

Price Setting Before and During the Pandemic: Evidence from Swiss Consumer Prices*



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We provide new evidence on price rigidity at the product level based on microdata underlying the Swiss consumer price index from 2008 to 2020. We find that the frequency of price changes has increased over the pre-pandemic period, particularly among products where collection switched to online prices, reflecting the rise of e-commerce. Furthermore, price changes tend to be synchronized within rather than across stores. Time variations in inflation can be attributed mainly to variations in the frequencies of price increases and price decreases. In the first year of the pandemic, the frequency of price adjustments changed little on average, while the frequency of temporary sales responded countercyclically to the respective demand conditions across sectors.

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How firms set the prices of their goods and services is of great importance for macroeconomic policy. Price-setting behavior determines how shocks propagate through the economy. As prices tend to respond sluggishly to economic conditions, monetary policy has real effects over short horizons. Therefore, a large empirical literature has investigated the extent and causes of sluggish price adjustment.¹

In Rudolf and Seiler (2022), we provide new evidence on price-setting behavior based on CPI microdata for Switzerland covering the period 2008—2020. Two noticeable developments fall into this period.

One is the rise of e-commerce. The Swiss Federal Statistical Office (FSO) responded to this trend by collecting prices increasingly online. Earlier studies used web-scraped prices to show that online prices are more flexible than prices collected in stores (e.g., Cavallo, 2018). By uncovering similar trends in Swiss CPI microdata, we document the role of online retailing as a source of greater price flexibility in the data underlying a national CPI.

The other is the COVID-19 pandemic. The pandemic and the measures to contain it greatly restricted business operations and consumer expenditures. Earlier studies on the response of firms' price-setting behavior to the COVID-19 shock resorted to survey data (Balleer et al., 2020) or online price data (Alvarez and Lein, 2020). Access to up-to-date CPI microdata allows us to study the impact of the pandemic on the full spectrum of the CPI.

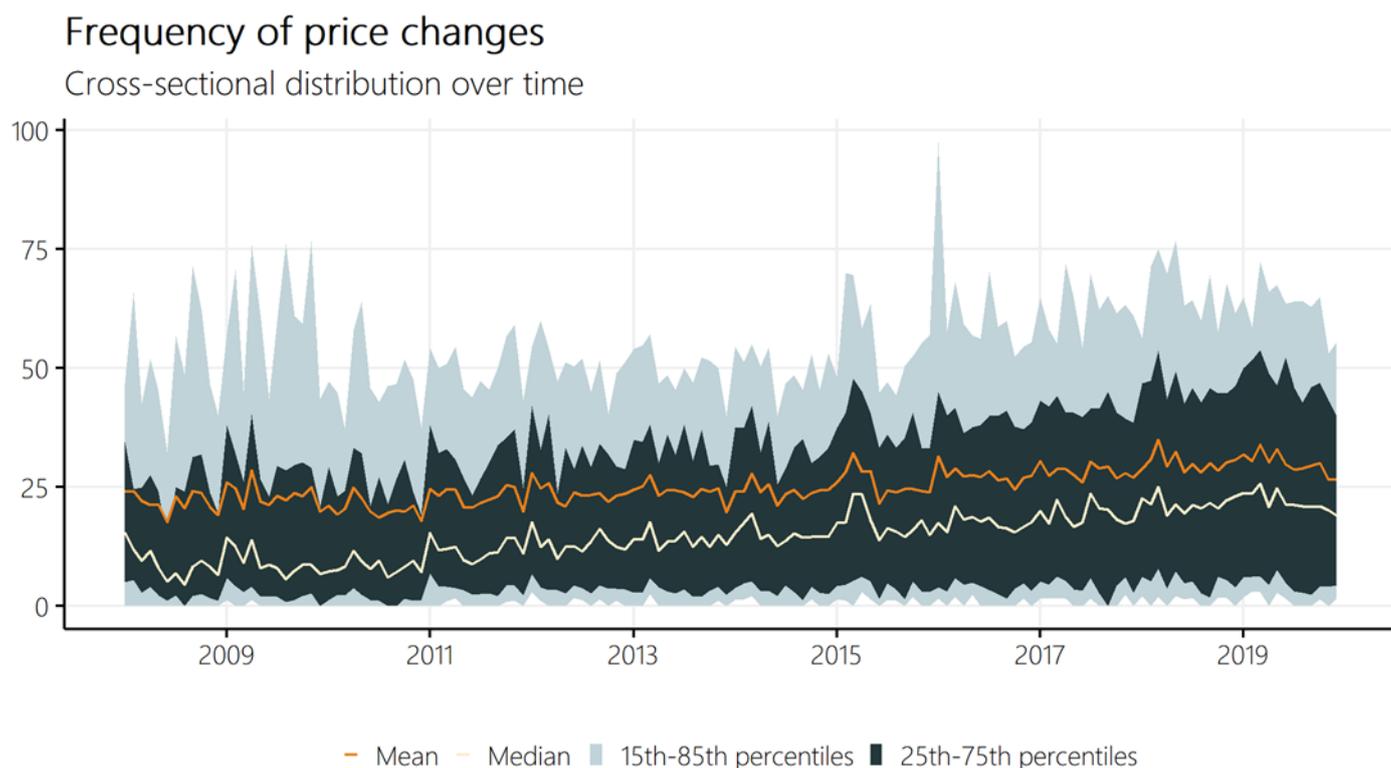
The CPI microdata used in our study are the monthly price quotes collected by the FSO to construct the Swiss CPI. We identify 160,000 individual products at the outlet level for 1,300 different goods and services for which prices were collected in more than 3,000 stores across Switzerland. After excluding administered prices, prices based on unit value indices, and a small group of other prices, the sample consists of 7.4 million price quotes from January 2008 to December 2020 and covers up to 60 percent of CPI expenditures.

We establish four stylized facts based on the analysis of the price quotes underlying the Swiss CPI — the first three focusing on price setting before and the fourth focusing on price setting during the pandemic.

The frequency of price changes has increased during the pre-pandemic period, especially for products where price collection has switched to online prices.

In line with earlier studies, we find evidence of considerable price rigidity. **Figure 1** illustrates the cross-sectional distributions of the frequency of price changes from January 2008 to December 2019. For each month, the figure shows the mean, median, interquartile range (dark-shaded area), and 15th-85th percentile range (light-shaded area) of the frequencies calculated across varieties.

¹This research relies primarily on quantitative price data. These quantitative price data include the increasingly available microdata underlying consumer and producer price indices or alternative price data sets, such as scanner data or prices collected via the Internet using “web scraping.” Klenow and Malin (2010) and Nakamura and Steinsson (2013) provide a comprehensive overview of micro-price studies and summarize the available microeconomic evidence. The research based on qualitative price data relies on surveys inspired by the seminal work of Blinder et al. (1998) in the United States. Seiler (2022) provides recent results of an ad-hoc survey in Switzerland.

Figure 1: Distribution of the frequency of price changes across varieties in Swiss CPI microdata.

Notes: The sample ranges from January 2008 to December 2019 and includes price changes due to temporary sales and product substitutions. The figure depicts the mean, median, interquartile range (dark-shaded areas), and 15th-85th percentile range (light-shaded areas). The frequency of price changes is reported in percent per month.

Three observations stand out. First, the average frequency of price changes is 26.9 percent over the sample period. Hence, around one in four prices changes every month. This result suggests that price rigidity is a pervasive feature of consumer prices in Switzerland. Prices are sticky and do not change continuously. By international comparison, consumer prices in Switzerland are more flexible than in the euro area (Gautier et al., 2022) and, if we disregard price changes related to temporary sales, about as flexible as in the United States (Nakamura and Steinsson, 2008).

Second, the frequency of price changes varies considerably over time and shows distinct peaks and troughs. Some of these periods have straightforward explanations. For example, the substantial increase in the frequency of price changes in early 2015 reflects the effect of the marked Swiss franc appreciation following the decision of the Swiss National Bank to discontinue the minimum exchange rate for the Swiss franc against the euro. This suggests that the frequency of price changes is not fixed exogenously but depends on the state of the economy.

Third, we observe that price rigidity has weakened over time. The average frequency of price changes has increased slightly but steadily from 23.2 percent in 2008 to 31.5 percent in 2019, implying that prices have become more flexible on average. This development is not the result of a broad-based tendency toward more frequent price adjustments but reflects a significant increase in the frequency of price changes in a subset of the CPI. We show that expenditure items for which the FSO has moved to collect prices exclusively online are among the items with the largest increase in the price adjustment frequency. The greater price transparency and competition in online markets provide a possible explanation. Estimating a fixed-effects model relating the frequency of price changes to average profit margins supports this interpretation: the rise of e-commerce has increased the frequency of price changes by increasing competition and reducing profits.

Variations in inflation are mainly due to variations in the frequencies of price increases and price decreases.

Aggregate inflation is the result of individual price adjustment decisions: inflation may change because more firms change their prices or because firms change their prices by a larger amount. To analyze how fluctuations in these dimensions of price adjustment contribute to inflation dynamics, we decompose inflation into an extensive margin (frequency of price increases and decreases) and an intensive margin (size of price increases and decreases). We find that the variations in the frequency of price increases and decreases contribute more than the variations in the size of price increases and decreases to inflation dynamics. This finding is in line with evidence presented by Gautier et al. (2022) for the euro area.

Price changes are synchronized within rather than across stores.

The synchronization of price changes can have important macroeconomic consequences. Whether all firms change their prices simultaneously or only a fraction adjust prices in every period has implications for the propagation of nominal shocks and the persistence of their effects. We distinguish between two types of synchronization: synchronization within and across outlets. Synchronization within outlets measures the extent to which firms coordinate price changes across their assortment. Synchronization across outlets measures the extent to which stores simultaneously change the prices of the same goods.

The estimation results from a multinomial logit model suggest that price changes are synchronized within rather than across stores. As firms decide to adjust their prices, they tend to change them for multiple products simultaneously. This result is consistent with the view that price adjustments are costly and therefore tend to be synchronized within stores.

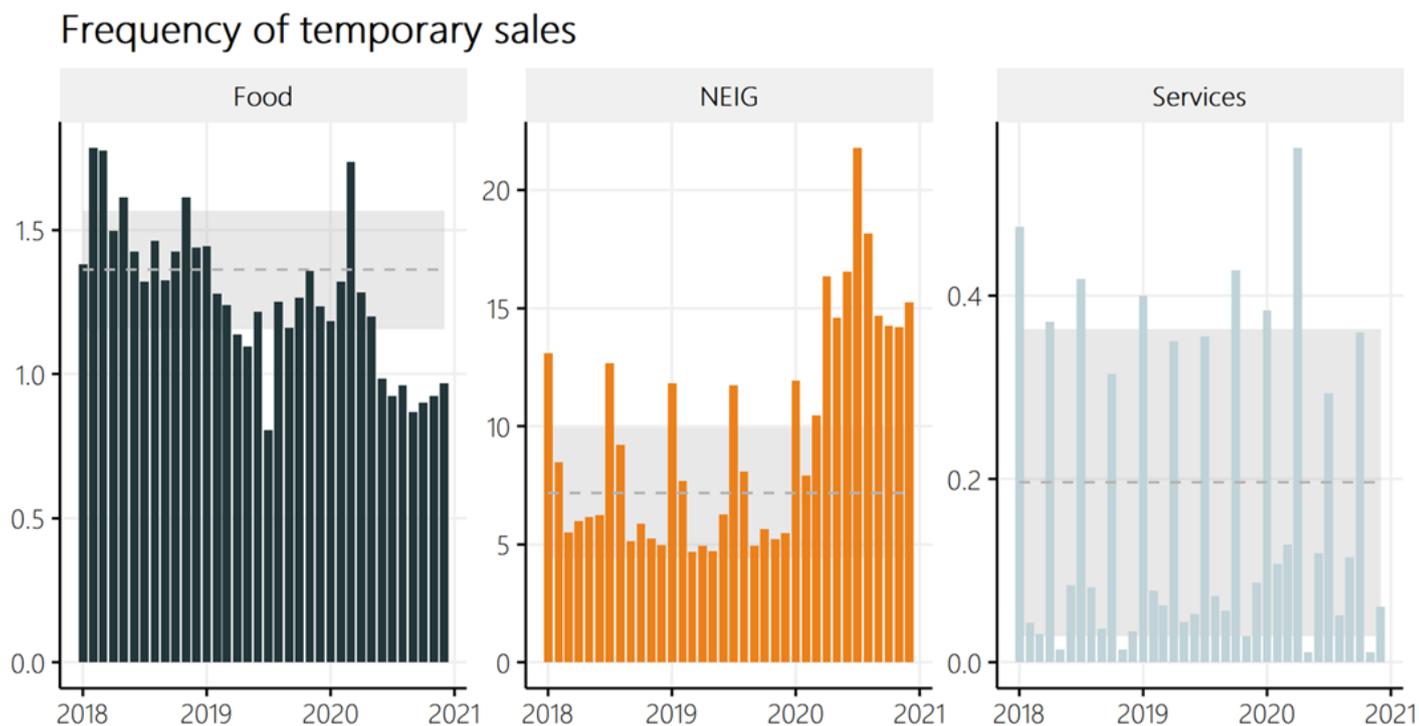
The response of price adjustment frequencies to the pandemic was small overall, while the frequency of temporary sales responded countercyclically to the respective demand conditions across sectors.

The COVID-19 pandemic and the measures taken to contain it severely restricted consumer spending. According to Swiss debit card transaction volumes, private consumption declined sharply in spring 2020 and, to a lesser extent, in late autumn 2020. However, the effect of the pandemic varied strongly across sectors. Spending in service sectors such as entertainment and sports, accommodation, and restaurants took the largest hit and recovered only slowly after that. By contrast, spending on food, beverages, and tobacco recorded higher sales throughout 2020 than in the previous year.

The response of the frequency of price changes to the COVID-19 pandemic was small overall. In the first half of 2020, the frequency of price changes fell by 0.4 percentage points compared to the same period of the two previous years. The high degree of uncertainty might have contributed to the relative stability of the price adjustment frequency.

Regarding temporary sales, we observe noticeable patterns at the sectoral level. **Figure 2** shows the frequency of temporary sales in the food, non-energy industrial goods (NEIG), and services sectors. The results suggest that firms used their sales policies to respond to the demand conditions in the various markets. In the food sector (where demand increased in the first year of the pandemic), the frequency of sales decreased. Conversely, in the NEIG sector (where demand decreased or was temporarily restricted by containment measures), the frequency of sales increased substantially. Temporary sales more than doubled in this sector and amounted to 14 percent on average between March and December 2020. These results are of particular interest for the debate in the literature about whether firms use their temporary-sales policy to adjust to aggregate shocks (Anderson et al., 2017; Kryvtsov and Vincent, 2021).

Figure 2: The frequency of temporary sales across sectors in Swiss CPI microdata from 2018 through 2020.



Notes: The shaded area shows the mean of the respective measures from January 2018 to December 2019 and one standard deviation thereof. The sample includes price changes due to temporary sales but excludes product substitutions and COVID imputations. The frequency of sales is reported in percent per month.

Conclusion

The empirical findings of our recent work on Swiss CPI microdata are relevant for macroeconomic models with nominal price stickiness. They provide updated and new moments to calibrate such models and highlight recent changes in how prices are set. In particular, they emphasize the effect of the rise of e-commerce and the importance of sectoral heterogeneity in analyzing price-setting behavior. ■

References

- Alvarez, S. E. and Lein, S. M. (2020). Tracking inflation on a daily basis. *Swiss Journal of Economics and Statistics*, 156(1):1–13.
- Anderson, E., Malin, B. A., Nakamura, E., Simester, D., and Steinsson, J. (2017). Informational rigidities and the stickiness of temporary sales. *Journal of Monetary Economics*, 90:64–83.
- Balleer, A., Link, S., Menkhoff, M., and Zorn, P. (2020). Demand or Supply? Price Adjustment During the Covid-19 Pandemic. Technical Report, CEPR DP14907.
- Blinder, A., Canetti, E. R., Lebow, D. E., and Rudd, J. B. (1998). Asking about prices: A new approach to understanding price stickiness. Russell Sage Foundation.
- Cavallo, A. (2018). More Amazon Effects: Online competition and pricing behaviors. Jackson Hole Economic Symposium Conference Proceedings (Federal Reserve Bank of Kansas City).
- Gautier, E., Conflitti, C., Menz, J.-O., Messner, T., Rumler, F., Santoro, S., Wieland, E., and Zimmer, H. (2022). New Facts on Consumer Price Rigidity in the Euro Area. ECB Working Paper Nr. 2669.
- Klenow, P. J. and Malin, B. A. (2010). Microeconomic evidence on price-setting. In *Handbook of Monetary Economics*, vol. 3, ed. by B. M. Friedman and M. Woodford, pp. 231–284. Elsevier.
- Kryvtsov, O. and Vincent, N. (2021). The cyclicality of sales and aggregate price flexibility. *The Review of Economic Studies*, 88(1):334–377.
- Nakamura, E. and Steinsson, J. (2008). Five facts about prices: A reevaluation of menu cost models. *The Quarterly Journal of Economics*, 123(4):1415–1464.
- Nakamura, E. and Steinsson, J. (2013). Price rigidity: Microeconomic evidence and macroeconomic implications. *Annual Review of Economics*, 5(1):133–163.
- Rudolf, B. and Seiler, P. (2022). Price Setting Before and During the Pandemic: Evidence from Swiss Consumer Prices. ECB Working Paper Nr. 2748.
- Seiler, P. (2022): Wie bestimmen Unternehmen ihre Preise? Ergebnisse einer Ad-hoc-Umfrage in der Schweiz. *KOF Analysen*, Vol. 2022(4).

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