the-envelope) extrapolation is required.

The SISU model is a static microsimulation model which models transfers and personal taxation in Finland. The model describes the relevant legislation and combined with individual-level data containing detailed information (concerning demographics, income, and labour market participation, for example) can be used to calculate counterfactuals for different tax-and-benefit laws or different employment levels, for example. SISU is regularly used by the government to assess the effects of different policy reforms on fiscal revenue and expenditure, and on the income distribution, and on occasion by researchers in research institutes and the academia as well.

As data the current exercise uses the register sample from 2017, which is the most recent year available. The 826,001 observations in the data have a uniform design weight of approximately 6.7, and all simulation results presented here are population-level figures.

The following algorithm describes how the simulation is carried out, building on the work of earlier SISU applications such as Kärkkäinen & Tervola (2018).[2]

1. Run the model using observed data and save baseline simulation results.
2. Increase employment in the data.
3. Set employment wages for those whose employment status was changed.
4. Run the model and save counterfactual simulation results.
5. Compare the baseline simulation and the counterfactual simulation.

[2] Kärkkäinen, O. & Tervola, J. (2018). Talouspolitiikan vaikutukset tuloeroihin ja työllisyyteen 2015-2018. Valtioneuvoston selvitys- ja tutkimustoiminnan julkaisusarja 59/2018.

Although the micro data also contains information on observed taxes and transfers, the baseline results are also simulation-based for better comparability. These simulation results are quite close to observed values in the data concerning taxes paid and transfers received.

Employment is increased in the following way. The data includes information on how many days an individual has received different forms of unemployment benefits. The counterfactual employment increase is defined in terms of days. Unemployment benefit recipiency days are then randomly zeroed one individual at a time in the data until the target employment increase is met.

A key problem is then how to set the newly-employed individuals' labour incomes. There are several possible approaches here. I follow earlier applications and use the set of employed individuals to predict wages for unemployed individuals based on their background characteristics.

The model is then run on the new counterfactual data. The baseline and the counterfactual simulations are compared in terms of sums taxes paid, transfers received, and earned income. Comparisons of earned income will be used when discussing the macro implications of the simulations.

Because the wage regression is quite crucial for the fiscal outcomes in the simulation, let's discuss it in more detail. A monthly wage variable is calculated for each individual in the data using information on annual wage and salary income and days worked during the year. The wage estimation sample is restricted by setting minimum thresholds for the monthly wage and days worked. The purpose of this restriction is to exclude constructed monthly wages which do not reflect full-time employment. In the baseline specification these are 1,187 euros and 200 days, respectively. The monetary threshold is taken from the eligibility requirement for unemployment insurance in. This corresponds to approximately the 0.1^{st} centile in the wage distribution of Statistics Finland's Structure of Earnings statistic (for 2017).

Additionally, pensioners, individuals on parental leave, conscripts, and those with self-employment income are excluded from the estimation sample.

Within this estimation sample log monthly wages are then regressed on background characteristics: education, household type, age and age squared, number of children of different ages, region (county), gender, marital status, and a dummy for mortgage and other debts. Unemployment months are also included as a control variable. The data also includes panel information on working days in previous 3 years, from which the last year's observation is included as a control variable.

Table 1 presents descriptive statistics for the regression sample and the unemployed sample, for which we predict wages. Statistics for the unemployed sample are also presented weighted by unemployment days.

As expected, the employed and the unemployed differ in many observable ways. The employed are, on average, more educated, more likely to be married and tend to live in the Uusimaa region. Unemployment is also persistent, as those who are unemployed have had less days in employment in the previous year compared to those who are employed. Note, however, that these samples may overlap, as some individuals with only a small amount of unemployment days may also be in the regression sample.

VARIABLE	REGRESSION SAMPLE	UNEMPLOYED SAMPLE	UNEMPLOYED SAMPLE, WEIGHTED BY UNEMPLOYMENT DAYS
POST-PRIMARY EDUCATION	.90	.76	.72
POST-SECONDARY EDUCATION	.46	.23	.21
MARRIED	.50	.34	.34
SHARE LIVING IN UUSIMAA	.35	.26	.27
AGE	43	41	42
AVERAGE NUMBER OF WORK DAYS IN PREVIOUS YEAR	348	133	94
NUMBER OF OBSERVATIONS	229,654	88,976	88,976

Table 1. Descriptive statistics on the employed and the unemployed.

After the regression model has been estimated, monthly wages can be predicted out-of-sample for those whose employment status changes in the employment simulation. One issue with this prediction is that some individuals' predicted wages will be unrealistically low, or at least they will be below the wage threshold set for the wage regression. In the present analysis, for example, the minimum predicted wage in the unemployed population is slightly over 800 euros. In all subsequent analyses predicted wages are truncated so that all individuals with predicted wages below the minimum threshold will be allocated the minimum threshold wage.

The wage regression only explains a part of the observed wage variation, and thus predicted wages will not have the same variance as actual wages. An intuitive way to understand this is that if wages were predicted only using a gender dummy, predicted wages would only take two values. Adding variance to wages could in principle be significant for the fiscal effect under non-linear taxation, but test simulations suggest that the magnitude of this issue is relatively small. Furthermore, adding variance exacerbates the problem of very low predicted wages. For these reasons all results below will use predicted wages without added variance.[3]

The simulations are still stochastic as change in employment status is randomly allocated to the target population, but the fiscal effects of this variation are very small. All results are based on averages from 10 rounds of simulation. Tests using a higher number of simulations (up to 50) suggest this is sufficient for current purposes (even one round of simulations would probably suffice).

Figure 1 presents compares the distribution of observed wages of the employed (used in the wage regression) and predicted wages of the unemployed, with the distribution truncated at 10,000 euros. Based on observables it seems likely that employment growth from the ranks of the unemployed will have a direct negative effect on the average wage in the economy.

[3] If the wage regression for log income is $ln(y) = A + \beta X + u$, then mean and variance preserving predicted value for linear income is $\tilde{y} = \breve{\alpha} e^{\widehat{lny}} \tilde{u}$, where $\breve{\alpha} = \overline{e^{\hat{u}}}$ and $\tilde{u} \sim N(1, (e^{\hat{\sigma}_u^2} - 1)e^{\hat{\sigma}_u^2})$. Significance of this issue was tested by comparing the results from the wage scenario with predicted wages without residual variation to a scenario where all wages are set to the mean of this scenario. Wages in the latter scenario thus have zero variance, while in the former there is wage dispersion. The results for the total direct fiscal effect are very close, the difference being less than two percent. R-squared in the wage regression is around 0.3.

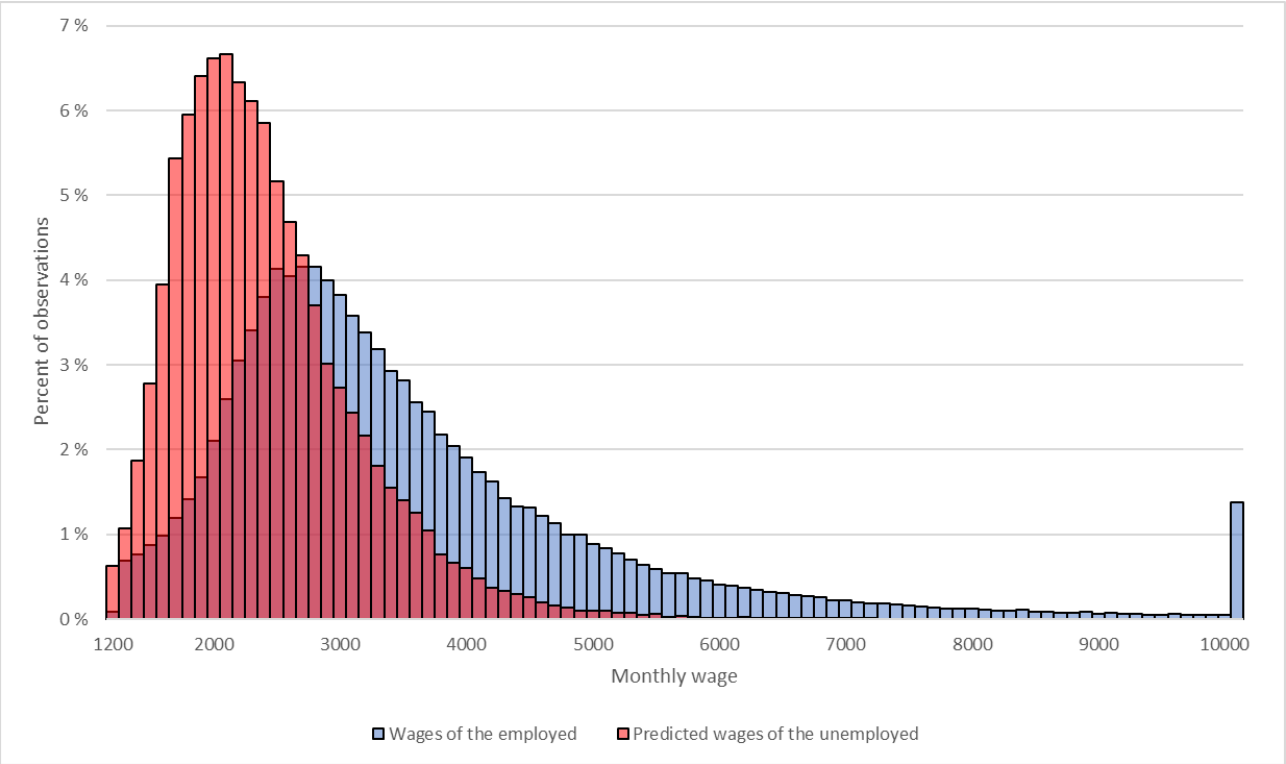

Figure 1. Wages of the employed, and predicted wages of the unemployed.

Table 2 presents results from three simulations. In the first, predicted wages of the unemployed are obtained from the aforementioned wage regression. In the second, all predicted wages are set to the average wage of the employed. This average regression wage is somewhat higher than average earnings of full-time wage and salary earners in Statistics Finland's Structure of Earnings-statistics (EUR 3,395 per month in 2017). This is likely to reflect two things. First, individuals with several months of unemployment are excluded from the regression sample, and these individuals are likely to have lower earnings when in full-time employment. Second, the Structure of Earnings-statistic does not include all income items included in the wage concept of the micro data, such as holiday pay.

The third wage prediction is created for comparison with the back-of-the-envelope calculation. The purpose of this is to maintain average wages. As the employment rate was 69.6 % in 2017, a 1 %-point increase in the employment rate is equivalent to a 1.44 % increase in employment for that year. All predicted wages then are set to a level which produces a 1.44 % increase of the wage sum in the micro data in these simulations.

The results from the microsimulation are presented in two parts. First, Table 2 presents results per employment month generated in euros, which is an individual-level point of view. Then, Table 3 presents the total direct fiscal effect in millions of euros, and note that here the magnitude of the employment increase (about 34,000 person-years) is relevant.

Looking at the first two rows in Table 2, conditioning on the observable characteristics of the unemployed is highly consequential. Average predicted wages of the unemployed are 64 % of the average wages of those included in the wage estimation sample. To a large extent this is due to the fact that the unemployed are less educated than the employed, and that level of education is positively correlated with wages.

Due to progressivity of the income tax system, the increase in taxes paid is more than double in the average wage-scenario compared to predicted wages-scenario. Differences in transfers received is quite small in the two scenarios. In sum, the total direct fiscal effect of the employment increase is reduced by about 30 % when conditioning on the observable characteristics of the unemployed.

EMPLOYMENT WAGE USED	WAGE INCOME	UNEMP. BENEFITS	OTHER BENEFITS	BENEFITS, TOTAL	SSC	INCOME TAXES	TAXES, TOTAL	BENEFITS & TAXES, TOTAL
PREDICTED WAGES	2,245	-975	-174	-1,149	207	132	339	1,488
AVERAGE REGRESSION WAGE	3,589	-975	-249	-1,224	337	546	882	2,107
AVERAGE MACRO WAGE	2,940	-975	-232	-1,207	274	324	596	1,805

Table 2. Direct fiscal effects of employment growth, per employment month generated, EUR. Source: SISU calculations by the author.

Table 3 reports the same results, but in total millions and not divided by employment months.

EMPLOYMENT WAGE USED	TRANSFERS, TOTAL	TAXES, TOTAL	DIRECT FISCAL EFFECT, TOTAL (MILLIONS €)
PREDICTED WAGES	-473	140	613
AVERAGE REGRESSION WAGE	-504	363	867
AVERAGE MACRO WAGE	-497	246	743

Table 3. Direct fiscal effects of employment growth, total, millions EUR. Source: SISU calculations by the author.

The SISU model only models direct transfers and taxes.[4] To obtain a more general result on the fiscal effects of employment growth, one needs to make some assumptions concerning other tax-and-spending items. I will assume other expenditure items do not react,[5] so extrapolation will involve assessing how non-modelled tax revenue reacts to employment growth.

[4] The broad SISU model has separate modules for employer contributions and consumption taxes, but these were not used here.

[5] As will be discussed later, this is in stark contrast to what is assumed in the sustainability gap framework. One possible mechanism that could be captured in the microsimulation framework is the fact that employment growth at below-average wages mechanically reduces the growth rate of Index of wage and salary earnings. On the transfer side at least earnings-related pensions are partly tied to this index, and this index is also often used in the inflation adjustment of tax brackets. The importance of this mechanism is not explored in this memo.

Extrapolating microsimulation results to aggregate level

On the tax side, the baseline SISU model includes the household income tax and employee social security contributions. Together these make up 39 % of all tax revenue (Table 4).

TAX CATEGORY	REVENUE, € BILLIONS	SHARE OF ALL TAX REVENUE, %
HOUSEHOLD INCOME TAX	28	29
EMPLOYEE SSC	9	10
EMPLOYER SSC	18	18
CORPORATE INCOME TAX	6	6
TAXES ON PROPERTY	3	4
VALUE-ADDED TAX	20	21
OTHER TAXES ON GOODS AND SERVICES	11	12
TOTAL	97	100

Table 4. Tax revenue by tax category. Source: Statistics Finland, Taxes and tax-like payments. Figures are for 2017. Category "Other taxes" (category code 6000), which is very small, is excluded.

Let's make two assumptions to extrapolate effects on non-modelled revenue. There are heterogeneities and uncertainties that are merely noted here, but are not taken into account in the calculations.

1. Employer social security contributions and the corporate income revenue increase at the same rate as GDP/wage sum.
    - For employer social security contributions (SSC) this seems like a relatively innocuous assumption. In principle changes will depend on some details of employment growth. For example the unemployment insurance contribution rate depends on employer's wage sum.
    - How corporate income tax revenue changes is more complicated and depends on numerous behavioural responses. For lack of a better assumption, it is assumed that the ratio of corporate income tax revenue to GDP stays constant.
2. Consumption tax revenue increases at the rate of growth in disposable income.
    - VAT is a consumption tax. The tax rate varies between goods, and in principle the tax revenue effect would depend on the type of households seeing increases in disposable incomes and the consumption profiles of these households.
    - Most of the items in the category "Other taxes on goods and services" are taxes on consumption, examples being excise duties on alcohol and tobacco. Some others, such as the excise duty on energy products, are collected both from household final consumption and firms' production.
    - I will also include property taxes in this calculation. An increase in disposable income is likely to increase demand for housing and the supply of gifts and inheritances, at least to some extent over some period of time. While this may seem like a contentious assumption, it should be noted that property taxes are a relatively small item and including them in the calculation has a negligible effect on the results.

Table 5 presents the key parameters of this extrapolation, the relative increase in wages and disposable income, as estimated within the microsimulation model. These are aggregate figures pertaining to an increase in the employment rate by 1 percentage point.

Using predicted wages, the wage sum grows by 1.1 %, but the increase in disposable income is only 0.3 %. The latter figure is smaller than the former because from the point of view of the individual

part of the wage gain from employment is lost on reduced transfers and increased taxes. The figures imply a sort of an aggregate-level participation tax rate of about 73 %.

EMPLOYMENT WAGE USED	INCREASE IN WAGE SUM, %	INCREASE IN SUM OF DISPOSABLE INCOME, %
PREDICTED WAGES	1.10	0.29
AVERAGE REGRESSION WAGE	1.75	0.56
AVERAGE MACRO WAGE	1.44	0.43

Table 5. Increase in wage sum and disposable income from a 1 %-point increase in the employment rate. Source: SISU calculations by the author.

Table 6 reproduces the microsimulation results and presents the results from the extrapolation using the aforementioned assumptions. The results are presented only for the scenario with predicted wages. The results are presented both as aggregate figures (in EUR million) and per unemployment month (EUR). The extrapolation effect increases the fiscal effect by half. Over half of the extrapolated effect is due to employer social security contributions, which are on a relatively solid footing in terms of assumptions. There is, of course, the caveat that these are mostly pension contributions which create a liability to the public sector, which is an issue that is returned to in the next section.

Coincidentally, the fiscal effect per employment month is very close to average monthly wages for this wage scenario.

SUBCOMPONENT	AGGREGATE FIGURES, € MILLIONS	EFFECT PER EMPLOYMENT MONTH, €
MICROSIMULATION		
TRANSFER SPENDING	-473	-1,149
DIRECT TAXES	140	339
TOTAL, MICROSIMULATION	613	1,488
EXTRAPOLATION		
EMPLOYER SSC & CIT	260	632
CONSUMPTION TAXES	91	220
TOTAL, EXTRAPOLATION	351	852
TOTAL	964	2,340

Table 6. Total fiscal effect of employment growth, microsimulation and extrapolation results combined, predicted wages scenario. The upper half of the table presents results obtained directly from microsimulation, while the bottom half presents results obtained by extrapolating these results using the figures in Tables 4 and 5 and the assumptions presented in the text. The first number column gives the aggregate figures from the simulation of a 1 %-point increase in the employment rate, while the second number column presents the same results per employment month. Source: calculations by the author.

Table 7 presents results for the key parameter of interest, the change in the primary balance-to-GDP ratio in face of a 1 %-point increase in the employment rate. Looking at the preferred specification of predicted wages and microsimulation+extrapolation, the ratio is very similar to the implicit ratio in the government programme.

EMPLOYMENT WAGE USED	$\frac{d(primary\ balance/GDP)}{d(employment\ rate)}$	
	Direct results from microsimulation	Microsimulation + extrapolation
PREDICTED WAGES	-0.28	-0.43
AVERAGE REGRESSION WAGE	-0.39	-0.65
AVERAGE MACRO WAGE	-0.34	-0.55

Table 7. Effects of employment growth on the primary balance-GDP-ratio in different wage scenarios. Source: calculations by the author.

Using observable characteristics of the unemployed depresses the fiscal benefit employment growth, but even after taking this into account the government's implicit ratio seems quite realistic. Of course the fiscal benefit would be further depressed if all employment growth were not full-time[6], or if taking into account the unobservable characteristics of the unemployed would further depress their predicted wages. It is beyond the scope of the present study to evaluate the magnitude of these adjustments on the fiscal effect, but I return to possible caveats later in the memo. For now, let's return to the macro level where the back-of-the-envelope calculation took place, but use the more sophisticated approach of the sustainability gap framework.

The sustainability gap model

The sustainability gap model calculates the sustainability gap, which is the permanent and immediate adjustment required for long-run balance in public finances. More specifically, the target is the fulfilment of the long-run budget constraint of the public sector, or, equivalently, a non-explosive path for public debt.

The basis of the sustainability gap framework is a population forecast entered into the SOME model which projects social expenditures. The SOME model combines the population forecast with information on current age-specific prevalence rates concerning the use of social security, and assumptions concerning how ageing effects social security usage in the future.

GDP growth is determined by employment growth and productivity growth. Age-specific employment rates are projected into the future, taking into account the expected rising age of retirement. Productivity growth is entered as an exogenous series. The baseline is a "no-policy change" scenario, where the ratio of taxes and non-age-dependent expenditure to GDP stays constant, and age-depend expenditures evolve according to the SOME model up to a certain year, currently 2070, after which the all expenditures grow at the same rate as GDP.

The simulated paths of age-dependent spending are then imported into the sustainability gap model proper. The base year of the model is set four years after the current year to avoid any required adjustments due to the current business cycle, idea being that after four years any output gap has closed and no cyclical adjustments are needed. This starting point of the model, currently 2023, is obtained from the MoF medium-term forecast. After this the model combines the projected change in age-related spending obtained from the SOME model with expected changes in asset income and debt dynamics to obtain the sustainability gap estimate, currently around 4½ % of GDP.

[6] Partly the fiscal effect of part-time employment flows mechanically from lower earnings, but partly it would need to modelled explicitly in the microsimulation framework to account for adjustment of unemployment benefits (*suojaosa)*, for example. About 15 % of all currently employed individuals work part-time in Finland.

As employment is entered exogenously into the model, simulating an increase in employment is straightforward. The MoF (e.g. 2019) has reported that increasing the employment rate by one percentage point decreases the sustainability gap by 0.4 percent of GDP. This figure, which successfully replicates, is based on a simulation where the participation rate is concomitantly increased by 0.3 percentage points. This means that employment growth is mostly simulated as coming from through a reduction in unemployment, with also some growth coming from outside the labour force as well.

The assumption concerning the change in participation rate is not entirely trivial in the model, as the effect varies between 0.3 in a scenario with equivalent change in the participation rate to 0.5 percentage points in a scenario with no change in the participation rate. However, the difference between the two is probably overstated in the SOME model. While in the model unemployment expenditure is reduced by a decrease in unemployment, no benefit expenditure is reduced by an increase in employment from outside the labour force. It is of course more difficult to say which expenditures would be reduced as a consequence of an outflow from non-employment to employment (possible candidates being home care allowance, pension expenditure, and student benefits, for example), but it seems likely that individuals outside the labour force typically receive government transfers.

In any case, the government ratio roughly corresponds to the ratio implied by the sustainability gap model. The government has neither explicitly stated the ratio itself nor made known where the ratio comes from, but it seems possible that the sustainability gap model has been used to reconcile employment and fiscal targets in the government programme.

Differences between the different approaches

This section compares the different approaches to highlight the relevant mechanisms at play. Let's first focus on why the back-of-the-envelope approach is (overly) optimistic relative to the microsimulation-based calculation in terms of the fiscal impact of employment growth.

By and large, the difference between the two is covered by two assumptions. If, in the microsimulation approach, one were to use average wages (equivalent to the back-of-the-envelope approach's assumption of holding average wages constant) and link consumption tax revenue growth to GDP growth instead of disposable income growth (equivalent to the back-of-the-envelope approach's assumption increasing all tax revenue at rate of GDP growth), the resulting d(PB/GDP)/d(employment rate)-ratio would be very similar to that obtained in the back-of-the-envelope approach.

The more accurate modelling of transfers and direct taxes in the microsimulation model does not, on net, change the conclusion relative to the back-of-the-envelope approach. One the one hand the microsimulation model results in a larger decrease in transfers through the general housing allowance and minimum social assistance. On the other hand the model implies a smaller increase in tax revenue, due to the reduction in taxes paid from transfer income and the progressivity of the income tax schedule.[7] These two differences largely cancel out.

[7] A person with a monthly income of 2,940 euros per month (the wage used in the "average macro wage" scenario) in 2017 had an income tax rate of 27.3 %. The aggregate income tax rate, obtained by dividing total income taxes by total wages, was around 30.5 %. This latter figure is obtained using data from the Statistical Database of the Tax Authority, Table 7.04. The numerator is the sum of items 1.1.1.1, 1.1.2, 1.1.4, 1.1.5, and 1.1.6, and the denominator is item 4.1.

The differences between the microsimulation-based approach and the sustainability gap approach are numerous and significant in magnitude. Against this background it is surprising that the two arrive at a very similar conclusion concerning the fiscal effects of employment growth.

The three major differences between the two approaches are i) assumption of constancy of average wages and the tax/GDP-ratio in the sustainability gap, ii) pension liabilities, and iii) other expenditure.

The sustainability gap framework paints a more fiscally optimistic picture as the increase in the employment rate does not have an effect on real wage growth (unless otherwise specified), and because the tax/GDP-ratio is held constant. In the microsimulation-based employment growth reduces the tax/GDP-ratio because of progressivity in the income tax system and because in the extrapolation consumption tax revenue growth is linked to growth in disposable income and not GDP.

The other two mechanisms has the sustainability gap framework taking a more fiscally pessimistic stance.

First, it models the long-run budget constraint of the public sector, including the pension system. An increase in employment increases pension contributions in the short run but also increases pension expenditure in the long run. Pension contributions make up about half of the revenue effect in the microsimulation-based approach (both the microsimulation results proper and the extrapolation), and about a quarter of the total fiscal effect, so this issue is of significant magnitude. In the sensitivity analyses of the long-run projections Finnish Centre for Pensions (Tikanmäki et al. 2019) permanent changes in employment do not change required contributions rates in the very long run.

Second, in extrapolating the microsimulation results to the macro level, it was assumed that other public expenditures (i.e. those not modelled in the microsimulation model) would remain unchanged. This is in stark contrast to the sustainability gap model, where a significant share of all public expenditures rise as a result of increased employment.

SOME models the evolution of age-related spending as the population age structure changes over time. The sustainability gap model takes the path of age-related spending simulated by the SOME model until 2070. All other spending items are assumed to grow at the same rate as GDP both before and after 2070, and all age-related spending items grow with GDP after 2070. Furthermore, in the SOME model health care spending is linked to GDP per capita, which means that as GDP per capita increases, health care expenditure rises. The simulated increase in employment growth increases the level of GDP (and GDP per capita), and in consequence the level of all non-age-related spending and health care spending.

Conclusion

The government has set itself targets for the employment rate and primary balance in 2023. An implication of these targets is that a one percentage point increase in the employment rate should improve the primary balance-to-GDP ratio by about one half of a percentage point.

Both a microsimulation-extrapolation based approach and the sustainability gap model imply a very similar ratio between employment growth and changes in the primary balance. The government's targets for these variables therefore seem to be consistent.

The microsimulation-extrapolation approach implies some rules of thumb for the fiscal effects of employment growth.

1. The fiscal effect of employment growth is roughly the same as monthly gross wage, when one assumes that employer social security contributions and the corporate income tax rate grow at the same rate as wages and consumption taxes (broadly defined) grow at the same rate as disposable income.
2. About half of the revenue effects of employment growth are due to increases in pension contributions, which are a special case in terms of the government budget constraint.
3. The reduction in transfers dominates the increase in income taxes and employer SSC by a factor of 2-3, depending on the wage assumption. The tax effects are much more sensitive to the wage assumption than the transfer effects.

There are two major caveats to the result concerning the aggregate fiscal effect. The first is that if a large or above-current-average share of employment growth comes via part-time employment, the fiscal benefit will fall short of that estimated in this memo. The second, and perhaps more importantly, the calculations assumed that the public sector bears no burden from the labour costs of the employed. This assumption would be violated if employment growth were to occur through public employment or through subsidized private employment.

Here, it is useful to think in terms of fiscal effects per employment month. Both the gross wage and the fiscal effect was found to be around EUR 2,350 using microsimulation and extrapolation. If one also takes into account employer social security contributions also as a cost of the public employer, the fiscal effect of direct public employment is slightly negative.[8] Of course additional costs would be born from supervision, materials, and other such required expenses.

Turning to subsidized employment, the average wage subsidy per employment month was around EUR 1,000 in 2018[9]. Average wages in subsidized employment are relatively close to average predicted wages in the microsimulation exercise, so these two are comparable in this sense. Wage subsidies therefore reduce the fiscal benefit of additional employment by over 40 %.

In addition to these two caveats, there are certain issues which are relevant for the fiscal effect but which are technically or even conceptually challenging, and which to some extent are also policy choices.

1. What are the wages of the newly-employed? Predicted wages of the unemployed are by and large quite low relative to the wage distribution of currently employed, and also for many quite low relative to lowest wages allowed by most collective agreements.

[8] See also Idman & Kotamäki (2014) for an earlier study of the marginal fiscal effect of employment changes in the public sector. The authors conclude that for the general government as a whole, the fiscal saving from a reduction in public employment is about one quarter of the saving from an employer perspective (labour costs). Although the calculations are not directly comparable, the net saving implied in the current memo is even lower, for two reasons. First, Idman & Kotamäki take into account effects on direct taxes and social security contributions, and extrapolate effects on VAT. The current memo also extrapolates revenue changes for other consumption taxes and the corporate income tax. Second, Idman & Kotamäki regress log consumption on disposable income and find a coefficient of .76, whereas this memo assumed this parameter as unity.

[9] I thank Ville Heinonen from the Ministry of Employment and Economic Affairs for the information used in estimating this.

2. What is response of tax items other than personal income tax and social security contributions? In this memo the corporate income tax was linked to GDP growth and consumption taxes (very broadly defined) to disposable income growth, but there are other valid choices as well.
3. What expenditure items are reduced by growth in employment? In their assessment of fiscal costs of unemployment Alasalmi et al. (2019) use a broad concept, including also public employment services. In their assessment a majority of the expenditure effects are, however, covered by more direct effects on unemployment benefits.
4. Are there mechanisms by which increased employment and disposable income increase public expenditure? The sustainability gap framework clearly implies this to be the case, with for example health spending increasing as individuals' incomes increase.
5. Do pension contributions create a net fiscal benefit? In terms of immediate primary balance, which is the government's target, yes. In terms of long-run sustainability of public finances, which is they key problem, the issue is less clear as pension contributions create a pension liability.

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APPENDIX

This appendix derives the implicit "source" of employment growth (unemployment vs. non-employment) in government's targets

Define the following (all values refer to 2023 forecasts or targets unless otherwise noted):

N: Population

U: Number of unemployed

E: Number of employed

u: Unemployment rate, u = U/(U+E)

e: Employment rate, e = E/N

All variables defined for two population groups (population group denoted by subscript, e.g. N_1):

1: 15-64-year-olds

2: 15-74-year-olds

In the MoF Summer 2019 forecast, which was used when the government programme was drafted, e_1 = 73.3 % and U_2 = 6.5 %. In the most recent Statistics Finland Population forecast N_1 = 3,407,905 and N_1 = 4,094,216. Also in the MoF Summer 2018 forecast $E_2 - E_1$ = 76,000 ≡ E_{d21} for 2019–2021.

Let's assume this also holds for 2023. Let's also assume that U_1=U_2. This is not entirely correct, but quite close, as there are very few unemployed 65-74-year-olds: about 2,000 in 2018 according to the Labor Force Survey. This is also an assumption about policy. As the key employment rate target is defined for 15-64-year-olds, it seems safe to assume that this is the age group in which the government wishes to increase employment.

The government's employment target translates into an increase of (75%-73.3%)*N_1=57,934 in employment. How much is the number of unemployed set to decrease? We can manipulate the definition of the unemployment rate to get

$$u_2 = \frac{U_2}{E_2 + U_2}$$
$$u_2 = \frac{U_1}{E_2 + U_1}$$
$$u_2 = \frac{U_1}{E_1 + E_{d21} + U_1}$$
$$U_1 = \frac{u_2(E_1 + E_{d21})}{1 - u_2}.$$

Plugging in the numbers we get U_1 = 178,941 for the forecast and U_1 = 132,702 for the government target, with a difference of 46,238. Thus 46,238/57,934 or about 80 % of the government's employment growth target is set to come from the pool of the unemployed, with the rest coming into employment from outside the labour force.