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Economics at the FTC: Fertilizer, Consumer Complaints, and Private Label Cereal

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Abstract
Staff in the FTC's Bureau of Economics perform economic analyses to support the Commission's missions to protect consumers and maintain competition. Staff contributions include both original economic research and theoretical and empirical analysis in specific matters where the Commission has to decide whether to take enforcement actions. This article describes: retrospective research of a consummated merger in the fertilizer industry; a novel analysis of the government's consumer complaint data to understand how frauds affect different demographic groups; and casework that supported a decision to challenge a merger of private label ready-to-eat cereal manufacturers.

Keywords Antitrust · Consumer protection · Efficiencies · Fraud · Merger retrospectives · Merger simulations

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1 Introduction

The staff of the Federal Trade Commission's Bureau of Economics (BE) is made up of just over 100 full-time employees. It is currently composed of 83 Ph.D. economists, with 7 new hires joining in 2020, 13 research analysts and statisticians, 6 administrative professionals, and 4 financial analysts. While this article focuses on the output of economists within BE, that work benefits from contributions of the entire BE staff, as well as the cooperation of many attorneys and paralegals in the FTC's Bureau of Competition and Bureau of Consumer Protection.

BE economists provide economic analysis in support of the FTC's dual competition and consumer protection missions. Most of the staff's time is spent on casework for particular matters that may come before the Commission. On the competition side, most matters involve proposed horizontal or vertical mergers, where BE's analysis can be critical in determining whether the proposed merger is likely to harm consumers. FTC merger enforcement is particularly active in healthcare (hospital, pharmaceutical and medical devices), and in the oil and gas, chemical, manufacturing and retail sectors. In 2019, the FTC entered into consent orders for eight mergers and filed suit in four, while merging parties abandoned eight proposed transactions that were investigated by the FTC staff. This article discusses some of the models that BE used to assess the proposed merger between private-label (PL) ready-to-eat (RTE) cereal manufacturers—Post and TreeHouse—which was one of the deals that was abandoned when challenged by the Commission.

Consumer protection matters cover a wide-range of cases where firms may be engaging in unfair or deceptive—and sometimes simply fraudulent—practices that harm consumers. These range from cases of identity theft and imposter scams, to deceptive advertising and unfair data-security practices. BE economists provide independent analyses of virtually all consumer protection matters before the Commission; work side-by-side with legal staff on investigations, reports, and workshops; serve as expert witnesses, and conduct original economic research on a range of consumer protection questions, including development of original theoretical economic models to improve understanding of consumer protection problems, applications of existing economic and marketing literature to policy questions, and original empirical analysis. The Commission filed actions in 76 consumer protection matters and obtained orders in 126 cases in 2019; and, amongst many other matters, the Commission is currently engaged in protecting consumers from COVID-related scams.[1]

BE also helps to shape Commission enforcement actions by conducting theoretical and empirical economic research projects on topics that are connected to policy. This article discusses two examples: The first is a retrospective analysis of a fertilizer manufacturer merger that the Commission investigated in 2016 and 2017. Since Barton and Sherman's (1984) study of two consummated mergers in the U.S. microfilm industry, BE staff have published over 30 retrospectives on consummated

[1] See FTC Annual Highlights 2019, Stats & Data at https://www.ftc.gov/reports/annual-highlights-2019/stats-and-data.

mergers. These studies provide insights into whether the tools that enforcement agencies worldwide use to evaluate mergers—including the type of tools used in the RTE cereals case—are effective. The second project consists of a set of studies (Raval 2020a, b, c) that link the ZIP codes reported in the government's customer complaints databases, and datasets on victims from several fraud cases that were prosecuted by the Commission, to local demographics. This work shows that residents of areas with higher numbers of Black and Latino residents are much less likely to report being victims of fraud even though they may be just as likely or more likely to be victims. This difference matters, because BE staff frequently use the complaints database as a source of information that can guide assessments of likely consumer harm.

Additionally, BE economists interact with broader policy and academic research communities by participating in and hosting conferences and workshops. For instance, FTC economists recently participated in a Consumer Financial Protection Bureau (CFPB) workshop on behavioral economics[2] and organized an FTC hearing on merger retrospectives.[3] In November 2019, BE welcomed a new co-host for the twelfth FTC Microeconomics Conference: the Tobin Center for Economic Policy at Yale.[4] A wide range of topics—including deception and collusion—were discussed in paper sessions, panel discussions, and keynote addresses. The next FTC Microeconomics Conference, again co-sponsored by the Tobin Center, is to be held online on November 5–6, 2020.[5]

Section 2 describes a retrospective analysis of the $36 billion merger of Agrium and PotashCorp, which formed the world's largest crop nutrient company. The study uses publicly available data to examine what happened to the price of potash, a vital source of potassium for farmers, in the U.S. Corn Belt—compared to potash prices in other countries and domestic prices of other fertilizers. Section 3 describes the consumer complaints research that was discussed above—one of the products of which is an approach to weighting complaint data so that it is likely to reflect more accurately victimization rates. Section 4 discusses the economic analysis of the PL RTE cereal manufacturers, and, in particular, describes how staff used a range of alternative models to calculate estimates of the effects of eliminating competition between the two companies in order to understand the range of possible outcomes that could be compared to creditable efficiencies.

[2] See https://www.consumerfinance.gov/about-us/events/archive-past-events/cfpb-symposium-behavioral-economics/.

[3] A print transcript as well as a video recording are available at https://www.ftc.gov/news-events/events-calendar/ftc-hearing-14-merger-retrospectives.

[4] The conference website is located at https://www.ftc.gov/news-events/events-calendar/twelfth-annual-federal-trade-commission-microeconomics-conference.

[5] Details are available at: https://www.ftc.gov/news-events/events-calendar/thirteenth-annual-federal-trade-commission-microeconomics-conference.

2 Retrospective Analysis of Price Effects from an Agricultural Fertilizer Merger

A Background

This section presents the key findings of a retrospective study of two North American crop nutrient fertilizer manufacturers (Kreisle, 2020), which is of particular interest because some observers have raised concerns about rising concentration in fertilizer production possibly leading to higher input prices for farmers and higher food prices for consumers.[6] Focusing on agriculture also broadens the scope of the merger retrospective literature, which tends to study retail, health care, petroleum, and formerly regulated industries, where data are more readily available. USDA estimates that agriculture and related industries accounted for 5.4 percent of U.S. gross domestic product in 2017, and 11 percent of employment.[7]

Three primary nutrients—nitrogen, phosphate, and potassium (potash)—are used to make agricultural fertilizer. While each nutrient requires a different production process, several manufacturers produce all three. When Agrium and PotashCorp announced a $36 billion merger to form the world's largest crop nutrient company in September 2016, some industry observers expected antitrust authorities to focus their regulatory review on potash, as the companies controlled 60 percent of North American potash capacity, compared to roughly 30 percent for nitrogen and phosphate.[8] A key question in the investigation was whether potash competition took place in a global market—as claimed by the merging firms[9]—or whether competition was more regional.

After negotiating settlements with antitrust authorities in multiple countries, the companies completed the merger on January 2, 2018, and renamed the firm Nutrien.[10] The U.S. Federal Trade Commission required divestitures of a nitrogen plant and a phosphate facility.[11] Competition authorities in China and India required PotashCorp to divest minority holdings in other potash businesses that were based in Jordan, Israel, and Chile.[12] However, the merged firm retained all of its North American potash assets.

[6] See, for example, Fuglie et al. (2012) from the Economic Research Service of the U.S. Department of Agriculture and Shields (2010) from the Congressional Research Service. However, note also that a Government Accountability Office (2009) analysis found that "Based on our review, empirical economic literature has not established that concentration has adversely affected commodity or food prices in these agricultural sectors."

[7] See https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/ag-and-food-sectors-and-the-economy/.

[8] Reuters, "Potash Corp, Agrium talk merger; competition scrutiny expected." August 30, 2016.

[9] See https://www.compasslexecon.com/cases/compass-lexecon-assists-in-obtaining-regulatory-approval-for-36-billion-merger/.

[10] Nutrien, Ltd. Press Release, "Agrium and PotashCorp Merger Completed Forming Nutrien, a Leader in Global Agriculture."

[11] Federal Trade Commission, "FTC Requires Canadian Fertilizer and Chemical Companies PotashCorp and Agrium to Divest 2 Production Facilities as Condition of Merger."

[12] Agrium press releases on October 18, 2017 and November 7, 2017. PotashCorp also had a minority investment in a Chinese potash subsidiary, which it was required to convert to a passive stake.

In light of the merged firm's large combined share of North American potash capacity, this study analyzes the effect of the Agrium/PotashCorp merger on potash prices in the "Corn Belt" region of the United States. Using a difference-in-differences approach, with a variety of control markets, the results suggest that North American potash prices did not increase after the merger. While this finding is consistent with the merger's having no anticompetitive impact, the study notes possible confounding factors such as contemporaneous capacity additions as well as developments in international trade policy.

Difference-in-differences requires identification of one or more control markets that experience similar demand and cost shocks. Our first comparison is between North American potash prices and prices in Brazil: the world's largest potash import market. As the geographic market for potash may be broader than North America, we also use the price of a different grade of potash sold in Southeast Asia, where it is utilized more heavily than in North America, as an alternative control. Finally, we turn to the other two primary crop nutrients—nitrogen and phosphorus—as potential controls. A drawback is that the production process, particularly for nitrogen, differs for these nutrients to a larger degree than is the case for other grades of potash. However, as these nutrients are complements, demand for any one of them derives from overall demand for agricultural commodities. Therefore, demand is highly correlated across nutrients.

All growing plants require relatively large amounts of nitrogen, phosphorus, and potassium. These three "macronutrients" are just as necessary as water, sunlight, and carbon dioxide. Different soils naturally contain different levels of each nutrient, and different crops absorb them in varying proportions. The manner in which a crop is harvested also affects the need to replenish nutrients in the soil.

The term potash refers to a variety of minerals containing potassium. The most common use for potash is as an agricultural fertilizer, usually as potassium chloride (KCl). Potash fertilizer is commonly sold as muriate of potash, or MOP, which contains at least 95 percent KCl.

Two-thirds of global potash reserves lie in evaporated sea beds in Canada, Russia, and Belarus.[13] Mines extract potash ore from underground. The ore is then refined into standard-grade product or a higher-quality granular product. While plant growth is affected only by the overall potassium content, which is common across standard and granular MOP, the more even sizing of granular MOP allows for more accurate placement by farmers with the right equipment. As a result, granular MOP is relatively more popular in higher-income regions (North America, Europe, and Brazil), while standard MOP is the product of choice in China, India, and Southeast Asia.

Table 1 displays approximate global potash mine capacities at the time of the Agrium/PotashCorp merger. The major North American producers were Agrium, PotashCorp, and Mosaic, with most of their mines in Saskatchewan. In June 2017, K + S, a German potash producer, commenced production at a new 2.0 Mt/y (million metric tons per year) mine in Saskatchewan. K + S had spent five years and over

[13] Potash can also be harvested from the brines in certain saltwater bodies, using solar evaporation. This method accounts for less than 15 percent of global potash capacity.

$3 billion to construct the mine.[14] The "Other" category in Table 1 includes a small amount of U.S. production in New Mexico and Utah, but this makes up less than 1 Mt/y.

In 2016, the world consumed approximately 60 Mt of potash. North American potash consumption amounted to roughly 8.5 Mt in 2016, of which the U.S. portion was 7.1 Mt. Most U.S. consumption is in the Corn Belt region. According to the USGS, around 80–85 percent of U.S. imports are from the Canadian producers. These imports likely arrive via rail from Saskatchewan. Uralkali and Belaruskali provide the vast majority of remaining U.S. imports, with delivery to the Corn Belt taking place through the port of New Orleans and Mississippi River barges.

The world's largest potash import market is Brazil (9.0 Mt in 2016 imports), where the potassium-deficient soils need regular replenishment.[15] The spot market for granular potash in Brazil is a common price benchmark. While other import markets typically operate on a spot basis, China (7.0 Mt) and India (3.9 Mt) typically negotiate annual contracts for standard grade potash imports.[16] Since 1972, Agrium, PotashCorp, and Mosaic have coordinated all of their offshore potash sales through Canpotex, which operates as an export cartel for all customers outside Canada and the U.S.[17] Uralkali and Belaruskali operated a similar export cartel until it collapsed in July 2013.[18]

If the geographic market for potash is global, Table 1 indicates that the Agrium/PotashCorp merger would not have had a large impact on market structure. By contrast, if the geographic market is North America, Table 1 indicates that the merger would have had a more substantial impact on market structure. The elasticity of offshore import supply likely plays a key role in whether the merger could lead to an increase in North American prices. A global potash market would invalidate the difference-in-differences econometric approach of comparing domestic and offshore potash prices, because any changes in market power would affect both. However, in this case, a comparison with the prices of other crop nutrients could still be informative.

Phosphorus fertilizer supply shares many similarities with potash. Production begins with the mining of phosphate rock. Phosphate rock is dissolved into

[14] See https://www.mining.com/ks-bethune-mine-canada-churns-first-tonnes-potash/23/.

[15] See https://www.canpotex.com/our-business/marketing/our-potash-markets/brazil; import figures from Nutrien's 2018 Factbook,

[16] Industry reports, as well as market participants, often refer to a single contract between an exporter and several buyers in China (and likewise for India). See, e.g., Canpotex News Release, "Indian Companies to Buy More Saskatchewan Potash," Nov. 20, 2014; describing an "Enhanced Market Development Agreement" between Canpotex and three Indian companies, the signing of which was witnessed by the Canadian premier and representatives of the Indian Ministry of Agriculture. See also Kulkarni, K. and R. Nickel, "India has enough potash to keep Canpotex waiting," *The Globe and Mail*, Jan. 17, 2013; noting that "India and China have long bought potash through contracts, rather than on the spot market from the big producers, and usually at market-low prices. China signed its most recent deal in December, ending a long holdout, and India last inked a contract in August 2011."

[17] K+S does not participate in Canpotex; see "K+S says EU law keeps it from joining Canpotex", *Reuters*, Nov. 29, 2011.

[18] A. McDonald, "How a Potash Cartel Collapsed," *The Wall Street Journal*, Dec. 14, 2015.

Table 1 Approximate 2017 Global Potash Mine Capacities (Mt/y, KCl equivalent). *Sources*: Nutrien's 2018 Factbook, the U.S. Geological Survey's Potash Statistics and Information publications, Agrium and PotashCorp's September 2016 investor presentation announcing the merger (available at http://www.ureaknowhow.com/ukh2/images/stories/worldnews/AGU-POT-Presentation.pdf), and the International Fertilizer Association. Swiss producer Eurochem was finalizing construction of two new potash mines in Russia, but only one of these began production by 2018 so these mines are excluded from the table. See https://www.eurochemgroup.com/project/eurochem-usolskiy-potash/

Company	Location(s)	Capacity	Global share (%)	North American Share (%)
PotashCorp	Canada	19.1	20	51
Agrium	Canada	3.0	3	8
Mosaic	Canada	11.9	12	34
Uralkali	Russia	12.4	13	
Belaruskali	Belarus	12.8	13	
K+S	Germany, Canada	7.0	7	5
ICL	Israel, Spain, UK	5.5	6	
Chinese Companies[1]	China	10.4	11	
Other[2]		13.7	14	2
Total		95.8		

[1] There are nominally over 30 Chinese potash producers, but the USGS notes that most capacity is concentrated in three firms. Industry observers often treat them as a single entity

[2] Roughly half of the capacity in "Other" consists of Arab Potash Company in Jordan, SQM in Chile, and Intrepid Potash and Compass Minerals in the U.S.

phosphoric acid, which can be used to make dry and liquid phosphorus fertilizers. According to the USGS, three-quarters of U.S. phosphorus production occurs in Florida and North Carolina, with the balance in Idaho and Utah.[19] Imports, almost entirely from Peru and Morocco, accounted for 2–5 percent of U.S. phosphate rock supply between 2015 and 2018. Prior to the merger, Agrium and PotashCorp had a combined share of 25 percent of North American phosphoric acid capacity. Three other firms, led by Mosaic, accounted for the balance.

Relative to potash and phosphorus, nitrogen offers a contrast in production and market structure. Nitrogen-based fertilizers are derived from ammonia, which is typically manufactured by reacting the methane in natural gas with atmospheric nitrogen. As nitrogen is abundant in the atmosphere everywhere, plants are located close to sources of natural gas: Oklahoma, Louisiana, and Texas account for half of U.S. capacity. The USGS reports that 15 companies produced ammonia at 32 plants in 16 states in 2017. Agrium and PotashCorp combined for 30 percent of North American ammonia capacity prior to the merger. For use as a fertilizer, ammonia is reacted with carbon dioxide to create synthetic urea. While the urea (nitrogen) market may not share the same cost structure as potash, production is much less concentrated, and it potentially presents a useful competitive benchmark.

[19] U.S. Geological Survey, Phosphate Rock Statistics and Information.

In addition to difficulties in choosing an appropriate control market, developments in international trade policy may complicate identification of any post-merger change in potash pricing. A substantial reduction in Chinese purchases of U.S. soybeans in 2019 may have caused Corn Belt farmers to shift to corn production, which is a more nitrogen-intensive crop.[20] In addition, China banned seaborne imports of potash for large parts of 2019.[21] Producers—including Nutrien, Mosaic, and Belaruskali—announced cuts in potash production in mid- to late 2019.[22] Proposed changes to the royalty rate charged on potash mining by the provincial government in Canada created additional uncertainty around the same time.[23] The next two sections describe the available data and research design, and then the results.

B. Data and research design.

Data for this study come from Mosaic—a producer of all three macronutrients—which publishes average weekly spot prices for several crop nutrients in multiple international markets.[24] We aggregate the data to the monthly level to reduce the impact of serial correlation. The primary data series of interest is the price for granular potash in the Corn Belt.

The most intuitive control market is the price for granular potash in Brazil, the world's largest international potash market. Because Agrium and PotashCorp sold potash into Brazil (and all other offshore markets) only through Canpotex, the merger should have no direct effect on offshore potash prices. For Brazil to be a valid control, the Corn Belt and Brazil need to reside in separate geographic markets. A global potash market would undermine this econometric approach, and would also weaken the structural basis on which to presume the merger could have anticompetitive effects.

An alternative control market available in the data is the price for standard potash in Southeast Asia. To the extent that geography is a good but imperfect delineation between treatment and control markets, considering a different grade of potash may add a degree of differentiation in the product market dimension as well.

[20] World Bank, "Fertilizer Market Outlook", June 3, 2019.

[21] See https://www.kpluss.com/en-us/press/press-releases/KS-reduces-potash-production/.

[22] K. Keen (S&P Global Market Intelligence), "Potash cuts aimed at bolstering spot prices amid weak market, analysts say", Sep. 13, 2019. Note, however, that Mosaic's decision to idle its Colonsay mine is somewhat offset by its planned opening of a new, lower cost mine (known as "K3") nearby.

[23] P. Sinkewicz, "Potash production faces challenge of cost vs. market price", *The Saskatoon Star-Phoenix*, May 24, 2019.

[24] Mosaic Plant Nutrient Price Dashboard, available at http://www.mosaicco.com/resources/3185.htm.

Domestic prices for the two other key nutrients offer potential controls as well, so long as the merger did not affect these markets.[25] A key marker for nitrogen-based fertilizer is the New Orleans spot price for urea. The primary phosphate-based fertilizer is di-ammonium phosphate, or DAP. The Tampa spot price is an oft-cited benchmark for DAP due to the presence of large phosphate mines in central Florida. Figure 1 plots the various price series with the solid line representing the potash (MOP) price in the Corn Belt. The other potash prices, in Brazil and (for standard grade) in Southeast Asia, follow similar trends before and after the merger. All crop nutrient prices were trending upward just prior to merger, and followed that trend in the year after the merger. Prices generally began to decline in 2019, although the benchmark phosphate price (DAP Tampa) falls more rapidly than the other nutrients.[26] Throughout the entire sample, the benchmark nitrogen price (urea NOLA) is more volatile than the other series.

We use variations of a difference-in-differences approach to attempt to identify any impact of the Agrium/PotashCorp merger on potash prices. This is a standard approach in the merger retrospective literature; see Weinberg (2008). The baseline approach uses the Corn Belt potash price as the treatment relative to a potential control market, by estimating the following equation:

$$\ln p_t^T - \ln p_t^C = \alpha + \beta_{2018} 1\left(year_t = 2018\right) + \beta_{2019} 1\left(year_t = 2019\right) + \gamma X_t + \epsilon_t \quad (1)$$

X_t can include monthly average U.S. corn prices to control for demand shifts and monthly average hourly earnings for Saskatchewan employees in the mining sector to control for costs.[27] Unfortunately, similar controls are not available in every control market, so these shifters are sometimes excluded as a robustness check. In every specification, X_t incorporates monthly dummies to allow for seasonality. Crop nutrient fertilizers can be applied in spring alongside seed planting, or after the fall harvest. Fertilizer is bought and sold year-round, and is easily inventoried at various stages of the supply chain.

[25] Notably, the FTC's required divestitures aimed to do just that. It is also worth noting that the divested facilities are somewhat removed from the spot prices that are available in the Mosaic data. The nitrogen facility produced only nitric acid, which is a feedstock in the production of nitrogen fertilizer (urea) but also has industrial uses. The FTC complaint noted that the affected customers in the nitrogen divestiture ranged from Kentucky to New Jersey. The divested phosphate facility produced a liquid phosphate fertilizer, which is distinct from the dry fertilizer (DAP) that is used in this study. As noted in the FTC's complaint, the price difference between liquid and dry phosphate "has at times expanded significantly without prompting customers to shift their purchases from liquid to dry phosphate fertilizers." See footnote 11.

[26] Capacity additions in Morocco—home to 70 percent of global phosphate reserves—combined with weak demand appeared to drive the DAP price decline in 2019. See World Bank, "Fertilizer Market Outlook," footnote 23. By contrast, potash capacity additions—including, notably, K + S's mine in Canada—fell short of projected 2019 production.

[27] Average U.S. Corn Prices Received from USDA, available at http://www.nass.usda.gov/Charts_and_Maps/Agricultural_Prices/pricecn.php. Saskatchewan mining wages from Statistics Canada, Table 14-10-0205-01, Average hourly earnings for employees paid by the hour, by industry, monthly, unadjusted for seasonality. Results are generally robust to exclusion of these controls, neither of which is perfect. As noted above, higher potash prices could be a cause of higher corn prices. Likewise, as discussed below, the merger could potentially enhance monopsony power and affect mining wages.

We estimate Eq. (1) via OLS separately for each of the available control markets. The identifying assumption is that supply and demand shocks that are not included in X_t affect treatment and control markets equally. In that case, differencing allows us to interpret the β's as the (log-point) changes in prices that are associated with the merger.

As a specification check, we adapt an approach from Ashenfelter et al. (2013) and use the following equation to examine more closely any differences in pre-merger trends between Corn Belt potash prices and other nutrients:

$$\ln p_{it} = \alpha_i + \sum_{\tau} \delta_{\tau}^{C} * 1(\tau = t) + \sum_{\tau} \delta_{\tau}^{T} * 1(\tau = t) * 1\left(i = MOP_{CornBelt}\right) + \gamma X_t + \epsilon_{it} \tag{2}$$

Equation (2) estimates time fixed effects separately for control (δ_{τ}^{C}) and treatment (δ_{τ}^{T}) markets, where the only treated group is the Corn Belt potash price. This equation allows us to examine whether the assumption of similar pre-merger trends in the treatment and control prices, which is implicit in Eq. (1), is consistent with the data when we control for other observables.

In estimating Eqs. (1) and (2), we calculate Newey-West standard errors to account for heteroscedasticity and first-order serial correlation.

C. Results

Table 2 presents the results of estimating Eq. (1) separately for each available control market: the prices of granular potash (MOP) in Brazil; standard MOP in Southeast Asia; phosphate (DAP) in Tampa; and nitrogen (urea) in New Orleans. The baseline result in column (1) of Table 2 shows a 0.152 log-point decline (or 16.4 percent) in Corn Belt potash prices relative to Brazil potash prices in 2018, the first year after the merger. Had the merger caused Corn Belt prices to increase relative to the control, we would have expected an effect with the opposite sign. Kreisle (2020) finds that results are similar when a combined 2018–2019 effect is estimated, and when controlling for corn prices and mining wages. The controls enter with the expected signs. The alternate specifications considered for robustness produce similar results for each of the controls, so the results are not reported here.

Column (2) reports similar analysis for Corn Belt potash prices relative to standard-grade potash prices in Southeast Asia. The estimated merger effects are negative, but smaller and not statistically different from zero. Column (3) reports model estimates when urea (nitrogen fertilizer) serves as the control market; we again find negative and statistically significant effects. The only control market against which Corn Belt potash prices do not decline is for DAP (phosphate fertilizer), shown in column (4). It appears that prices decreased in the first year after the merger, but then increased in 2019. This result corresponds with industry reports of significant international phosphate capacity additions in 2019 (see footnote 29) which appear to have led to decreasing DAP prices (see Fig. 1). Thus, it is difficult to conclude that this one category with a positive and statistically significant result should be interpreted as evidence of an anticompetitive effect of the merger on potash prices.

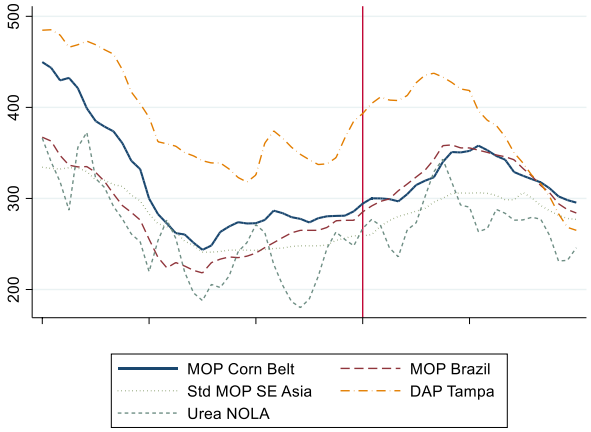

Fig. 1 Monthly Crop Nutrient Prices

Across all of these control markets, the results in Table 2 indicate that the Agrium/PotashCorp merger broadly was not associated with an increase in Corn Belt potash prices. Results are generally similar when restricting the pre-merger data sample to two years. In most cases the estimated coefficients in the smaller sample are closer to zero, although in one specification using standard MOP as the control the estimated price effect is positive and statistically significant. Again, the bulk of the evidence indicates that the merger did not lead to an anticompetitive increase in the price of potash in the Corn Belt.

Figure 2 summarizes the main results of estimating Eq. (2). It plots the estimated δ_{τ}^{T}'s: the time fixed effects for the treatment group (Corn Belt potash prices) relative to all other control groups (i.e. all other prices). The shaded area of the graph plots the 95 percent confidence interval for each estimate; it shows that—both before and after the merger—they are generally indistinguishable from zero. Thus, we cannot reject the null hypothesis of identical pre-merger trends. While the size of the pre-merger fixed effects may not be economically insignificant, averaging 5.3 percent lower, they are smaller in magnitude than the average post-merger time fixed effects, which average 9.1 percent lower.

D. Discussion

In its review of the Agrium/PotashCorp merger, the FTC had to evaluate whether a substantial increase in the concentration of North American potash capacity would hurt U.S. farmers and consumers. Ultimately, while the Federal Trade Commission required divestitures related to nitrogen and phosphate, it placed no restrictions on the firm's consolidation of 60 percent of North American potash production capacity. Especially in light of a history of export cartel behavior, this combination of potash producers may have been close to the enforcement margin. Retrospective analysis of potential price effects of the merger may be informative as to the overall effectiveness of current antitrust policy.

Table 2 Estimated merger effects relative to individual control markets

CONTROL MKT	(1) MOP Brazil	(2) Std. MOP	(3) DAP	(4) Urea
Year = 2018	− 0.152***	− 0.017	− 0.065***	− 0.096***
	(0.016)	(0.022)	(0.020)	(0.033)
Year = 2019	− 0.134***	− 0.019	0.180***	0.001
	(0.019)	(0.021)	(0.030)	(0.038)

Newey-West standard errors in parentheses

N = 60 in each specification

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

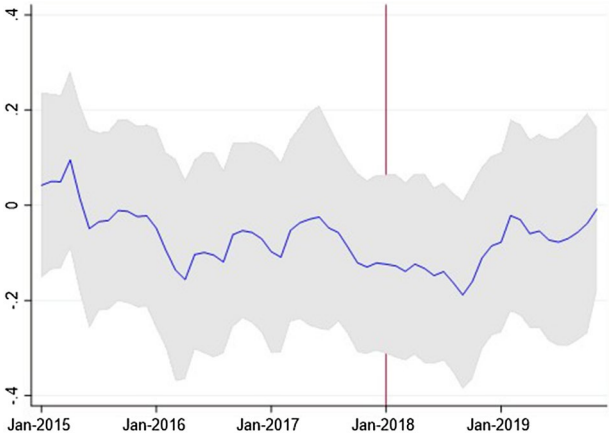

Fig. 2 Estimated Difference between Time Fixed Effects for Corn Belt MOP and Control Prices (solid line indicates the estimates of the monthly effects, and shaded area is the 95% confidence interval)

The evidence reviewed here generally does not find that the Agrium/PotashCorp raised North American potash prices. Of course, it is possible that North American potash prices would have declined anyway, due to other developments such as the ramp up of production at K + S's mine in Saskatchewan and other global capacity additions. Changes in global trade policy are yet another confounding factor for each of the treatment and control markets that are used in this study. These types of confounding factors are not unusual in the retrospective analyses that the FTC conducts.

As is common in the merger retrospective literature, this analysis studies price effects to the exclusion of other effects. One area for potential study consistent with calls to strengthen antitrust enforcement would be on the merger's labor market effects. The control variable used in this study is the average Saskatchewan wage for all mining industries. Statistics Canada publishes an average monthly wage for mining exclusive of oil and gas as well, which may be more closely correlated with potash mining wages. At the time of this study, this data series currently has numerous missing observations, but the available data indicate that this wage increased after

the merger ($42.02 per hour to $45.10) more than did overall mining wages ($41.49 to $43.57) in Saskatchewan. This is only preliminary evidence that the Agrium/PotashCorp merger did not lead to increased monopsony power in the Saskatchewan potash mining labor market. A more rigorous analysis of better data, other control variables, and alternative comparison groups may be a fruitful avenue for future research of any potential monopsony effect.

3 Consumer Complaints and Victimization

A Background

Consumer complaints are a major source of information on the marketplace for the FTC. These complaints help policymakers learn about emerging problems in the marketplace, identify companies that might be violating the law for further investigation, and provide evidence of potential wrongdoing to the Commission and the courts. Public release of information about complaints can also help make consumers aware of scams; for example, the FTC reports information on consumer complaints in regular "Data Spotlights" and a public-facing Tableau visualization page.[28]

The Consumer Sentinel Network, a massive database of consumer complaints—collects consumer complaints from many sources, including the FTC, other agencies of the federal government such as the Consumer Financial Protection Bureau (CFPB), private nonprofits such as the Better Business Bureaus (BBBs), and states' attorneys general.[29] Complaints in the Consumer Sentinel database contain self-reported information about the consumer complaining, the business that they complain about, and information about the harm that they suffered, including: their financial loss; a categorization code for the complaint; and a free form text field with the consumer's description of the incident.

The number of complaints collected in the Consumer Sentinel database has exploded over the past 20 years. This growth may be attributed to a number of factors including increased contributors, increased online reporting access, and the promotion and improvement of the complaint reporting system. Figure 3 below depicts the number of complaints per year for the entire Consumer Sentinel database as a red solid line, and for the FTC itself as a blue dashed line. The number of complaints received by Consumer Sentinel has risen from about 250,000 in 2000 to over 3 million by 2019. Similarly, the number of complaints that have been received by the FTC has increased from almost 600,000 in 2006 to 1.8 million in 2019.

The dataset does not contain demographic information for the complainant, except age information for a subset of the reports. It does contain the self-reported ZIP code for most complainants, which allows us to match complaints to local demographics in order to examine how complaint rates vary across different communities.

[28] See https://www.ftc.gov/exploredata for more details.

[29] See https://www.ftc.gov/ enforcement/consumer-sentinel-network for more details on the Consumer Sentinel Network.

Complaint rates, in fact, do vary substantially across communities with different demographic characteristics. To examine these differences, Raval (2020b) uses aggregate data on complaint rates at the ZIP code level and estimates a fractional logit regression of per capita complaint rates on splines of several demographic variables, including measures of race and ethnicity as well as socioeconomic status. Given these estimates, Raval (2020b) estimates that a 100 percent Hispanic ZIP code has, on average, a 47 percent lower per-capita complaint rate for fraud related complaints than a 0 percent Hispanic ZIP code, after controlling for other demographic and socioeconomic factors. Similarly, he found a 100 percent college educated ZIP code has a 45 percent higher complaint rate than a 0 percent college educated ZIP code.

It is tempting to infer differences in victimization from the aforementioned differences in complaint rates across communities. Consumer complaints are, however, voluntary; not all consumers complain to the FTC or the other Consumer Sentinel complaint contributors. Differences in the propensity to complain across consumers could bias any conclusions drawn from the complaints. A location with more complaints per capita could suffer more victimization; on the other hand, its residents could be more prone to complain about their problems. Thus, for example, it is not a-priori clear whether ZIP codes with more Hispanic residents face less victimization or have residents that are less prone to complain.

B. Evidence for differences in the propensity to complain

Raval (2020a) examines the issue of differences in the propensity to complain by combining data on victims in certain fraud related consumer protection cases with data on complaints from the same case from Consumer Sentinel. By combining these datasets, he is able to investigate how local community demographics correlate with the propensity to complain. Raval (2020a) includes nine cases in total, which cover different frauds involving: among others; payday loans; herbal supplements; business opportunity scams; a technical support scam; and the money transfer component of an imposter scam.[30] The total number of victims and average loss per victim also ranges widely across cases: between thousands of victims to millions of victims, and an average loss per victim of less than fifty dollars to losses in the thousands of dollars.

[30] In two payday loan related cases, the FTC alleged that companies purchased payday loan applications and used them to withdraw money from consumers' bank accounts without their consent (*Ideal Financial*) or offer them deceptively marketed credit cards (*Platinum Trust*). In the *WinFixer* case, the FTC alleged a company falsely claimed that security scans had found malware on consumers' computers, and then sold software to fix the identified problems. In the *SimplePure* case, the FTC alleged that a company marketed dietary supplements with deceptive health claims, as well as enrolling consumers in a negative option program (automatic subscription billing) without their consent. In three cases, the FTC alleged that companies deceptively offered a business opportunity or business coaching when no such opportunity existed. Finally, in the *PHLG* case, the FTC alleged that a company served as an intermediary in the transfer of money from US consumers to call centers in India operating different imposter frauds. See Appendix A of Raval (2020a) for more details of these cases.

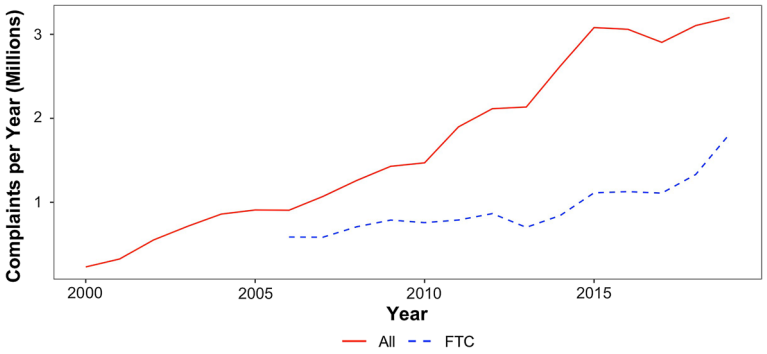

Fig. 3 Consumer sentinel complaints over time

As expected, the number of complaints is much lower than the number of victims in all nine cases. The number of complaints per 1000 victims varies from 0.35 complaints per 1000 victims to about 150 complaints per 1000 victims across the nine cases. In general, complaints are a larger fraction of victims in cases where consumers face greater monetary losses.

Raval (2020a) then examines how community complaint rates vary with community demographics after controlling for victimization using the set of consumer protection cases. The most striking finding is that residents of predominantly Black and Hispanic communities are much less likely to complain in these cases relative to how likely they are to be victims. The complaint rate falls by 61 percent relative to the victim rate as the percentage of Black residents rises from 0 percent to 100 percent, after controlling for other demographic and socioeconomic variables. Similarly, the complaint rate falls by 43 percent relative to the victim rate as the percentage of Hispanic residents rises from 0 percent to 100 percent. Raval (2020a) estimates a lower propensity to complain for predominantly Black and Hispanic communities, relative to their victimization, in most of the consumer protection cases examined separately.

C. Explanations for differences in the propensity to complain

Why are predominantly Black and Hispanic areas less likely to complain than white areas relative to the victimization that they face? In a 2016 FTC report to Congress that references some of the early findings from this line of research, several potential explanations that had been discussed by participants in workshops and conferences are introduced:[31]

[31] "Combating Fraud In African American & Latino Communities: The FTC's Comprehensive Strategic Plan", see. https://www.ftc.gov/system/files/documents/reports/combating-fraud-african-american-latino-communities-ftcs-comprehensive-strategic-plan-federal-trade/160615fraudreport.pdf.

> In the FTC's workshops and conferences, however, many have observed a general reluctance and embarrassment to report fraud. Further, despite the higher prevalence of fraud, some have stated that African American and Latino consumers may distrust the government, may not know where to complain, may believe their complaints will not make a difference, or may have concerns about encountering the government because of their immigration status.

Subsequent analysis discussed in Raval (2020a) examines several of these potential explanations. One potential explanation is differences in information: whether consumers know that they were victimized, as well as how to complain. Raval (2020a) explores this explanation by comparing cases with low dollar losses to cases with high dollar losses. When consumers lose thousands of dollars, they are much more likely to be aware of the victimization and have incentives to find out how to complain. Consistent with such incentives, complaint rates are substantially higher in cases with higher per-victim losses. Nevertheless, residents in predominantly Black and Hispanic areas continue to be less likely to complain, relative to their victimization, in these high-dollar-loss cases.

Another potential explanation is lower social trust or greater social alienation in heavily Black or Hispanic areas, which could reduce complaining because a feeling of societal exclusion reduces pro-social activity. Raval (2020a) finds some suggestive evidence in favor of lower social trust. Evidence from the General Social Survey demonstrates that Blacks and Hispanics have lower social trust than whites. On average, only 16 percent of Blacks and 17 percent of Hispanics say that one "can trust people", compared to 39 percent of non-Hispanic whites. A large body of work in marketing and sociology cited in Raval (2020a) documents greater alienation in minority areas.

One specific type of social trust issue is mistrust of the government. Raval (2020a) documents similar patterns in the propensity to complain given victimization when complaints are made to the Better Business Bureaus, which are private NGOs, as when complaints are made to government entities. He also cites similar levels of mistrust of government across race and ethnicity groups in the General Social Survey. Finally, socioeconomic status could interact with community race and ethnicity demographics if alienation is greater in poorer areas. Raval (2020a) examines this possibility through a set of interaction models and does not find evidence that the lower propensity to complain for residents of Black and Hispanic areas varies with the socioeconomic status of the area.

D. Remedies for differences in the propensity to complain

Statistical weighting can provide one remedy for issues of differential propensities to complain when interpreting self-reported data. Intuitively, complaints from areas that are less prone to complain can be given greater weight in order to examine differences in victimization. Raval (2020a) develops a set of statistical weights that are based on the estimated differences in the propensity to complain using data from the nine consumer protection cases. For example, complaints from majority Black

ZIP codes would receive, on average, about double the weight of complaints from the median ZIP code in order to compensate for a lower propensity to complain.

Raval (2020b) then uses these weights to examine differences in victimization across different communities with the use of aggregate complaint data. Unlike the statistics that were reported earlier, the weighted statistics imply that areas with few Hispanics have a similar degree of implied victimization from fraud compared to areas with almost all Hispanics, and areas with few college-educated residents have a similar degree of implied victimization compared to areas with almost all college-educated residents. On the other hand, while the aggregate fraud related complaint rate is only 7 percent higher in 100 percent Black areas compared to 0 percent Black areas, the implied victimization rate using the weights is 161 percent higher in 100 percent Black areas compared to 0 percent Black areas. Thus, after accounting for differences in the propensity to complain through weights, complaint data from Consumer Sentinel suggest that heavily Black areas suffer much greater rates of victimization from fraud.

Another potential remedy is to examine data on victimization directly. A major advantage of examining victim data is that one can include scams where consumers do not know they are victimized, and so are unlikely to complain, such as cases involving products with credence characteristics for which consumers cannot observe the quality of the good they purchase. Raval (2020c) uses data on victims from 23 consumer protection cases to do so, and confirms the finding that victimization for fraud is much greater in Black communities. Pooling across all 23 cases, victimization rates are 116 percent higher in 100 percent Black areas compared to 0 percent Black areas after controlling for other demographic and socioeconomic factors. Raval (2020c) estimates higher victimization rates for Black communities for several different types of fraud, including: payday-loan-related cases; student-debt-relief-related cases; business opportunity cases with low dollar losses; and health care (mostly dietary supplement) cases, and in most of the cases examined individually.

Finally, policymakers can try to reduce the disparities in the propensity to complain, such as by working to build access to information about the FTC and other consumer protection agencies in racially and ethnically diverse communities. As laid out in the FTC's 2016 report discussed above, FTC staff designed a comprehensive strategy to strengthen connections with Black and Hispanic communities. The agency works with trusted partners in the communities to share information and to hear first-hand about the problems that residents encounter. Since the report issued in 2016, the FTC has hosted nine Common Ground events, including panels discussing how fraud affects specific communities, and 24 state webinars that brought together law enforcement and community stakeholders and partners across the country.[32] The FTC has also conducted 17 ethnic and community media briefings, which brought together state and local law enforcement, community stakeholders, and

[32] A list of Common Ground events and Ethnic Media briefings can be found at www.consumer.gov/commonground. A list of the state webinars can be found at www.consumer.gov/statewebinars.

ethnic media to discuss fraud awareness and to encourage the reporting of scams affecting local communities.

E. Discussion

While the research described above has examined the disparities in the propensity to complain, there are several limitations of the approach taken and many questions left for further analysis. First, the consumer protection cases examined in Raval (2020a) are all related to fraud; it remains unclear whether the findings extend to other types of consumer protection complaints. For example, Raval (2020b) finds much higher rates of complaints from Black communities compared to white communities on finance topics such as bank, credit card, and debt collection issues, as well as much higher rates of complaints from Black communities compared to white communities to the CFPB compared to the FTC. These differences could reflect greater relative victimization in Black communities for finance-related consumer protection issues compared to fraud, or differences in the propensity to complain about different consumer protection concerns.

More broadly, complaints are only one form of user-generated content. Just as consumer protection agencies learn about marketplace issues through consumer complaints, consumers and producers learn about the quality of products, services, and businesses through online reviews. The quantity of online reviews has exploded in the past 20 years, just as consumer complaints have. Are residents in Black and Hispanic areas also less likely to write online reviews? And, if so, does this affect what products and services are reviewed, and the estimates of quality from those reviews?

Second, this research has only examined differences in complaints and victimization across different communities based on area-level demographics at the ZIP code level. Surveys of either complaints or victims for specific types of fraud could allow the FTC and other consumer protection agencies to learn more about whether psychological differences, such as the Big 5 personality factors,[33] as well as other explanatory variables such as financial literacy affect victimization, and how the effect of these factors varies across different consumer protection issues. Doing so might allow the FTC to develop a more detailed profile about the types of consumers who are affected by different types of consumer protection issues. In addition, with surveys, one could directly ask consumers for reasons about why they complained or failed to complain.

Finally, a major finding of this research has been that the degree of victimization varies substantially across communities. It remains unclear why this is the case, as well as what potential remedies or interventions could improve matters. One reason for differences in victimization could reflect an underlying susceptibility to a type of fraud (for example, use of payday loan services or student debt for scams

[33] The literature on personality psychology has found that five primary factors—Openness to Experience, Conscientiousness, Agreeableness, Extraversion, and Neuroticism—can explain much of differences in psychological traits across individuals and can be measured through survey questionnaires.

related to those issues, or computer use for technical support scams). Another explanation could be targeting: Many cases involve lists of likely victims that are bought by scammers to target consumers, or advertising to specific demographics. Finally, residents of particular communities might be more likely to take up a scam that they encounter; for example, they might have fewer alternative options to the purported product of the scam, or less access to institutions that warn consumers against such products. The reasons for greater victimization might then affect potential remedies, such as the type of information to provide in consumer education campaigns.

4 Modeling Procurement in Private Label Ready-to-Eat Cereal

A Background

This section discusses elements of an FTC investigation into the proposed acquisition of the private label ready-to-eat cereal business of TreeHouse Private Brands, Inc. by Post Holdings, Inc.[34] Private label (PL) cereal manufacturers make "emulations" of branded cereal varieties. Retailers procure PL cereal from manufacturers, and then sell it to final consumers under their own brand names (e.g., a Kroger-branded PL emulation of Cheerios). Some retailers carry both the branded product and its PL emulation (often side-by-side on the same shelf), while others carry only either the emulation or the brand.

In addition to Post and TreeHouse, there is one other large U.S. manufacturer of PL ready-to-eat cereal—Gilster Mary-Lee—as well as a fringe of much smaller PL cereal manufacturers. National brands are also a very important part of the breakfast cereal space. Our investigation found that branded cereal accounts for over 90% of the dollar sales of ready-to-eat cereal sold in the United States, with PL cereal accounting for the remaining less than 10%.

On December 19, 2019, the Federal Trade Commission voted 5−0 to issue an administrative complaint and to authorize staff to seek a temporary restraining order and preliminary injunction against the merger.[35,36] On January 13, 2020, the parties announced that they were abandoning the merger.[37] This section briefly lays out one important element of our analysis of the proposed transaction; the quantitative economic modeling approach that the Bureau of Economics adopted in this case to evaluate unilateral competitive effects.[38]

[34] https://www.ftc.gov/enforcement/cases-proceedings/191-0128/post-holdings-inc-matter.

[35] https://www.ftc.gov/news-events/press-releases/2019/12/ftc-alleges-post-holdings-incs-proposed-acquisition-treehouse.

[36] https://www.ftc.gov/system/files/documents/cases/d09388posttreehousecomplaint.pdf.

[37] https://www.ftc.gov/news-events/press-releases/2020/01/statement-ian-conner-director-ftc-bureau-competition-regarding.

[38] This investigation was performed with close coordination with staff from the FTC's Bureau of Competition. It was wide ranging, and included both quantitative and qualitative elements. This article discusses only the quantitative analyses.

B. Competitive effects analysis: preliminaries.

The merger would have eliminated direct competition between Post and TreeHouse to manufacture private label emulations for retailers. Competition also arises from the presence of rival PL cereal manufacturers (Gilster Mary-Lee plus the fringe) and from branded cereal (e.g., PL Cheerios compete with branded Cheerios). The key objective in this investigation, as in many merger investigations, was to determine the effect of eliminating the competitive constraint that the merging parties impose on each other, given that the other competitive constraints on them will remain in place.[39] While there is the possibility for coordinated effects after a merger, the loss of direct competition between the parties was the primary concern in this investigation, and so this article focuses on the evaluation of unilateral competitive effects. Bureau of Economics staff performed a number of quantitative analyses to predict the likely effect of the merger on prices.

One possible constraint on post-merger wholesale (procurement) prices is the fact that there is some price above which a PL cereal emulation will be removed from the retailer's shelf in favor of another product. A retailer will allocate shelf space to a PL cereal product (e.g., PL oat circles that emulate Cheerios) only if the wholesale price at which it buys the product is sufficiently low that the benefits that it receives from using that space for PL Cheerios are at least as high as those from its next-best use of that space.[40] This threshold price constitutes a ceiling on the price that the retailer will be willing to pay to any manufacturer of PL Cheerios.

One quantitative test of the likely effects of the merger on prices is to compare each PL emulation's pre-merger price with an estimate of its price ceiling. If a pre-merger price is below the ceiling, then the merger can cause that price to increase—possibly all the way up to the ceiling—without causing the retailer to remove that emulation from the shelf. But if the pre-merger PL prices are very close to the ceiling, then even a small price increase is not possible, *regardless of the competitive constraint imposed by rival PL cereal manufacturers*, as this would drive the product below the retailer's profitability threshold, which would result in removal from the retailer's shelf. While measuring the height of the price ceiling is challenging and can be done only imperfectly, the pre-merger prices were found to be well below the price ceiling, at least for the important PL cereal emulations, meaning that PL cereal prices had significant room to increase without resulting in removal from the retailer's shelf.[41]

[39] The purpose of this article is to describe the analyses that were performed by the Bureau of Economics in this case, not the claims made by the parties or by the economists that they retained, the analyses that they performed, or how BE staff responded to them.

[40] The focus is on "benefits" instead of "profits" because product-specific profits are not the only criterion that retailers use in deciding whether to stock a product. A retailer may stock some products that are less profitable than other products to which they could assign the same shelf space would be, in the interest of variety or customer convenience or some other factor that influences store-wide appeal and hence store-wide profitability.

[41] This analysis implicitly assumes that the gap between the benefits to the retailer from the least-beneficial product that it stocks and the most-beneficial product that it does not stock is small. Given the large number of products that are stocked by a typical grocery retailer, this assumption is probably valid.

C. Competitive effects analysis: merger simulation and CMCR.

Showing that pre-merger wholesale prices are well below the ceiling that is imposed by competition from the retailer's next best choice is a necessary but not a sufficient condition for showing that the merger would likely cause prices to increase. The next step was to use merger simulation models to generate a prediction of the price effects of the merger, and also to calculate the Compensating Marginal Cost Reductions (CMCRs, which will be explained below) for the merger.[42] The merger simulations and the CMCRs (and closely related analyses) were the primary quantitative economic analyses that were performed in the Post-TreeHouse case.

Merger simulation involves taking information observed in the pre-merger world (which is assumed to be in equilibrium) and using it to generate predictions about a counter-factual post-merger equilibrium. To see why this is challenging, note that according to basic economic theory, equilibrium prices are determined by demand and marginal cost. But both demand and marginal cost are *functions*: A demand function specifies the quantity that is demanded at *any* price, and the cost function yields the marginal cost for *any* quantity. These functions are not observed. Rather, a limited number of points on these functions that represent pre-merger outcomes are observed. But to make counter-factual predictions—such as predictions regarding the price effects of a merger—requires information about the entire functions. The more that is known about them, the better are the predictions likely to be; but ultimately some combination of data and theoretical assumptions is required. The assumptions adopted in the merger simulation models are discussed below.

In addition to merger simulation, CMCRs were another element of the economic analysis in this case. In recent years, CMCRs have become an important part of BE merger analysis. As the name would suggest, the CMCR is the marginal cost reduction that generates downward pricing pressure to exactly offset the upward pricing pressure that is generated by the elimination of competition between the merging firms (Werden 1996; Froeb and Werden 1998). In other words, if the merging firms' costs are reduced by the CMCRs—calculated for the appropriate model of competition, the post-merger equilibrium will be exactly the same as the pre-merger equilibrium in a merger simulation. Once calculated, the CMCRs can be compared to the

[42] As will be discussed below, a key input into the merger simulation models is the wholesale market elasticity of PL cereal. In principle, this elasticity could capture the entire quantity response to a price increase, including both reduced quantity demanded at retailers where the product remains on the shelf and also eliminated sales at retailers where the product was removed from the shelf. However, our elasticity estimate is derived from data in which the PL cereal product in question *is* on the shelf. For this reason, the price ceiling analysis discussed above was performed separately from the merger simulation analysis. The former analysis showed that the gap between the pre-merger prices and the price ceiling was large enough that the ceiling could be mostly ignored as a binding constraint, at least for the important varieties of PL cereal. That is, in most instances the price effects that were predicted by the merger simulation model can be used without modification. In those instances where the merger simulation model predicted price increases that were larger than the gap between pre-merger prices and the price ceiling, the predicted price increase would simply equal the size of the gap.

marginal cost reductions that have been deemed cognizable[43] in a separate efficiencies analysis; the cost reductions are sufficient to render the merger neutral or beneficial to consumers if they are both at least as big as the CMCRs.

Note that the evaluation of a merger's net effect based on CMCRs will be inconclusive if the cognizable cost reduction for one firm is above its CMCR and the cognizable cost reduction for the other firm is below its CMCR. Therefore, we also performed analyses of a less restrictive condition within the context of our merger simulation models. We computed the set of cost changes such that aggregate consumer welfare is maintained at the pre-merger level, but with cost reductions such that one price may increase while another price decreases, rather than both prices remaining unchanged. The results reported below include the analyses that are based on this less restrictive condition in addition to the CMCR analysis.

One major advantage of CMCR analysis is that it is remarkably parsimonious in the sense that it requires significantly fewer structural assumptions than does merger simulation. Specifically, in Bertrand and Cournot models, the CMCR can be computed without any assumptions about the specific properties of the demand curve or cost curve away from the pre-merger equilibrium. This parsimony comes at a cost: Unlike merger simulations, CMCR does not generally provide a prediction about the magnitude of a merger's effect on prices or consumer welfare. In contrast, merger simulation provides such predictions but requires assumptions about demand and cost functions, as noted above. So, too, does the analysis of cost changes that would cause post-merger prices to differ from pre-merger prices but would leave aggregate consumer surplus—but not prices—unchanged, which requires the same structural assumptions as the merger simulation models. Which of these approaches is preferred depends on the circumstances. Our analysis in the Post-TreeHouse investigation included both, but this article focuses more heavily on the CMCR results.

We now turn to a discussion of the specific models that were used in this case. Several reasonable models that are commonly used by antitrust practitioners may fit the procurement setting. These include the Bertrand price-setting model and the second-score auction (SSA) model. In this matter, BE implemented merger simulations of the Bertrand and SSA models because these models best captured the key characteristics of private label cereal competition. It would be convenient if these different models all produced very similar predicted merger effects and CMCRs, as then there would be no strong need to determine which model is the most appropriate. Unfortunately, this is not the case, and these models often generate meaningfully different results, which they did in this matter; they thus required an evaluation of which model was more appropriate. We now turn to a discussion of these models.

[43] The Horizontal Merger Guidelines (U.S. DOJ & FTC 2010) recognize cost savings as cognizable if they are achievable only via the merger, have been verified, and do not arise from anticompetitive reductions in output.

1 Differentiated Bertrand (Unilateral Effects) model

One model that was applied in this case was the differentiated products Bertrand price-setting model.[44] In the standard interpretation of this model, manufacturers set prices, and retailers decide how much to buy based on those prices. When choosing a price, a firm faces competing objectives. A higher price has the upside that the seller will get a higher price for the sales that are not lost. It also has the downside that some sales (and the associated profits) will be lost to rivals. The profit-maximizing price is the price at which these two objectives are exactly balanced: where the upside of a small price increase is exactly equal to the downside. If this were not the case, then the firm would have an incentive to change the price, which would mean that it was not the profit-maximizing price to begin with.

A merger changes this balancing. The upside of a price increase is the same as it was before; there will still be a higher price for the sales that are not lost. But the downside has changed. The same number of sales will be lost, to the same firms as before, but now one of those firms is the merger partner and not a rival. Sales "lost" to that partner are no longer truly lost, rather they and the associated profits are *recaptured* by the merger partner. Since the upside to a price increase is the same as before the merger, and the downside is smaller, the pre-merger price can no longer be the profit-maximizing price. The profit-maximizing price (absent efficiencies, about which more later) must be higher.

While the above is an accurate intuitive description of where unilateral merger effects come from in the Bertrand model, generating a quantitative prediction is more difficult. The pre-merger prices, for both the merging and the non-merging firms, are such that no firm wants to change its price given the prices of the other firms. That equilibrium reflects the demand faced by each firm, but these demands are interdependent; *each* firm's demand depends on the prices of *all* the other firms. The change in the merging firms' pricing incentives due to the recapture effect described above disrupts this complex system. The price changes at *all* of the firms that will occur are determined by the complex interplay of all of the demand and cost functions, and hence are difficult to determine. Any merger simulation model must make some assumptions to address this difficulty. The specific model that we used, and its assumptions, are discussed below.

The above description is of the standard interpretation of the Bertrand model, in which sellers set prices and buyers decide how much to buy at that price. This does not match the procurement setting for PL cereal. However, as discussed below, under an alternative interpretation of the Bertrand model as an auction model, the Bertrand model plausibly does apply.

[44] Though a given variety of PL cereal made by one manufacturer is often quite similar to that made by another, the products are differentiated both vertically in terms of quality and horizontally in terms of product attributes. This is confirmed by qualitative evidence and also by the relatively high price-cost margins for PL cereal manufacturers.

2. Second-score auction (SSA) model

A second model that may be suitable for procurement markets is the second-score auction (SSA) model, developed in Miller (2014). The SSA model is a variation on the well-known second-price auction model. In a second-price procurement auction, each seller submits a bid to the buyer. The lowest bid wins, but the price received by the seller is not its own bid, but rather the *second*-lowest bid. The SSA takes this basic structure and modifies it to account for product differentiation. This is important because when the products are differentiated, the buyer will care about both the price and the product attributes.

In the SSA, as in the more standard second-price auction, the merger has an effect when the merging sellers are the buyer's first and second choices. The merged entity will not want to compete against itself, so it submits one bid instead of two, for whichever of the two products that it owns is more attractive to the buyer.[45] That product will win, just as it would have before the merger. But now instead of receiving a price equal to the bid of the buyer's second-best option (now the merger partner), the seller will receive a price equal to the buyer's *third*-best option. The more often the merging firms had been the first- and second-best options for the buyers, and the bigger the gap between the second and third bids, the bigger is the merger effect.[46]

Using the SSA model involves many of the same technical difficulties that were described above with regard to the Bertrand model. Nevertheless, the models are significantly different, and may produce substantially different predictions of price effects.

3. Procurement model implementation

These models are relatively straightforward to implement.[47] However, they have a number of limitations, and a number of judgment calls must be made in implementing them. The discussion below of those issues will be in the context of the Bertrand model, but similar points apply to the SSA model:

[45] Alternatively, the merged entity might discontinue some of its products.

[46] The description in the text is of a single auction. However, the SSA model employed here is based on the assumption that manufacturers participate in a large number of small auctions, in which each manufacturer wins at least once (they each have a positive share) and in each of which their probability of winning the auction is determined according to the logit assumption of substitution according to share. Since the number of retailers in the U.S. that sell PL cereal is large, this seems to be a reasonable context for the SSA.

[47] One tool that can be used readily to implement these merger simulations is the "Antitrust" R Package developed by Charles Taragin and Michael Sandfort. This tool allows for calculation of the CMCR in the Bertrand model, as well as the evaluation of marginal cost efficiencies that allows one to calculate something akin to a CMCR for the SSA model that represents the change in each merged firm's marginal cost that is necessary to equate the merged firm's pre-merger and post-merger expected equilibrium prices. At the risk of abusing terminology, we refer to this as our measure of CMCR in the SSA analysis presented here, although we note that it also bears some resemblance to our analyses of efficiencies that leave aggregate consumer surplus—but not prices—unchanged in the Bertrand model. See https://cran.r-project.org/web/packages/antitrust/index.html.

Since retailers choose a single PL supplier for a given emulation, this is a discrete choice modeling problem.[48] As is common in discrete choice modeling, we assume that the functional form of demand for all firms is logit. This is convenient because logit models have a closed-form solution and so are easy to solve. The logit model has the underlying assumption that substitution patterns occur proportionally to shares. If that assumption is reasonably consistent with the facts of the case under analysis, then using a logit model is a reasonable choice. The Bertrand model employed adopts the following assumptions: (1) firms simultaneously choose linear prices; (2) demand is logit; and (3) marginal costs are constant.

These assumptions constrain the relationships among the different elements of the model. This provides a certain flexibility in the informational requirements of the model. With some necessary minimum amount of information, one can "calibrate" the values of other pieces of information: One can determine what those other pieces of information must be—under the assumption that both the inputs and the model are correct. To some extent, there is also flexibility in which elements are inputs and which are outputs.

The primary inputs into the model are prices, market shares, and price-cost margins.[49] These inputs are sufficient by themselves to generate a prediction of the price effects of the merger on the merging firms, and on all unmerged rivals as well.

When additional information is available, it can be utilized in the model. One such piece of information is a market share for the outside option. The simplest case to consider is when the share of the outside option is set to zero. But this is not reasonable, as it is tantamount to an assumption that competition from branded cereal does not matter at all. An alternative is to set the share of the outside option to be some positive value, but it is unclear what information one would use to determine that value. The extent to which competition from branded cereal constrains PL cereal prices is an empirical question better answered by the data than an assumption.

Yet another alternative is to allow the outside option share to be positive, but treat it as a calibrated output rather than an estimated input. However, in this case there was a tension between the data inputs and the assumptions of the logit-based model—specifically the assumption that products with higher margins should also have higher shares. The data were not always consistent with that relationship, and when they were not, the model rationalized this tension by calibrating outside option

[48] The retailer is assumed to stock a PL product for the emulation in question—the price ceiling that was discussed above does not bind—and the choice is assumed to consist of Post, TreeHouse, Gilster Mary-Lee, and the fringe (all of the fringe firms were combined into a single choice). One of the properties of the logit model is that it assumes that the closeness of substitution between different products in the choice set is proportional to share. A product with a large share is considered a closer competitor for all of the other products than is a product with a low share. In this case, Post and TreeHouse were likely closer substitutes for each other, and more distant substitutes for Gilster Mary-Lee, than the shares would suggest. See https://www.ftc.gov/system/files/documents/cases/d09388posttreehousecomplaint.pdf. Because of this, the models may have understated the true merger effect.

[49] This is more than the minimum amount of information that is required to run the model, so the model is over-identified. The minimum information that is required depends on the version of the model. In the simplest version only one margin is needed, and in richer versions two margins are needed.

shares below 0% or greater than 100%; this instilled little confidence in model predictions that were based on this approach.

The approach that was finally employed to allow for the possibility that branded cereal and other products impose a competitive constraint on PL cereal prices was to capture this using a wholesale market elasticity, rather than an outside option share, as the key input (along with prices, shares, and margins). The wholesale market elasticity is the percentage by which quantity demanded for all PL cereal would change in response to a one percent change in the price of all PL cereal.[50] A higher elasticity (in absolute value) means more switching from PL cereal to branded cereal in response to a PL price increase, and hence a smaller merger effect.[51]

As noted above, the relevant elasticity for this approach is the wholesale market elasticity. However, the available elasticity estimates were *retail* elasticities (e.g., if the price of the *sole* PL Cheerios product at Kroger increased by 1%, what would happen to sales of that product). To make use of this retail elasticity, it must be converted into a wholesale market elasticity.

To see how this conversion was done, note that the definition of the wholesale market elasticity is $\epsilon_w = \frac{dq}{dw}\frac{w}{q}$, where q is the quantity sold at retail, and w is the wholesale price. The retail elasticity is similarly $\epsilon_r = \frac{dq}{dp}\frac{p}{q}$ where p is the retail price. Now note that the wholesale elasticity can be re-arranged to be expressed in terms of the retail elasticity: [52]

$$\epsilon_w \equiv \frac{dq}{dw}\cdot\frac{w}{q} = \frac{dq}{dp}\frac{dp}{dw}\cdot\frac{w}{q}\cdot\frac{p}{p} = \frac{dq}{dp}\frac{p}{q}\cdot\frac{dp}{dw}\cdot\frac{w}{p} = \epsilon_r\cdot\frac{dp}{dw}\cdot\frac{w}{p}$$

This simple rearranging of terms illuminates the relationship between the wholesale market elasticity that is the required input into the model and the retail elasticity that we have. However, to apply this relationship requires information about $\frac{dp}{dw}\cdot\frac{w}{p}$. One could make one of at least two reasonable assumptions: The first is full pass-through, so that $\frac{dp}{dw} = 1$. This implies that the wholesale elasticity is equal to the retail elasticity scaled by the inverse of the retail markup, so that $\epsilon_w = \epsilon_r\cdot\frac{w}{p}$. The second is that there is a constant retail markup, so that $p = \theta w$ always holds for some constant $\theta > 1$. Under this assumption, the retail and wholesale market

[50] As discussed above, this elasticity is derived from data in which the PL cereal products in question are on the shelf, and so it does not account for the possibility that the product will be removed from the shelf in response to a small price increase. The merger simulation results represent the predicted price changes as long as they do not cause the price ceiling to bind. Because of the large gaps between the pre-merger prices and the price ceilings (at least for the important PL cereal emulations), this assumption is largely justified. But in those instances where the price increases that are predicted by the merger simulation are greater than the gap, the predicted price increase is assumed to equal the gap.

[51] Among the advantages of using the wholesale market elasticity as the key input is that it captures the effect of downstream retailer markups. Higher wholesale prices are passed through to higher retail prices, which reduces the quantity sold, dampening the incentive to increase prices. To the extent that upstream manufacturers take this into account, it will be captured by the wholesale market elasticity.

[52] A similar derivation appears in Hosken et al. (2002).

elasticities are equal: $\epsilon_w = \epsilon_r \cdot \frac{dp}{dw} \cdot \frac{w}{p} = \epsilon_r \cdot \frac{p}{w} \cdot \frac{w}{p} = \epsilon_r$. The merger simulation model was analyzed using each of these assumptions.

4. Elasticity Estimates

Since the merger simulation used the retail elasticity as a key input, it was necessary to find a reliable estimate of that elasticity. A substantial economic literature attempts to measure the price elasticity of demand for products that are sold at retail, and some of that literature is specifically about ready-to-eat cereal (though not PL cereal). The elasticity estimates from this literature vary quite widely.[53]

Based on both the qualitative and quantitative evidence that was obtained during the investigation, the judgment of BE staff was that the elasticity was likely in the lower end of this range (lower meaning lower in absolute value, so less elastic demand). However, the evidence was not sufficient to rule out higher elasticities decisively. For this reason, the full range of elasticities that had any support in the academic literature were considered. As discussed below, even for an elasticity at the high end of the range and cost savings at the high end of our range of cognizable efficiencies, the model still predicted that the merger would increase prices.

5. Procurement model discussion

An important question in the case was how much weight to give to each model. The question was especially important because the models produced different predictions, with the Bertrand model producing merger effects that were 1.5–2.5 times as large as the SSA model.

As in many procurement situations, PL breakfast cereal contracts are generally sought through requests for proposals (RFPs), in which suppliers submit price bids to retailers. This has something of the flavor of an auction, though it does not take place under formal auction rules, and further negotiation can and does occur even after the bidding. This may appear to favor the SSA model over the Bertrand model, as the standard interpretation of the Bertrand model is that sellers simply set the prices to be paid by buyers. However, it has been shown that the Bertrand model can be also be interpreted as an auction model: as a first-price auction setting with incomplete information (Einav 2003).[54] That is, Bertrand versus SSA is not a contest

[53] A well-known paper (Nevo 2001) finds a low (in absolute value) elasticity for cereal before correcting for endogeneity, and a much higher elasticity after correcting for it. Other researchers have debated whether endogeneity is present, whether it necessarily biases estimates downwards, and whether Nevo's instrumental variables approach to correcting it is valid. Matters are further complicated by the fact that cereal is a product that consumers buy in large quantities and then stockpile when it goes on sale. This may indicate a higher elasticity than would exist in response to a permanent price change. There is also one paper that uses a different, experimental approach (i.e., intentionally manipulated real-world prices in order to measure the quantity response), which found a low elasticity (Fong et al. 2011). There was also some non-public, case-specific information that appeared to support a lower elasticity estimate.

[54] In particular, if the bidders have incomplete information about their competitors' costs, the objective functions are analogous.

between a pricing model and an auction model, but rather a contest between two different auction models.

Thus, in determining which model is most appropriate for a given context, it is not correct to rule out the Bertrand model only because goods are sold via an auction. Rather, determining whether a particular RFP procurement setting is best modeled by an SSA model or a Bertrand model depends on the information structure of the market. As the context approaches a situation with complete information, the information structure more closely resembles that of the model in Miller (2014), and thus it is likely the case that the SSA model is more appropriate; as the situation approaches one of incomplete information about competitors, the information structure more closely resembles that considered in Einav (2003), who suggests that the Bertrand model is probably more appropriate. It is not obvious which model is more suitable, though both seem reasonable enough to merit receiving some weight. As will be discussed below, they produced quite different answers, but they both supported the conclusion that the merger was likely to increase prices, so we were not faced with the difficult decision of having to determine how much weight to give to each model.

This highlighted the need for further research to guide model selection in procurement markets. Several models can reasonably fit the broad industry details, but because the models can yield varied results, further research that speaks to when one model is better suited than others would be beneficial. Such research would provide further guidance on which questions need to be answered to determine the most appropriate model and what evidence points to which model. As was described above, the information structure of the games that underlie the various models is different, and so developing further empirical evidence about how well various modeling assumptions apply in different industries would also be an important contribution.

D. Efficiencies

Both Post and TreeHouse claimed that the merger would result in significant efficiencies. Post claimed that "(t)he transaction will generate significant efficiencies that will help Post to compete more aggressively by combining the complementary production and distribution networks of Post and TreeHouse, reducing costs in manufacturing, shipping, distribution, and other areas."[55] TreeHouse claimed "that the Proposed Acquisition will generate substantial merger-specific efficiencies resulting primarily from shifting production among facilities formerly owned by separate entities that will be combined into one entity."[56] At least a portion of these efficiencies, if found to be cognizable, would likely have been variable cost efficiencies, and therefore would have exerted downward pressure on prices to be weighed against the upward pricing pressure that would be caused by the elimination of competition between Post and TreeHouse.

[55] https://www.ftc.gov/system/files/documents/cases/d9388_r_post_holdings_answerpublic.pdf.
[56] https://www.ftc.gov/system/files/documents/cases/d9388_r_treehouse_answer_public.pdf.

An important focus of the investigation was to determine whether these efficiencies were in fact cognizable: that they were likely to occur, and that they were specific to the merger (i.e., would not have occurred otherwise). A detailed description of this efficiencies analysis is beyond the scope of this article, except to state that a range of marginal cost reductions was regarded as plausibly cognizable. Analysis revealed that even the high end of this range was below the low end of the range of estimated CMCRs.

E. Compensating marginal cost reduction (CMCR) and related results

We now turn to our results with regard to the net effect of the merger on prices. This could be discussed in terms of the price effects that were predicted by the merger simulation model or in terms of marginal cost reductions that would be necessary to offset the effect of lost competition.[57,58] For brevity, we focus on the latter. Since, as discussed above, absent a clear basis to conclude whether the Bertrand model or the SSA model is more appropriate, both were given some weight. In this matter, the conclusion is the same regardless of how much weight is given to each model: The top of the range of cognizable efficiencies was below the lowest estimate of the CMCRs. Had this not been the case, then the conclusion drawn from this analysis would have rested on the difficult question of how much weight to give each model.

More specifically, the CMCRs that were calculated using the Bertrand model were much higher than our highest reasonable estimate of the cognizable efficiencies. This is true regardless of what estimate is used for the retail price elasticity. The CMCRs that were calculated using the SSA model, while substantially lower, were also much higher than the highest reasonable estimate of the cognizable efficiencies given the most reasonable estimate of the retail price elasticity. The SSA model that used the retail elasticity estimate most favorable to the merger produced CMCRs that were still higher than the highest reasonable cognizable efficiencies, but it was quite close. Based on these results, the merger was deemed very likely to harm consumers, with a high chance that that harm would be large. There was a low chance that the merger would benefit consumers, and almost no chance that it would benefit them by a large amount.

F. Discussion

Broadly considered, the Post-TreeHouse case was a relatively straightforward horizontal merger case. As in many merger cases, the principal challenge in the

[57] To avoid disclosing non-public information, the magnitudes of estimated price effects or CMCRs are not reported. However, they are consistent in the sense that both the simulated price effects and the CMCRs were higher in the Bertrand model than in the SSA model.

[58] The analyses of marginal cost reductions include calculation of CMCRs, as well as the consideration of cost reductions that would leave aggregate consumer welfare unchanged by the merger as discussed above. The results of those alternative analyses were consistent with the results that are presented in the main text.

economic analysis of the Post-TreeHouse merger investigation was to compare the upward pricing pressure that would arise from the lost competition between the merging firms against the downward pricing pressure that would arise from marginal cost efficiencies. This case did present some challenges, the most important of which was to determine which model of competition was most appropriate for this specific environment, or failing that, how much weight to give to different reasonable models.

On its face, the upward pricing pressure appeared likely to be substantial, as the proposed merger was between two of only three major manufacturers of private label (PL) cereal in the United States. However, it was necessary to consider the possibility that other competitive constraints beyond those imposed by rival PL cereal manufacturers on each other may have been sufficiently strong that the competitive harm from the merger would be small. Of particular interest were the constraints imposed on PL cereal manufacturers by competition from branded cereal, and also by the fact that higher wholesale prices are passed through to higher retail prices, which reduces quantity demanded and therefore dampens the incentive to increase prices.

An important component of the analysis of the case involved estimating CMCRs, which quantify the marginal cost efficiencies that would be required to render the merger competitively neutral, and then comparing them to estimated cognizable efficiencies. The CMCRs that were calculated with the use of the Bertrand model were far above any reasonable efficiencies estimate. The CMCRs that were calculated using the second-score auction model were much lower, but were still well above the maximum reasonable efficiencies estimate that was implied by our preferred estimate of the wholesale market elasticity for PL cereal. Even with a much higher elasticity estimate, the CMCR was still above the high end of the range of reasonable efficiencies estimates—though in that case it was quite close.

Based on this analysis, in conjunction with the qualitative analysis, we concluded that the merger was likely to harm consumers—possibly by a large amount. There was a small but not trivial probability that the merger would be neutral or even that it would benefit consumers. The probability that the merger would be highly beneficial to consumers—so that blocking it would cause significant harm—was very low.

5 Conclusion

The work discussed in this article are a few examples of the important work recently conducted by economists at the FTC. Casework frequently inspires new research questions that lead staff to develop new methodologies and insights, and help to ensure that the Commission can meet its twin competition and consumer protection mandates effectively. Many of these results are also relevant for broader academic and policy debates on how to protect all members of society and how to maintain a competitive economy, which is one reason why Sect. 6(f) of the FTC Act allows the Commission's staff to distribute the results of its research widely.

As all cases are unique, and often reflect the changing nature of economic activity, research will remain central to the work of BE staff economists in the future.

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