Nowcasting Household Income in Sweden

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Producing SILC based flash estimates by using the Swedish micro simulation model FASIT

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1 Introduction

In recent years, there has been an increasing demand for more timely statistics on income and living conditions. The EU-SILC (EU Statistics on Income and Living Conditions) is the main statistical survey used to follow up policy decisions at EU level in this area. However, there is a problem with timeliness (Rastrigina, Leventi, and Sutherland (2015)), especially regarding income based indicators, which in some countries such as Sweden are sourced from administrative registers, with the effect being a time lag between the income reference year and the time of reporting the indicators.

In addition to the ongoing work on improving timeliness in the EU-SILC, Eurostat has started producing so-called flash estimates (Eurostat, (2017)) on income-based indicators. Eurostat is testing several options, involving microsimulations and now-casting, but has encouraged national statistical institutes to present national approaches for providing more timely indicators.[2] Sweden already use a national microsimulation model, FASIT (an abbreviation in Swedish for "Distributional Analysis System for Income and Transfers")[3], which has been developed with the main purpose to predict effects on income distribution and tax revenue due to changes in the Swedish tax-benefit system. However, due to different definitions of income, households, equivalence scales, calibrated weights etc between the Swedish national income distribution statistics and EU income statistics based on SILC (Lindberg and Helgeson (2018)), the income based indicators produced using FASIT simulations differ from SILC estimates. Accordingly, estimates from FASIT cannot be used for nowcasting SILC indicators for Sweden. Through the financial support of Eurostat, Statistics Sweden has had the opportunity to adapt the Swedish

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[1] Paper prepared for the 35th General Conference of the International Association for Research in Income and Wealth (IARIW), Copenhagen, Denmark, August 20-24, 2018.

[2] See eg Stoyanova and Tonkin (2017) for another example of using national microsimulations for creating nowcast indicators. National microsimulation models are also briefly described in Navicke, Rastrigina and Sutherland (2013).

[3] The FASIT model is very briefly described under Methodology. More details are available in the annex and on Statistics Sweden's website: http://www.scb.se/en/finding-statistics/statistics-by-subject-area/household-finances/income-and-income-distribution/distributional-analysis-system-for-income-and-transfers/

microsimulation model to the income definitions used in the SILC and build a microsimulation model using samples from the Swedish SILC.

The structure of the paper is as follows: After a brief presentation of FASIT, we describe how the model was adapted to be able to use data from the Swedish SILC. We then look at the simulated results for the income year 2015 and evaluate these estimates both against Swedish official register based indicators and indicators from the Swedish SILC. We focus on some of the main income based indicators such as at-risk-of-poverty (AROP), the Gini coefficient, the income quintile share ratio (S80/S20) and income deciles. We conclude with an overall evaluation of the model and discuss further evaluations.

2 Methodology

2.1 The FASIT model[4]

FASIT (an abbreviation in Swedish for "Distributional Analysis System for Income and Transfers") is a micro simulation model developed to predict distributional and revenue effects due to changes in the Swedish tax-benefit system. Before new regulations are introduced their effects on both the government's finances and the income distribution need to be evaluated (Statistics Sweden (2018)). For this purpose, Statistics Sweden developed FASIT in the 1990s in cooperation with the Swedish Ministry of Finance.

The advantage of FASIT is that it covers the main parts of the Swedish tax-benefit system for both individuals and households. This is possible due to easy access to a broad range of register information of high quality. Register information is collected from authorities such as the Tax Agency, the Social Insurance Agency and the Pension Agency etc. FASIT simulates the majority of the benefit systems that are connected to individuals and households. The main systems that FASIT simulates for individuals are Sickness and activity compensation, Sickness benefit, Parental allowance, Maintenance support, Unemployment etc. The main areas for households are Housing allowance, Income support, Income support for elderly etc. FASIT also covers all parts of the tax- and tax reduction system as well as other areas such as Fees for childcare and Fees for elderly care. The FASIT systems are interconnected, and as a result, it´s possible to discover effects from a change of a regulation in several systems. As an example, a simulated decrease in the compensation for unemployed will result in an increase in income support and housing allowance etc.

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[4] More information on FASIT is available on Statistics Sweden's website, mostly in Swedish but with elements of English: https://www.scb.se/en/finding-statistics/statistics-by-subject-area/household-finances/income-and-income-distribution/distributional-analysis-system-for-income-and-transfers/

FASIT is a static model, which means that it does not take into account behavioural changes due to changes in the tax- benefit system. There is however, a dynamic model on labour supply connected to FASIT developed at the University of Gothenburg, Sweden. FASIT is based on two samples. MSTAR and STAR both samples are register based. MSTAR is a sample of about 90 000 individuals and the second sample STAR has about 2 000 000 million individuals. FASIT simulates results for the year that the register information is available and the following five years. When working with FASIT the most recent register information is two years old. In order to project the results to the current year and following years, two approaches are used: calibration of sample weights and projection with coefficients. The calibration of weights are made in order to capture structural changes in areas such as unemployment, sickness benefit, family benefits etc. Coefficients are used to project wages, number of hours worked, and changes in various indexes such as the consumer price index.

The main users of the model are government offices and ministries, where FASIT use on a daily basis in order to evaluate changes in the tax-benefit system, but other authorities, labour unions, universities and lobby organisations also use FASIT.

The aim of the project has been to adapt FASIT to the income definitions used in the EU-SILC in order to develop a microsimulation model based on samples from the Swedish SILC. Below is a description of the preparation and the necessary re-weighting of the data.

2.2 Preparation of the SILC data

To be able to use SILC data in FASIT, the data from SILC has to be adapted to the FASIT model. In FASIT, there are three levels of information: information at the individual level, family level and household level. In SILC, there are only two levels of information: data at individual level and data at household level.

In FASIT, data at family level is used for simulating all household transfers, i.e. housing allowance, housing allowance for the elderly and income support. For this purpose, the household data from SILC must be transformed into family units. This means that every household will now consist of one or more family units. This is a very time-consuming process as it has to be done mostly through manual inspections of the households.

After having created data at the three different levels the dataset now contains information on the household composition, the family composition and the individuals in the household. It is now possible to create the necessary register used in the FASIT model. At individual level, we can select the data from the register, which can be used to simulate with the FASIT model based on the total population. There is one minor problem though: there is a small number of individuals are

included in the SILC sample but not in our register based on the total population. There are two possible explanations for this. The person could have immigrated to Sweden *after* the 1st of January 2014, since the interviews were made during 2014 but the register information is based the population at the end of 2013. Alternatively, the interview might not contain enough information, i.e. the personal number is missing which makes it impossible to match the person with the information in the register.

In the model, there is a number of other registers at individual level, which are created in the same way. There are also registers at family level and at household level. The register at family level is created from the individual register by different types of calculations.

For the register at household level information regarding which household the selected individual in SILC belongs to is collected. Information regarding housing is collected. Information about number of household members is created through calculations based on the individual register.

After having performed these steps the necessary registers have been created, making it possible to run simulations in FASIT based on the SILC data.

2.3 Reweighting

For the projections for the different years, FASIT uses structural and economic projections. The economic projections can be performed without any changes to the model, but for the structural projections it is necessary to calculate new weights. The quality of the new weights depends on the quality of the original weights. During 2017, Statistics Sweden developed and implemented new calibrated weights in the Swedish SILC, which were then used for calculating the weights for the SILC part of the FASIT model.

For the re-weighting the following information was used:

- number of persons by age and gender
- number of days with parental allowance
- number of persons receiving unemployment benefit by gender,
- number of persons receiving development allowance and activity grant by gender
- number of persons employed in the government sector
- number of persons employed in the municipal sector
- number of persons employed in the building industry
- number of persons employed in the industry
- number of person employed in other private sector
- number of persons with sickness compensation
- number of persons with activity compensation
- number of persons with widower's pensions

- number of persons with introduction compensation

2.4 Simulations

After having created the data and calculated the new weights, it is possible to perform the simulations. Using FASIT on the SILC sample, the project created new output data files and performed simulations for 2013 and 2015. We then use the simulations regarding 2013 as a benchmark when analysing the results. This means that the 2013 result is not exactly reflecting the original SILC result. For the calculations of the 2013 data, we used the new calibrated weights created for 2013 by Statistics Sweden to improve the estimates. We then use FASIT to simulate the results for the years 2013 and 2015. The simulations for 2013 should give the same results as when doing the calculations based on the original SILC data.

3 Results

3.1 Overall results

Table 1 shows the results from the simulations for 2013 and 2015, i.e. the simulations based on SILC samples using the FASIT model. These estimates will be used as "flash estimates" or FE in the graphs under 3.2. Looking at the results there are significant (95%) differences between 2013 and 2015 for all estimates except for the GINI coefficient and the S80/S20.

The actual result for SILC 2015 (income year) is for the GINI coefficient 0.276 compared to the simulated result of 0.2752 for 2015. Taking into account the confidence intervals for the estimates there is now a significant difference between the result and the simulated figure. For the AROP the actual result 2015 is 0.162 compared to the simulated result of 0.1642. Taking into account the confidence intervals for the estimates there is now a significant difference between the result and the simulated figure. For S8020 the actual result is 4.3 compared to the simulated result of 4.1819. Taking into account the confidence intervals for the estimates there is now a significant difference between the result and the simulated figure.

Table 1 Estimate and 95-% confidence interval for some parameters using the FASIT model for 2013 simulating 2013 and 2015 with the SILC dataset. Amounts in Swedish kronor (SEK).

Indicator	2013			2015			Diff		
Decile 1	119653	±	4435	123492	±	4019	3839	±	2361
Decile 2	149754	±	3737	155102	±	3417	5348	±	2213
Decile 3	180390	±	3419	186765	±	3309	6375	±	1988

Decile 4	206654	±	3804	213711	±	3726	7057	±	2212
Decile 5	231660	±	3607	241051	±	3416	9391	±	2100
Decile 6	258895	±	3733	268630	±	3607	9735	±	2156
Decile 7	291268	±	4383	301899	±	4076	10631	±	2262
Decile 8	330339	±	4502	343940	±	4743	13601	±	2265
Decile 9	395497	±	7218	409675	±	7267	14178	±	2990
AROP	0,1584	±	0,0119	0,1642	±	0,0114	0,0058	±	0,0041
S8020	4,1274	±	0,219	4,1819	±	0,2167	0,0546	±	0,0594
GINI	0,273	±	0,0116	0,2752	±	0,0114	0,0022	±	0,0025

The official Swedish income statistics is based on data from administrative registers, through calculations performed for the total Swedish population. The income concept used in those compilations are slightly different from the income concept in SILC, the main difference being that the Swedish income concept includes capital gains. In order to have comparable data we used the FASIT STAR register (see appendix for technical details) to calculate the same income concept as the one used in SILC. The results from the simulation for 2013 and 2015 using STAR data are presented in table 2.

Looking at the statistical error there are significant differences between 2013 and 2015 for all indicators. The main difference between using the STAR data and the SILC data is that the statistical error is much smaller using the STAR dataset compared to using the SILC dataset.

Comparing the results between STAR and SILC the results are similar for the deciles and AROP but for S8020 and GINI the results have different signs. Using SILC data these indicators increase, but using STAR data the result is a decline.

Table 2 Estimates and 95% confidence intervals for some parameters using the FASIT model for 2013 simulating 2013 and 2015 with the STAR dataset. Amounts in Swedish kronor (SEK).

Indicator	2013			2015			Diff		
Decile 1	127523	±	297	132472	±	267	4949	±	175
Decile 2	157313	±	293	163926	±	290	6613	±	185
Decile 3	186487	±	309	194342	±	279	7855	±	190
Decile 4	213047	±	298	222345	±	277	9298	±	181
Decile 5	238397	±	302	248943	±	287	10546	±	176
Decile 6	264598	±	328	276474	±	311	11876	±	180

Decile 7	294930	±	359	308219	±	359	13289	±	186
Decile 8	334318	±	451	349052	±	440	14734	±	209
Decile 9	398534	±	601	415229	±	669	16695	±	265
AROP	0,1492	±	0,0009	0,1537	±	0,0009	0,0045	±	0,0004
S8020	3,9022	±	0,0119	3,8871	±	0,0112	-0,0151	±	0,0045
GINI	0,2644	±	0,0005	0,263	±	0,0005	-0,0014	±	0,0002

In table 3 the results from simulating 2015 using FASIT 2013 are compared to data based on simulating 2015 using FASIT 2015. We can look at the result for 2015 using FASIT 2015 as the true result. Using FASIT 2013 to simulate for 2015 we can see that there are significant differences between the results for all indicators except decile 2 and decile 3. We can also notice that using FASIT and the STAR data we underestimate the results for all indicators except for the first two deciles.

Table 3 Estimate and 95-% confidences interval for some parameters using the FASIT model for 2013 simulating 2015 and the result using FASIT2015 to simulate for 2015 with the STAR dataset. Amounts in Swedish kronor (SEK).

Indicator	2015 sim			2015			Diff		
Decile 1	132472	±	267	132065	±	275	-407	±	383
Decile 2	163926	±	290	163551	±	299	-375	±	417
Decile 3	194342	±	279	194751	±	320	409	±	425
Decile 4	222345	±	277	223541	±	312	1196	±	417
Decile 5	248943	±	287	251034	±	314	2091	±	425
Decile 6	276474	±	311	279230	±	326	2756	±	451
Decile 7	308219	±	359	311637	±	383	3418	±	525
Decile 8	349052	±	440	353150	±	469	4098	±	643
Decile 9	415229	±	669	420489	±	657	5260	±	937
AROP	0,1537	±	0,0009	0,1586	±	0,0009	0,0049	±	0,0013
S8020	3,8871	±	0,0112	4,0384	±	0,0129	0,1513	±	0,0171
GINI	0,263	±	0,0005	0,2725	±	0,0005	0,0095	±	0,0007

3.2 Evaluations of indicators

We continue the evaluations of the estimates from the FASIT simulations using the SILC dataset but by doing comparisons with actual SILC estimates and in some cases official register-based national data. As

discussed by Navicke et al (2013) it is preferable to focus on the scale and the direction of movement in the indicators rather than the exact point estimates when evaluating nowcasted data against actual SILC indicators. However, we have also included comparisons of point estimates in order to enable comparisons to other national data sources and ensure the overall quality of the data. We focus on some of the main indicators related to income distribution; the at-risk-of poverty rate (AROP)[5], the Gini coefficient[6], the S80/S20 income quintile share ratio[7] and the evolution of income deciles (D10, D30, Median, D70 and D90)[8]. In order to enable better comparisons between Swedish SILC-based estimates and the register-based official estimates we sometimes include (where available) official estimates excluding capital gains (which are normally included in the Swedish official estimates), and SILC-adjusted register based estimates where we have taken into account some of the major differences between SILC and the national Swedish income statistics[9].

3.2.1. At-risk-of poverty (AROP)

Starting with one of the main income based indicators, the at-risk-of poverty rate (AROP), we compared simulated estimates (FE) with actual SILC estimates and fully register-based official Swedish estimates.

Figure 1 shows the development of AROP starting with the income year 2007, or SILC 2008, and from 2011 with comparable official national results. Considering confidence intervals the simulated estimates, where available, are in line with both actual SILC results and SILC-adjusted register based estimates.

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[5] http://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:At-risk-of-poverty_rate

[6] http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Gini_coefficient

[7] http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Income_quintile_share_ratio

[8] http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Equivalised_disposable_income

[9] See Lindberg and Helgeson (2018) for further details regarding differences between SILC and the official Swedish income statistics.
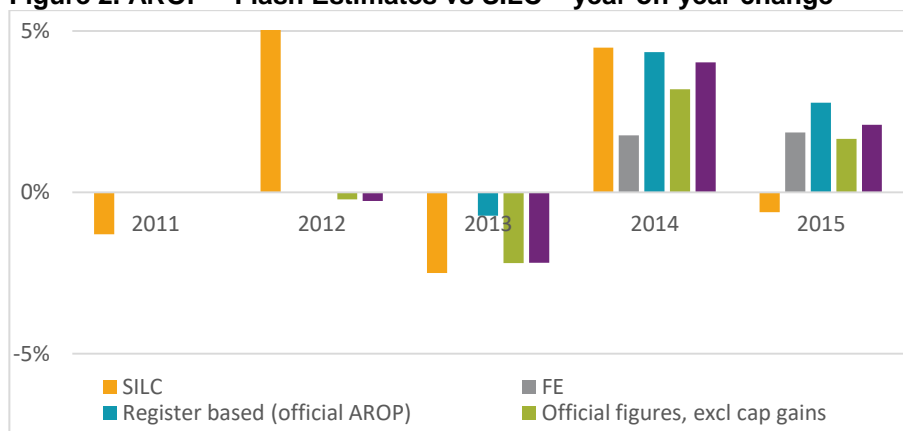
Figure 1. AROP estimates based on national data, the Swedish SILC and simulations.
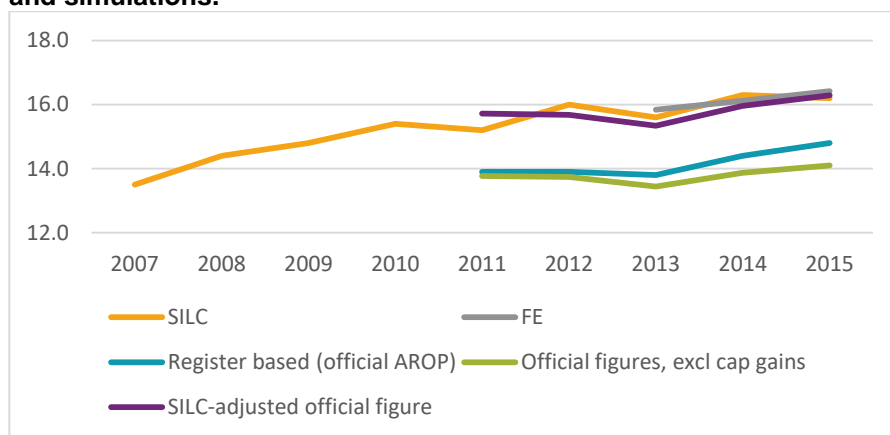
Source: Statistics Sweden.

Figure 2 shows the year-on-year change in percent for the simulated estimates (FE) compared to SILC and register based data. The simulated estimates seem to perform fairly well both to SILC and register based estimates.

**Figure 2. AROP – Flash Estimates vs SILC – year-on-year change**

Source: Statistics Sweden.

3.2.2 The Gini coefficient
Looking at figure 3 it would seem that the Gini coefficient is slightly underestimated compared to both actual SILC estimates and official register based data. However, taking into account the confidence intervals (as shown in figure 4 further down) it's clear that the estimates are close to the actual SILC results.

Figure 3. Gini estimates based on national data, the Swedish SILC and simulations.
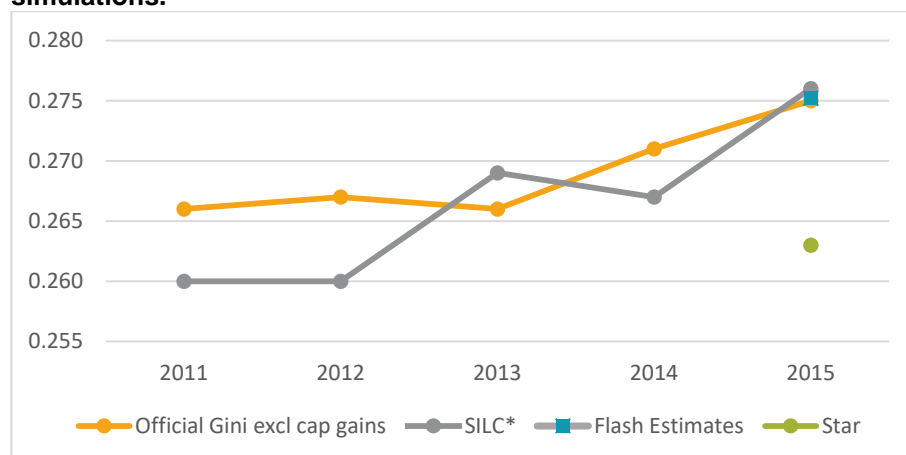
Source: Statistics Sweden.

Figure 4 shows reliable estimates for the SILC income year 2015 when using the modified SILC-based microsimulation model. However, the statistical error is much smaller using the STAR dataset compared to using the SILC dataset, the main reason being that the STAR dataset consists of a much larger sample than the Swedish SILC.
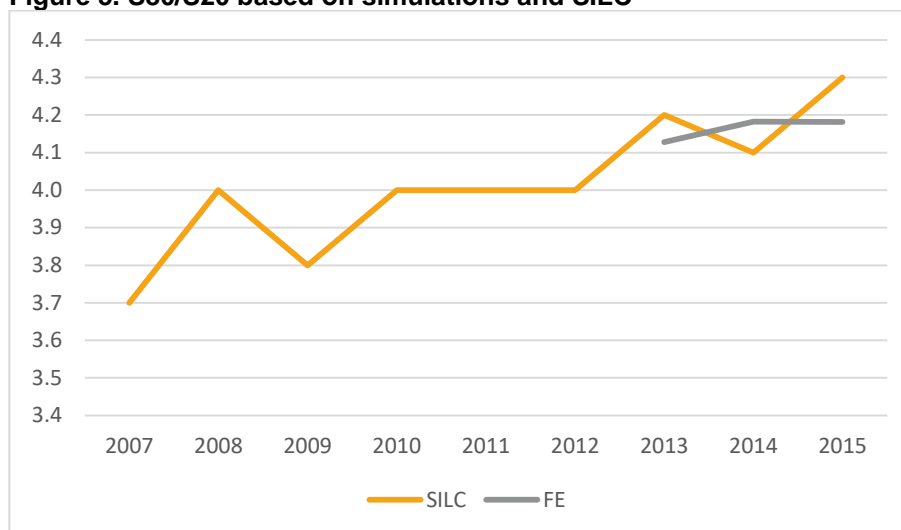
Figure 4. Gini estimates for 2015 based on simulations and SILC 2016
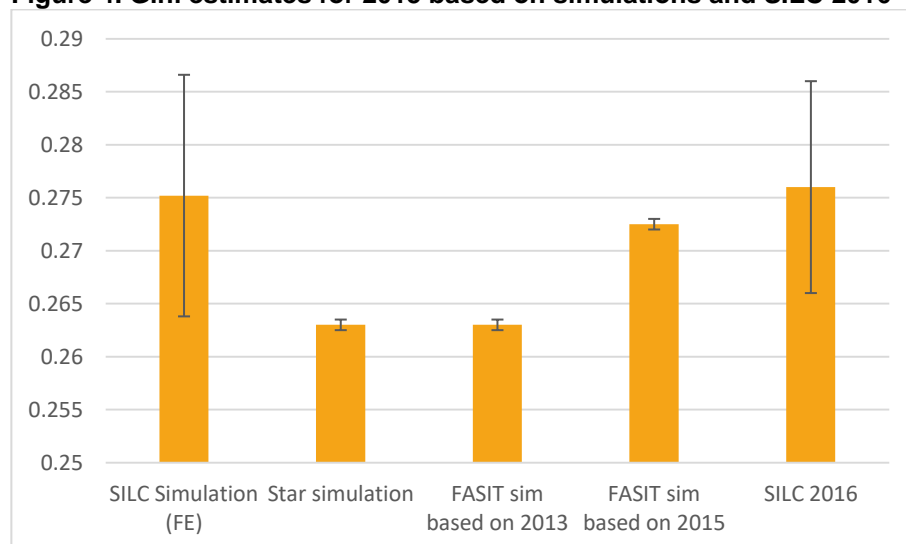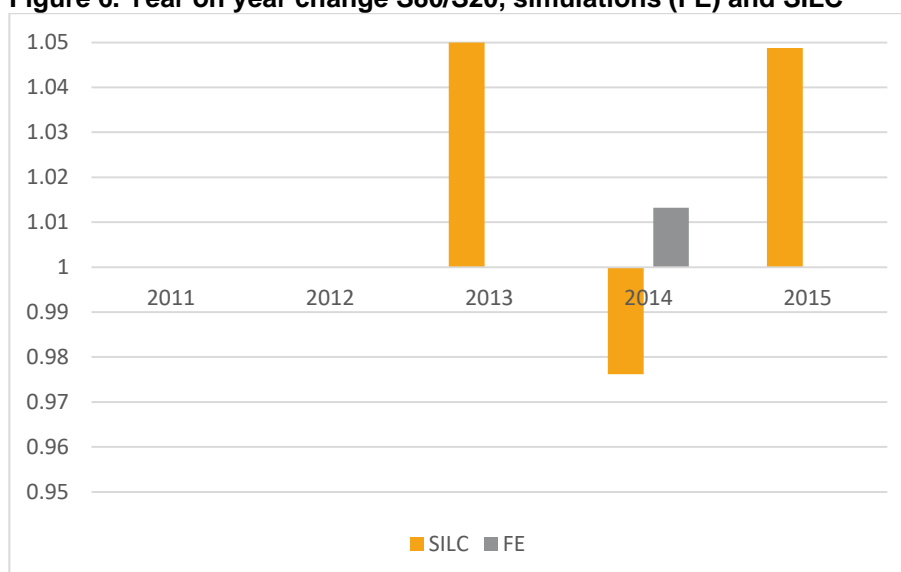

Source: Statistics Sweden.

3.2.3 S80/S20 income quintile share ratio

Looking at the income quintile share ratio (S80/S20) the simulated estimates perform well against actual SILC results (figure 5).

Figure 5. S80/S20 based on simulations and SILC

Source: Statistics Sweden.

When looking at the year on year change for the income quintile share ratio (S80/S20) compared to actual SILC results figure 6 seems to suggest that the simulated estimates are more stable. However, as with the other indicators a proper analysis would need further estimated years.
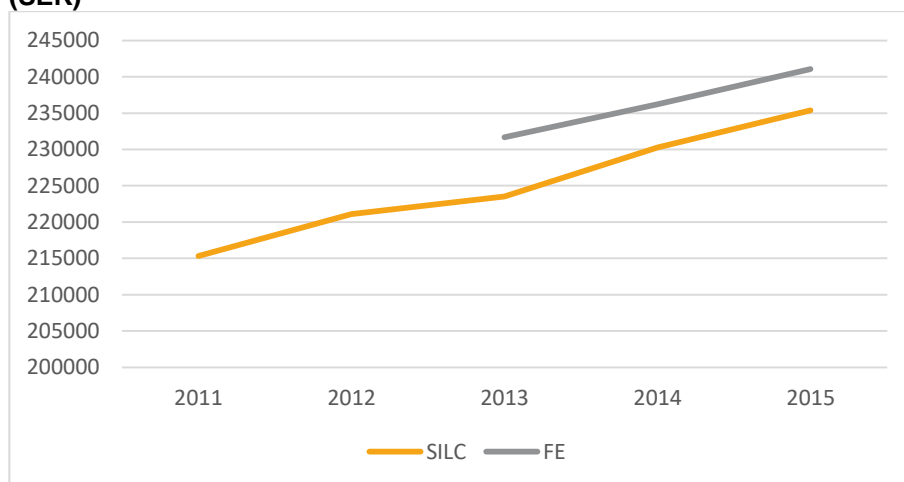
Figure 6. Year on year change S80/S20, simulations (FE) and SILC

Source: Statistics Sweden.

3.2.4 Median income

Looking at the median disposable equivalised income Figure 7 seems to suggest that the simulated estimates (in SEK) are slightly higher than the actual SILC results. However, taking into account confidence intervals (as shown in table 1 above) it is clear that there is no significant difference between the simulated estimates and SILC.
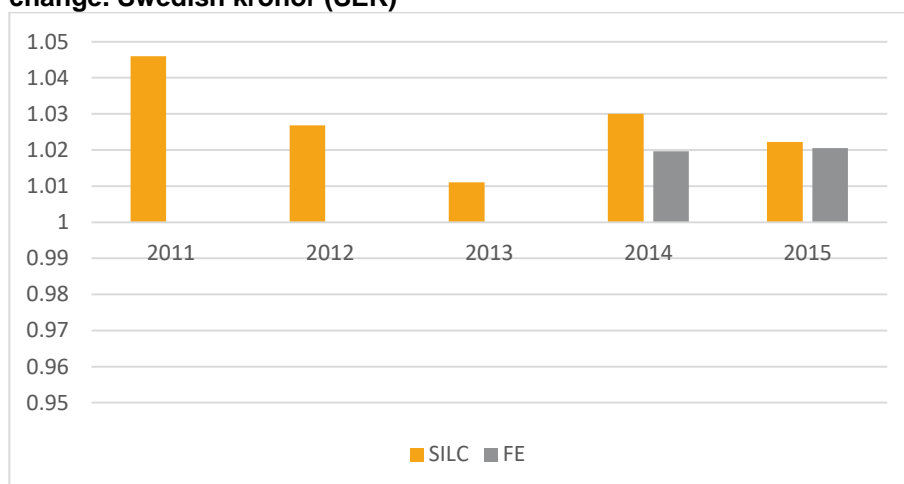
Figure 7. Median income, simulations (FE) and SILC. Swedish kronor (SEK)

Source: Statistics Sweden.

Looking at the year on year change (figure 8) the simulated estimates for income years 2014 and 2015 seem to perform quite well compared to SILC.

**Figure 8. Median income, simulations (FE) and SILC. Year on year change. Swedish kronor (SEK)**

Source: Statistics Sweden.

3.2.5 Income deciles
Looking at D10 the simulated figure (FE) seems to underestimate the yearly change for 2014 compared to 2013. Estimated amounts (in SEK) in line with SILC taking into account confidence intervals in table 1.
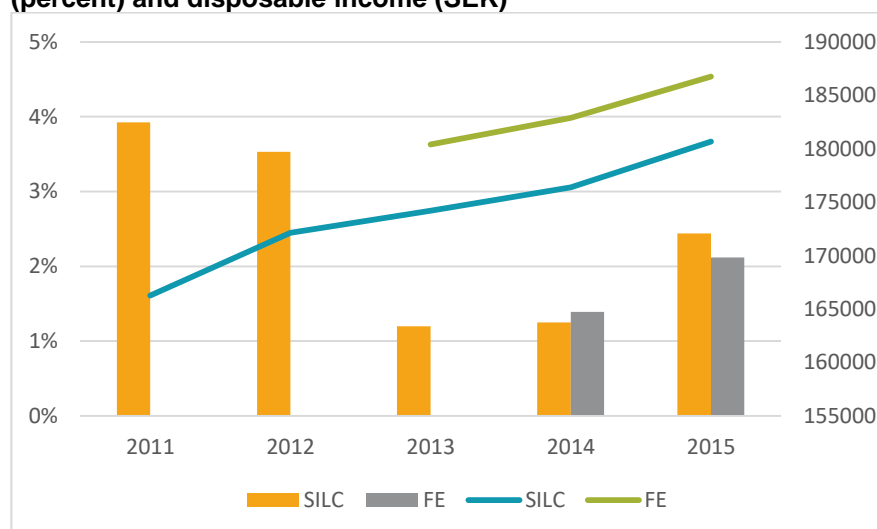
Figure 9. D10, simulations (FE) and SILC. Year on year change (percent) and disposable income (SEK)
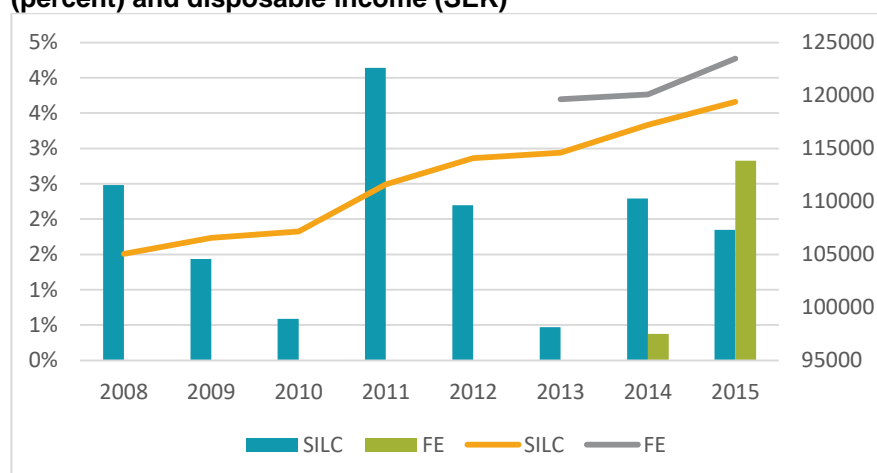
Source: Statistics Sweden.

For D30 the simulated figure (FE) seems to be in line with the year on year change for SILC. Again, the estimated disposable income (in SEK) is in line with SILC taking into account confidence intervals in table 1.

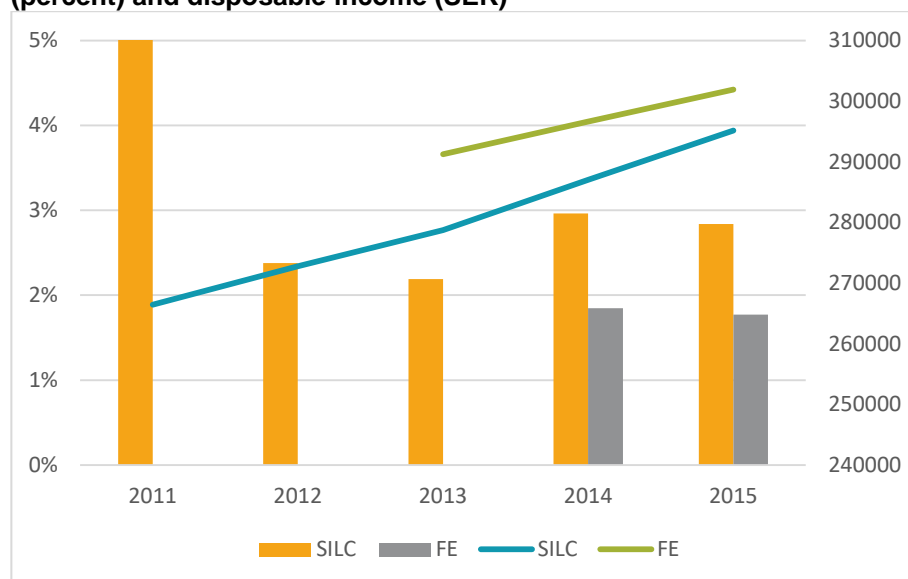**Figure 10. D30, simulations (FE) and SILC. Year on year change (percent) and disposable income (SEK)**

Source: Statistics Sweden.

As figure 11 below shows, for D70 the simulated figure (FE) shows a slightly lower increase compared to SILC looking at the year on year change. However, the estimated disposable income (in SEK) is in line with SILC taking into account confidence intervals in table 1.

Figure 11. D70, simulations (FE) and SILC. Year on year change (percent) and disposable income (SEK)

Source: Statistics Sweden.

Finally, looking at D90 (figure 12 below) the simulated figure (FE) shows a slightly lower increase compared to SILC looking at the year on year change. However, the estimated disposable income (in SEK) is in line with SILC taking into account confidence intervals in table 1.
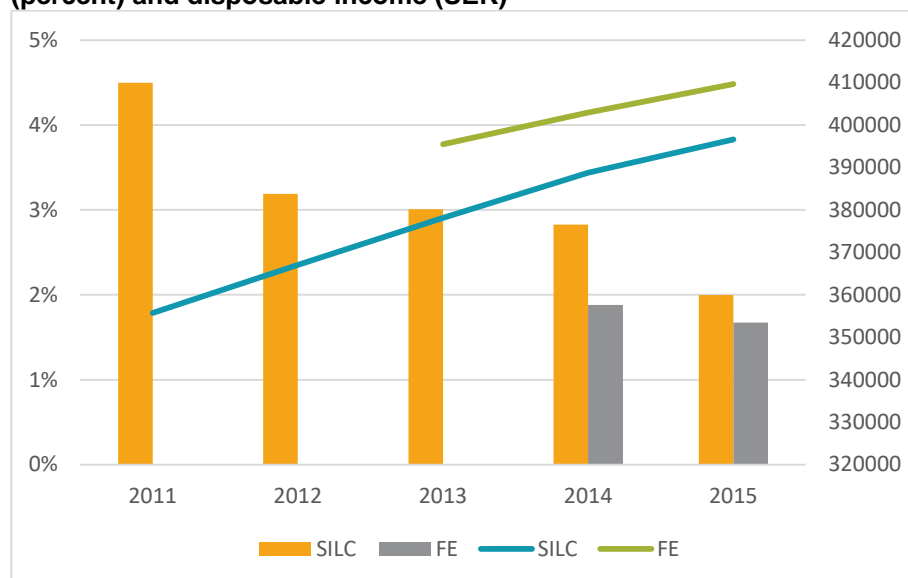
Figure 12. D90, simulations (FE) and SILC. Year on year change (percent) and disposable income (SEK)

Source: Statistics Sweden.

4 Conclusion

The aim of this paper has been to describe the project of adapting the Swedish microsimulation model FASIT in order to enable microsimulations based on samples from SILC.

Based on the SILC-adapted datasets, the project used FASIT to simulate datasets and indicators for the income years 2013 and 2015. The estimates were evaluated both against available register based data and data from the Swedish SILC but also against micro-simulated indicators using FASIT and the STAR dataset as described above.

Overall, the results from the project are promising. Taking into account the confidence intervals in in both SILC and the SILC-based simulations the simulated estimates are in line with actual SILC results, both when looking at year-on-year change and yearly estimates (amounts and shares).

The choice of model depends on the purpose of the estimates. Both the standard FASIT model and the STAR dataset produce estimates of higher precision than the SILC-based simulations. Another advantage of using the standard FASIT model and the STAR dataset for measures such as Gini, S80/S20, and the aggregated AROP are that the large dataset will result in smaller statistical errors, and that other national users can produce the same results when using the model. However, in order to produce estimates that are comparable to actual SILC results it is necessary to use simulations based on SILC datasets, i.e. either EUROMOD or a national SILC-based simulation model. One advantage of using nationally produced flash estimates compared to using EUROMOD is that there are more details regarding income components available at a national level, especially regarding social benefits, which theoretically would imply estimates of better quality. The main drawback of using any SILC-based model, whether EUROMOD or the SILC-adjusted Swedish FASIT, is the relatively low sample size in SILC which will inevitably lead to larger confidence intervals and consequently lower precision in the estimates.

The conclusion is that for creating flash estimates comparable to actual SILC estimates, the SILC-based FASIT simulations is currently a good solution. However, in order to ensure flash estimates of continuous high quality further assessment of the SILC-adapted Swedish model is needed. Additional studies need to be performed on age, sex and other groups. We would also need to include more years in the assessment in order to be able to analyse year-on-year change for a longer period. Finally, as the quality of the estimates from EUROMOD increase, it would be interesting to analyse Swedish flash estimates based on the national model with EUROMOD estimates.

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Appendix – The FASIT model

Data

FASIT is based on two different samples of individuals from the Swedish population. The two samples called MSTAR and STAR are both register based. The MSTAR register consists of about 90 000 individuals and the STAR register consists of about 2 000 000 individuals.

The MSTAR and STAR sample is an SRS drawn from the income and taxation register supplemented with individuals with large income from employment and business or large capital income. Aided by register information, a household is created around the sampled individual and all individuals in the household are included in the sample. The strength of STAR is the size of the sample, the large sample size makes it possible to analyse small groups with certain characteristics or analyse effects on a regional level.

Sources of information:

Information is collected from several sources within both Statistics Sweden (SCB) and other national authorities. The main source of information is SCB's register of income and taxation, which is based on information from the Tax Agency, the Social Insurance Agency, the Pension Agency as well as other registers within SCB. Other important sources of information for FASIT are listed below.

External sources

The Tax Agency: Tax declarations for sole proprietor.
Swedish Board for Study Support: Remaining student loans, repayment time, level of the financial subsidy, extent of the studies.
The Social Insurance Agency: Sickness benefit, parental allowance, labour market assistance, housing allowance and dental care.
The Swedish Pensions Agency: Retirement pension, survivor's pension and housing allowance.
The Public Employment Service: Unemployment benefit, number of days of unemployment.
The National Board of Health and Welfare: Type and extent of elderly care.

Sources within Statistics Sweden:

- Population projection
- Real estate tax assessments register: Assessed value on real estate, share of ownership, date of acquisition.
- Short-term business statistics on sick pay: Number of days with sick pay.

The result of this extensive collection of information is the FASIT register, which contains approximately 900 variables.

FASIT modules

The FASIT modules, the programs with programmed regulations for calculation of taxes, benefits, measures of income and marginal effects, are written in the computer software, SAS. For each area where FASIT simulates, there is an associated module. The calculations in the modules are controlled by parameters, the parameters describe tax rates, levels of income for certain benefits etc and are contained within a parameter program. With the parameter program, it is easy to simulate changes in the tax- benefit system. By reprogramming the FASIT modules, it is also possible to evaluate larger changes in the system. When new policy decisions are made that affect the tax- benefit system, the modules are updated in order to reflect the changes.

FASIT is divided into three levels. These three levels handle different types of objects. The first step handles all systems that are connected to the individual. The second step handles most systems that are related to the family, the third step contains a summation to the housekeeping unit.

Modules for individuals

In the respective modules, FASIT performs calculations in accordance with the regulation system for the year that the user chooses to work with. FASIT performs calculations in the following areas during the first step.

Parameters

The calculations in the modules are controlled by parameters. The parameters are stored in a separate program, which makes it easy for a user to change the values of the parameters if needed. Parameters that control a certain simulation area are stored together in the parameter program. Since FASIT stores parameters for all simulation years, one can easy follow changes in the system over consecutive years. For the first years the value of the parameters are known, but for the following years, they contain either forecasts or values of the most recent known value.

Projections for individuals

In most cases, the user wants to perform a simulation for a year that differs from the base year. Since wages and other economic variables change over time, they are projected with coefficients in FASIT. When projecting wages, either a known or a projected change in the expected development of the hourly wages is used. For several of the other variables, FASIT uses the consumer price index to project the values of the variables. The coefficients that are used in the projections are updated four times per year. Updates are made in connection to the release of new forecasts from the National Institute of Economic Research.

Pensions

FASIT simulates all compensations associated with pensions that can be created by use of register information, both the different kinds of retirement pensions and survivor's pensions. The pension system is very complex in its design and requires many underlying variables. In addition, FASIT also needs to deal with the fact that there is an

alternation between two different pension schemes that will last for many years. When the compensations are created from registers it is possible to experiment with parameters that control the size of the compensation. A few pension compensations cannot be created from register information. When this is the case, FASIT uses income statements from the base year and uses a projection based on coefficients of the basic amount for the following years. The Swedish pension system contains continuous monitoring to ensure that pension payments will not be larger than the system can bear. Effects of alternative scenarios for this phenomenon is an example of simulations within the pension's area.

Sickness and activity compensation (the former early retirement pension)
For individuals that receive sickness and activity compensation FASIT uses register information on the number of months and to what extent the individual has received the compensation as well as the income that the payment is based on. For example, it is possible to evaluate how the cost for sickness and activity compensation is affected when the compensation ceiling is changed simply by making changes to parameters in the parameter program.

Unemployment
Simulation of unemployment compensation is based on information on each individual's unemployment case. For the individuals in the sample, there is data on the number of unemployment days, days in labor market assistance and the wage that the compensation is based on. This data is structured in a separate dataset that FASIT uses during simulation. When analyzing the compensation from unemployment a user can, for example, evaluate the effect of changing the floor that the compensation is based on.

Sickness benefit
The sickness benefit module simulates compensation associated with sickness and rehabilitation from sickness. FASIT simulates both the compensation that is paid by the social insurance agency as well as sick pay, the payment one receives as an employee from one's employer for the first 14 days of one's sick period. In the simulation, FASIT uses information from each individual's sickness period. For each period, there is information on the length, in days, and the income that the compensation is based on. Sickness compensation decreases with the duration of the sick period, the compensation differs between different day intervals. By experimenting with parameters, a user can for example, evaluate the effect of changing compensation in the different intervals.

Child allowance
For parents with children, a simulation is made for child allowance with the addition of the allowance that parents with several children receive. By interacting with the parameter program, a user can for example analyse the cost of an increase of the child allowance.

Financial aid for studies
In this module, FASIT simulates payments associated with financial aid for studies and repayment of student loans. Simulations are made both for financial aid given to students attending high school and students at university. Financial aid for students attending high school is a subsidy while the financial aid given to students at university is composed of two parts. One part is a loan that the student starts to repay after graduating and the second part is a grant. The calculations are based on information on number of weeks with student loan and weeks with student grant. For simulation of the repayment of student loan, FASIT uses data on the type of the loan and the amount that remains to be paid. The type of loan depends on when the loan was acquired.

Parental allowance
Parental allowance is calculated for parents that has received some sort of family benefit during the base year. In the module FASIT calculates pregnancy benefit, parental benefit, temporal parental benefit in connection with the birth of a child or adoption and temporary benefit for care of children. In the simulation, FASIT utilizes information on the number of compensated days during the base year. When evaluating the costs for family benefits a user can, for example, study the effect of changing the ceiling that the payment of the benefits are based on.

Taxes
With the information on income that has been calculated either through simulation or through projection of known income variables in the previous modules, FASIT calculates taxes according to the current tax regulations. In the module, FASIT calculates state tax, municipal tax, country council tax and tax on capital etc. The tax module also calculates earned income tax credit, real estate fees, employer fees etc. In the last step of the module, FASIT calculates the final tax.

Maintenance support
Maintenance support is paid for children that do not live together with both parents. There are two sets of regulations governing the monthly payments. Either the payments are done with the Social Insurance Agency as a middle hand, or the payments are made without any governmental involvement. The size of the monthly payments is not known if the Social Insurance Agency is not involved. In order to calculate maintenance support FASIT assumes that all payments are made with the Social Insurance Agency as a middle hand. In the FASIT registers, there is information as to whether a child lives together with both parents or not. For the parent with custody, FASIT calculates the amount that is received and for the other parent, FASIT calculates the amount that should be paid.

Public welfare services
The module is based on two data sets, one includes the amount of public consumption for upper secondary school, municipal adult education, university, preschool, after-school, day care etc., and the other contains

the cost for each consumed unit of the service. Fees, for example, elderly care vary between different municipalities. With this in mind, the costs for the public services are on a municipal level in as many areas as possible in order to display the cost of the service on a local level. With this approach, the module gives the possibility to analyze costs of public consumption on a regional level.

Costs for consumed services and individual amounts consumed are connected on municipal level with a SAS program. This program is interconnected with the remaining modules in FASIT. The connection of all modules makes it possible to construct an alternative measure of disposable income that accounts for public welfare services.

Dental care
The dental care module describes the current dental subsidy system and the module makes it possible to simulate costs for dental care and costs for dental care subsidies. Two datasets are used in the simulation. One of the datasets contain information on the type of dental treatment and the cost of the treatments for the individuals in the sample. The second dataset contains information on the size of the subsidy.

Income concepts
In the last individual module, FASIT calculates a number of income concepts.

Modules for households
Household simulations are based on a summation of individual properties to the household level. The structure of the household step is similar to that of the individual step where the modules are controlled by parameters that are kept in the parameter program. The following modules are included in the household step.

Parameters
The household modules use the same parameter program as the individual modules. Parameters for both households and individuals are thus stored in the program.

Housing costs
In the module, FASIT makes a projection for the cost of housing as well as the cost of interest for individuals living in houses and tenant ownership. From the projection, FASIT calculates the total cost of living for the household.

Housing allowance
The module simulates housing allowance for families with children and young adults without children. Housing allowance depends on the income of the household, the size of dwelling, the number of children and housing costs. The module uses this information in order to calculate the size of the households housing allowance. In the parameter program, it is

possible to analyze, for example, the effect of an increase of the allowance that is given for children living at home.

Housing allowance for the elderly

Housing allowance for the elderly is a supplement to the pension in order to compensate for the cost of housing. In the module, FASIT calculates the amount of housing allowance as well as the special housing allowance for elderly. Furthermore, the module simulates income support for elderly. In the parameter program, it is possible, for example, to investigate the effect of an increase of the maximum rent that the housing allowance is based on.

Fees for childcare

Fees for childcare vary between different municipalities and are calculated from the total income of the household. In the calculation of the fees for childcare, FASIT uses the total income of the household and the fee for childcare in the municipality.

Fees for elderly care

Fees for elderly care are charged for services given to the elderly in their home or in a nursing home. The fees vary between different municipalities. In the module, FASIT calculates the fees for elderly with home help services with respect to the fees in the municipality where the individual lives.

Income support

Income support is given to households that are unable to provide for themselves. The amount given is meant to give the household a reasonable standard of living. What is reasonable is given by the national norm that is defined by the National Board of Health and Welfare. The national norm is given in the parameter program. It is thus possible to analyze how changes to the norm affect the cost for income support.

Income concepts

In the last household module, FASIT calculates a number of income concepts.

Projections

Since there is a lag in the information in the FASIT register in relation to the current year, FASIT projects the variables in order to represent the simulation year that chosen by the FASIT user. The information in the current version of FASIT represents 2015. In order to simulate results for 2017 the model needs to project the information for two years.

The projections are based on information from the authorities responsible for producing forecasts within their area. FASIT projections are based on forecasts from the following institutes and authorities:

- National Institute of Economic Research

- The Social Insurance Agency
- The Pension Agency
- The Swedish National Financial Management Authority
- Statistics Sweden
- The Public Employment Service

Projections of information from the base year to the simulation year can be divided into two parts: structural projections of the benefit system together with demography and the labor market; and second, projection of the development of economic variables with coefficients. FASIT projects results five years into the future from the base year.

FASIT is updated four times per year. Updates are made when new forecasts are made available by the authorities/institutes that were listed above. As a FASIT user it is also possible to include your own projections, both on the development of the economy as well as the structure of the benefit system, labor market and demography. These projections will then be used by FASIT during simulations.

Structural projections
Structural projections are based on calibration estimation. Calibration estimation is a method to obtain sample weights so that estimates of certain parameters will be equal to the totals known. If, for example, unemployment has increased between two years, the weights will be calibrated in order to reflect this change.

For each year that FASIT simulates, there is a corresponding dataset containing weights for the individuals in the sample.

The calibration use the following auxiliary information:

- Number of employed by sector
- Employed in the private sector, divided by type of industry
- Number of unemployed
- Number of individuals in labor market assistance
- Number of days with sickness benefit
- Number of individuals with sickness and activity compensation
- Number of self-employed
- Number of days with parental allowance
- demographical changes

Economic projections
In order to reflect economic development, FASIT uses coefficients to project economic variables. These coefficients are, in the same way as information for structural projections, collected from other institutes and authorities. The main source of information is the National Institute and Economical Research but data from The Swedish National Financial Management Authority, The Social Insurance Agency and Statistics Sweden are used.

Examples of economic variables that are projected with coefficients are:

- Development of hourly wages
- Mean number of hours worked during a week
- Basic amount
- Changes in consumer price index
- Income from interest, Expenditure from interest
- Income from capital

For the development of hourly wages and the mean number of hours worked, FASIT uses information on the development in the different sectors. Information on which sector an individual belongs to is available in the FASIT registers. In order to project an individual's income from work, FASIT uses the product of the two coefficients.

For variables where it is difficult to identify a coefficient to use in the projection, FASIT uses the development of the consumer price index or the development of the base amount.

Output
FASIT performs simulations according to the parameters that are set in the parameter program and the characteristics of the individuals in the sample. The output from the simulation is a SAS dataset. This dataset contains descriptive information and simulated values for the individuals in the sample. When evaluating results from FASIT, a user can choose to use one of the SAS macros that are a part of the FASIT structure. The macros are designed to make comparisons between a FASIT simulation containing results where a change of some regulation has been made, with results where the default parameter settings have been used. There are several macros designed to cover a variety of analyses that a user might be interested in, for example, the effect on income distribution for individuals and households as well as aggregated results for the variables that are being simulated. The aggregated results follow the form of the financial statement of a company where simulated results for wages, taxes, benefits and fees are included. Macros designed to describe distributional effects allow the user to choose a variable, results for this variable are then presented by age and gender, if the analysis is made for individuals. When distributional effects for households are calculated, the macros present results by different household compositions. Since FASIT calculates both income and taxes, there is also a macro available that calculate marginal effects for a given year.