

# Economic Commentaries

## Changed consumption during the pandemic affects inflation

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The pandemic has affected what and how households consume. According to our calculations, the inflation rate measured during the pandemic underestimated the rate of increase in the prices paid by an average household. But as the weights in the calculation system for the CPIF are based on the consumption breakdown two years earlier, the changed consumption behaviour this year will instead affect the inflation rate measured in the future.

Prior to the publication of the CPIF for January 2021, Statistics Sweden will as usual update the weights in its calculation system. Normally, the weights would have been based on the breakdown in consumption of various products in 2019, but next year they will instead be based on the consumption breakdown in 2020.<sup>2</sup> The purpose of the change is so the weights in the CPIF will reflect a more up-to-date household consumption pattern, and thereby take into account the changed consumption during the pandemic. Eurostat has also taken up this issue, and provided a guidance stating that weights in the EU-harmonised HICP index in 2021 should also be based on the consumption breakdown in 2020.<sup>3</sup>

The more up-to-date consumption weights mean that the rate of inflation measured will probably be a couple of tenths of a percentage point higher in 2021 than it would have been according to Statistics Sweden's ordinary method. However, it is difficult to say exactly how large this effect will be. The construction of the CPIF index nevertheless ensures that the level of the CPIF is "right" in the long run, and the change can therefore be regarded as parts of the so-called basket effect that should have affected the inflation rate measured in 2022 will instead be visible in the index in 2021.

This Economic Commentary describes how the CPIF is calculated, and how the measured rate of inflation will be affected by changes in weights next year and the following years. We present some calculations that can provide guidance with regard to the direction and size of the effects.

### Major changes in how and what households consume

In the wake of the pandemic, there have been significant changes to how and what households consume. Air travel and package holidays were in principle not consumed at all during certain months in 2020. However, consumption of hotel stays, restaurant visits and various types of entertainment, such as theatre, cinema, sporting events has also declined substantially. Consumption of other

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<sup>2</sup> See Ståhl (2020) and Statistics Sweden (2020b).

<sup>3</sup> See Eurostat (2020).

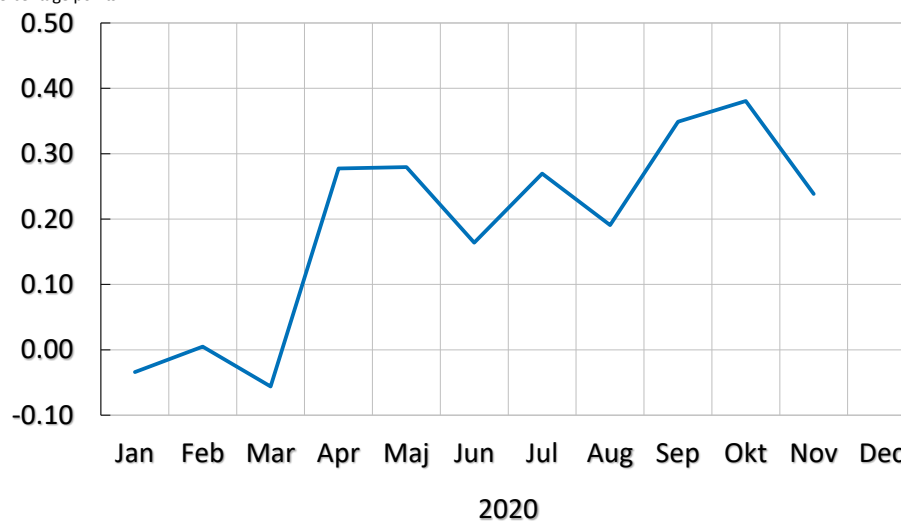
things has increased instead, as people are to a larger extent working from home and also staying home when they are not working. For instance, consumption of food, gambling, products for home renovation and home electronics have all increased during the pandemic.

Here one can see a pattern. The prices of the products consumed less have in many cases increased relatively slowly or fallen, while prices of products consumed more have in many cases increased relatively rapidly. As the weights in the CPIF 2020 are largely based on how consumption was broken down in 2018, the rate of inflation measured may thus underestimate the rate of increase in the prices faced by an average household. If the current weights had been used, the aggregate rate of price increase would have been higher, as the weights can be said to be overestimated for the products with prices that are increasing relatively slowly and underestimated for the products with prices that are increasing relatively quickly.

Figure 1 shows the results of a calculation whereby the annual percentage change in almost 80 sub-groups, which together comprise the CPIF, have been weighed together using weights that reflect consumption during 2020. The difference between this rate of change and the corresponding rate of change calculated with weights based on consumption in 2018 is shown in the figure. During the period from April onwards, the difference has been between 0.2 and 0.4 percentage points.

**Figure 1. Estimated difference between CPIF inflation calculated with weights from 2020 and weights from 2018.**

Percentage points



Note. Detailed data on household consumption from the National Accounts up to the end of the third quarter of 2020 has been used to calculate weights in 2018 and in 2020. After that, the actual weights for 2020 have been adjusted on the basis of the difference calculated between the whole year 2018 and the three first quarters of 2020. The annual rate of change in the CPIF broken down into around 80 sub-groups has then been weighed together with these weights.

Sources: Statistics Sweden, the National Institute of Economic Research and the Riksbank

The result that inflation would probably have been higher if more up-to-date weights were used during the pandemic has also been noted in a number of studies of international data.<sup>4</sup> In other countries the restrictions have often been tighter than in Sweden, but a similar pattern to Sweden can also be found abroad, where consumption of, for instance, transport services had declined substantially, at the same time as the price of these services has fallen.

The CPIF is not revised historically. The shifts in consumption during 2020 will instead affect the inflation rate measured in coming years. To understand how this works, one needs to familiarise oneself with how the CPIF is calculated.

<sup>4</sup> See, for instance, Cavallo (2020), Diewert and Fox (2020) and Reinsdorf (2020).

## Brief information on CPIF index construction

In addition to households' mortgage rate being held constant in the calculation of the CPIF, the CPI and the CPIF are calculated in the same way. The description in this section is based on the index formula for the CPI, but also applies to the CPIF.

The CPI aims to measure how price changes affect households' costs for maintaining the same standard of consumption as before. Calculation of the index therefore needs to take into account changes in both prices and the products consumed by households. Technically, this is managed with an index construction that tries to approximate consumers' adaptation to relative price changes. The CPI is a so-called chain index, and the final links in the chain looked like this in November:<sup>5</sup>

$$CPI_{1980}^{2020,Nov} = \dots I_{2016}^{2017} * I_{2017}^{2018} * I_{2018}^{2020,Nov}$$

The final link shows how prices developed from the whole year 2018 to November 2020. The weights in this link are based on how consumption was broken down in 2018 (a so-called Laspeyres index).<sup>6</sup> The penultimate link shows how prices developed between the whole year 2018 and the whole year 2017. The weights in this link are based on how the consumption index was broken down in 2018 and 2017 (a so-called Walsh index).<sup>7</sup>

When the CPI for January 2021 is calculated, a further link will be added to the formula above that describes price developments between the whole year 2018 and 2019, while the final link will instead describe developments between the whole year 2019 and January 2021 in the following way:

$$CPI_{1980}^{2021,Jan} = \dots I_{2017}^{2018} * I_{2018}^{2019} * I_{2019}^{2021,Jan}$$

It is with this change in the final links that the so-called basket effect arises. Purely mathematically, the new links mean that developments from the whole year 2018 to 2019 will be described by a link with more up-to-date weights than was previously the case (Laspeyres is replaced by Walsh). Up to January 2021, weights based on consumption in 2018 are used in the calculation of price developments in 2019. When the links are changed, the weights for price developments in 2019 will instead be based on the average consumption breakdown in 2018 and 2019. The final link, which is now calculated from the whole year 2019 and onwards, is now calculated using weights based on the consumption breakdown in 2019 instead of 2018. In practice, therefore, a change arises in the index level because weights are changed going back in time a couple of years.

However, the CPI is not revised historically; the entire revision resulting from the new updated weights is added to the outcome for January 2021.<sup>8</sup> Normally, this would contribute to the index falling, as households tend to replace products that have become relatively more expensive with products that have become relatively cheaper. This is what Statistics Sweden calls the basket effect.<sup>9</sup>

One important purpose of this index construction is that the level of CPI should be "right" in the long run.<sup>10</sup> During individual years, the index level can be misleading if there are large shifts in consumption, but this will be compensated for later when the links in the chain are replaced by a new whole year index with more up-to-date weights.

<sup>5</sup> Statistics Sweden has defined 1980 as the base year for the CPI, with an index value of 100.

<sup>6</sup> The main reason why the weights are normally based on consumption two years earlier is that one then has access to more reliable data. Normally, there are not very large shifts in consumption patterns between the years.

<sup>7</sup> A detailed description of the CPI's index construction can be found on page 12 onwards in Statistics Sweden (2020a).

<sup>8</sup> After the CPI for a particular month has been published, there is a formal confirmation of the total index figure. The figure is not reassessed after this, and that applies to all contexts when one refers to the consumer price index in laws, statutes or agreements.

<sup>9</sup> For a technical description of how the basket effect is calculated see the document "Korgeffekten 2020" on Statistics Sweden's website.

<sup>10</sup> There is no absolute right or wrong, but here we use right in the meaning that the price index will be as correct as possible. One often talks about so-called superlative indices, which are based on weights during both comparison periods.

## What changes is Statistics Sweden making next year, and how will the measured rate of inflation be affected in the coming years?

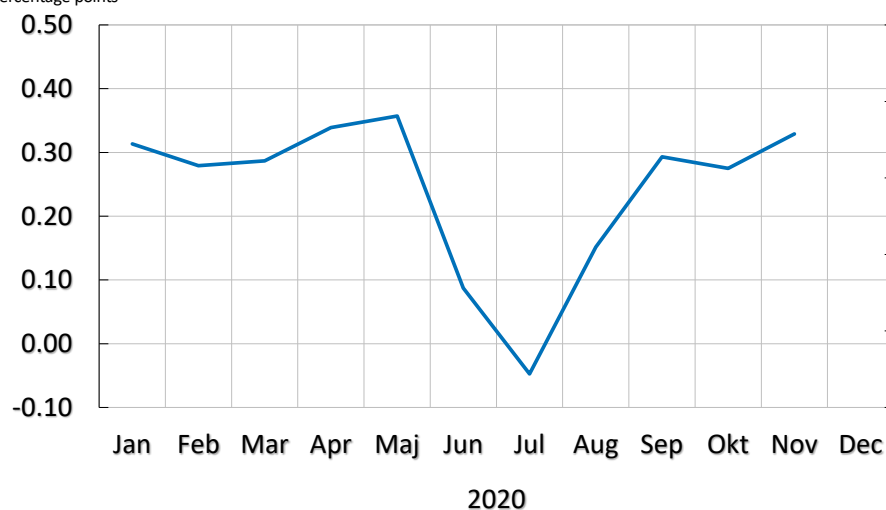
Next year, Statistics Sweden will use a more up-to-date base for calculating the final link than they usually have.<sup>11</sup> The weights will then be based on the breakdown of consumption in 2020 instead of in 2019. This means that some of the adjustment that would be visible in the index in 2022 will instead be visible already in 2021.

Is it possible to say anything about what direction this effect will take and how large it will be? Intuitively, one can expect the effect to be positive. In practice, a reversed substitution effect has arisen, as households have consumed less of products whose prices have increased relatively slowly. One might therefore expect that the final link in the formula for the CPI will be somewhat higher when a more updated weight base is used. This should give a somewhat higher rate of inflation in 2021 than if Statistics Sweden were to do as they usually do.

One obtains a clue as to how much higher inflation can become next year by using data from the National Accounts to calculate approximate consumption weights for 2020, which are then used to calculate the final link in the CPIF's index formula. The result is that the index becomes a few tenths of a percent higher on average in 2020 (see Figure 2).<sup>12</sup> This is because consumption has declined substantially with regard to some products whose prices have at the same time increased relatively slowly. However, the effect varies over the year, as the weight of, for instance, foreign travel declines substantially at the same time as prices for this category have a clear seasonal pattern.<sup>13</sup> These results give an indication that the final link in the CPIF's index formula will be somewhat higher in 2021, too, if the weights are based on more current statistics on consumption breakdown.

**Figure 2. Effect of updated weights on the final link of the CPIF's index formula**

Percentage points



Note. The figure shows the effect on the final link in the CPIF's index formula (index with whole year 2018=100) if the weights are based on consumption in 2020 instead of consumption in 2018. Detailed data on household consumption from the National Accounts up to the end of the third quarter of 2020 has been used to calculate weights in both 2018 and 2020. After that, the actual weights in the final link for 2020 have been adjusted on the basis of the difference calculated between the whole year 2018 and the three first quarters of 2020.

Sources: Statistics Sweden, the National Institute of Economic Research and the Riksbank

<sup>11</sup> The base for calculating the weights will at the same time be more uncertain than usual, as the statistics for the whole year 2020 will not be available.

<sup>12</sup> In Figure 1, the annual percentage changes are instead weighed together with weights based on the actual consumption pattern.

<sup>13</sup> Indices for clothes and shoes are also given a smaller weight and the prices of these products also show a clear seasonal pattern. This means at the same time that the seasonal pattern in the CPIF will be less accentuated in the coming year, when the weights for products with clear seasonal patterns become smaller. However, the annual rate of change in the CPIF can become more volatile when the seasonal pattern changes.

But this calculation is uncertain, for many reasons. For one thing, we do not have access to the same detailed data that Statistics Sweden will use as a base in calculating the final weights and for another thing, the results depend on how prices develop in the coming months. But the results in Figure 2 should nevertheless provide some guidance on the direction and size of the effect.

Table 1 shows the contribution from some of the product groups whose weight adjustments will affect the changed index level in Figure 2 the most. The weights for foreign travel, clothes and energy have declined, at the same time as prices within these groups have increased relatively slowly. Parallel to this, the weight for food has gone up, at the same time as food prices have increased relatively rapidly.

**Table 1. Index, weights and contribution to the difference in index level from various components**

	Average index January to November 2020 (index 2018=100)	Weight in CPIF (per cent)	Contribution (percentage points)	Estimated weight in 2020 (per cent)	Adjusted contribution (percentage points)	Contribution to difference in index level (percentage points)
<b>Foreign travel</b>	95.82	1.8	-0.07	0.5	-0.02	0.05
<b>Clothes and shoes</b>	97.78	4.6	-0.10	3.9	-0.09	0.01
<b>Food</b>	104.91	17.6	0.86	19.0	0.93	0.06
<b>Energy</b>	92.83	7.0	-0.50	6.3	-0.44	0.07
<b>Other</b>	103.26	69.0	2.25	70.3	2.29	0.04
<b>Total</b>	<i>102.44</i>	<i>100</i>	<i>2.44</i>	<i>100</i>	<i>2.68</i>	<i>0.24</i>

Note. Detailed data on household consumption from the National Accounts up to the end of the third quarter of has been used to calculate weights in both 2018 and 2020. After that, the actual weights have been adjusted on the basis of the difference calculated between the whole year 2018 and the three first quarters of 2020.

Sources: Statistics Sweden, the National Institute of Economic Research and the Riksbank

There are also effects that could go in the opposite direction next year. If the pandemic subsides and the price of, for instance, foreign travel begins to increase rapidly, this development could be underestimated in the index, as just as for 2020, the weight would not then reflect the actual consumption. But, as we have discussed earlier, this would be compensated for when the annual index links are updated, so that the level of the CPIF is right in the long run.

Whichever method one uses, inflation in 2022 and 2023 will thus be affected by the unusually large change in consumption breakdown in 2020.

## How is the HICP affected by changed consumption behaviour?

The starting point for the HICP is that the index shall measure “pure” price changes on current transactions.<sup>14</sup> The rate of increase in the HICP should not be affected by consumers changing their behaviour when adapting their consumption to changes in relative prices.<sup>15</sup> The HICP is also a chain index, but the final links in the chain instead look like this:

$$HICP_{2015}^{2020,Nov} = \dots I_{2017,Dec}^{2018,Dec} * I_{2018,Dec}^{2019,Dec} * I_{2019,Dec}^{2020,Nov}$$

The links in the index formula for the HICP are of the Laspeyres type, and do not take into account in the same way as the CPIF that households substitute to products that have become relatively cheaper. The weights in the respective link are to be based on

<sup>14</sup> The HICP is the EU-harmonised price index that comprises the target variable for the ECB’s monetary policy, for instance.

<sup>15</sup> See, for instance, Eurostat (2018).

consumption in the previous year. In reality, however, Statistics Sweden has for practical reasons used the same weights base as in the CPI, so that the weights are instead based on the consumption breakdown two years previously. During 2021, however, they will use the breakdown that applied in 2020 in the final link, in accordance with the guidelines from Eurostat.

There is thus no aim in the HICP to make adjustments for substitution and reflect the level of the actual living costs in the long run. There will be no adjustment afterwards for the fact that inflation this year has probably been underestimated as a result of the weights for certain services being overestimated (as is the case with the CPIF). And as with the CPIF, price developments could be underestimated next year, if the pandemic subsides and prices of products with smaller weights begin to increase rapidly. This will not be adjusted afterwards in the HICP, either.

## Summary and conclusions

The pandemic has entailed major changes to what and how households consume, which has given rise to methodological difficulties in calculating inflation statistics. For the same reason, the statistics may be difficult to interpret in the coming period. It is important to understand what is happening in the statistics, if we are to be able to assess how much of a change in the inflation rate measured is permanent and will therefore continue to affect inflation.

According to the calculations presented in this Economic Commentary, the inflation rate measured during the pandemic underestimated the rate of increase in the prices paid by an average household. Consumption of some products has fallen, at the same time as the prices of these products have increased relatively slowly. But there are also examples of products whose consumption has increased, at the same time as their prices have increased relatively rapidly. For instance, travel has declined substantially, at the same time as prices of travel have fallen, while the opposite applies to foods, for example. And as the weights in the CPIF are based on how consumption was broken down a couple of years ago, these price changes will have a too large or too small significance to correctly reflect the price development faced by an average household this year.

The way in which the CPIF is calculated does ensure, however, that shifts in consumption during the pandemic will sooner or later affect the CPIF. According to Statistics Sweden's normal calculation methods, the CPIF would have been affected by the changes in 2020 mainly during 2022 and 2023. But when Statistics Sweden updates the weights in the CPIF next year, they will use a more up-to-date base for their calculations than they usually do. This will probably mean that the rate of CPIF inflation measured will be a couple of tenths of a percent higher than it would otherwise have been next year.

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