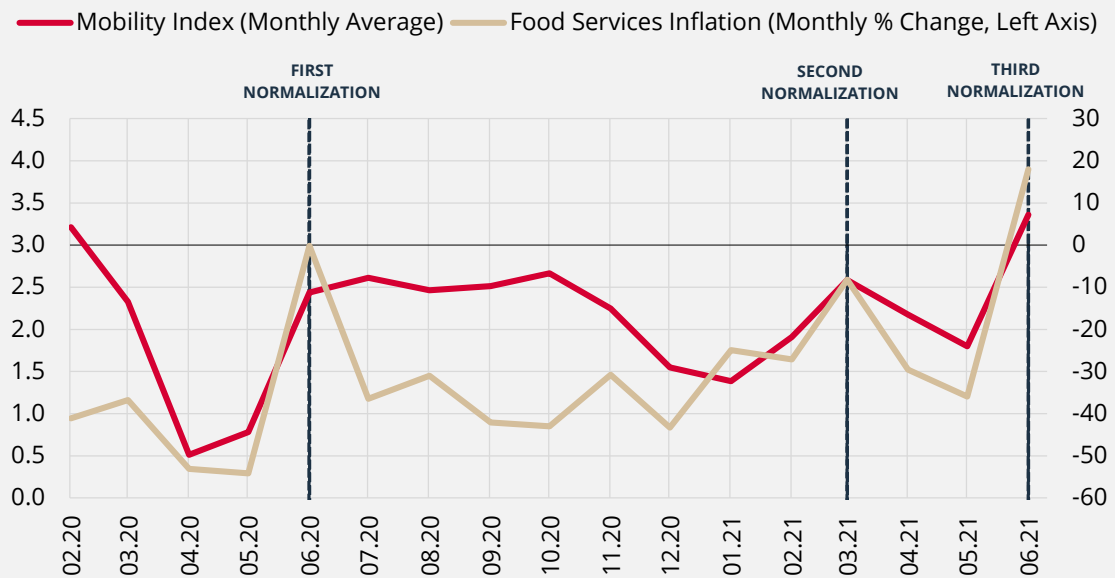


## Box 2.7

### An Evaluation of the Impact of Normalization Steps on Food Services Inflation

The measures taken during the pandemic and the normalization processes that started with the easing in these measures had significant effects on inflation developments in some sectors. Food services stand out among these sectors as they are directly affected by these measures. In this context, an upward “opening effect” is observed in food services inflation during periods of increased activity following the normalization steps (Chart 1).

**Chart 1: Mobility Index\* and Food Services Inflation**



Source: Google Mobility Index, TurkStat.

\* The monthly average of the "Retail and Recreation", "Grocery and Pharmacy" and "Workplaces" groups of Google Mobility Indices.

The opening effect on inflation data is observed in two ways: 1) The price compilation process was interrupted due to temporarily suspended activities of restaurants; cumulative cost pressures spilled over into prices, which re-emerged with the easing of measures, 2) The relevant restrictions suppressed the markups of those restaurants that continued to operate, and when this pressure was relieved by the normalization process, an "opening effect" was observed on prices. This box summarizes the main findings of the Eldemir and Yürek (2021) study on the effect of re-opening on food services inflation. Due to the structure of the data used in the study, only the opening effect mentioned in the second item above can be estimated. It should therefore be noted that the results presented here should be considered as a “partial opening effect”.

During the pandemic period, three different normalization periods were observed in Turkey: June 2020 (First), March 2021 (Second) and June 2021 (Third). When each period is evaluated in itself, a more significant easing is observed in the restrictions on restaurants with the normalization in the first and third periods (Table 1). On the other hand, in the second normalization process, restrictions varied across provinces, which were categorized according to color-coded risk groups. In the study, online price data<sup>1</sup>, which are compiled twice a month, were used for the product types within the scope of

<sup>1</sup> Although the dataset used does not belong to official inflation statistics, it is representative of the official data. Prices in the dataset are observed twice a month, mostly around the 10th and 20th days of the relevant month.

food services of the restaurants that operated uninterruptedly, and a regression discontinuity design (RDD)<sup>2</sup> was used to examine whether there was an opening effect on prices. In other words, prices observed just before and immediately after the relevant normalization period were compared, and it was checked whether there was a price movement above what would be expected under normal conditions. For the increases that fit in this definition, the part that was evaluated as beyond normal was defined as the opening effect. This analysis was applied to the prices of food services across Turkey for each normalization period, and additionally, separate estimates were made for each risk group in the second opening period.

**Table 1: June 2020, March 2021 and June 2021 Normalization Conditions**

	June 2020	March 2021*	June 2021
Pre-Normalization Condition:	Just takeaway or home delivery	Weekdays: Takeaway and home delivery between 10 a.m-08 p.m, home delivery after 08 p.m Weekend: 10 a.m-08 p.m home delivery	Weekdays: Takeaway or home delivery between 07 a.m-08 p.m, home delivery between 08 p.m-12 p.m Weekends: Home delivery between 07 a.m - 12 p.m
Post-Normalization Condition:	Service at the table, takeaway or home delivery with a distance sitting within the rules determined until 10 p.m	Blue and Yellow: 50% capacity between 07 a.m-07 p.m, 07 p.m-09 p.m takeaway or home delivery, 09 p.m-12 p.m home delivery Orange: 50% capacity between 07 a.m-07 p.m, 07 pm-09 p.m takeaway or home delivery, 09 p.m-12 p.m home delivery, Sunday: 10 a.m-08 p.m takeaway or home delivery, 08 p.m-12 p.m home delivery Red: 10 a.m-08 p.m takeaway or home delivery, 08 p.m-12 p.m home delivery	Weekdays and Saturdays: Service at the table with distance sitting, takeaway or home delivery between 07 a.m-09 p.m, home delivery between 09 p.m-12 p.m Sunday: 07 a.m - 12 p.m only home delivery

Source: Ministry of Interior.

\* According to the criteria determined by the Scientific Committee, provinces were divided into 4 different risk groups (low, medium, high, very high) and the degree of measures to combat the pandemic was set according to risk groups by color (blue, yellow, orange, red, respectively). The number of provinces by color: Blue (14), Yellow (28), Orange (22), Red (17).

Graphical analysis of average product and food services prices exhibits a spike at the beginning of the first and third normalization periods (Chart 2). On the other hand, the same analysis implies that there was no significant opening effect in the second period, or the effect is limited. Although the variation in these effects seems to be consistent with the content of the relevant normalization steps, an econometric estimation was conducted within the framework of equation (1) to obtain more reliable results.

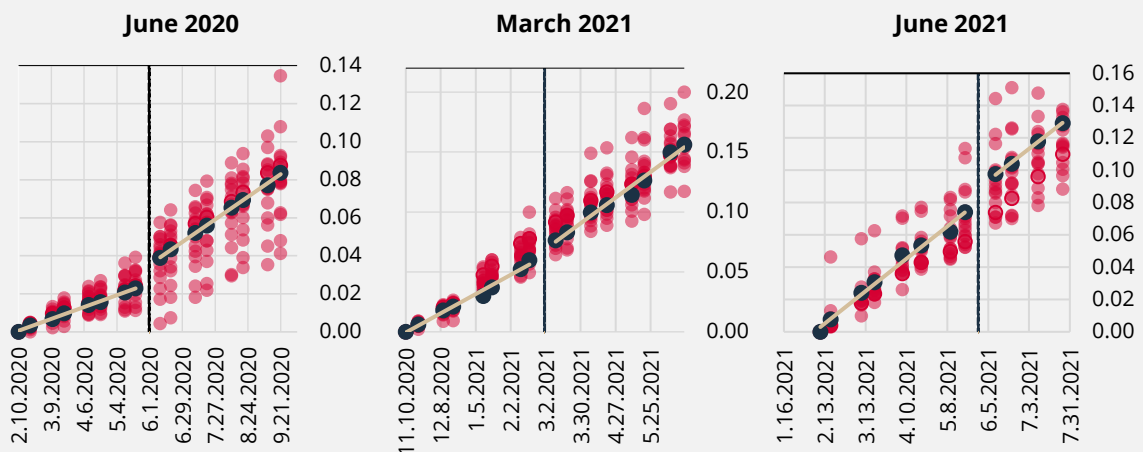
$$100 * \log(\text{price})_{it} = \alpha + \beta D + \gamma_1 D * (R - c) + \gamma_2 * (1 - D) * (R - c) + \mu_i \quad (1)$$

$D$  is a dummy variable that takes the value 0 for the pre-normalization period and 1 for the post-normalization period.  $R$  is a linear time trend (running variable),  $c$  is the discontinuity point that shows the date when normalization process begins and  $\mu_i$  shows fixed effects for each product sold in each restaurant. In this formulation, the estimation for the parameter  $\beta$  shows the opening effect.

<sup>2</sup> For detailed information on regression discontinuity design, see Angrist and Pischke, (2008), Imbens and Lemieux, (2008), Lee and Lemieux, (2010). For detailed information and applications on the use of time as a running variable in regression discontinuity design, see Hausman and Rapson, (2018), Aysoy, Kırılı and Tumen (2015), Davis (2008).

The results of our estimations for the impact of normalization are presented in Table 2. The impact of normalization observed on prices in the first and third periods is estimated to be around 1.1 percent and 1.3 percent, respectively. For the second period, although estimations by each group shows that there may be a partial opening effect for some of groups, no significant effect was found on average prices in Turkey. The impact identified via RDD with high frequency data, shows only the impact that emerges during the period from the last observation of pre-normalization in dataset to the first observation of post normalization. In order to evaluate the impact on the whole month after normalization, the high frequency price data is averaged for the months and the same estimation procedure was conducted again with the new low frequency data. Results show that estimations with the use of both frequency produce similar results, which implies that the opening effect mostly emerges at the beginning of normalization process.

**Chart 2: Average Food Services Prices Before and After Normalization \***



Source: Authors' calculations.

\* Red dots show the logarithmic averages of online prices of the product varieties, and dark blue dots show the average logarithmic prices of food services. All series are normalized to be 10.02.2020=0.

**Table 2: June 2020, March 2021 and June 2021 Periods Opening Effects**

Window Width (3)	High Frequency(1)			Low Frequency (2)	
	4 Months	6 Months	8 Months	6 Months	8 Months
June 2020	<b>1.13***</b> (0.89, 1.39)	1.12*** (1.00, 1.29)	1.10*** (0.96, 1.21)	1.19*** (1.13, 1.24)	1.19*** (1.14, 1.24)
Turkey	0.15 (-0.75, 0.7)	0.26 (-0.14, 0.78)	0.26 (-0.20, 0.78)	0.06 (-1.33, 2.03)	0.17 (-1.28, 1.67)
Blue	-0.55 (-1.98, 0.7)	-0.58 (-1.58, 0.36)	-0.31 (-0.85, 0.46)	-0.83 (-3.73, 2.78)	-0.48 (-1.66, 1.15)
March 2021	0.26* (-0.80, 0.93)	0.24 (-0.20, 0.75)	0.13 (-0.41, 0.55)	0.04 (-1.47, 2.12)	0.03 (-1.91, 1.63)
Orange	0.20** (-0.60, 0.65)	0.37* (-0.08, 1.05)	0.41** (0.02, 0.94)	0.16 (-2.05, 2.39)	0.30 (-1.85, 1.65)
Red	-0.35 (-1.61, 0.43)	-0.26 (-0.71, 0.19)	-0.24 (-1.07, 0.81)	-0.40** (-0.60, -0.24)	-0.27 (-3.05, 1.94)
June 2021	<b>1.34**</b> (0.7, 2.56)	-	-	-	-

Source: Authors' calculations.

(1) The observation level used in the model is the product and price compilation period. There are two price observations per month for each product.

(2) The observation level used in the model is at the product and month level. Accordingly, each observation shows the monthly average price of the relevant product. \*\*\*, \*\* and \* show the statistical significance at 1%, 5% and 10% levels, respectively. When confidence intervals presented in the parenthesis are calculated, standard errors are clustered by date of observation and the wild bootstrap (Cameron, Gelbach, & Miller, 2008) method was applied.

(3) The window size defines the time period covered by the sample included in the analysis. The first day of the normalization period is in the middle of the window. For example, if the window size is 4 months, the analysis period covers the period two months before and two months after the start of the normalization period.

In sum, online restaurant prices are utilized in this study and the impact of normalization periods on prices are evaluated within a microeconomic framework. Findings point to an upward opening effect on prices for June 2020 and June 2021, while no significant impact is found on prices (average price of Turkey nationwide) for the March 2021 period. More clearly, recovery in sectoral demand conditions following the normalization steps are estimated to have an upward impact of approximately 1.1 and 1.3 percentage points on food services inflation for the June 2020 and June 2021 periods, respectively. On the other hand, in this study, since only the prices of the restaurants that operated uninterruptedly are examined, it should be noted that the size of opening effects on the prices of the companies that suspended their activities may be different. Therefore, it is considered that the overall opening effect on official food services inflation may be slightly higher than the above-mentioned estimates.

## References

- Angrist, J. D., & Pischke, J. S. (2008). *Mostly harmless econometrics*. Princeton university press.
- Aysoy, C., Kirli, D. H., & Tumen, S. (2015). How does a shorter supply chain affect pricing of fresh food? Evidence from a natural experiment. *Food Policy*, 57, 104-113.
- Cameron, A. C., Gelbach, J. B., & Miller, D. L. (2008). Bootstrap-based improvements for inference with clustered errors. *The Review of Economics and Statistics*, 90 (3), 414-427.
- Davis, L. W. (2008). The effect of driving restrictions on air quality in Mexico City. *Journal of Political Economy*, 116(1), 38-81.
- Eldemir, C., & Yürek, S. (2021). Easing the restrictions on restaurant inflation: The impact of normalization process in Turkey during Covid-19. CBRT, ongoing study.
- Gelman, A., & Imbens, G. (2019). Why high-order polynomials should not be used in regression discontinuity designs. *Journal of Business & Economic Statistics*, 37(3), 447-456.
- Hausman, C., & Rapson, D. S. (2018). Regression discontinuity in time: Considerations for empirical applications. *Annual Review of Resource Economics*, 10, 533-552.
- Imbens, G. W., & Lemieux, T. (2008). Regression discontinuity designs: A guide to practice. *Journal of econometrics*, 142(2), 615-635.
- Lee, D. S., & Lemieux, T. (2010). Regression discontinuity designs in economics. *Journal of economic literature*, 48(2), 281-355.