WP/20/224

IMF Working Paper

COVID-19 and the CPI: Is Inflation Underestimated?

by Marshall Reinsdorf

INTERNATIONAL MONETARY FUND

 WP/20/224

IMF Working Paper

Statistics Department

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November 2020

Abstract

COVID-19 changed consumers' spending patterns, making the CPI weights suddenly obsolete. In most regions, adjusting the CPI weights to account for the changes in spending patterns increases the estimate of inflation over the early months of the pandemic. Under-weighting of rising food prices and over-weighting of falling transport prices are the main causes of the underestimation of inflation. Updated CPI weights should be developed as soon as is feasible, but flux in spending patterns during the pandemic complicates the development as quickly as 2021 of weights that represent post-pandemic spending patterns.

JEL Classification Numbers: C-43; E-31

Keywords: COVID-19, inflation measurement, Consumer Price Index, CPI

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[1] I am grateful for helpful comments from Brian Graf , Niall O'Hanlon, Weicheng Lian, Lusine Lusinyan, Jennifer Ribarsky, Edgardo Ruggiero, Michael Stanger, Jim Tebrake, Patrizia Tumbarello and Erwin Diewert.

I. INTRODUCTION

1. Methods for compiling economic statistics such as the consumer price index (CPI) were not designed with the possibility in mind that economic conditions might be transformed overnight. The discontinuous changes in economic conditions caused by the pandemic have therefore created some unprecedented challenges for compiling and interpreting these statistics.

2. The CPI is among the economic statistics most affected by sudden changes caused by the pandemic. Lockdowns, staying at home, and social distancing caused products to disappear and outlets to close. They also caused sharp changes in consumers' spending patterns, and declining income accelerated many of these changes. The challenges for the CPI posed by COVID-19 are both conceptual and practical. On a conceptual level, a commonly used conceptual framework for the CPI is a cost-of-living index (COLI). The product disappearances had an upward effect on the COLI (Diewert and Fox, 2020). Reduced availability of varieties also had upward effects on the component indexes of a COLI (Jaravel and O'Connell, 2020), which were exacerbated by consumers' reduced ability to search for varieties and low prices.

3. This paper considers one of the practical challenges, the sudden obsolescence of the CPI weights caused by the changes in spending patterns. The paper's practical focus fits well with the cost-of-goods index or COGI conceptual framework of the CPI (Committee on National Statistics, 2002), in which the measurement objective is to track the prices that consumers actually pay. The CPI has been found to underestimate inflation in the prices actually being paid in selected advanced economies in the early months of the pandemic.[2] This paper asks whether this is a global problem. It finds that underestimation of inflation during the early months of the pandemic occurs in nearly all regions of the world.

4. The organization of this paper is as follows. Section II discusses the CPI weights and explains why COVID-19 weights are likely to imply more inflation. The estimates of the changes in budget shares during the pandemic are discussed in Section III. Section IV discusses the estimation of the impact on the price index of weights that adjust for those changes. Section V presents the results. Section VI makes recommendations for CPI compilers and users. A concluding section summarizes the main findings and recommendations.

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[2] Cavallo (2020) finds that monthly COVID-19 baskets imply 0.83 percentage points more cumulative inflation from February to May, 2020, than the U.S. CPI, Mitchell et al. (2020) find 0.3 percentage points more cumulative inflation than the Canadian CPI, and Seiler (2020) finds 0.32 percentage points more cumulative inflation than the Swiss CPI. Cavallo (2020) also considers the effect of adjustments other countries' CPI weights based on spending changes in the US, and finds that the adjustments imply higher 12-month inflation in 13 of the 18 countries investigated.

II. WHY COVID-19 WEIGHTS COULD TEND TO IMPLY MORE INFLATION

5. The CPI is constructed as a weighted average of micro-indexes in which the weights reflect the budget shares of a base period. These budget shares are estimated from a consumer expenditure survey, sometimes in combination with national accounts data. Most countries use a Lowe index formula for the CPI. This formula adjusts the weights for price changes that occurred between the base period and the starting month of the rebased CPI that uses these weights, say month *s*. Let w_{ib} be the budget share in the base period *b* of item *i*. Also, let I_s be the Laspeyres index from the base period to month *s*:

$$I_s = \sum_i w_{ib}(p_{is}/p_{ib}). \quad (1)$$

Then the Lowe index weights allow the change in the Laspeyres index from month *s* to month *t*, I_t/I_s, to be expressed as an average of price relatives, $\sum_i w_{is}(p_{it}/p_{is})$. The Lowe index weight for any item *i* is:

$$w_{is} = \frac{w_{ib}(p_{is}/p_{ib})}{I_s}. \quad (2)$$

Similarly, the weight $w_{i,t-1} = w_{ib}(p_{i,t-1}/p_{ib})/I_{t-1}$ adjusts for price change up to month *t*–1. With such weights, the Laspeyres index's change from month *t*–1 can be calculated as an average of price relatives from month *t*–1 to month *t* because $I_t/I_{t-1} = \sum_i w_{i,t-1}(p_{it}/p_{i,t-1})$.

6. Provided that the base period is not too far in the past, spending patterns normally evolve slowly enough to make the price-updated budget shares of the base period a good approximation of the actual budget shares. The differences between the Lowe index weights and current budget shares may, however, have a systematic component that reflects consumer substitution behavior caused by changes in relative prices. Consumer substitution behavior causes a Laspeyres index (which the Lowe index resembles) to be greater than or equal to the Paasche index unless changes in real income significantly alter demand patterns. Thus, under normal conditions, Lowe indexes often have a small upward bias. For example, the chained Törnqvist CPI published by the U.S. Bureau of Labor Statistics (which has continually updated weights) tends to rise about a quarter-percent per year less than the Lowe index used for the headline CPI.

7. The changes in spending patterns when the pandemic began are distinctive both for their size and their sources. Lockdowns, staying at home, and social distancing caused sharp declines in spending on items consumed or used outside the home. Households also curtailed consumption of non-essential items because of falling income, further boosting the importance of food and housing in their budget.

8. Product disappearances caused by lockdowns of suppliers of non-essential products have a clear upward effect on a COLI, but their effect on the difference between a Paasche index weighted by COVID-19 budget shares and an index with a pre-pandemic weights is

hard to predict. The lockdowns of non-essential suppliers, including restaurants, reduce the weight of the affected items in the Paasche index. The effect of these weight reductions depends on the price behavior of the affected items. Reopening after a lockdown could involve costly restrictions, with an upward effect on prices. The prices that are missing during to the lockdown are generally imputed using price changes of a similar product. There is no obvious reason to expect these prices changes to differ in a systematic way from the general rate of inflation. However, the imputations for missing products could bring the effective weights of the CPI closer to the basket purchased during the pandemic.

9. In contrast to the usual effects of consumer substitution behavior, changes in demand due to staying at home and social distancing are likely to have an upward effect on the difference between a Paasche index and an index with pre-pandemic weights. Demand changes due to falling income may add to this effect. Upward sloping supply curves mean that prices of items with expanded demand tend to rise and prices of items with diminished demand tend to fall. For example, falling demand for motor fuel and airline tickets contributed to a decline in the transport price index, and substitution of food at home for restaurants may have contributed to an increase the food price index. (Food for home consumption has different supply chains from food in restaurants.)

10. Changes in demand patterns during the pandemic, such as reduced demand for products consumed or used outside the home, represent a change in the consumers' effective preferences given the state of the external environment.[3] In models of producer behavior in response to demand-side shocks, the Paasche index is greater than or equal to the Laspeyres index (Varian, 1984). Figure 1 illustrates the positive sign of the difference between the Paasche and Laspeyres indexes in these models. The indifference curve shifts from U_0-U_0 to U_1-U_1 because of a shift in consumer preferences for good 1 relative to good 2. Equilibrium prices change from those of budget line P_0-P_0 ($\mathbf{p}_0$) to those of budget line P_1-P_1 ($\mathbf{p}_1$). At the new prices, the old consumption basket $\mathbf{q}_0$ gives suppliers *less* revenue than the new basket $\mathbf{q}_1$, as shown by the position of the budget line of the new prices that passes through the old basket, labeled P_1^*- P_1^*. The Laspeyres index $\mathbf{p}_1 \cdot \mathbf{q}_0 / \mathbf{p}_0 \cdot \mathbf{q}_0$ is therefore less than the overall change in spending $\mathbf{p}_1 \cdot \mathbf{q}_1 / \mathbf{p}_0 \cdot \mathbf{q}_0$. But at the old prices, the old basket yields *more* revenue, causing the Paasche index $\mathbf{p}_1 \cdot \mathbf{q}_1 / \mathbf{p}_0 \cdot \mathbf{q}_1$ to be greater than the change in spending. (Note that the Lowe index can be expected to behave similarly to a Laspeyres index.)

[3] Consumers' underlying tastes may be unchanged, so a COLI based on pre-pandemic is a useful measure of the change in economic welfare from the pandemic.

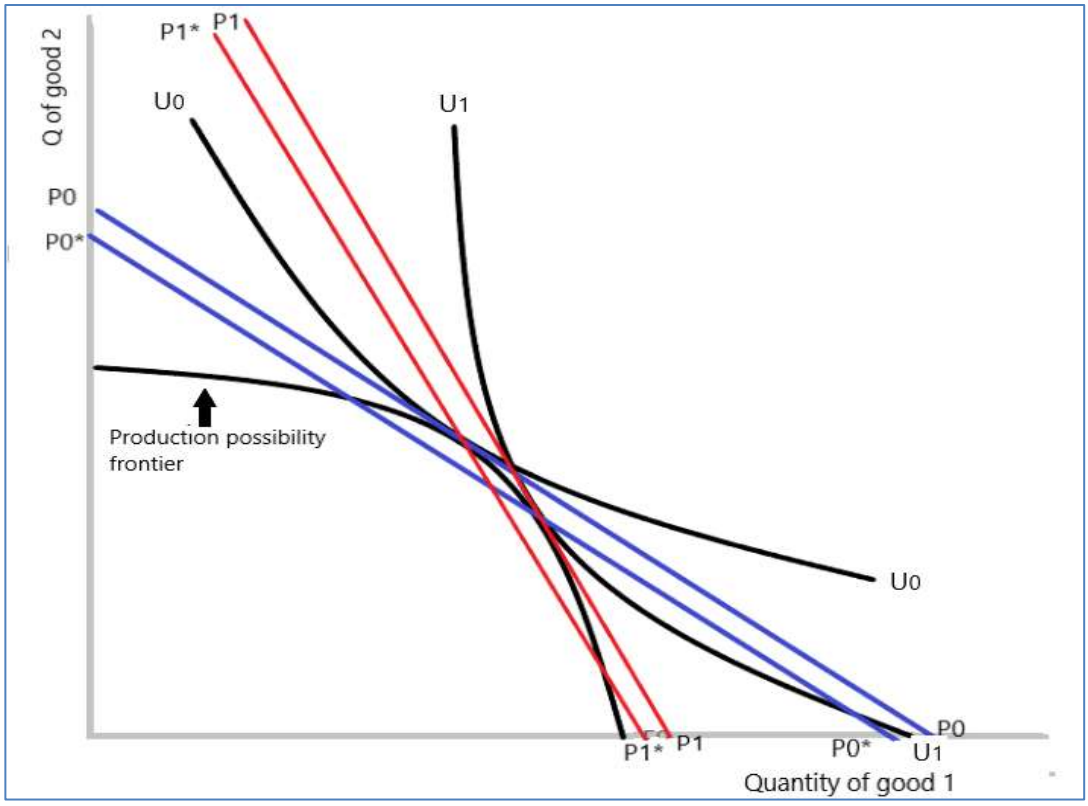

Figure 1: Producer Substitution in Response to a Shift in Consumers' Preferences

11. Note that the gap between the COVID-19 index and the CPI shows the sign of the measurement error of the CPI, but is likely to overstate its magnitude. A COVID-19 basket will provide a good estimate of short-run inflation over intervals that start after the pandemic began. However, this paper's COVID-19 index over an interval that starts before the pandemic is a close approximation to a Paasche index. A Fisher index (which averages Laspeyres and Paasche indexes) provides a good estimate of "true" inflation. Taking a Fisher-like average to be the benchmark measure of true inflation would imply that only half the gap between to the COVID-19 index and the CPI represents measurement error in the CPI. A chained Törnqvist index whose basket is updated every month (with smoothing of spikes in demand due to stockpiling) would be an even better benchmark for true inflation, and can also be expected to lie in between the COVID-19 index and the CPI. Mitchell et al. (2020) find that the growth over three months of chained monthly indexes exceed the growth of the CPI by 0.22 percentage points, which is less than the 0.36 percentage points of extra growth of the COVID-19 basket index for Canada.

III. Empirical Evidence on the Changes in Spending Patterns

12. As expected, credit and debit card data and payments data from the early months of the pandemic show sharp declines in spending on items consumed or used outside the home. The shifts in higher-level spending patterns in the advanced economies for which data are available are all similar.[4] During the pandemic, consumers reduced their spending on transport, restaurants and bars, hotels, recreational, cultural and sporting events, and clothing. They increased their spending on food for home consumption rose, partly reflecting substitution away from food at restaurants and cafeterias. Spending on alcoholic beverages for home consumption also tended to rise. Finally, spending on housing and electricity, water and other utilities (measured by amounts owed rather than amounts actually paid in cases of missed payments) was probably stable.[5] Because overall spending fell sharply, items with stable spending had increased budget shares.

13. CPI weights based on budget shares during the pandemic have been estimated from credit card and payments data for Canada and the United States. Using the difference in spending patterns between February and April in Canada to represent the effects of the pandemic on spending patterns implies large increases in the budget shares of food and shelter, moderate increases in the shares of household operations and alcohol, and declines in the shares of clothing, transportation, and recreation (Table 1, which is based on Mitchell et al., 2020). Removing restaurants from the total for food implies an increase of 7.2 percentage points in weight on food at home (Annex A).

14. Estimates for the United States show similar patterns, except the decline in the weight of clothing is smaller and decline in the weight of transport is larger (Table 2, which is based on Cavallo, 2020). COVID-19 weights have also been developed for the CPI of Switzerland (Seiler, 2020). Like the estimates for Canada, they show a large decline in the clothing weight and a moderate decline in the transport weight. For other products, however, the changes in the weights in the Swiss data show more similarity to the weight changes of the U.S. than to those of Canada.

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[4] See Mitchell et al. (2020) for data on Canada, Andersen et al. (2020) for Denmark, Bounie et al. (2020) for France, Carvalho et al. (2020) for Spain, Seiler (2020) for Switzerland, Chronopoulos et al. (2020), and Hacioglu et al. (2020) for the United Kingdom, and Cavallo (2020) and Dunn et al. (2020) for the United States.

[5] Consolidation of households previously living apart could have had a small downward effect on overall housing costs, but at least for electricity, spending more time at home tended to cause a net increase in expenditures. Hacioglu et al. (2020) report a modest decline in payments for services such as electricity and water but this may reflect inability to pay for amounts consumed. The amount the consumer is *asked* to pay is relevant for CPI purposes.

Table 1. COVID-19 Budget Shares in Canada in March-April, 2020

(Percentages)

	Derived weights, February	COVID-19 Basket in March	COVID-19 Basket in April	April-February Difference
Food (including away from home)	16.54	20.68	20.84	*4.30*
Alcoholic beverages, tobacco and cannabis	2.60	3.15	3.55	*0.95*
Clothing and footwear	5.00	3.30	2.22	*-2.78*
Shelter	27.70	31.23	37.12	*9.42*
Household operations, furnishing, and equip.	12.66	13.04	13.99	*1.33*
Health and personal care	4.85	5.61	4.96	*0.11*
Transportation	19.04	15.01	12.14	*-6.90*
Recreation, education and reading	11.62	7.97	5.18	*-6.44*

Notes: Expenditures on shelter are imputed from general spending.
Source: Statistics Canada, as reported in Mitchell et al. (2020).

Table 2. COVID-19 Budget Shares in the United States, April 2020

	CPI Weight	COVID Basket Weight	COVID-19 Weight difference from CPI Weight
Food at home	7.6	11.3	3.7
Alcoholic Beverages (at home)[a]	1.0	1.5	0.5
Apparel	2.8	2.2	-0.6
Housing[b]	42.1	55.8	13.7
Medical	8.8	5.6	-3.2
Transportation	15.7	6.3	-9.5
Recreation	5.8	2.2	-3.6
Education and Communication	6.8	9.0	2.2
Food away from Home	6.2	3.1	-3.1
Other	3.1	3.0	-0.1

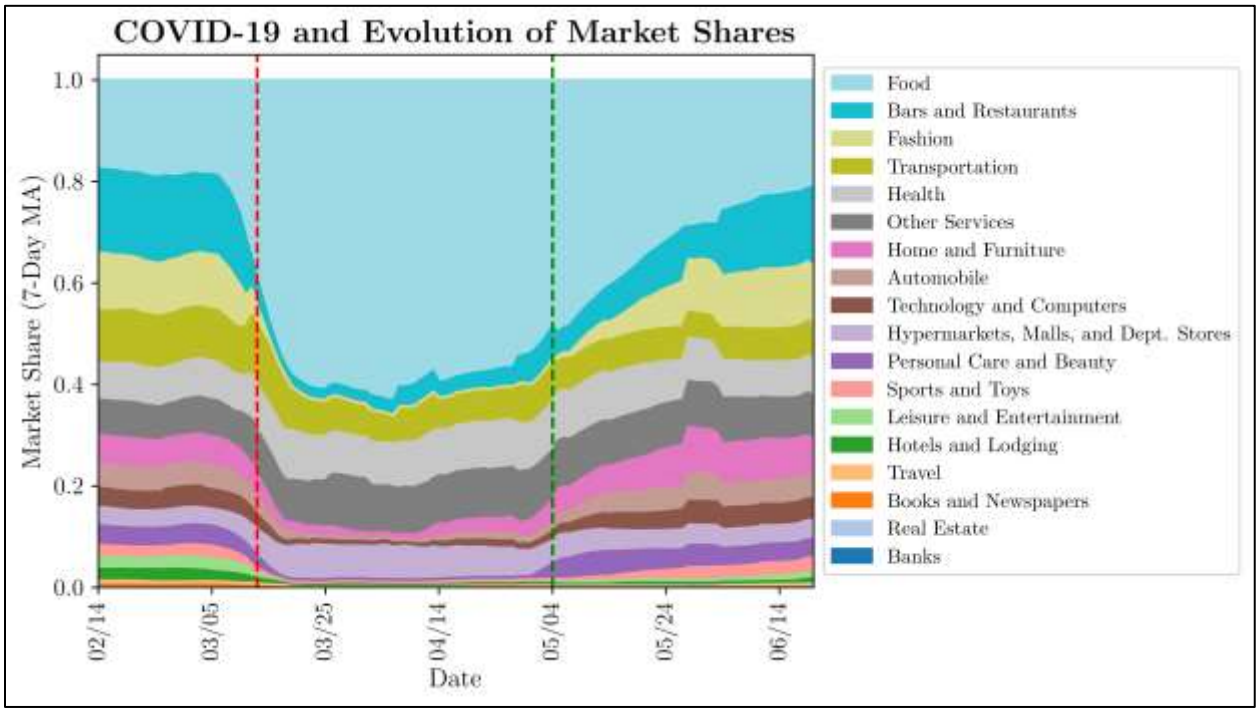
a. Change in alcoholic beverages inferred from change in food as measured by grocery store spending
b. Housing adjustment is based on an assumption of stable expenditures.
Source: Cavallo (2020).

15. Budget shares can be estimated with minimal delays from credit card and payments data, but this speed comes at the cost of less detail and precision than with the data sources normally used to estimate CPI weights. The lack of product detail in credit card and payments data makes the COVID-19 baskets derived from these data imprecise approximations. For example, spending in grocery stores is typically treated as purchases of food even though those stores also sell non-food items. In addition, the mix of detailed products within each higher-level aggregate must be assumed to be constant. This means that the substitution between detailed products caused by the pandemic must be ignored. (Within clothing, for example, after saying at home and working from home began, consumers spent more on pajamas and shirts and less on

pants – Lasiy et al., 2020.) Finally, credit card data may overstate the increases in spending on items frequently purchased with cash, such as food in some economies.[6]

16. Note that some of the sharp changes in spending patterns in the early months of the pandemic moderated when the lockdowns were eased. In Spain, for example, credit card data from Carvalho et al. (2020) show that the types of spending that fell sharply in the first phase of the lockdown later rebounded (Figure 2). Furthermore, in the longer run, expenditure patterns could partially return to their pre-pandemic configuration. Development of CPI weights that reflect post-pandemic spending patterns will be difficult while spending patterns are still in flux.

Figure 2. Credit Card Spending Patterns during Lockdown Phases in Spain



Source: Carvalho et al. 2020.

[6] If breakdowns of household consumption expenditures from the national accounts are available at a monthly (or even quarterly) frequency, they can also be used to analyze the likely effect of changes in spending patterns during the pandemic on the measurement of inflation (Compelo Junior et al., 2020). However, national accounts data allow only approximate adjustments to CPI weights. Some national accounts expenditures include indirect or imputed expenditures. Also, the detailed expenditures in the national accounts data may be compiled by using indicators to infer the change from an initial benchmark or by applying ratios to source data that lacks product detail.

IV. Estimating the Effect on the CPI of Adjusting the Weights for COVID-19

17. The pandemic could potentially have caused measurement error in the CPI by making the upper-levels weights obsolete, by making the lower-level weights obsolete, or by making the price samples used to compile the indexes for individual products unrepresentative due to the surge in buying online. This section will discuss the calibration of the likely effect on the CPI of adjusting the upper-level weights for the changes in purchasing patterns caused by the pandemic. Because no information is available on the effects of the pandemic on the lower-level weights or on the construction of price indexes for individual products, the net impact of these possible problems will be assumed to be zero. However, the changes in lower-level spending patterns caused by the pandemic could add to the impact of the changes in upper-level spending patterns – Campelo Junior et al. (2020) find that adjusting the weights within the food index for the changes in consumption patterns during the pandemic increases this index's growth rate substantially. Also, difficulties in capturing rent concessions to struggling tenants could have prevented the housing index from fully reflecting rent reductions during the pandemic.

18. A price index will understate inflation if the items whose weights are too small have rapid price growth and the items whose weights are too large have below-average price growth. The impact of adjusting the CPI weights to reflect the purchasing patterns of the pandemic depends on the interaction between the weight adjustments and the item-level price indexes. In particular, an item's contribution to the total difference between the COVID-19 index and the CPI equals the product of its weight adjustment and the deviation of its index from the all-items CPI.

19. The IMF CPI database has information on the major components of the CPI, defined at the division (2-digit) level in the COICOP classification system. This database covers most of the world's economies. Data up to May 2020 was available for 83 economies in eight regions (shown in Annex B) at the time of the writing of this paper. On average, the food indexes rise substantially over both a 12-month interval and over a 3-month interval, and indexes for transport decline substantially (Table 3). The behavior of clothing prices depends on the interval over which they are measured. The all-items CPI rises at a rate just over 0.6 percent per year in the three months ending in May 2020, indicating very low inflation.

Table 3. Average Change in CPI Component Indexes

COICOP Division	12-Month % Change to May 2020	3-Month % Change to May 2020
01 Food and non-alcoholic beverages	**4.7**	**1.58**
02 Alcoholic beverages, tobacco, and narcotics	4.9	1.03
03 Clothing and footwear	0.2	2.48
04 Housing, water, electricity, gas and other fuels	1.0	-1.11
05 Furnishings and household equipment and maintenance	1.9	0.64
06 Health	2.5	0.74
07 Transport	**-2.9**	**-3.18**
08 Communication	-0.1	-0.12
09 Recreation and culture	1.0	-0.07
10 Education	1.8	-0.20
11 Restaurants and hotels	2.3	0.39
12 Miscellaneous goods and services	3.3	0.53
All-Items	**1.9**	**0.16**

Source: Author's calculations using data in the IMF CPI Database on the economies listed in Annex B of this paper

20. Some components of the COVID-19 basket of Canada shown in Table 1 straddle two COICOP divisions and hence must be disaggregated to arrive at COICOP division weights. For example, the COICOP division "restaurants and hotels" contains parts of the top row and bottom row of Table 1. The COVID-19 basket of Table 1 and other information Mitchell et al. (2020) are used to derive a basket classified by the 12 COICOP divisions of the CPI database in Annex A. For reference, Annex A also shows the spending changes implied by the changes in budget shares.

21. A breakdown by COICOP divisions of spending during the pandemic has also been estimated from U.S. credit card data (Cavallo, 2020, online appendix). These spending changes generally resemble those estimated for Canada. However, the estimates for the U.S. rely on assumptions to infer the budget share of some items that are estimated from source data in the case of Canada (e.g., alcoholic beverages). Also, Canada may better represent the change in spending on clothing and footwear during lockdowns in the many economies where online shopping is less prevalent than in the United States.[7]

[7] Statistics Canada estimates that e-commerce sales jumped to 11.4 percent of total retail sales in April 2020 (https://www150.statcan.gc.ca/n1/pub/45-28-0001/2020001/article/00064-eng.htm), while the U.S. Census Bureau estimates that e-commerce sales rose to 16.1 percent of total retail sales in the second quarter of 2020 (https://www.census.gov/retail/mrts/www/data/pdf/ec_current.pdf).

22. The COVID-19 basket is relevant for measuring short-run inflation during the pandemic. To analyze the sources of the short-run change in the all-items CPI, this change must be expressed as a weighted average of the short-term changes in the component indexes. As noted above, the weights of a short-run indexes are calculated by adjusting the base period shares for the effects of price changes up to the starting point of the short-run index.

23. To calculate the impact of COVID-19 on a country's spending patterns, the proportional change in spending on any item will be assumed to be the same as in the data available for either Canada or the United States. Changes in spending patterns due to COVID-19 should be generally similar throughout the world, though the effects may be more muted in emerging market and low income countries, where fewer people have jobs that can be done from home (Caselli et al., 2020), and social distancing may be more difficult and lockdowns less common. Necessities such as food at home and housing became more important in consumers' budgets. Items that expose the consumer to health risks or that are complementary to work and recreation outside the home (such as clothing) became less important. An economy's COVID-19 weights are calculated by adjusting its CPI weights using ratios of COVID-19 weights to CPI weights in either Canada or the United States. Let m_i be the ratio for item i in Canada or the United States:

$$m_i = \frac{\textit{COVID-19 basket share of item } i}{\textit{CPI weight for item } i}. \tag{2}$$

Also, let s_{ic} be the price-updated weight of item i in the CPI of economy c in the month furnishing the COVID-19 basket (in practice, May 2020). Multiplying the CPI weight by m_i and normalizing so that the adjusted weights still add up to 1 gives the weight of item i in the COVID-19 basket:

$$\begin{aligned} s^*_{ic} &= m_i\, s_{ic} \,/\, \textstyle\sum_{j=1,\ldots,12} m_j\, s_{jc} \\ &= (m_i \,/\, \bar{m}_c)\, s_{ic} \end{aligned} \tag{3}$$

24. The COVID-19 weights derived from the spending changes in Canada and the U.S. are generally similar. In an average basket for all the economies in the dataset, food and housing have large weights, while recreation and culture, and restaurants and hotels have small weights (Table 4). However, the adjustments to the weights of clothing and footwear and transport differ. Canada's spending changes imply a larger adjustment to the weight on clothing and a smaller adjustment to the weight on transport. This difference between the weights based on Canada and the weights based on the U.S. can have a noticeable effect on the results.

Table 4. COVID-19 Basket Weights implied by Spending Changes in Canada and the US (Global Averages)

COICOP Division	CPI Weight, Price-updated to April 2020	COVID-19 Weight, based on Spending in Canada	COVID-19 Weight, based on Spending in the US
01 Food and non-alcoholic beverages	27.1	38.2	36.7
02 Alcoholic beverages, tobacco, and narcotics	4.0	5.1	5.6
03 Clothing and footwear	5.3	2.1	3.9
04 Housing, water, electricity, gas and other fuels	17.7	21.8	22.6
05 Furnishings and household equipment and maintenance	5.4	5.5	5.0
06 Health	4.1	3.9	2.5
07 Transport	11.9	7.0	4.6
08 Communication	3.5	3.8	4.4
09 Recreation and culture	5.6	1.3	2.1
10 Education	2.7	2.5	3.5
11 Restaurants and hotels	6.3	2.8	3.2
12 Miscellaneous goods and services	6.4	6.0	6.0

Source: Authors' calculations based data from the IMF CPI database, Mitchell et al. (2020), and Cavallo (2020).

25. The difference between an index that reflects COVID-19 purchasing patterns and the CPI will be measured over the three months starting in February. February was just before COVID-19 began to affect spending patterns. Letting t represent May, the change in the CPI of economy c is approximated by $\sum_i s_{ic}(p_{itc}/p_{i,t\text{-}3,c})$ and the change in the COVID-19 index equals $\sum_i s^*_{ic}(p_{itc}/p_{i,t\text{-}3,c})$. The difference between the COVID-19 index and the CPI can be rearranged into a sum of items' contributions to the overall difference:

$$\text{COVID-19 index} - \text{CPI of economy } c = \sum_{i=1,\ldots,12} s^*_{ic}(p_{itc}/p_{i,t\text{-}3,c}) - \sum_{i=1,\ldots,12} s_{ic}(p_{itc}/p_{i,t\text{-}3,c})$$

$$= \sum_{i=1,\ldots,12} (s^*_{ic} - s_{ic})(p_{itc}/p_{i,t\text{-}3,c})$$

$$= \sum_{i=1,\ldots,12} (s^*_{ic} - s_{ic})[(p_{itc}/p_{i,t\text{-}3,c}) - (I_{tc}/I_{t\text{-}3,c})] \qquad (4)$$

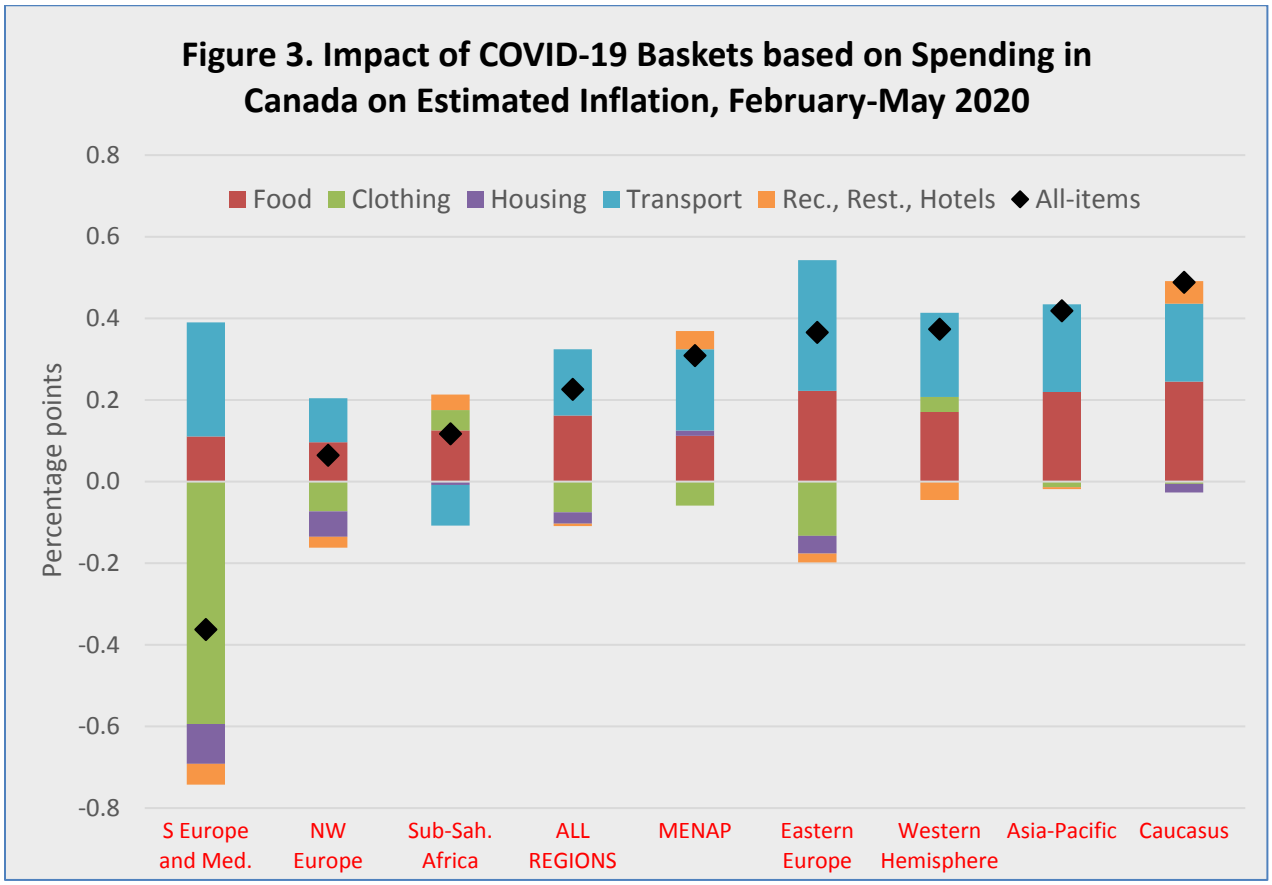
26. An item's contribution to the difference between the COVID-19 basket index and the CPI in economy c equals the product of its weight adjustment $s^*_{ic} - s_{ic}$ and its price change deviation from the all-items CPI. The contribution in a region is calculated as a simple average of the countries included in the region. The effects on the contributions of altering the assumed size of the weight adjustments (for example, because pre-pandemic spending patterns return after the lockdowns are lifted) are straightforward to calculate. This makes the effect of a change in assumptions on the difference between the COVID-19 index and the CPI easy to calculate.

V. RESULTS

27. The COVID-19 indexes based on spending changes in Canada imply that the CPI underestimated inflation over February-May in all but one region (Figure 3). For the world as a whole, the 3-month growth rate of the COVID-19 index exceeds the 3-month growth rate of the CPI by 0.23 percentage points. However, the difference between the indexes varies between regions. It is 0.31 percentage points in the Middle East-North Africa-Pakistan (MENAP) region, around 0.37 percentage points in Eastern Europe and the Western Hemisphere, 0.42 percentage points in the Asia-Pacific region, and 0.49 percentage points in the Caucasus. At the low end are the Southern Europe/Mediterranean region, with an impact of –0.36 percentage points and Northwest Europe, with an impact of 0.06 percentage points. In the results for individual economies (Annex B), the COVID-19 basket index rises more than the CPI in 65 of 83 cases.

28. The main positive contributors to the gap between the COVID-19 index and the CPI are rising food prices and falling transport prices. They each contribute just over 0.16 percentage points to the average gap for the world as a whole. Food prices rise faster than the overall CPI in all regions, and transport prices fall relative to the CPI except in Sub-Saharan Africa.

29. The main negative contributors to the world average gap between the COVID-19 index and the CPI are housing, which contributes –0.028 percentage points, and clothing, which contributes –0.075 percentage points. February is a sale month for clothing in many economies and prices rise after the sales end. The seasonal increases in clothing prices add more to the CPI than to the COVID-19 index. In the Southern Europe/Mediterranean region clothing prices even push the CPI above the COVID-19 index. Delaying the starting point of the comparison from to March would eliminate the negative outlier for the clothing contribution in the Southern Europe/Mediterranean region shown in Figure 3 and raise the overall gap between the COVID-19 index and the CPI in that region from –0.36 to +0.11 percentage points.



Source: Author's calculations.
MENAP: Middle East, North Africa and Pakistan

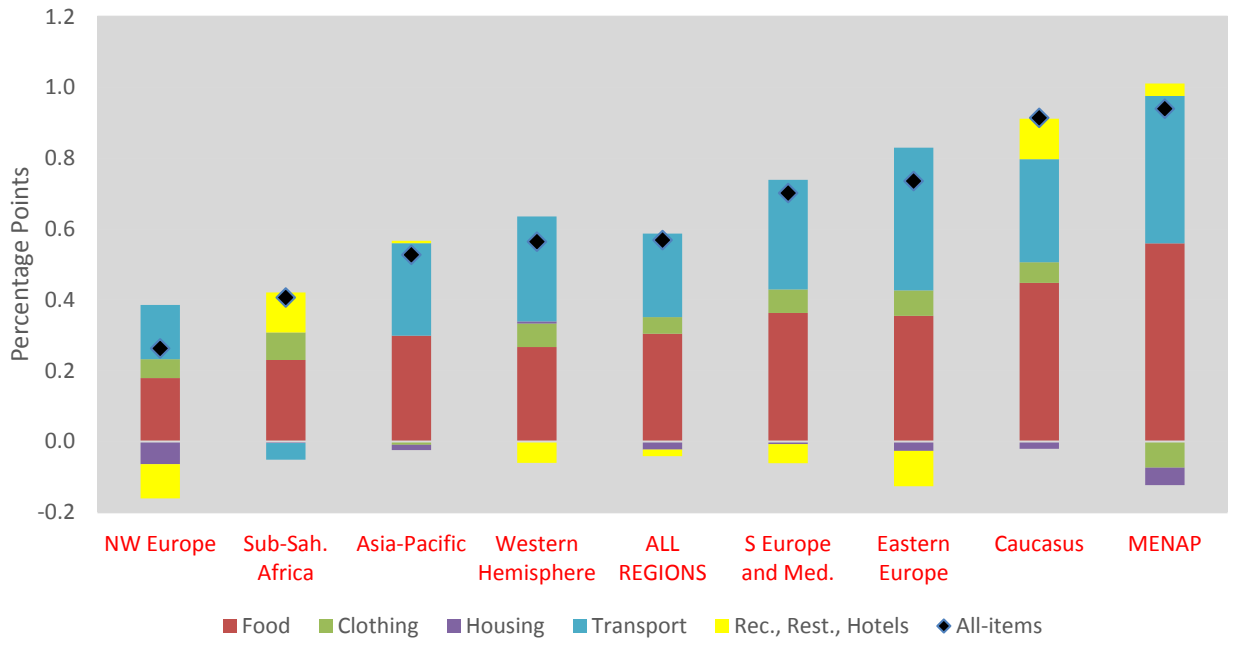
30. The smaller adjustment to the clothing weight and the larger adjustment to the transport weight make the impact of COVID-19 weights greater when they are based on the spending changes of the U.S. On average, the CPI underestimates inflation over the three months ending in May by 0.32 percentage points with weights based on the spending changes in the U.S. (Figure 4). In the Southern Europe and Mediterranean region, the COVID-19 basket index based on U.S. spending patterns *exceeds* the CPI by 0.15 percentage points. In Sub-Saharan Africa the difference between the COVID-19 index and the CPI is, however, near zero. The COVID-19 indexes based on the U.S. spending changes exceed the CPI in 73 of 83 economies (Annex C).

Figure 4. Impact of COVID-19 Basket based on Spending Changes in the US on Estimated Inflation, February-May 2020

Source: Author's calculations.
MENAP: Middle East, North Africa and Pakistan

31. COVID-19 indexes comparing May 2020 to May 2019 also exceed the CPI (Figure 5). This interval is of interest because it avoids problems of seasonality in clothing prices and because prices often have long-run trends. For the world as a whole, the 12-month growth rate of the index with COVID-19 weights based on the spending changes of Canada exceeds the 12-month growth of the CPI weights by almost 0.6 percentage points. Clothing contributes positively to the 12-month difference in growth rates in almost every region. Food prices always contribute positively to the higher estimate of 12-month inflation, with an average contribution to the faster growth of the COVID-19 index of 0.3 percentage points.

Figure 5. Impact of COVID-19 Basket based on Spending Changes in Canada on Estimated Inflation, May 2019 to May 2020



VI. How Should CPI Compilers Respond?

A. Should the CPI Weights be Updated to Reflect Budget Shares during the Pandemic?

32. Changes in spending patterns since the CPI base period are normally only a minor concern as long as the base period is not too old and special procedures are in place for bringing in important new products promptly. However, the discontinuous changes in spending patterns during the pandemic made the differences between the basket bought during the pandemic and the basket tracked by the CPI become larger than normal.

33. If the next scheduled rebasing of the CPI is more than two years away, advancing its date would be appropriate if feasible. A rapid interim adjustment of the CPI weights to reflect the spending patterns of the pandemic is, however, inadvisable. To be rapid enough to be worthwhile, an interim update of the CPI weights would have sacrifice accuracy and completeness. Collecting and processing survey data on consumer expenditures and transforming them into detailed CPI weights is a lengthy process (and detailed household final expenditures from the national accounts also become available with a lag). The interim update of the weights to reflect COVID-19 spending patterns would therefore have to be based on credit card and electronic payments records, perhaps supplemented by information from merchants. Yet, these types of data lack the product detail needed for a precise classification of expenditures into major categories, and for any classification into detailed products. Also, credit card data do not cover some important

items, such as housing, and overstate spending growth for items previously purchased with cash. These weaknesses could be acceptable in a supplementary index, but not in the official CPI.

34. In addition, chaining the CPI to bring in weights that reflect pandemic expenditure patterns could jeopardize the long-run accuracy of the CPI. Sub-annual chaining makes the weights more relevant for measuring inflation over the short run, but at the cost of risking chain drift distortion over the longer run.[8] Chain drift occurs because information contained in items' price histories is lost when the index is chained, and with repeated chaining, the losses of information accumulate. If prices tend to oscillate, perhaps due to seasonality of items like clothing, weight shifts that occur with high frequency chaining could be timed in a way that gives items different weights in the rising and falling parts of the pricing cycle.[9]

35. The pandemic is a particularly inopportune time to introduce sub-annual chaining, as spending patterns are still in flux. Sharp swings in weights exacerbate the risk of chain drift. The changing conditions of the pandemic are likely to lead to large changes in spending patterns, and improved conditions could lead to a return to pre-pandemic expenditure patterns.

B. Supplementary Index showing Changes in the Cost of Living during the Pandemic

36. A supplementary COVID-19 index could provide useful information on the inflation experienced by consumers during the pandemic. A COVID-19 index could also provide insight into inequality, as it would give larger weights to food and housing, which are important determinants of the cost of living of low-income households. An example of a special index tracking the cost of living during the pandemic is the *Essential Products CPI* published by Statistics South Africa, a weekly index that tracked the prices of those products designated as essential during the strict lockdown for the month of April 2020. This index showed relatively high inflation in the first half of April, but ended the month down by 0.5 percent (Statistics South Africa, 2020). Statistics Canada (2020) has also published a COVID-19 index.

37. Development of a rapid set of weights that reflect pandemic expenditure patterns will require special procedures. Credit card and other payments data, supplemented by data on products sold from retailers and other businesses serving consumers, may permit rapid estimation of budget shares of higher-level aggregates during the pandemic. For example, the COVID-19 consumption basket developed by Statistics Canada (Mitchell et al., 2020) is based on this sort of

[8] Chain drift is not the only drawback of chaining at a sub-annual frequency. It can also lead to inconsistency between the component indexes and the all-items CPI.

[9] Procedures to avoid chain drift, including use of a superlative index formula such as the Törnqvist or the Fisher and smoothing the weight changes, cause long publication lags that would be acceptable only in a supplementary index.

data. The supplemental index could also reflect the increased importance of online shopping and other changes in consumers' outlet selection during the pandemic.

38. In the absence of a supplementary COVID-19 index, users of the CPI can gauge the possible effect of adjusting the CPI weights to reflect spending patterns during the pandemic by calculating their own averages of the component indexes with alternative sets of weights. This can be approximated by examining the sensitivity of the inflation estimate to an increase in the weight on food and a decrease in the weight on transport. The weight adjustments in this paper, and perhaps also detailed expenditure data from the national accounts, can help to guide the assumptions for experiments with COVID-19 baskets.

C. Possible Need for Special Procedures for Planned Updates of the CPI Weights

39. The changes in expenditure patterns during the pandemic may imply a need for special procedures if an update of the CPI weights is planned for 2021. A new base year ought to bring the weights closer to current budget shares, and a rebasing of the CPI that does not help with this is not worth undertaking. However, the flux in spending patterns caused by pandemic has complicated this task. The spending patterns of 2020 are likely to be anomalous, and the spending patterns of 2021 could also differ substantially from the patterns of the pre-pandemic years.

40. A delay in rebasing the CPI scheduled for 2021 may be warranted if the year that would normally serve as the next base year fails to represent post-pandemic spending patterns. Such a delay could, for example, allow use of a two-year base period of 2019 and 2020. A two-year base period could work well if post-pandemic expenditure patterns end up in between the pre-COVID expenditure patterns and the expenditure patterns of 2020.

41. At the same time, the pandemic has increased the urgency of avoiding unnecessary delays in rebasing. Pre-pandemic weights reduce the accuracy of the estimates of consumer inflation, so they should be replaced as soon as development of an accurate and complete set of weights for a post-pandemic CPI would be feasible. If the next rebasing would normally be after 2022, advancing its timing should be considered. The five year intervals between updates of the CPI weights allowed by international guidelines can be too long if spending patterns change rapidly.

VII. CONCLUSION

42. The basket purchased during the pandemic differs significantly from the one purchased before the pandemic, on which the CPI weights are based. As a result, the CPI weights understate the importance in consumers' budgets of food and housing and overstate the importance of transport, clothing and footwear, recreation and entertainment, and restaurants and hotels. In the early months of the pandemic, food prices rose faster than the overall CPI almost

everywhere and transport prices fell in most regions,[10] causing the CPI to understate inflation in most regions. On average, adjusting countries' CPI weights for the effects of the pandemic based on available data on spending changes in Canada adds 0.23 percentage points to estimated inflation over the first three months of the pandemic. Assuming, instead, that all economies have similar patterns of spending change to the U.S. adds 0.32 percentage points. These results show the sign of the average measurement error caused by the obsolete weights, but they do not mean that the CPI understated inflation by 0.23 or 0.32 percentage points, as part of the difference may come from the COVID-19 indexes overstating inflation over a period that begins before the pandemic.

43. Users of the CPI should bear in mind that inflation may have been underestimated in the early months of the pandemic. Data users can gauge the likely effect of adjusting the CPI weights to reflect the spending patterns of the pandemic by examining the sensitivity of the all-items CPI to increasing the weight on the component index for food and decreasing the weight on the component index for transport. Effects of increasing the weight on housing and decreasing the weight on clothing should also be considered. Over the first three months of the pandemic, the upward effect of adjusting the weights on food and transport was partially offset by downward effects from adjusting the weights on housing and clothing (though the clothing effect reflects seasonality in clothing prices).

44. Although underestimation of inflation may have been a short-run problem caused by the unusual conditions of the early months of the pandemic, the potential for the differences between current spending patterns and the CPI weights affect the accuracy of the CPI is clear. Weight adjustments based on credit card and payments data would likely be too inaccurate and incomplete to incorporate into the official CPI, but a supplementary COVID-19 index could provide useful information on the prices being paid by consumers during the pandemic. An acceleration of the normal timetable for rebasing the CPI may also be warranted if the normal cycle for rebasing would delay the next updating of the weights past 2022. The five year interval between rebasings of the CPI allowed by international standards is too long when new conditions rapidly shift spending patterns. Nevertheless, at the same time as rapid changes in spending patterns increase the urgency of promptly updating the CPI weights, they may also create obstacles to doing so. In particular, flux in spending patterns may complicate the development of a representative set of new weights until spending patterns stabilize. In the case of COVID-19, a partial return to pre-pandemic spending patterns could eventually occur. The flux in spending patterns during the pandemic may imply a need for special procedures for a CPI rebasing planned for 2021.

[10] Food prices rose faster than the overall CPI in 69 out of 83 countries, while transport prices fell relative to overall CPI in 64 out of 67 economies excluding Sub-Saharan Africa.

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Annex A: Break Out of COICOP Division Shares Changes from the Published Budget Share Changes for Canada of Table 1

Description	Budget share, February	Change in share, Feb. to April	Percent Change in Share	Percent Change in Spending.	*Memo: Change in Spending in US Data*[a]
Food (including away from home)	**16.54**	**4.30**	**26.0**		
Food at home[b]	11.39	7.20	63.2	21.8	*12.3*
Food in restaurants[c]	5.15	-2.90	-56.3		
Alcoholic beverages, tobacco and cannabis	**2.60**	**0.95**	**36.5**		
Alcoholic beverages, tobacco and narcotics at home[b]	2.46	1.029	41.8	5.9	*12.3*
Alcoholic beverages at restaurants and bars[c]	0.14	-0.08	-56.3		
Clothing and footwear	**5.00**	**-2.78**	**-55.6**	**-66.9**	***-41.0***
Shelter (Housing, water, electricity, gas, other fuels)	**27.70**	**9.42**	**34.0**	**0**	***0***
Household operations, furnishing, and equipment	**12.65**	**1.34**	**10.6**		
Communication[b]	3.43	0.74	21.5	-9.4	*0*
Furnishings, household equipment and routine household maintenance [b]	5.69	0.60	10.6	-17.5	*-26.8*
Other household operations[c]	3.53	0.00	0.0		
Health and personal care	**4.85**	**0.11**	**2.3**		
Health[b]	2.82	0.06	1.9	-23.9	*-52.2*
Personal Care[c]	2.03	0.06	2.7		
Transportation (Transport)	**19.04**	**-6.90**	**-36.2**	**-52.4**	***-70.1***
Recreation, education and reading	**11.62**	**-6.44**	**-55.4**		
Hotels, calculated as:	1.49	-0.59	-40.0		
Restaurants and hotels[b]	6.77	-3.57	-52.8	-64.8	*-61.9*
LESS: Food + alcoholic beverages at restaurants	5.29	-2.98	-56.3		
Education[b]	2.34	0.00	0.0	-25.4	*0*
Recreation and culture[b]	7.79	-5.85	-75.0	-81.4	*-71.1*
Miscellaneous goods & services; calculated as sum of:	**5.56**	**0.06**	**1.0**	**-24.6**	***-26.8***
Other household operations	3.53	0.00	0.0		
Personal Care	2.03	0.06	2.7		

a. Percent change in spending estimates for the U.S. are from Cavallo (2020).

b. Price-updated CPI weight from IMF database (rescaled by a factor of 0.97 in cases of Education and Recreation and Culture).

c. Estimated as a residual.

Annex B: Contributions to the Impact of COVID-19 Weights derived from Spending Changes in Canada on the Growth of the CPI over 3 Months Ending May 2020

(Percentage points)

Economy	TOTAL IMPACT	01 Food	03 Clothing	04 Housing	07 Transport	09 Recreation	11 Restaurants & Hotels	All other
Asia-Pacific								
China, P.R.: Hong Kong	**-0.18**	-0.18	-0.05	0.03	0.01	0.01	-0.03	0.02
Japan	**0.08**	0.11	-0.11	-0.01	0.12	-0.09	0.04	0.01
Samoa	**0.20**	0.03	-0.06	-0.02	0.38	-0.01	-0.07	-0.06
Brunei Darussalam	**0.23**	0.15	0.10	-0.02	-0.05	0.00	0.05	0.00
Singapore	**0.29**	0.13	0.02	0.06	0.15	-0.01	-0.08	0.00
Myanmar	**0.35**	0.11	-0.02	0.00	0.38	0.00	-0.09	-0.02
Korea	**0.38**	0.20	-0.03	0.03	0.26	-0.05	-0.07	0.03
Bhutan	**0.71**	0.37	-0.06	-0.02	0.32	0.03	0.03	0.03
Lao People's Dem. Rep.	**0.75**	0.40	0.01	0.00	0.17	0.02	0.14	0.01
Mongolia	**0.88**	0.50	0.01	-0.01	0.37	0.00	-0.02	0.02
Fiji	**0.92**	0.59	0.03	-0.06	0.25	0.08	0.05	-0.02
Caucasus								
Azerbaijan	**0.17**	0.13	0.01	-0.03	0.02	0.01	0.00	0.02
Armenia	**0.38**	0.18	-0.04	-0.01	0.15	0.05	0.01	0.05
Georgia	**0.92**	0.42	0.02	-0.02	0.41	0.02	0.07	0.00
Eastern Europe Region								
Slovenia	**-0.32**	0.44	-0.34	-0.40	0.22	-0.18	-0.09	0.03
Croatia	**-0.22**	0.07	-0.68	-0.04	0.38	0.00	0.01	0.05
Belarus	**-0.12**	-0.07	-0.02	-0.01	-0.04	0.01	0.00	0.00
Albania	**-0.01**	-0.06	0.01	0.01	0.11	-0.02	-0.02	-0.03
Latvia	**0.08**	0.20	-0.43	-0.06	0.42	-0.04	-0.06	0.05
Lithuania	**0.09**	0.19	-0.38	-0.12	0.39	-0.04	-0.06	0.12
Slovak Rep.	**0.26**	0.18	-0.07	0.00	0.20	-0.03	-0.01	-0.01
Estonia	**0.38**	0.27	-0.06	-0.08	0.40	-0.12	-0.08	0.07
Russian Federation	**0.39**	0.25	0.08	-0.03	0.04	0.04	0.02	0.00
Moldova	**0.53**	0.26	0.00	-0.01	0.25	0.01	0.01	0.01
Poland	**0.57**	0.16	-0.09	0.05	0.44	0.06	-0.04	0.00
Czech Rep.	**0.59**	0.17	-0.04	0.00	0.18	0.22	-0.02	0.07
Serbia	**0.63**	0.23	-0.04	0.01	0.41	0.04	-0.02	0.00
Kosovo	**0.69**	0.27	-0.09	0.00	0.55	-0.04	-0.01	0.00
North Macedonia	**0.71**	0.33	0.03	-0.01	0.32	0.01	0.00	0.04
Hungary	**0.72**	0.39	-0.04	0.00	0.45	-0.01	-0.10	0.04
Bosnia and Herzegovina	**0.77**	0.38	-0.07	-0.06	0.66	-0.05	-0.05	-0.04
Bulgaria	**0.83**	0.33	-0.15	-0.02	0.40	0.39	-0.08	-0.03
Middle East, North Africa and Pakistan (MENAP) Region								
United Arab Emirates	**-0.08**	0.05	-0.12	-0.02	0.17	-0.18	0.02	-0.01
Djibouti	**0.08**	0.10	0.00	-0.02	0.01	0.00	0.00	0.00
Pakistan	**0.15**	0.05	-0.19	0.00	0.36	-0.02	-0.01	-0.04
Oman	**0.40**	0.13	-0.02	0.03	0.29	-0.01	-0.02	-0.01
Saudi Arabia	**0.61**	0.38	-0.03	-0.03	0.28	0.00	0.00	-0.01
Qatar	**0.70**	-0.04	0.00	0.11	0.09	0.47	0.02	0.05

Economy	TOTAL IMPACT	01 Food	03 Clothing	04 Housing	07 Transport	09 Recreation	11 Rest. & Hotels	All other
Northwest Europe								
Norway	**-0.47**	-0.05	-0.13	-0.20	-0.03	-0.07	0.01	0.01
Ireland	**-0.22**	0.06	0.03	-0.23	0.08	-0.03	-0.18	0.05
Germany	**-0.17**	0.04	-0.07	-0.05	0.18	-0.28	-0.01	0.02
Netherlands, The	**0.01**	0.08	-0.08	-0.08	0.10	0.03	-0.11	0.06
Austria	**0.09**	0.02	-0.29	0.04	0.10	0.16	0.06	0.00
United Kingdom	**0.09**	0.03	0.04	0.03	0.06	-0.04	-0.06	0.02
Luxembourg	**0.16**	0.20	-0.04	-0.14	0.23	-0.10	-0.05	0.06
Iceland	**0.17**	0.17	-0.08	-0.08	0.08	0.04	0.03	0.00
Denmark	**0.17**	0.07	-0.08	-0.01	0.12	0.20	-0.14	0.01
Sweden	**0.20**	0.17	-0.13	-0.04	0.11	0.05	0.02	0.01
Switzerland	**0.20**	0.15	-0.11	-0.02	0.11	0.01	0.04	0.00
Finland	**0.20**	-0.01	-0.01	0.02	0.11	0.04	0.03	0.02
Belgium	**0.39**	0.32	-0.01	-0.07	0.16	-0.05	0.02	0.02
Southern Europe and Mediterranean								
Greece	**-1.28**	-0.07	-1.27	-0.16	0.28	0.00	-0.06	-0.01
Portugal	**-0.64**	0.02	-0.75	-0.08	0.28	0.15	-0.25	-0.02
Spain	**-0.26**	0.22	-0.62	-0.18	0.35	0.05	-0.10	0.02
Cyprus	**-0.23**	0.11	-0.48	-0.12	0.41	-0.07	-0.09	0.01
Turkey	**0.08**	0.24	-0.34	-0.08	0.20	0.05	0.08	-0.07
Israel	**0.14**	0.14	-0.10	0.04	0.14	-0.06	-0.02	0.00
Sub-Saharan Africa								
Guinea	**-1.28**	-0.11	0.18	-0.05	-1.55	0.14	0.05	0.06
Rwanda	**-1.16**	-0.38	0.02	0.01	-0.80	-0.02	0.02	-0.01
Zambia	**-0.08**	0.03	0.13	0.00	-0.29	0.01	0.00	0.03
Senegal	**-0.07**	-0.01	0.07	0.00	-0.17	0.02	0.01	0.01
Madagascar	**0.03**	-0.01	0.01	0.00	0.01	0.00	0.01	0.02
Mauritius	**0.03**	0.10	0.00	-0.07	-0.02	0.01	0.02	-0.01
Nigeria	**0.11**	0.06	0.02	0.00	0.01	0.00	0.00	0.01
Equatorial Guinea	**0.14**	0.08	0.00	0.00	-0.03	0.01	0.07	0.01
Uganda	**0.15**	0.15	0.02	-0.02	-0.03	0.03	-0.01	0.01
Namibia	**0.26**	0.09	0.00	0.00	0.21	-0.07	0.01	0.01
Botswana	**0.39**	0.00	0.01	0.21	0.15	0.03	0.00	-0.02
Côte d'Ivoire	**0.42**	0.27	0.04	-0.02	0.06	0.02	0.04	0.01
Gambia, The	**0.54**	0.24	0.12	0.00	0.17	0.01	0.01	-0.01
South Africa	**0.56**	0.13	0.01	0.05	0.43	-0.05	0.01	-0.02
Lesotho	**0.68**	0.65	0.04	-0.14	0.08	0.04	0.01	0.02
Burkina Faso	**1.14**	0.71	0.13	-0.09	0.18	0.03	0.12	0.07

Economy	TOTAL IMPACT	01 Food	03 Clothing	04 Housing	07 Transport	09 Recreation	11 Rest. & Hotels	All other
Western Hemisphere								
Paraguay	**-0.05**	-0.10	-0.02	0.02	0.10	-0.03	-0.02	0.00
Dominican Republic	**0.03**	-0.15	-0.02	0.03	0.27	-0.04	-0.09	0.03
Costa Rica	**0.12**	0.02	0.00	0.01	0.12	-0.04	-0.01	0.01
Canada	**0.36**	0.15	0.15	0.00	0.17	-0.11	-0.02	0.02
Colombia	**0.44**	0.31	0.02	0.01	0.10	0.02	0.01	-0.03
Chile	**0.44**	0.16	0.07	0.00	0.13	0.06	0.03	-0.01
Honduras	**0.48**	0.40	0.00	-0.11	0.22	-0.01	-0.01	-0.01
El Salvador	**0.60**	0.31	-0.01	-0.01	0.32	0.01	-0.01	0.00
Mexico	**0.63**	0.39	0.07	-0.08	0.32	-0.03	-0.07	0.03
United States	**0.68**	0.21	0.11	0.14	0.31	-0.08	-0.02	0.02

Annex C: Impact of COVID-19 Weights derived from Spending Changes in the United States on the Growth of the CPI over 3 Months Ending May 2020

(Percentage points)

Economy	TOTAL IMPACT	01 Food	03 Clothing	04 Housing	07 Transport	09 Recreation	11 Rest. & Hotels	All other
Asia-Pacific								
China, P.R.: Hong Kong	**-0.10**	-0.14	-0.02	0.03	0.02	0.01	-0.02	0.03
Brunei Darussalam	**0.09**	0.12	0.03	-0.02	-0.09	0.00	0.04	0.00
Japan	**0.17**	0.09	-0.05	-0.01	0.19	-0.08	0.04	-0.02
Singapore	**0.39**	0.12	0.01	0.07	0.27	0.00	-0.07	0.00
Samoa	**0.44**	0.03	-0.03	-0.05	0.50	-0.01	-0.06	0.06
Myanmar	**0.46**	0.10	-0.01	0.00	0.48	0.00	-0.08	-0.03
Korea	**0.50**	0.16	-0.01	0.03	0.44	-0.04	-0.06	-0.01
Lao People's Dem. Rep.	**0.71**	0.36	0.01	-0.01	0.23	0.01	0.13	-0.03
Bhutan	**0.79**	0.33	-0.03	-0.03	0.44	0.03	0.03	0.03
Fiji	**0.91**	0.53	0.01	-0.08	0.37	0.07	0.04	-0.04
Mongolia	**0.96**	0.38	0.00	-0.01	0.58	0.00	-0.02	0.01
Caucasus								
Azerbaijan	**0.12**	0.12	0.01	-0.07	0.03	0.01	0.00	0.02
Armenia	**0.42**	0.17	-0.02	-0.03	0.19	0.04	0.01	0.06
Georgia	**0.98**	0.38	0.01	-0.03	0.57	0.02	0.06	-0.02
Eastern Europe Region								
Belarus	-0.12	-0.06	-0.01	-0.01	-0.05	0.01	0.00	0.00
Slovenia	0.00	0.39	-0.10	-0.44	0.36	-0.14	-0.08	0.02
Albania	0.05	-0.05	0.00	0.01	0.15	-0.02	-0.02	-0.03
Russian Federation	0.28	0.21	0.04	-0.04	0.05	0.03	0.01	-0.03
Croatia	0.33	0.06	-0.31	-0.05	0.56	0.00	0.01	0.07
Slovak Rep.	0.38	0.15	-0.03	0.00	0.31	-0.03	-0.01	-0.01
Estonia	0.51	0.24	-0.02	-0.09	0.61	-0.10	-0.07	-0.05
Lithuania	0.52	0.17	-0.14	-0.15	0.59	-0.03	-0.05	0.14
Latvia	0.54	0.18	-0.17	-0.07	0.64	-0.03	-0.06	0.06
Moldova	0.58	0.22	0.00	-0.02	0.34	0.01	0.01	0.02
Czech Rep.	0.64	0.14	-0.02	0.01	0.26	0.18	-0.02	0.08
Poland	0.77	0.13	-0.04	0.06	0.64	0.05	-0.04	-0.03
North Macedonia	0.79	0.28	0.01	-0.01	0.44	0.01	0.00	0.06
Serbia	0.81	0.21	-0.02	0.01	0.58	0.03	-0.02	0.02
Kosovo	0.94	0.25	-0.04	0.00	0.76	-0.03	-0.01	0.01
Bulgaria	0.94	0.30	-0.07	-0.02	0.55	0.32	-0.08	-0.06
Hungary	0.95	0.35	-0.02	0.00	0.67	-0.01	-0.09	0.05
Bosnia and Herzegovina	1.02	0.35	-0.03	-0.09	0.91	-0.04	-0.05	-0.03
Middle East, North Africa and Pakistan (MENAP) Region								
Djibouti	0.04	0.08	0.00	-0.04	0.01	0.00	0.00	-0.01
United Arab Emirates	0.09	0.04	-0.05	-0.03	0.26	-0.15	0.01	0.00
Pakistan	0.36	0.04	-0.11	0.00	0.50	-0.01	-0.01	-0.05
Oman	0.54	0.12	-0.01	0.05	0.41	0.00	-0.02	0.00
Saudi Arabia	0.67	0.31	-0.01	-0.03	0.41	0.00	0.00	-0.01
Qatar	0.70	-0.04	0.00	0.12	0.15	0.38	0.02	0.08

Economy	TOTAL IMPACT	01 Food	03 Clothing	04 Housing	07 Transport	09 Recreation	11 Restaurants & Hotels	All other
Northwest Europe								
Norway	**-0.42**	-0.05	-0.04	-0.23	-0.06	-0.05	0.01	-0.01
Ireland	**-0.18**	0.05	0.01	-0.24	0.14	-0.03	-0.16	0.04
Germany	**0.03**	0.03	-0.02	-0.05	0.29	-0.23	-0.01	0.03
Netherlands, The	**0.10**	0.07	-0.03	-0.08	0.16	0.03	-0.10	0.06
United Kingdom	**0.14**	0.03	0.01	0.03	0.11	-0.03	-0.05	0.04
Iceland	**0.18**	0.15	-0.03	-0.09	0.12	0.04	0.03	-0.04
Finland	**0.19**	-0.01	0.00	0.02	0.18	0.03	0.03	-0.06
Denmark	**0.25**	0.06	-0.03	-0.01	0.19	0.16	-0.13	0.00
Sweden	**0.30**	0.15	-0.04	-0.05	0.18	0.04	0.02	0.00
Luxembourg	**0.33**	0.18	-0.01	-0.16	0.38	-0.08	-0.04	0.05
Switzerland	**0.33**	0.15	-0.03	-0.02	0.18	0.01	0.04	0.01
Austria	**0.33**	0.02	-0.08	0.05	0.17	0.12	0.06	-0.01
Belgium	**0.45**	0.29	0.00	-0.08	0.25	-0.04	0.02	0.02
Southern Europe and Mediterranean								
Greece	**-0.34**	-0.06	-0.47	-0.19	0.44	0.00	-0.05	-0.01
Portugal	**0.04**	0.02	-0.22	-0.10	0.45	0.12	-0.22	-0.01
Turkey	**0.27**	0.21	-0.14	-0.10	0.30	0.04	0.07	-0.12
Israel	**0.27**	0.11	-0.04	0.04	0.22	-0.05	-0.02	0.00
Cyprus	**0.29**	0.09	-0.17	-0.14	0.65	-0.06	-0.08	-0.01
Spain	**0.36**	0.19	-0.19	-0.20	0.58	0.04	-0.09	0.02
Sub-Saharan Africa								
Guinea	**-2.01**	-0.11	0.07	-0.09	-2.15	0.11	0.05	0.11
Rwanda	**-1.40**	-0.30	0.01	0.01	-1.10	-0.02	0.02	-0.03
Zambia	**-0.30**	0.03	0.07	-0.02	-0.38	0.01	0.00	-0.02
Senegal	**-0.17**	-0.01	0.04	-0.01	-0.23	0.01	0.01	0.01
Mauritius	**-0.05**	0.08	0.00	-0.08	-0.04	0.01	0.02	-0.04
Madagascar	**0.02**	-0.01	0.00	0.00	0.01	0.00	0.01	0.00
Nigeria	**0.08**	0.05	0.01	0.00	0.01	0.00	0.00	0.01
Uganda	**0.08**	0.13	0.01	-0.03	-0.04	0.03	-0.01	-0.01
Equatorial Guinea	**0.10**	0.07	0.00	0.00	-0.04	0.01	0.07	0.00
Namibia	**0.34**	0.07	0.00	0.00	0.30	-0.06	0.01	0.02
Côte d'Ivoire	**0.39**	0.23	0.02	-0.03	0.09	0.01	0.04	0.03
Botswana	**0.50**	0.00	0.00	0.27	0.24	0.03	0.00	-0.04
Lesotho, Kingdom of	**0.51**	0.48	0.02	-0.15	0.11	0.03	0.01	0.02
Gambia, The	**0.53**	0.20	0.07	-0.01	0.23	0.01	0.01	0.02
South Africa	**0.83**	0.11	0.00	0.06	0.63	-0.04	0.01	0.05
Burkina Faso	**0.94**	0.61	0.07	-0.18	0.24	0.03	0.11	0.07

Economy	TOTAL IMPACT	01 Food	03 Clothing	04 Housing	07 Transport	09 Recreation	11 Restaurants & Hotels	All other
Western Hemisphere								
Paraguay	**0.03**	-0.09	-0.01	0.02	0.15	-0.02	-0.02	0.00
Dominican Rep.	**0.10**	-0.14	-0.01	0.04	0.40	-0.03	-0.08	-0.07
Costa Rica	**0.21**	0.02	0.00	0.02	0.20	-0.03	-0.01	0.01
Canada	**0.36**	0.13	0.05	0.00	0.28	-0.09	-0.02	0.00
Colombia	**0.37**	0.26	0.01	0.01	0.15	0.02	0.01	-0.07
Honduras	**0.46**	0.33	0.00	-0.13	0.32	-0.01	-0.01	-0.04
Chile	**0.47**	0.14	0.03	0.00	0.20	0.05	0.02	0.03
Mexico	**0.69**	0.33	0.03	-0.10	0.48	-0.02	-0.06	0.03
El Salvador	**0.72**	0.28	-0.01	-0.02	0.47	0.01	-0.01	-0.01
United States	**0.77**	0.18	0.04	0.16	0.47	-0.06	-0.02	-0.01