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RETAIL MERGERS AND FOOD PRICES: EVIDENCE FROM FRANCE*

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This paper analyzes the impact of a merger in the French supermarket industry on food prices. Using consumer panel data, we compare the changes in prices for merging and rival firms in affected and comparison markets. We use a novel definition of affected markets when some firms have a local pricing strategy and others a more centralized pricing strategy. We find that prices increase significantly following the merger, and that the merging firms lose market shares. For the rivals, the price increases are larger in local markets, in which concentration increased and differentiation changed after the merger.

I. INTRODUCTION

Over the last thirty years, successive merger waves have dramatically increased food retail sector concentration in most western economies. In the U.S., in 2000, the largest five retail groups realized close to one-third of total food

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sales. In 1999, the Federal Trade Commission (FTC) reviewed and approved two of the most important supermarket mergers: Albertson's acquisition of American Stores (the second and fourth largest chains in the U.S.) and Kroger's acquisition of Fred Meyer. This second merger created the largest U.S. grocery chain and the second largest retailer in the U.S. in terms of revenue, behind Wal-Mart. Western European countries have also experienced merger waves since the 1980's, and the retail sector is highly concentrated: the highest concentration ratios are attained in the northern European countries, where the total market share of the largest three retailers (CR3) reaches up to 90%.[1]

Supermarket mergers are a particularly important issue for antitrust authorities because food expenditures represent a large share of household budget – about 13% on average in European countries for 2012, and 7% in the U.S.[2] Price variations due to a retail merger may have a large impact on consumer surplus. When reviewing retail mergers, two particular features of the retail sector, namely the local dimension of competition and buyer power, make the antitrust analysis more complex. First, because supermarkets compete at the local level, the effects of a merger have to be analyzed for each relevant local market. Second, antitrust authorities have to balance potential anticompetitive effects against efficiency gains due to synergies, as in all merger cases, but also against buyer power gains. Indeed, the merged retailer is likely to obtain better terms and conditions from its suppliers, and to pass on part of this price reduction to consumers. Increased buyer power can thus lead to a welfare-enhancing reduction in final prices: this effect is specific to the vertical structure of the retail industry and explains why competition authorities may be more prone to clear mergers in the retail industry than in other sectors. Between 1998 and 2007, the FTC approved 134 supermarket mergers out of a total of 153 cases under investigation.[3] Between 1990 and 2012, among the one hundred retail mergers proposed to the European Commission, eight were approved subject to conditions, and only two were denied.[4]

The aim of this paper is to analyze retrospectively the impact of a merger among supermarkets on food prices in France. In 1999, the second largest retail group launched a bid to take over the fifth largest retail group.[5] This merger was

[1] In 2004, the retail CR3 was 91.2% in Denmark, 79.6% in Finland, 81% in Iceland, 82% in Norway, and 91.2% in Sweden (Einarsson [2007]), while in 2003, the CR5 was 72.6% in France, 67.8% in Germany, 69.1% in Spain, 68.5% in Portugal and 63.5% in the UK.

[2] Sources: Eurostat (*http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Household_consumption_expenditure_-_national_accounts*) and USDA (*http://www.ers.usda.gov/data-products/food-expenditures.aspx#.UpMmqhCPglA*).

[3] See Table 4.2 *http://www.ftc.gov/os/2008/12/081201hsrmergerdata.pdf*.

[4] For instance, in 1997, the EC prohibited a merger between two leading food retail chains in Finland, Kesko and Tuko (see, 97/277/EC Kesko/Tuko (OJ L 110/53, 26/4/1997)). In 1999, the merger in Austria between Rewe and Meinl was allowed conditional on divestment of some stores (1999/674/EC Rewe/Meinl (OJ L 274/1, 23/10/1999)).

[5] Due to a confidentiality agreement with *TNS Worldpanel*, which provided us the data, we are not allowed to disclose the retailers' names. The ranking is based on store surface market shares. Source: *Panorama Tradedimensions*.

approved by the EC and the French Competition Authority (French CA) in the year 2000. Together, the new group had almost a 30% market share. The merging firms kept almost all their existing store locations, but rebranded two of the pre-existing retail chains. Our research question is twofold: first, we investigate what happened to prices after this approved merger. Second, we empirically assess potential economic forces behind the price changes, and we test the effect of the merger on household expenditures.

While the ideal dataset would be to have price data at the store-product level before and after the merger for all retailers and for all products sold at the stores, we have to combine two sources of data to construct the best available dataset to tackle our research question. First, we have a store panel dataset on the French retail sector (location, ownership, and characteristics of the stores) for the years 1998–2001. These data allow us to define local markets as catchment areas around the city center of each store, in order to capture the local dimension of retail competition. The other dataset we have is a consumer panel (Kantar *TNS Worldpanel*) recording, at the household product level, all consumer food purchases and prices at the stores during the same period. Given that tracking the prices of products with low sales at the store level is difficult, we choose to aggregate the data over a period of six months, and we compute a quantity-weighted price at the store-product level. This way, we account for a larger share of the food products bought in France.

In our identification strategy, we take advantage of the fact that, before the merger, the two merging firms were not operating in all local areas. Because the merger was approved at the national level, it was implemented in all local areas where merging firms were present. We estimate the post-merger changes in prices of stores in local markets affected by the merger compared to changes in prices of stores in comparison markets. We use two definitions of affected and comparison markets. First, we define the affected group as any local market that experienced a change in local concentration after the merger. This is the standard definition used in the retrospective merger evaluation literature and applied by competition authorities. Then, observing that merging firms' prices do not vary with local concentration, we consider that merging firms may have internalized the merger at a more centralized level. We thus adopt a second definition in which the affected group includes all local markets in which at least one merging firm is active. To perform this analysis, we select a sample of products that are sold before and after the merger in a large number of stores across all retail chains. Given that the pre-merger location of the merging firms is not random, we also need to control for differences in local markets that could affect prices.

Our results show a significant post-merger price increase of approximately 2% (between 1.8% and 2.4%) at the rivals' stores affected by the merger, compared to comparison rivals' stores. This price change is robust and even higher (around 2.7%) when we control for differences in the pre-merger characteristics of the affected and comparison groups. The merger is also correlated

with a 4 to 5% increase in merging firms' prices. However, the price changes at merging firms are not larger when local concentration increases, which is consistent with a model in which the merging firms set their prices at a more centralized level than their rivals. In contrast, we find that the price increases of rival firms are larger in local markets in which concentration increased and in which, due to the rebranding operations, the merger reduced the number of competing chains. Finally, we show that rival firms gain market shares post-merger.

This paper fits into a growing economic literature which attempts to evaluate *ex post* the price effect of approved mergers, in a context of some experts' stating that the U.S. antitrust policy towards horizontal mergers has been too lenient (Ashenfelter *et al*. [2014]). Historically, empirical mergers analysis goes in two main directions and there is a lively debate between the two approaches (Angrist and Pischke [2010], Nevo and Whinston [2010]). First, some papers, in the spirit of Nevo [2000], build structural models of demand and supply in order to simulate mergers using pre-merger data. Smith [2004] simulates structural changes in the U.K. supermarket industry, and finds that retail divestitures reduce prices, while mergers increase prices. A second stream of empirical research uses both pre and post-merger data on prices to directly estimate the effects of structural changes and mergers (such as Focarelli and Panetta [2003] for retail banking; Hastings [2004], Hastings and Gilbert [2005], Taylor and Hosken [2007] – all three papers in retail gasoline; Hausman and Liebtag [2007] and Basker and Noel [2009] for retail entry; Ashenfelter and Hosken [2010]; Ashenfelter *et al*. [2015] for food and non-food grocery sectors; and Ashenfelter *et al*. [2013] for the home appliance sector). Recently, Houde [2012] conducts both a retrospective analysis and a structural econometric simulation of a vertical merger in the Canadian gasoline sector, and reconciles both approaches.[6] Considering the U.S. supermarket industry, Davis [2010] examines post-merger price changes using store-level scanner data and shows that chains reduce promotions after a merger, both in terms of depth and frequency. The most closely related study to date is by Hosken *et al*. [2012], who examine the price effects of a large set of national U.S. retail chain mergers occurring over a period of time. They find geographically heterogeneous price effects. The implication of these findings is that mergers should be analyzed at the local level, as we do.

Our paper extends this stream of literature in multiple directions. First, we base this retail merger analysis on a large set of products, rather than just focusing on one product category, as is often done in the literature. The second contribution of our paper is to investigate several economic mechanisms at play behind the price responses to a retail merger. In particular, we highlight the role of store rebranding on retail prices. Third, we show that the degree of centralization in pricing decisions matters for the analysis of price effects of mergers. This dimension of pricing strategy has implications for the assessment of the price effect

[6] See also Weinberg and Hosken [2013], Weinberg [2011], or Björnerstedt and Verboven [2015].

of a merger, as shown theoretically in Allain *et al*. [2016].[7] In this paper, we show how the interaction between firms' pricing strategies drives the effect of the merger on prices: a global price increase at the merging firms may trigger a local price increase by rivals.

The paper proceeds as follows. Section II provides the background of the French retail sector and an overview of the merger case. Section III describes the data and Section IV provides a general analysis of retailers' pricing strategies. Our empirical strategy is detailed in Section V. Section VI develops the results and performs several robustness checks. Section VII then explores the effect of the merger on consumer expenditures. Finally, Section VIII concludes and discusses the policy implications of our results.

II. THE MARKET AND THE MERGER

At the end of August, 1999, the second largest retail group (henceforth $M1$) proposed a friendly take-over of the fifth largest retail group (henceforth $M2$). The EC approved the merger on January 25, 2000, on the condition that $M1$ realize some divestments. It then delegated the decision to the French and Spanish competition authorities in order to assess the impact of the merger on retail competition at the local level in the two countries where the firms had large market shares. The French CA concluded that competition was likely to be affected in 27 local areas. However, the remedies required were not all enforced by the French Ministry of Economics, and the merger received final administrative approval on May 3, 2000.

In what follows, we provide some background on the French food retail market structure and the regulatory environment in Section II(i), before giving a more detailed overview of the main facts about the merger in Section II(ii).

II(i). *Market Structure and Regulatory Framework*

In 2000, i.e., before the merger, the French retail sector was already concentrated: the total market share of the five main retail groups (CR5) was close to 73%, a rather high concentration compared to the U.K. or Germany (respectively 64 and 57%). According to the French CA estimates, in the overall retail market, the joint market share of the two merging groups, henceforth denoted $M1$ and $M2$, was 29.4%, while most of the remaining share was split between the

[7] Dobson and Waterson [2005] also developed a model of chain-store pricing where retailers can price either uniformly across local markets, or on a local basis according to market conditions. They compare the profitability of both strategies, and show that both can be optimally chosen, according to market conditions. Aguzzoni *et al*. [2016] introduce this issue in their empirical evaluation of the price effect of a merger in the book retailing sector in the U.K. They consider that *all* retailers use either a local pricing strategy or a national pricing strategy. In both cases, they conclude that the merger had no impact on prices.

largest rivals, denoted Ri, with $R1$ (15.4%), $R2$ (15.1%), $R3$ (13%), $R4$ (9.9%), $R5$ (4.1%), and $R6$ (4.0%).[8]

According to the standard categorization of stores, there are four main store formats in the French food retail sector. *Hypermarkets* are large grocery stores with a selling surface over 2,500 m^2, which sell both food and non-food products (on average, food accounts for at least one-third of their sales). They are generally located outside of the main cities. *Supermarkets* are smaller, but located closer to the city centers: their selling surfaces range from 400 to 2,500 m^2. Compared to hypermarkets, these stores offer a reduced assortment of products, and are more specialized in food products (more than two-thirds of their sales). *Convenience stores* have a selling surface below 400 m^2. Finally, *discount stores* are (usually small) supermarkets that carry a limited assortment of products, mostly sold at low prices and under private labels.[9] In 2001, food expenditures of French households were split as follows: 34.7% in hypermarkets, 29.9% in supermarkets, 8.5% at convenience stores, and 16.3% at specialized shopkeepers, such as butchers, and bakers.[10]

Two laws, the Galland Act and the Raffarin Act enacted in 1996, have had a deep effect on competition and prices, and expert reports, as well as academic papers, point out that these two laws contributed to dampening retail competition. First, the Galland Act aimed at preventing below-cost pricing. A side effect of this law was to allow for the use of price floors in the retail sector, which encouraged an increase in retail prices (see Allain and Chambolle [2011], for a study of the price-floor mechanism involved in the law).[11] Second, the Raffarin Act increased administrative control over opening or extensions of stores. Experts also claim that the Raffarin Act had a strong effect on retail competition. By limiting the 'organic' growth of retail groups, this law has triggered important merger operations that have led to an increase in retailers' market power.

In 2002 the monetary change (the French Franc disappeared as the Euro was launched on January 1, 2002) is also likely to have had an effect on retail prices.[12] In order to avoid these two sets of shocks that are orthogonal to the merger, we focus our merger analysis on the period 1998–2001. We concentrate our analysis

[8] The French CA uses Nielsen data to compute these estimates. The report also displays the joint market shares provided by the two groups: 31.2% of hypermarket sales, 22.3% of supermarket sales, 16.1% of discounts and overall 26.9% of the whole grocery retailing sales. Computing the market shares in terms of selling surface does not strongly modify these figures: in 1998, $M1$ owned 20.2% and $M2$ 10.3% of total hypermarket surface, while for supermarkets these figures are 9.8% for $M1$ and 16.4% for $M2$, and 15.1% for $M1$ among discounters.

[9] In 2000, the market share of private labels in France was around 22.1% in volume and 19.1% in value (source: Private Label Manufacturers' Association).

[10] Source: INSEE, Tableaux de l'Economie Française 2002/2003.

[11] For expert reports, see, e.g., Commission Hagelsteen [2008] or Allain *et al*. [2008] for a review.

[12] The introduction of the Euro has led to extensive discussion about its possible effect on inflation, and the economic literature points out ambiguous conclusions. Dziuda and Mastrobuoni [2009], for instance, show that, although the Euro changeover did not significantly increase inflation, it nevertheless had a distortionary effect on prices inside the Eurozone. After the changeover, cheaper goods had higher inflation, and this effect was significant in France.

on the short-term effect of the merger. This will enable us to distinguish competitive effects from the unobserved efficiency gains from reorganization that can reasonably be expected to materialize after a few years (e.g., Focarelli and Panetta [2003], Hastings [2004] or Houde [2012]). However, cost reductions due to renegotiation of supply contracts may be immediate.

II(ii). *The Merger*

The merger created the largest retail group in France, where $M1$ and $M2$ gathered around 220 hypermarkets and 1,100 supermarkets, and had a significant impact on concentration measures in the market during the period 1998–2001. According to the EC horizontal merger guidelines, a merger is likely to raise competition concerns if the post-merger Herfindhal-Hirschman Index (HHI) is above 2000, while the variation is above 150.[13] Panel A of Table I displays the evolution of the HHI before and after the merger, at the regional and national levels.[14] At each level, concentration is low enough for the merger to be approved without conditions. However, the local dimension of the retail competition calls for a local assessment of the merger. For each store, we can compute a local concentration index (HHI) using the definition of local markets explained in more detail in Section III(iii). Panel B of Table I presents the distribution of HHI's across local markets. Local concentration often appears clearly higher than the threshold recommended by the EC, and this explains why the EC referred to the French CA for an assessment of the merger at the local market level.[15]

Another important feature of this merger is that a substantial rebranding process took place among merging firms: several chains were renamed after the merger. Before the merger, $M1$ operated stores under eight chains: the hypermarket chain $M1_H$, a main supermarket chain $M1_S$ and other supermarkets, convenience stores, and hard discount chains that we bring together under a single notation $M1'$. $M2$ operated stores under seven chains: the hypermarket chain $M2_H$, a main supermarket chain $M2_S$, and $M2'$, which gathers all the remaining supermarkets and convenience store chains.

As illustrated in Figure 1, hypermarkets $M2_H$ were rebranded into $M1_H$, while supermarkets $M1_S$ were rebranded into $M2_S$. Therefore, although $M1$ acquired $M2$, the $M2_S$ supermarket chain remained active. According to the industry press,

[13] See the 'Guidelines on the Assessment of Horizontal Mergers under the Council Regulation on the Control of Concentrations between Undertakings,' 2004, III, 16.

[14] We do not have sufficient data to build the concentration measure upon real market shares. However, it is widely admitted that store sales are highly correlated with their selling area. Therefore, we base the concentration index on store surface area rather than on turnover or quantities sold; the HHI in one market area is then the sum of the squared share of total retail surface for each retail group. See also footnote 8.

[15] Note that, overall, concentration seems to have increased mostly in areas with the lowest initial concentration (the first quartile of the HHI distribution increased by 393), while the increase in the most concentrated areas is less pronounced (the third quartile increased by 187). These data gather the effects of all market changes and not only the effects of the merger on which we focus.

TABLE I
CHANGE IN MARKET CONCENTRATION BEFORE AND AFTER THE $M1 - M2$ MERGER

Panel A: Regional and National levels

	Paris	East	North	West	Central-W.	Central-E.	South-E.	South-W.	France
2000Q1	1599	1171	1261	1510	1430	1325	1498	1551	**1214**
2001Q1	2168	1242	1693	1735	1769	1683	1846	1811	**1534**
ΔHHI	+569	+71	+432	+225	+339	+358	+348	+260	**+320**

Panel B: Local market level

	p_{25}	p_{50}	p_{75}	Mean (S.E.)	Min.	Max.
2000Q1	1939	2424	3310	2939 (16)	1389	10000
2001Q1	2332	2658	3497	3180 (15)	1430	10000
ΔHHI	+393	+234	+187	+241 (5)	–	–

Notes: The table reports the Herfindahl-Hirschman Index (HHI) calculated at the retail group level three months before the merger (2000Q1) and three months after (2001Q1). In Panel A, regions are defined according to the *TNS World-panel* classification. In Panel B, local markets are delimited with the baseline definition (20/10km) used throughout the paper (see Section III(iii)). The 25^{th}, 50^{th} and 75^{th} percentiles of the distribution of the local HHIs are reported. The change in the HHI between 2000Q1 and 2001Q1 is denoted by ΔHHI. The mean of the local HHIs is computed and its standard error is reported in parentheses. For this last case, ΔHHI is computed as the average of the HHI variation observed in each local market.

this decision was motivated by a desire to keep the hypermarket and supermarket chains with the highest brand image.[16] The rebranding operations were progressively implemented by the two groups. The first rebranding of a $M2_H$ into $M1_H$ took place on May 31, 2000 and by August 2000, all the hypermarkets had been rebranded into $M1_H$. The reorganization of the supermarkets took more time (in August, 2000, only half of the rebranding of supermarkets into $M2_S$ had taken place), while the reorganization of the logistics system started at the end of 2000.[17]

Because the rebranding of stores took place gradually during the second half of 2000, this leads us to drop the data for the second half of 2000 in order to avoid issues related to transitory shocks generated by the rebranding of stores. We also choose to remove data from the first half-year of 2000 to leave data uncontaminated by a potential anticipation of the merger by the parties.

III. THE DATA

This study uses a unique dataset that combines information from three sources. We first present our dataset in Section III(i). before presenting our product and market definitions in Section III(ii). and Section III(iii).

[16] See *Libre-Service-Actualités*, October 14th, 1999, and *Libre-Service-Actualités*, November 25th, 1999.

[17] See the Online Appendix for the time-line evolution of the number of stores per chain. Note that the cost of rebranding a store is rather high, as it involves building work, changes in operation systems, and induced demand shocks. In 2000, $M1$ estimated the cost for rebranding a $M2_H$ into $M1_H$ at 75,000 to 150,000 Euros.

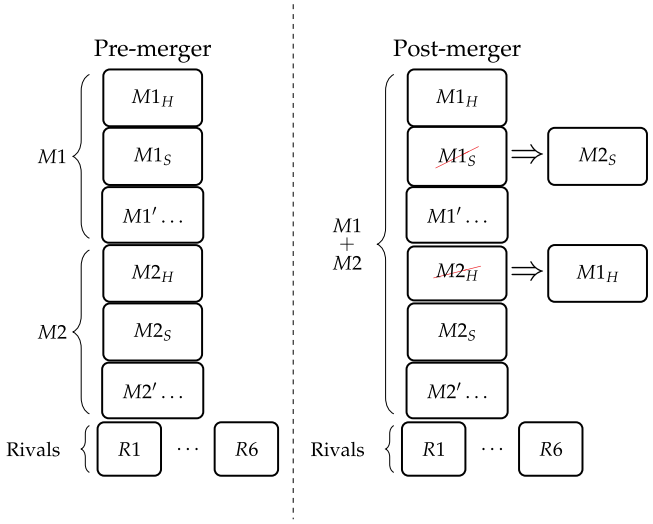


Figure 1
Rebranding Operations [Color figure can be viewed at *wileyonlinelibrary.com*]

III(i). *Data Sources*

The primary data are scanner data collected by the company *TNS Worldpanel* (Kantar Worldpanel [1998−2001]). This dataset records food purchases from a panel of households that are representative of the geographical and socio-economic group characteristics of the French population. The data contain detailed information on household characteristics, including the postcode of their home address and all their purchasing activity during the year. Purchase data are collected by the households themselves by recording all their purchases with a home scanner. Information is reported at the level of the individual food product, and for most products these data are directly scanned from the bar-code, making information available at the universal product code (UPC) level. Hence a product can be defined by up to 15 descriptive variables (such as flavor, container, and nutritional characteristics, for instance), plus the brand name and the name of the manufacturer. Otherwise, for fresh products without a barcode (often called random weight products), such as fruits, vegetables, meat or fish, information on product characteristics are reported manually into a diary.

In addition, households provide information about the shopping places where the purchases were made, by filling in the store type (e.g., hypermarket, supermarket, convenience store or specialized shop, for instance), the store size and, for retail chains, their name. For the purpose of this study, we consider the period that spans 1998 to 2001 – which corresponds to nearly 32 million food

product purchases.[18] We complement these data with information on retail store characteristics over the same time period, obtained from the *Panorama Trade-Dimensions* dataset. This dataset lists grocery retail stores that operate in France and gives information on their attributes such as store size (in square meters), format, chain name or the postcode of the city where they operate. The dataset also reports information on changes in ownership, as well as opening, extension, or closing of stores. Lastly, we collect population and average household income information from census surveys, for the same time period, to proxy for determinants of demand faced by stores at the *commune* level (the French administrative unit similar to city).

Even though the *TNS Worldpanel* home-scan data provide one of the most detailed pictures of French shopping habits for food products, the lack of information on the precise store where the product is purchased prevents us from directly matching the purchase data with the dataset on store characteristics. We recover the missing information by combining data on the household postcode, the name of the chain and the size of the store where the purchase was made in the following way: we construct an algorithm which (i) defines the set of all candidate stores of the relevant chain around the household residence, (ii) selects the store that matches the store size reported by the household, or if several stores have the same size, selects the closest one among them, and (iii), if no store meets these criteria, we increase the range around the reported surface by 200 square meters and re-run step (ii). Although it is common to observe a discrepancy between the surface reported by a household and the one recorded in the store characteristics dataset, the algorithm matches 70.78% of purchases when adopting a measurement error of the store size up to 400 square meters. Overall, 96.78% of purchase observations are matched with a store and unmatched observations are removed from the dataset. We thus obtain a store-product level dataset covering around 27 million purchases.[19]

III(ii). *Product Definition and Sample Construction*

In the *TNS Worldpanel* database, products are described by a rich set of attributes. However, the barcode of branded products is not reported, which complicates their tracking over time. To facilitate the comparison of product prices over time, we therefore create a unique identifying code for each combination of product characteristics using the whole set of attributes, except product volume and package size.[20] As a result, our definition of a product is close to the universal product

[18] A more detailed presentation of the home-scan data is given in the Online Appendix.

[19] The Online Appendix gives more detailed information about the matching procedure and also reports a sensitivity analysis that shows that choosing the closest store when several stores are candidates does not alter the results.

[20] We make the choice to aggregate the data across product volumes and package sizes in order to get more observations in the final dataset. When products are delivered in multiple package sizes or capacities, the computation of a mean price per unit of weight or volume inevitably introduces

code (UPC) definition and eliminates aggregation bias which could result from an identifier constructed at the category or brand level, for instance (henceforth, and unless otherwise specified, we use the term UPC to refer to both barcoded products and random weight products). Consequently, the finer level of aggregation is the UPC. Then, UPC's can be clustered into more than 480 categories of food products which can themselves be aggregated into 63 families of products. For instance, in the family 'Water,' there is a category of product 'Plain Water' in which we find the following UPC: 'Mineral Water, plastic bottle, still, Evian.' UPC prices are then reported in centimes of the French Francs (1 centime $\approx$ 0.0015 €or $0.0017) per measurement unit (i.e., per kg, per liter or per unit) and are deflated. To give an example of the fine grained-level of our product definition, we track the price of Danone (Dannon) plain yogurt (skimed cow's milk) without bifidus in a glass container, or the price charged for bananas from the Ivory Coast (as an example of random weight product).

We observe a large disparity in the frequency of purchases among product categories. For instance, 'plain water' represents 2.60% of the recorded purchases, whereas stock cubes amount to 0.001%. Within product categories, most of the UPC's correspond to a few observations. In fact, as is always the case with home-scanned panel data, we observe only a fraction of food sales in the population; the tracking of product prices with low sales at the store level is thus difficult. Consequently, we choose to aggregate the data over a period of six months in order to account for a larger share of the food products bought in France. For each UPC, we then compute a mean unit price per half-year through the ratio of the sales measured in Francs to the quantity purchased. Because most of the UPC/store/half-year prices are computed with a few observations–the median number of observations per UPC/store/half-year is two and only 10% of them have more than eleven observations–, we choose to exclude infrequently sold UPC's by requiring at least three purchase observations by store and by time period.[21] Furthermore, we remove the promotional prices (5.4% of the data) to limit measurement errors (see Section IV(ii)).

Finally, for the purpose of the econometric analysis, we use the purchase data consisting of all UPC's (i) for which we can easily track their prices over time within stores, (ii) that are offered in all the main chain stores and throughout the territory, and (iii) that we can compare across stores affected or not by the merger. Specifically, we impose the criterion that a store-UPC pair is observable for every period of six months. This implies, for instance, that a new product launched after the merger is excluded from the sample.[22] We also require

measurement error. However, only a small number of products are subject to this bias in the final dataset.

[21] An obvious but noteworthy caveat is that our results may not carry across to the infrequently purchased items that are excluded from the analysis.

[22] Though analyzing the effect of the merger on product variety is outside the scope of this paper, we check how much change there is in the UPC's offered by the merging firms after the merger. In line with the theoretical literature on this topic (see, e.g., Inderst and Shaffer [2007]), we find

that each selected product is sold in all the main retail chains and in every region defined by *TNS Worldpanel* (eight in total). This last condition *de facto* excludes from our analysis private labels that are by definition sold only by one chain.

III(iii). *Local Market Definition*

To assess the price effect of the merger, we first define the relevant market for each store. We base our definition of local competition on the *catchment area* of each store, i.e., the area from which most of the customers originate. Hence, the set of competitors for a store will be defined as the set of stores located in its *catchment area*.

The French CA assumed in this particular merger case that, on average, consumers are willing to drive up to 30 minutes to reach a hypermarket, while they drive 10 to 15 minutes to reach a supermarket or a discount store.[23] Furthermore, it is generally agreed that hypermarkets have a larger catchment area than supermarkets. In line with the position of the French CA, and converting driving time into kilometric distance, we define, for each store, a catchment area centered around the center of the city in which the store is located that spans up to 20km and includes all the stores (hypermarkets, supermarkets, convenience stores, discounts) within 10km, and only hypermarkets between 10 and 20km. A given store i is thus assumed to compete with all the stores contained in its catchment area, that is, all the hypermarkets located in the cities whose center is within a circle of 20 kilometer radius around the center of the city in which store i is located, and all the stores located in the cities whose center is within a circle of 10 kilometer radius around the center of store i's city.[24]

Figure 2 illustrates our city-centric definition of catchment areas for the case of stores located in Rennes (the largest city in the Brittany region). The figure plots the borders of the city of Rennes and of the surrounding cities. Several retail chains operate in Rennes ($M1_H$, $M1_S$, $M1'$, $R1_S$, $R1_H$, $R2_H$, $R4_S$, $R6_S$, $R7_S$) and are not reported to make the figure clearer. The area within 10km from the center of Rennes is colored dark grey; it includes all the cities whose center is less than 10km away from the center of Rennes. Similarly, the area between 10km and 20km around the center of Rennes is colored light grey. As observed, only one hypermarket ($R6_H$) is present in the light grey area. In other words, the

that the merging firms reduced the number of UPC's offered by10.6%. This figure probably partly reflects the loss of $M2$ private labels after the merger, whereas rival firms increased their assortment by 3.5%.

[23] In other retail merger cases, such as the Rewe/Billa and Rewe/Meinl decisions, the EC states that: 'These local markets can be defined as a circle with a radius of approximately 20 minutes by car centered on the individual sales outlet.'

[24] Because the distance traveled for a given driving-time varies according to geographical features and urbanization, we test other definitions of local markets in the robustness section.

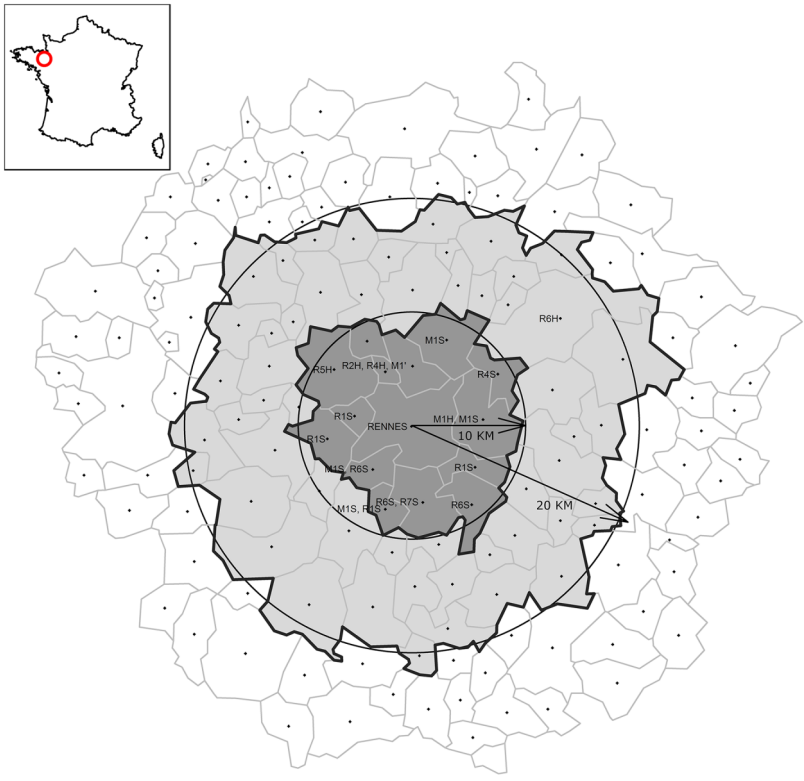


Figure 2
An Example of Store's Catchment Area: The Case of Stores Located in Rennes

Notes: The figure depicts the delineation of the catchment area of stores located in the city of Rennes. The area is composed of all the cities whose center is within a radius of 30km around the center of Rennes. For each city, we draw the borders of the *commune* and we represent its center with a dot. For cities with a large grocery store, we detail the retail chain and the store format. To make the figure clearer, we do not report the retail chains that operate in Rennes. These retail chains are: $M1_H$, $M1_S$, $M1'$, $R1_S$, $R1_H$, $R2_H$, $R4_S$, $R6_S$, $R7_S$. Stores located in Rennes are competitors as well as all the stores located in cities whose center is within a 10km radius around the center of Rennes (colored dark grey) and with all the hypermarkets located in cities whose center is within a 20km radius (colored light grey). Note that there is only one hypermarket ($R6_H$) between 10km and 20km. [Color figure can be viewed at *wileyonlinelibrary.com*]

set of local competitors of the stores located in Rennes consists of $R6_H$ and all the other stores within the dark grey area.[25]

[25] This city-centric approach could be equivalent to a store-centric definition if and only if stores were located in the center of their city. When a store is located in a small city, our city-centric definition of catchment areas is closer to a store-centric definition. The largest cities such as Paris, Lyon and Marseille are divided into districts, each having a proper postcode, and we then apply a district-centric approach. However, we agree that having precise information on stores' address and using a store-centric definition would be preferable for stores located on the outskirts of 'middle-size' cities (such as Rennes).

Note that our market definition assumes symmetric substitutability between formats: if larger stores (i.e., hypermarkets) are viewed by consumers as credible substitutes for other store formats, then smaller formats also exert some competitive pressure (though less intensely) on larger stores. As shown by several studies (see, e.g., Cleeren *et al*. [2010], Haucap *et al*. [2013], Maican and Orth [2015], Turolla [2016]), discount stores, and to a lesser extent supermarkets, are serious rivals for hypermarkets. This approach contrasts with the definition used by the French CA, which considers an asymmetric substitutability between hypermarkets and other formats: hypermarkets and other stores are supposed to constitute separate markets, but hypermarkets located within 15 minutes driving-time around household residences might be considered as 'local' substitutes for supermarkets and discounters. We refer the reader to the robustness section where we discuss in greater detail the sensitivity of the results when adopting one or the other of these definitions.

IV. RETAIL CHAINS' PRICING STRATEGIES

This section presents some general features of the retailers' pricing strategies based on what we observe in the data, such as the price positioning of the main retail chains (Section IV(i)) of the merging firms and retailers' promotional strategies (Section IV(ii)). Finally, we analyze how prices vary with local market conditions (Section IV(iii)). Understanding these strategies is key in the subsequent analysis.

IV(i). *Price Positioning of the Merging Firms*

The merger between $M1$ and $M2$ was motivated by strong complementarities, both at the geographical level and due to the price positioning of their chains. To illustrate this last point, we plot in Figure 3 the price level of the merging chains over the period 1998–2001. Each line corresponds to a quarterly price index computed for the main retail chains of the merging firms ($M1_H$, $M1_S$, $M2_H$, $M2_S$). For convenience, we keep the pre-merger chain name of the rebranded stores throughout the period, so as to compare the price evolution of the rebranded and non-rebranded stores after the merger.[26] In order to cover a large share of food purchases, we use a broader definition of 'a product' (i.e., a UPC) than in the rest of the article to compute the price indices. Specifically, an item is defined at the product category level (e.g., yogurts, crackers, veal to roast, bananas). The formulation of the price index is based on a weighted average of mean prices, where the mean prices of the product categories are weighted by their average share in consumer expenditures.

[26] We do not report the price indices of rivals as they clutter up the figure but, except $R4$ and $R5$, all the rivals have a lower price index than the hypermarkets of the merging group over the same period.

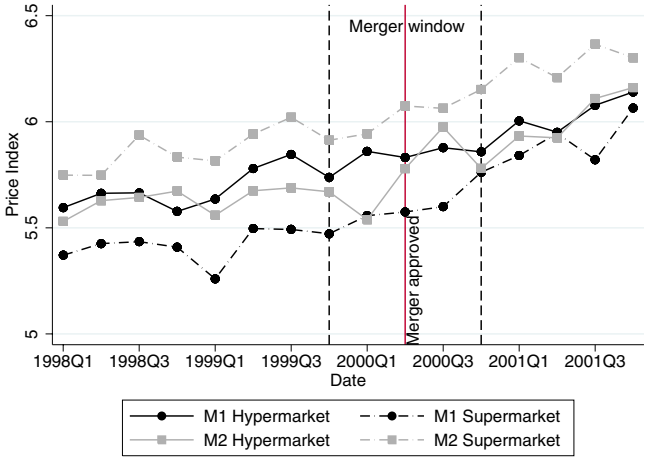


Figure 3
Price Indices by Retail Chain of the Merging Firms

Notes: This figure plots the price trends of $M1$ and $M2$ hypermarket and supermarket chains during the pre- and post-merger period. Each line corresponds to a quarterly price index of a chain, computed as a weighted average of mean prices, where the mean prices of the product categories are weighted by their average share in consumer expenditures. Specifically, for a product category k, sold in retail chain c at period t, the mean price is computed as $\hat{p}_{kct} = \sum_i p_{ikct} q_{ikct} / \sum_i q_{ikct}$, where p_{ikct} is the price of the $i - th$ observation of the product category k, sold in retail chain c at period t, and q_{ikct} is the quantity purchased. Then the price index for retail chain c at period t is computed as a weighted average $\tilde{p}_{ct} = \sum_k \hat{p}_{kct} \omega_k$, where the weight for each product category ω_k is calculated based on the share of the product category k in the total expenditure. We impose two selection criteria on product categories: a time-continuity of purchases over the pre-merger period and at least 10 observations per retail chain and per period of time. These two criteria limit the sample to 150 product categories. [Color figure can be viewed at *wileyonlinelibrary.com*]

As observed, $M1$ holds a low-price supermarket chain, whereas $M2$ operates a supermarket chain with a higher price positioning. The price positioning is reversed for the hypermarkets between the two groups, and the price gap is less pronounced. These features led the merging groups to conduct important rebranding operations after the merger. In particular, they kept the hypermarket and supermarket chains with the highest price positioning. Interestingly, we can observe in Figure 3 that the merging firms do not maintain the price differences between the chains after the rebranding. At first sight, the price gap between the rebranded stores and the non-rebranded stores has shrunk. This suggests that the rebranding operations might have a significant impact on prices in the post-merger period.

IV(ii). *Promotions*

All the major French retailers carry out promotional operations throughout the year. In Table II, we display the average percentage of promotional purchases by

TABLE II
SUMMARY STATISTICS ON PROMOTIONS

	Pre-merger period		Post-merger period		T-test	
Retail chain	Mean	S.E.	Mean	S.E.	t-stat	(p-value)
$M1_H$	0.0682	(0.0004)	0.0535	(0.0005)	−21.4788	(0.0000)
$M2_S$	0.0564	(0.0006)	0.0420	(0.0006)	−16.5529	(0.0000)
R_1	0.0428	(0.0003)	0.0403	(0.0004)	−4.8043	(0.0000)
R_2	0.0570	(0.0003)	0.0559	(0.0004)	−1.9964	(0.0000)
R_3	0.0735	(0.0005)	0.0659	(0.0007)	−8.7711	(0.0000)
R_4	0.0483	(0.0009)	0.0372	(0.0012)	−7.0390	(0.0000)
R_5	0.0793	(0.0008)	0.0593	(0.0011)	−14.1431	(0.0000)
R_6	0.0652	(0.0005)	0.0535	(0.0007)	−13.3592	(0.0000)
# six months period	4		2			

Notes: The reported means correspond to the average percentage of promotional purchases by retail chain for the pre- and post-merger period. S. E. corresponds to standard errors. The T-test columns give the t-statistic and the p-value of the mean equality test between the pre- and post-merger period. Data for the year 2000 are removed (i.e., event windows).

retail chain for the pre and post-merger period, as reported by the panelists. This table highlights no significant difference in the promotional strategy of firms: for each retail chain, the average number of promotions is not statistically different in the post or pre-merger period.

However, we have serious concerns about the quality of the data on promotions, as consumers do not report the type of promotions precisely enough. Retailers use a wide variety of promotional supports, such as coupons, bundles, fidelity rebates and price discounts, among others. The system used to collect data (homescan) does not enable the panelists to report the whole variety of promotions – some limited information is included in the barcode, but open questions seem poorly answered. As a consequence, we choose to remove all purchases reported as 'promotions' from our sample. Note that our results are robust if we keep these promotional purchases in the sample.[27]

IV(iii). *Prices and Local Market Characteristics*

Using our store-product dataset, we present stylized facts on the pricing strategies implemented by both the merging firms and rivals during the pre and post-merger periods. The purpose is to assess to what extent prices are set with regard to local market characteristics; an important pre-requisite before estimating the effect of the merger on prices is to understand how retailers set prices as a function of local demand characteristics (population, average income) and observable proxies of local competition.[28]

[27] The results of the regressions on the sample including promotions are available upon request.

[28] Numerous papers devoted to the analysis of the grocery retailing sector have highlighted that, irrespective of global concentration ratios, on average, final prices are related to local competitive conditions (e.g., Asplund and Friberg [2002], Barros *et al*. [2006], Biscourp *et al*. [2013], Turolla [2016]). In recent years, the French CA has expressed the view that retailers benefit from weak local competitive conditions and exert significant market power in local markets (see Competition Authority [2007]).

As detailed in Section III(iii), we define each store's catchment area according to our baseline definition (20/10km distance bounds). Concentration in local markets is measured by the HHI computation based on selling surfaces at the retail group level. Note that each retail group is composed of several retail chains, each owning several stores. Controlling for unobserved components at the product and retail chain levels, we relate prices to local market conditions (e.g., income, population, or concentration level). The facts are presented in Table III. From Column (1) to (3), we gradually introduce distinct factors of local conditions: concentration (HHI), log of market income, and log of market population, while controlling for store size as well as time, retail chain, and product fixed effects. In line with the aforementioned studies, we find a positive correlation between local concentration (HHI) and prices during the pre-merger period that is statistically significant, although not very intense. Indeed, a monopoly retailer would raise prices by slightly more than 1%. In Column (4), we control for unobserved product-time specific factors that can affect prices without changing the correlation effects. We then investigate in the specification presented in Column (5) whether pricing strategies differ among retailers by interacting the HHI with merging firms' dummy variables (decomposed between $M1$ and $M2$) and rivals. We obtain a statistically significant point estimate for the rivals ('HHI x Rival'), but while similar in magnitude, a non statistically significant point estimate for the merging firms ('HHI x $M1$' and 'HHI x $M2$'). Nevertheless, we find as before that the effect of local concentration on prices are small. A one standard deviation change of local concentration would change rivals' prices by less than 0.13%, for instance. These price patterns reflect elements of regional/national pricing strategy probably at all of the firms, but more pronounced at the merging firms. Finally, we replicate in Column (6) the analysis conducted in Column (5), but after the merger. Once again, the new merged entity prices are not statistically significantly correlated with local HHI (an insignificant point estimate of 0.0073), whereas the rivals' prices are slightly positively correlated with local HHI (a positive and significant point estimate of 0.0097).

In a more extreme case, in the U.K., retailers adopt a uniform pricing strategy at the national level.[29] In France, retailers do not use such a national pricing policy. However, two organizational structures exist among the largest retailers: *integrated* groups which operate either directly through company owned stores, or through franchised entities, and *independent* groups which gather shopkeepers supplied by a common buying group managed cooperatively by its members. Decisions, and in particular pricing strategies, are more centralized for integrated groups than for independent groups. Yet, as we show in Section VI(ii), the impact of a merger on prices also relies on the choice (and diversity) of the retailers'

[29] In 2004, the main retail chains in the U.K., Tesco, ASDA, Sainsbury's, and Morrison's, made a public commitment to uniform national pricing in the newspapers. For instance, ASDA stated that 'ASDA pricing does not discriminate by geography, store size or level of affluence – we have one ASDA price across the entire country.'

TABLE III
REGRESSION OF PRICES ON LOCAL MARKET CONCENTRATION

Dependent variable: (log) of mean price (by half-year)						
	Pre-merger period					Post-merger period
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Store size (m^2/1000)	0.0002	−0.0000	−0.0001	−0.0002	−0.0002	0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
log(market income)		0.0350***	0.0265***	0.0262***	0.0262***	0.0236***
		(0.0019)	(0.0022)	(0.0022)	(0.0022)	(0.0024)
log(market population)			0.0014***	0.0014***	0.0014***	0.0015***
			(0.0002)	(0.0002)	(0.0002)	(0.0003)
HHI (/10000)	−0.0106***	0.0015	0.0098***	0.0102***		
	(0.0025)	(0.0025)	(0.0028)	(0.0028)		
HHI $\times M1$					0.0070	
					(0.0051)	
HHI $\times M2$					0.0134	
					(0.0096)	
HHI × Merging Firm						0.0073
						(0.0049)
HHI × Rival					0.0103***	0.0097***
					(0.0031)	(0.0030)
Chain store FE	Yes	Yes	Yes	Yes	Yes	Yes
Half-year FE	Yes	Yes	Yes	No	No	No
Product FE	Yes	Yes	Yes	No	No	No
Product-Half-year FE	No	No	No	Yes	Yes	Yes
R^2	0.978	0.978	0.978	0.981	0.981	0.981
Observations	8909340	8909340	8909340	8909340	8909340	3456648

Notes: Data for the pre-merger period correspond to prices collected between January 1998 and June 2000, and between January 2001 and December 2001 for the post-merger period. Prices are expressed in centimes of French Francs (one centime equals 1/100 French franc) per measurement unit (i.e., liter, Kg or unit). Promotional prices are excluded from the computation of average prices. The *market income* variable corresponds to the mean household income calculated over the set of cities that belong to the catchment area of a given store. The *market population* variable is computed as the sum of inhabitants in 1999 living in cities that belong to the catchment area of a given store. The standard errors, shown in parentheses, are clustered by store. *, **, *** indicate significance at the 10%, 5%, 1% level, respectively.

pricing strategies. These insights help us interpret the empirical results in Section VI(ii).

V. EMPIRICAL STRATEGY

Our goal is to estimate the price changes for the merging and rival firms at the time of the merger. A straightforward way to measure these price changes would consist of comparing the mean changes in prices, i.e., the average differences between pre and post-merger prices, for stores affected by the merger, to the potential mean changes that those stores would have experienced if they had not been affected by the merger. Because it is not possible to observe how prices would have changed absent the merger, we construct a counterfactual group that reflects as closely as possible how stores would have reacted in the absence of the merger. We take advantage of the quasi-experimental setting observed at the local level. Before the merger, the merging firms were not operating in all local

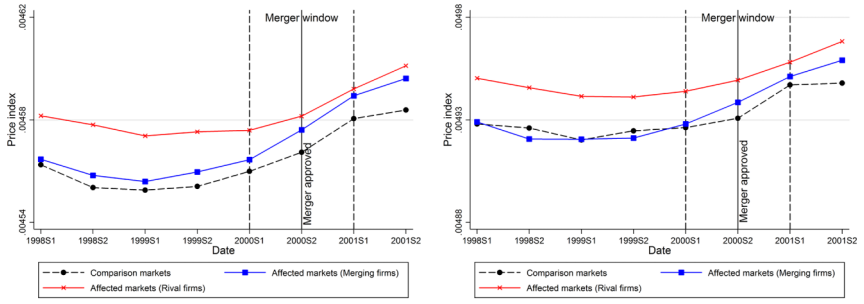
markets (see Table III in the Online Appendix); thus the merger did not have a direct impact on local competition in all markets. We are therefore able to estimate the effect of the merger on food prices by comparing price changes in local markets affected by the merger (affected markets) to price changes in local markets unaffected by the merger (comparison markets). The key identifying assumption is that, absent the merger, the prices would have evolved identically between the two groups. Section V(i) presents two definitions of affected and comparison groups and Section V(ii) highlights summary statistics for these groups for each definition.

V(i). *Definition of Affected and Comparison Markets*

The spatial dimension of retail competition makes it particularly difficult to draw the line between affected and comparison markets. In what follows, we consider two definitions of affected groups.

- *Definition 1*. Affected markets are those in which the merger affected the market structure, i.e., caused a change in the local concentration. This definition is in line with the literature on *ex post* evaluation of mergers (e.g., Houde [2012]). Indeed, competition authorities generally consider that markets affected by a merger are those in which the HHI varies. A change in local concentration arises in local markets in which, before the merger, both merging firms ($M1$ and $M2$) were active. The affected group is thus defined as all stores belonging to a local market in which at least one store among ($M1_H$, $M1_S$, and $M1'$) *and* one store among ($M2_H$, $M2_S$, and $M2'$) were active before the merger. For instance, consider a market that had only $M1_S$ and *Ri*. This market is not affected by the merger because there is no change in market concentration, given that only one of the merging parties was present in the pre period. Therefore, under Definition 1, this is a comparison market. As a result, there are both merging firms and rivals in the comparison group markets under Definition 1.
- *Definition 2*. The affected group is defined as all stores belonging to a local market in which at least one merging firm – that is, at least one store among ($M1_H$, $M1_S$, and $M1'$) *or* one store among ($M2_H$, $M2_S$, and $M2'$) – is active during the pre-merger period. In the previous example, the market is now considered as affected by the merger, because $M1_S$ was active pre-merger. Therefore, under Definition 2, there are no merging firm in the comparison groups' markets.

Despite this clear definition of affected and comparison groups, a store owned by a rival, say $R1$, may belong simultaneously to the catchment area of a store included in the affected group, say $R2$, which competes with $M1_S$ and $M2_S$, and to the catchment area of a store included in the comparison group, say $R3$, which does not compete with any of the merging firms. To leave the comparison group uncontaminated by indirect effects of the merger, we exclude from it all stores



(a) Definition 1 (b) Definition 2

Figure 4
Price Trends in Affected and Comparison Markets

Notes: This figure provides a graphical illustration of the evolution of both merging firms' and rivals' prices in the affected and comparison groups for the two definitions of affected markets. In Definition 1, a market is affected by the merger if there is at least one firm from $M1$ *and* one firm from $M2$, whereas in Definition 2, a market is affected by the merger if there is at least one firm from $M1$ *or* one firm from $M2$. For each group, the price index is calculated as an average of the weighted mean prices of the UPC's, where a weight corresponds to the share of the UPC in total expenditure (before any product selection). [Color figure can be viewed at *wileyonlinelibrary.com*]

whose catchment area includes a rival such as $R1$. Indeed, these stores are likely to be indirectly affected through their competitive interaction with the rival that also belongs to the affected catchment area.[30]

V(ii). *Empirical Facts on Affected and Comparison Markets*

This section explores whether the affected and comparison markets defined above present structural differences for which we should control. We first check that there are no significant differences in the pre-merger price trends. We then discuss how the definition of the affected markets affects the composition of the product sample. For each definition, we provide summary statistics on local market characteristics.

Price Trends. We check that there are no differences in pre-existing price trends for the affected and comparison markets in our product sample. Figure 4 presents, for both Definitions 1 and 2, the time patterns of average (log) prices for merging firms and rivals belonging to the affected and comparison groups, where prices are computed as a weighted average over UPC's. We first observe no substantial difference in the price trends between the affected and comparison groups in the

[30] This happens for 68 stores under Definition 1 and 22 stores under Definition 2; we exclude those stores from the comparison group sample. For a discussion of the definition of the control and treatment groups when seemingly distant entities may be affected through indirect channels, see Choné and Linnemer [2012].

pre-merger period, suggesting that the two groups of stores share broadly similar price patterns in the pre-merger period. Looking at the post-merger period, it appears that the merger coincides with a larger price increase for the affected group than for the comparison group. However, Figure 4 presents raw price trends, and does not control for any factors that could be correlated with prices. In the econometric analysis that follows, we control for such factors so as to isolate the direct effect of the merger on prices 'all else being equal'.

Composition of the Product Samples. The definition of the affected and comparison groups affects the selection of the product sample (see Section III(ii)). We identify 206 UPC's for Definition 1 and 183 UPC's for Definition 2. Over the 480 product categories present in the raw data, 76 are represented in the product sample for both definitions. All the major product families are included: meat (7.1% and 7.5% of the observations for Definition 1 and 2, respectively), dry grocery (22.4% and 22.0%), fruits (6.1% for both), vegetables (1.5%), dairy products (25.1%), beverages (22.5%), and so on. On average, a UPC is sold in 88 stores with Definition 1 (*versus* 96 with Definition 2) and a store offers 12 UPC's regardless of the definition. Overall, our selection of UPC's covers 18.2% (*versus* 17.2%) of household expenditures recorded in the *TNS Worldpanel* database.[31]

While limiting the number of products creates a risk that we will measure only part of the effect of the merger, our comparison of price changes of identical products across stores avoids any sample composition effect that would biase our estimates.

To sum up, the dataset used in this study is an unbalanced panel covering the period 1998 to 2001. For Definition 1, the dataset includes 206 UPC's sold in 1,219 stores; for definition 2, it includes 183 UPC's sold in 1266 stores. The information is aggregated per six-month period. The unit of observation in our analysis is the mean price of a product, computed as a quantity-weighted price, sold in a given store during a six-month period.

Local Market Characteristics. Table IV presents summary statistics on the affected and comparison markets for both definitions. Note first that the merging firms tend to be underrepresented in the comparison group under Definition 1, while they all are in the affected group under Definition 2. This table shows that markets in the affected and comparison groups differ with respect to several dimensions. The number of stores and average store size are larger in the affected group than in the comparison group, though the difference is smaller under Definition 1. The two groups also differ in their local market characteristics (revenue, population). Under both definitions, on average, the stores in the comparison group are located in areas that are less populated and poorer than those in the affected group. The HHI is also higher on average in the comparison

[31] In the Online Appendix, we provide the lists of the 206 and 183 UPC's, as well as descriptive statistics on the composition of the product samples.

TABLE IV
SUMMARY STATISTICS FOR AFFECTED AND COMPARISON MARKETS

	Affected markets			Comparison markets		
	All stores	Merging firms	Rivals	All stores	Merging firms	Rivals
A. Definition 1						
Average Population (in 1999)	1228014	1408735	1148189	54519	41313	56518
Yearly average income per household	14788	14877	14749	12756	12418	12795
Average HHI	2130	2184	2106	3526	3905	3470
Number of stores observed	643	197	446	576	76	500
Average store size (in m^2)	4488	6158	3751	2544	2587	2539
B. Definition 2						
Average Population (in 1999)	729901	952710	647317	–	–	42839
Yearly average income per household	13965	14106	13913	–	–	12785
Average HHI	2564	2699	2514	–	–	4195
Number of stores observed	1102	298	804	–	–	164
Average store size (in m^2)	3846	5214	3339	–	–	2227

Notes: The table reports summary statistics on stores and local market characteristics. We report in Panel A the statistics for Definition 1 and in Panel B the statistics for Definition 2. In Definition 1, a market is affected by the merger if there is at least one store from $M1$ *and* one store from $M2$, whereas in Definition 2 a market is affected by the merger if there is at least one store from $M1$ *or* one store from $M2$.

group; a possible explanation is that the density of stores is lower in these less populated areas.

Clearly, stores of the two groups face different competitive and demand environments, and we cannot assume that being assigned to an affected or a comparison market is orthogonal to all other factors that influence retailer prices. In our setting, given that the merger is decided by the merging firms, the fact that a market is considered affected by the merger is based on the predetermined location of the merging firms. Therefore, a concern is that locations of retailers are endogenous and thus retailers that merge may be present in areas that are very different from the areas where the merging retailers are not located. For instance, retailers that offered low quality items are more likely to locate in isolated, low-income markets, while other retailers may prefer to operate in more concentrated and wealthier markets. To account for such selection bias, we estimate the price effect of the merger using a set of covariates that control for the observed disparities between affected and comparison markets.

VI. PRICE EFFECTS OF THE MERGER

Section VI(i) first presents a simple before and after analysis of the merger effect on prices of the merging firms and their rivals. Section VI(ii). then reports our estimation of the direct price effect of the merger using our Definitions 1 and 2 of affected and comparison markets. We test the robustness of the results to various definitions of catchment areas and to other matching methods in Section VI(iii). Section VI(iv) analyses the economic forces underlying the price effect

of the merger by assessing the effects of the rebranding strategy of the merging firms.

VI(i). *Before and After Analysis*

We first estimate a simple comparison of prices before and after the merger, i.e., a time difference estimate. This estimate is done for all markets without distinction between affected and comparison markets. We estimate the following regression with OLS using store-product level (log) prices as the dependent variable:

$$\ln P_{ijt} = \alpha_1 + \alpha_2 PostMerger_t \times Rival_i + \alpha_3 PostMerger_t \times MergingFirm_i + \delta' \mathbf{Z}_{it} + \mu_i + \tau_j + \varepsilon_{ijt} \quad (1)$$

where P_{ijt} denotes the average price (in centimes of Francs) charged by the i-*th* store, for product j during the half-year t, and $PostMerger_t$ is a dummy variable that identifies the post-merger period. The dummy variable $Rival_i$ takes the value one if store i belongs to a rival, while the dummy variable $MergingFirm_i$, takes the value one if store i belongs to a merging firm. The regression also includes time-variant catchment area attributes of stores $\mathbf{Z}_{it}$ (e.g., local market income) that control for time-varying, market-specific effects (e.g., local demand shocks), as well as store and product fixed-effects (μ and τ, respectively).

Table V displays the results of our estimates. We find that prices increased after the merger for both the merging firms and the rivals. Column (1) shows that prices increased by 4.76% on average at merging firms' stores, while they have increased by 7.37% on average at rivals' stores.[32] Breaking up the before and after comparison by the chains of the merging firms, Column (2) points out that the price increase at the merging firms is more striking for the hypermarket chains $M1_H$ and $M2_H$ (around 5% and 5.5% respectively). As for the supermarkets, prices increased significantly at $M2_S$ but not at $M1_S$.

In the early 2000's, other European countries experienced retail price increases due to the rise in commodity prices and other macro shocks such as the mad cow crisis. Using Eurostat data on food and beverages prices, we observe that retail prices rose by 2.73% in Germany between 1998 and 2001, 3.59% in the U.K., and 6.26% on average for the Eurozone.[33] However, France ranks third in the EU, with a price increase of 8.04%. This significant rise suggests that the price increase observed in France during the post-merger period is mostly due to national shocks, and is thus likely to be partly driven by the merger. These preliminary results corroborate the theory that, absent efficiency gains, the primary effect of a merger should be correlated with a price increase.

[32] While not reported, a specification without fixed effects has an R^2 of 0,005. This means that the fixed effects contribute about 99.3% of the explained variation in log prices.

[33] Sources: Eurostat, harmonized index of consumer prices (teicp010) (*http://ec.europa.eu/eurostat/data/database*).

TABLE V
BEFORE AND AFTER PRICE COMPARISONS ESTIMATES

Dependent variable: (log) price (P_{ijt})		
Variable	(1)	(2)
PostMerger × Rival	0.0737***	0.0731***
	(0.0048)	(0.0049)
PostMerger × Merging Firm	0.0476***	
	(0.0056)	
PostMerger × $M1_H$		0.0495***
		(0.0069)
PostMerger × $M1_S$		0.0164
		(0.0160)
PostMerger × $M1'$		0.0750
		(0.0497)
PostMerger × $M2_H$		0.0563***
		(0.0076)
PostMerger × $M2_S$		0.0321**
		(0.0125)
PostMerger × $M2'$		0.0677**
		(0.0295)
log(market income)	−0.0925	−0.0826
	(0.0572)	(0.0593)
Store FE	Yes	Yes
Product FE	Yes	Yes
R^2	0.988	0.988
Observations	33714	33714

Notes: Stores' catchment areas are delimited using the baseline definition (20/10km). The observations are weighted by the expenditure shares of food products, calculated at the national level. Data for the year 2000 are removed (i.e., event windows). The standard errors, shown in parentheses, are clustered by store. *, **, *** indicate significance at the 10%, 5%, 1% level, respectively.

VI(ii). *Direct Effect of the Merger on Prices*

We now directly estimate the effect of the merger on prices by analyzing how retail prices for affected and comparison groups evolved before and after the merger. We present successively our regressions and results for Definitions 1 and 2.

Definition 1. Recall that, under Definition 1, a market is defined as affected by the merger if there is at least one store from $M1$ *and* one store from $M2$, which definitely results in a change in local concentration. We estimate the following regression:

$$\begin{aligned}\ln P_{ijt} = {} & \alpha_1 + \alpha_2 PostMerger_t + \alpha_3 T_i + \beta_1 PostMerger_t \times T_i \times Rival_i \\ & + \beta_2 PostMerger_t \times T_i \times MergingFirm_i + \delta' \mathbf{Z}_{it} + \mu_i \\ & + \sum_{n=1}^{N=j\times t} \lambda_n \tau_{jt} + \varepsilon_{ijt} \end{aligned} \tag{2}$$

where, adding to the covariates introduced in Equation (1), T_i is a dummy variable that characterizes store i as belonging to the affected group, and τ_{jt} are now

TABLE VI
DIRECT PRICE EFFECT ESTIMATES

Dependent variable: (log) price (P_{ijt})				
	All stores	All stores	Rivals only	Merging firms only
Variable	(1)	(2)	(3)	(4)
PostMerger × T	0.0114**			
	(0.0051)			
PostMerger × T × Rival		0.0236***	0.0223***	
		(0.0056)	(0.0059)	
PostMerger × T × Merging Firm		−0.0077		−0.0014
		(0.0059)		(0.0099)
log(market income)	−0.0302	−0.0350	−0.0086	−0.0837
	(0.0657)	(0.0647)	(0.0798)	(0.1265)
Store FE	Yes	Yes	Yes	Yes
Product-time FE	Yes	Yes	Yes	Yes
R^2	0.989	0.989	0.989	0.991
Observations	33714	33714	23994	9720

Notes: Stores' catchment areas are delimited using the baseline definition (20/10km), and affected and comparison groups are defined according to Definition 1. The observations are weighted by the expenditure shares of food products calculated at the national level. Data for the year 2000 are removed (i.e., event windows). The standard errors, shown in parentheses, are clustered by store. *, **, *** indicate significance at the 10%, 5%, 1% level, respectively.

product-half-year fixed effects, which control for factors that could have changed every six months for each product separately. The factors that have changed could be, for example, advertising at the national level for a given product that coincided with the post-merger period, or changes that would be common to all products within a category, such as a drop in the number of manufacturers for a product category in the post-merger period at the national level. None of these factors is correlated with the merger; that is, they are all exogenous to it. Consequently, the average effect of the merger is captured through the coefficients β_1 and β_2, which can be interpreted as the effect of a change in local concentration caused by the merger on (i) the average price change for the rivals, β_1, (ii) and the average price change for merging firms, β_2. The interaction terms $T_i \times Rival$ and $T_i \times MergingFirm$, as well as the dummy variables $PostMerger$, T_i, $Rival$, and $MergingFirm$, are not included in the regression due to multicollinearity issues. The market level factors $\mathbf{Z}_{it}$ control for observed shocks that could also affect prices differently among groups. We assume that unobserved shocks affect the outcome identically in both groups.

We now estimate Equation (2) and present the results in Columns (1) to (4) of Table VI. Though Column (1) of Table V shows that the prices have increased after the merger, both at the rivals and at the merging firms' stores, the estimates in Table VI highlight a striking difference between the effect of the merger on prices at merging firms and rivals. Column (1) presents the results of the merger's effect on all firms, while Columns (2) to (4) split the effect between rivals and merging firms. The average effect of the merger is significant with a magnitude of about 1.14% (see Column 1). However, Column (2) shows that the only

statistically significant effect comes from the rivals: the merger is correlated with a 2.36% significant increase for rivals, whereas there is no increase for the merging firms. In Column (3), the sample is reduced to rivals only. This enables us to better isolate the effect of the merger on rivals (compared to Column 2), as the comparison group now consists only of rival stores. As switching from the specification of Column (2) to that of Column (3) removes the merging firms that were in the comparison group, and as these merging firms tend to increase prices less, this contributes to explaining why the coefficient is lower in Column (3). In Column (4), the sample is reduced to merging firms only and no statistically significant effect arises.

Definition 2. The absence of a significant effect of a change in local concentration on the merging firms' prices leads us to consider a second definition of affected markets. In theory, in a given market, if all firms respond to a local change in concentration, the estimates should reflect a positive correlation between the merger and firms' prices both at the merging firms and rivals. Indeed, the merging firms $M1$ and $M2$ internalize the competition effect in all affected markets, and therefore increase their prices. In reaction, their competitors also increase their prices. The absence of a significant effect of a change in local concentration on the merging firms' prices is therefore puzzling.

At first sight, the absence of a significant price variation at the merging firms could be explained by the presence of short-term efficiency gains compensating for the increase in the market power of the merging firms. Yet this explanation is invalidated, first, by our before-and-after analysis, which exhibits an increase in merging firms' prices, and second, by a significant price increase at rivals in reaction to a change in concentration, estimated in Table VI. Moreover, as mentioned in Section II(i)., efficiency gains are likely to fully materialize after a few years, that is, after the period we focus on.[34] Finally, even if efficiency gains did materialize in a short run, they would apply to all stores from the merging group and therefore would not impact differently merging firms' stores in the affected group and those in the comparison group. Therefore, for all these reasons they would fail to explain our puzzle.

We rather explain the puzzle by a difference in retail pricing strategies between merging firms and their rivals. As we can observe in Table III, before the merger, the merging firms do not adjust their prices in response to local concentration, whereas their rivals change their prices in local markets depending on local concentration, in both pre and post-merger periods. The merging firms may thus internalize the competitive effect of the merger at a larger scale (regional or national) rather than at the local market level, by raising their prices uniformly

[34] Though the efficiency gains due to an increase in bargaining power are likely to materialize rather quickly, i.e., as soon as the next round of negotiations starts, other possible efficiency gains due to the reorganization of the retailers activity may take years to be realized. See, e.g., Focarelli and Panetta [2003], or Hastings [2004].

in all local markets in the area. This price increase may in turn trigger local reaction by rivals.

To illustrate this idea, consider the following simple model with two separate markets A and B, each formalized by a Salop circle with a circumference normalized to 1. Consumers are uniformly distributed around each circle and have a homogeneous unit valuation for the good such that the market is covered. To buy the product, a consumer incurs a transportation cost t (normalized to 1) linear with the distance, i.e., $t(x - x_s)$, where x is a consumer's address and x_s the address of the store.[35] Three retailers are symmetrically located around each circle. In Market A, we assume that $M1$, $M2$ and $R1$ compete. In Market B, $M1$, $R1$ and $R2$ compete.

Consider first that all firms price locally. As firms are symmetric, before the merger, all prices are $\frac{1}{3}$. After the merger, $M1$ and $M2$ internalize competition in Market A and raise their price, triggering a price increase by their rivals: equilibrium prices are $\frac{5}{9}$ for the merging firms and $\frac{4}{9}$ for $R1$. In Market B, nothing happens and, as before, prices are $\frac{1}{3}$. This example illustrates the price effects of a merger with Definition 1: only Market A in which local concentration has changed after the merger is affected; the prices of the merging firms and the rival increase.

Consider instead that $M1$ has a 'national' pricing strategy.[36] With this national pricing assumption, before the merger, all prices are the same and equal to $\frac{1}{3}$.[37] After the merger, the prices set by $M1$ in Markets A and B increase alongside each other to the same level, and the rival $R1$ reacts by increasing its price. Post-merger, equilibrium prices are then $\frac{16}{39} \approx 0.41$ for $M1$ or $M2$ in the two markets, and the rival $R1$ raises its price to ≈ 0.37 in Market A and to ≈ 0.35 in Market B. In this example, all markets in which a merging firm is present are affected by the merger. Because the extent of the price increase at the merging firms is the same in the two markets, it is clearly independent of the change in local concentration. By contrast, the price increase for the rival $R1$ is stronger in Market A than in market B because, in Market A, $R1$ reacts to the price increase of both $M1$ and $M2$; the model predicts a larger price increase in the market in which local concentration has changed. This story fits with our Definition 2: all the markets where a merging firm is active are affected by the merger.

In what follows, we therefore adopt Definition 2: the affected group is now defined as all stores belonging to a local market where at least one merging firm is active during the pre-merger period. There are no merging firms in the

[35] A sketch of the formalized analysis is available in the Online Appendix. For a complete analysis and solution of the model, see Allain *et al*. [2016].

[36] In this simple model, the retailer sets uniform pricing over the two markets. In practice, the degree of centralization in firms' pricing decisions is not extreme, i.e., total centralization, or local pricing. Moreover, as shown in Table III, all the retailers' prices are correlated with the size of population and the revenue in local markets. However, the results obtained in the model can be extended to an intermediate level of centralization in pricing decisions.

[37] As the two markets are symmetric before the merger, prices are the same irrespective of the pricing strategy (uniform or local). This is not key to the results that follow.

TABLE VII
LOCAL EFFECTS ON RIVALS

Dependent variable: (log) price (P_{ijt})		
Variable	Rivals only (1)	Rivals only (2)
PostMerger × T	0.0181**	
	(0.0076)	
PostMerger × T × Hypermarket		0.0236***
		(0.0078)
PostMerger × T × Supermarket		0.0110
		(0.0083)
log(market income)	−0.0261	−0.0230
	(0.0776)	(0.0776)
Store FE	Yes	Yes
Product-time FE	Yes	Yes
R^2	0.989	0.989
Observations	25164	25164

Notes: Merging Firms are removed from the sample. Stores' catchment areas are delimited using the baseline definition (20/10km), and affected and comparison groups are defined according to Definition 2. The observations are weighted by the expenditure shares of food products calculated at the national level. Data for the year 2000 are removed (i.e., event windows). The standard errors, shown in parentheses, are clustered by store. *, **, *** indicate significance at the 10%, 5%, 1% level, respectively.

comparison group and it is thus impossible to estimate the impact of the merger on the merging firms' prices with this definition. We therefore focus on the effect of the merger on the rivals' prices. To this end, we estimate the following equation (the sample now excludes the merging firms):

$$\ln P_{ijt} = \alpha_1 + \alpha_2 PostMerger_t + \alpha_3 T_i + \beta\,(PostMerger_t \times T_i) + \delta' \mathbf{Z}_{it} + \mu_i + \sum_{n=1}^{N=j\times t} \lambda_n \tau_{jt} + \varepsilon_{ijt} \quad (3)$$

where T_i is a dummy variable that characterizes store i as belonging to the affected group using Definition 2. We estimate Equation (3) and present the results in Table VII. Column (1) shows that the merger is associated with a significant increase in rivals' prices by 1.81%. It is interesting to compare this figure with the 2.23% price increase obtained in Column (3) of Table VI. In each of these two columns, there are only rivals in the comparison group but the sample of stores differs. In Column (3) of Table VI, some rivals in the comparison group compete with stores belonging to one of the merging firms. In Column (1) of Table VII, these rivals have switched to the affected group. The rivals that have switched are likely to be those who compete with a smaller number of merging firms on average: this tends to decrease the average price change in the affected group more than it reduces the average price change in the comparison group, which help explains why the point estimate obtained is lower with Definition 2 than with Definition 1.

By contrast, Column (2) splits up the price increase in rivals' stores according to store format. The estimated coefficients highlight a positive and significant price increase at the rivals' hypermarkets, whereas no significant price changes were found at the rivals' supermarkets. On the one hand, the price changes in the before-and-after comparison were higher at merging hypermarkets than at merging supermarkets. On the other hand, rivals' hypermarkets react more than rivals' supermarkets, which supports the view of a more intense intra-format competition in which, ultimately, most of the estimated merger price effects come from the hypermarkets (of the merging and rival firms).

To recap, our results demonstrate that, regardless of the definition of the affected and comparison groups, the merger is associated with a price increase at rivals' stores.

VI(iii). *Robustness Checks*

We assess the robustness of our findings with respect to several central hypotheses used in the baseline specification, namely, the definition of stores' catchment area and the hypothesis that the affected and comparison groups have similar characteristics. Throughout this section, we keep Definition 2 of whether a market is affected by the merger, and we focus on the merger effect on rivals.[38]

Robustness to the Definition of Catchment Areas. Panel A of Table VIII repeats the estimate of Equation (3) for four additional definitions of a catchment area, resulting in five columns. In the first column (labelled 30/15km), we consider larger catchment areas, and delimit local markets around city centers where stores are located using a 30km radius for hypermarkets and 15km for all other stores. Column (2) corresponds to the baseline definition (20/10km) and the results are reported for ease of comparison. In Column (3), we adopt a tighter definition of the catchment areas by using a 10km radius for hypermarkets (5km for all other stores): this may be more appropriate for densely populated areas where traffic congestion significantly reduces the distances that people can travel. In Column (4), we adopt a more flexible definition by using the baseline 20/10km definition, except for stores located in the most populated areas, where we adopt the 10/5km definition.[39] Finally, in the last column, we use the market definition used by the French CA. In contrast with our approach, the French CA considers an asymmetric substitutability between hypermarkets and other formats. Specifically, the French CA assumes that the catchment area of a hypermarket

[38] Our findings hold for several product categories and are robust to relaxing the assumption of absence of anticipation of the merger beyond the merger window we define, as shown in the Online Appendix.

[39] The most populated areas are defined at the *département* (French administrative unit) level and correspond to stores located in one of the following *départements*: Bouches-du-Rhône (13), Rhône (69), Paris (75), Seine-et-Marne (77), Yvelines (78), Essonne (91), Hauts-de-Seine (92), Seine-Saint-Denis (93), Val-de-Marne (94), and Val-d'Oise (95).

TABLE VIII
ALTERNATIVE DEFINITIONS OF CATCHMENT AREAS

Dependent variable: (log) price (by product, by store, by half-year)					
	Rivals only				
Variable	30/15km	20/10km	10/5km	20/10/5km	French CA 20/10km
Panel A: DID estimates					
PostMerger × T	0.0024	0.0181**	0.0189***	0.0190***	0.0187***
	(0.0099)	(0.0076)	(0.0061)	(0.0071)	(0.0068)
Stores FE	Yes	Yes	Yes	Yes	Yes
Product-Period FE	Yes	Yes	Yes	Yes	Yes
R^2	0.989	0.989	0.989	0.989	0.989
Observations	21450	25164	26196	25596	18768
Panel B: DID-Matching estimates					
PostMerger × T	0.0398***	0.0273***	0.0283***	0.0272***	0.0239**
	(0.0133)	(0.0106)	(0.0087)	(0.0092)	(0.0107)
Stores FE	Yes	Yes	Yes	Yes	Yes
Product-Period FE	Yes	Yes	Yes	Yes	Yes
R^2	0.990	0.990	0.991	0.991	0.990
Observations	21450	25164	26196	25596	18768

Notes: Merging firms are removed from the sample. Affected and comparison groups are defined according to Definition 2. Columns labelled *x/y km* report the point estimates of the merger effect on rivals with catchment areas including all the hypermarkets within an x km distance bound around a store and all the other stores within a distance bound of y km. The column labelled *20/10km* reports the results of the baseline definition previously available in Column (1) of Table VII. The column labelled *20/10/5km* reports the results with the 20/10/5km boundaries. Column labelled *French CA 20/10km* reports the results when adopting the asymmetric definition of the French CA and the 20/10km boundaries. The results shown in Panel A are obtained using a difference-in-differences (DID) estimator, whereas a DID-matching estimator is used in Panel B. The observations are weighted by the expenditure shares of food products calculated at the national level. Data for the year 2000 are removed (i.e., event windows). The standard errors, shown in parentheses, are clustered by store. *, **, *** indicate significance at the 10%, 5%, 1% level, respectively.

is composed uniquely of hypermarkets located within 20km. In other words, no other store formats can exert a competitive pressure on hypermarkets. The CA assumes by contrast that hypermarkets are valid substitutes for other formats. Using this definition, we define the catchment area of all other stores (i.e., supermarkets, discount stores, convenience stores) as all the stores located within 10km, including hypermarkets.

Except for the case of large markets (30/15km), the results appear robust to alternative market definitions. When we use a narrower definition of local markets (10/5km and 20/10/5km), the size of the comparison group increases mechanically, because fewer stores are affected by the merger, and yet the results appear very similar to those of the baseline definition. This shows that our results are not driven by rivals' stores located far away from merging firms. In the case of large markets (30/15km), the absence of a merger effect on rivals is not surprising. Indeed, with this wide definition of the catchment areas, the affected group includes rivals' stores located far away from merging firms; those stores are presumably less (or not) affected by the merger. Mechanically, we obtain a comparison group composed of few stores (only 66 stores for 1,152 affected stores), located in remote areas with market characteristics that differ significantly from those of the affected group. The lower price responsiveness of the

affected stores, combined with a poor definition of the comparison group, explain why we cannot measure any price effect of the merger. Finally, note that when we adopt the market definition used by the French CA, we obtain results that are very similar to those obtained with the baseline definition. Thus, whether one considers a symmetric or an asymmetric substitutability between hypermarkets and other formats does not substantially change the result.

An Alternative Matching Estimator. One of the key identifying assumptions of our strategy is that the affected and comparison groups must share similar pre-merger characteristics. For instance, we assume that, absent the merger, the average prices for the affected and comparison groups would have followed parallel paths over time. If there is only limited overlap in the distributions of the confounding factors across the affected and comparison groups, missing outcomes will be incorrectly imputed. Estimates of average effects can also be biased if observations in the comparison group are not appropriately re-weighted to control for differences in the distribution of the set of variables over regions common to the comparison and affected groups. This problem is highlighted when using a large market definition (30/15km) in Table VIII because the characteristics of the comparison stores differ substantially from those of the affected stores.

To assess the robustness of the results to this particular concern, we perform alternative comparisons for the stores affected by the merger through a propensity score matching estimator. As a first step, we estimate a probit of the merger occurring in a local market where we include, as explanatory variables, store characteristics (*e.g.*, store size), baseline factors that affect price trends (*e.g.*, baseline concentration and competitors operating in the market), baseline factors that affect demand (*e.g.*, the market population and the average income in the local area), and regional dummies. We then estimate the probability that a store is affected by the merger (the propensity score) as a function of these variables.[40] In a second step, we apply a re-weighting scheme, as proposed by Hirano *et al.* [2003] and Imbens [2004], to control for differences in observed confounding factors between affected and comparison stores. The basic idea is to use the fitted values of the propensity scores to re-weight the regression sample, thereby effectively creating a smooth version of a match. Let the propensity score S be the probability that a market in the data is impacted by the merger as a function of baseline characteristics. We re-weight observations in the comparison sample by $S/(1-S)$. This balances the distribution of baseline characteristics across the

[40] The propensity score probit estimates are reported in the Online Appendix. We also estimate the price effect of the merger using the more standard nearest neighbor matching estimators. However, due to the common support assumption, we lose almost half of the affected stores, which considerably reduces the sample size; we then can no longer guarantee the balance between the panels of products in the affected and in the comparison groups. Subject to this caveat, and except for the case of one-nearest neighbor, we obtain significant point estimates with 2, 3, 4 or 5 nearest neighbors. These results are available upon request.

affected and comparison stores. Intuitively, this technique up-weights data from stores that were not affected but had a high probability of having been affected by the merger based on observable data.

The matching estimates are performed for each definition of the catchment areas and are reported in Panel B of Table VIII. Overall, the point estimate of the merger effect appears substantially higher and remains highly statistically significant. The higher point estimate suggests that stores unaffected by the merger but whose characteristics are closer to those of the affected stores have moderately increased their prices. With our baseline definition of catchment areas (20/10km), rivals have reacted to the merger by increasing their prices by 2.73% compared to comparison stores. When using a narrower definition of catchment areas (10/5km and 20/10/5km), we obtain lower point estimates; this simply reflects the fact that the comparison group is now enlarged, as it includes new rivals' stores, which have a high probability of being affected by the merger, and also reflects the fact that those stores raised their prices substantially after the merger. Interestingly, with the largest market definition (30/10km), we obtain now a relatively high point estimate, which is statistically significant; however, this result relies on a small comparison group in which a few stores have a high probability of being affected by the merger. Taken together, these results stress the importance of controlling for unbalanced covariates between the affected and comparison groups, as well as choosing a relevant definition of local markets when conducting retrospective merger analyses in retail markets.

VI(iv). *The Effect of Rebranding.*

To further investigate the mechanism behind the price effects of the merger, we explore the effect of the rebranding strategy. Recall that, with the merger, $M2_H$ was rebranded into $M1_H$ and $M1_S$ into $M2_S$. Therefore, at the national level, two chain names disappeared. In local markets, depending on the geographical distribution of the stores in the pre-merger period, we can have one of three situations post-merger: a drop in two chain names, labelled as '$\Delta N = -2$;' a drop in only one chain name, labelled as '$\Delta N = -1$;' or, finally, no drop at all, labelled '$\Delta N = 0$.' The situation '$\Delta N = -2$ ' characterizes markets where the four chains $M1_H$, $M1_S$, $M2_H$, and $M2_S$ were active before the merger. The situation '$\Delta N = 0$ ' covers two cases: either 'no rebranding' or a 'pure rebranding'. A 'pure rebranding' case refers to local markets in which a rebranding occurred, but the net change in names is zero. We analyze in turn the 'differentiation' effect (resulting from $\Delta N \neq 0$) and the pure rebranding effect on rivals' prices.[41]

Differentiation Effect. A drop in the number of chain names operating in a given local market is also a reduction in the variety of stores available to consumers.

[41] Part of retail differentiation is geographic. Here we look at the change in differentiation due to relabeling, while the geographical differentiation is not removed by relabeling.

TABLE IX
DIFFERENTIATION AND REBRANDING EFFECTS ON RIVALS

Dependent variable: (log) price (P_{ijt})		
Variable	Rivals only (1)	Rivals only (2)
PostMerger × T × $\Delta N = -2$	0.0322***	0.0322***
	(0.0094)	(0.0094)
PostMerger × T × $\Delta N = -1$	0.0120	0.0120
	(0.0098)	(0.0098)
PostMerger × T × $\Delta N = 0$	0.0158*	
	(0.0081)	
PostMerger × T × $\Delta N = 0$ × Rebranding		0.0171*
		(0.0091)
PostMerger × T × $\Delta N = 0$ × No Rebranding		0.0148
		(0.0091)
log(market income)	−0.0260	−0.0237
	(0.0771)	(0.0771)
Store FE	Yes	Yes
Product-time FE	Yes	Yes
R^2	0.989	0.989
Observations	25164	25164

Notes: Merging firms are removed from the sample. Stores' catchment areas are delimited using the baseline definition (20/10km), and affected and comparison groups are defined according to Definition 2. The observations are weighted by the expenditure shares of food products calculated at the national level. Data for the year 2000 are removed (i.e., event windows). The standard errors, shown in parentheses, are clustered by store. *, **, *** indicate significance at the 10%, 5%, 1% level, respectively.

In a spatial oligopoly model, when two neighboring retailers merge, a drop in the number of chains can be modeled as the relocation of two previous stores into the same unique location. By relocating symmetrically around the circle, all firms obtain a higher market share because their two nearest neighbors are more distant. In equilibrium, the merger then results in a price increase for all stores (e.g., Levy and Reitzes [1992]). Table IX presents the correlation of a drop in N on affected rivals' prices. We show in Column (1) that, in all areas where the number of chain names dropped by 2 ($\Delta N = -2$), the rival's price increase post-merger is statistically significant and about 3.22%, which is higher than the average effect on rivals' prices.

Rebranding Effect. A 'pure rebranding' may have consequences in itself for both merging firms and rivals. Indeed, the rebranding of stores may negatively affect the local demand of the merging firms. By adopting the chain name of a previous competitor, a risk exists of disrupting the established connection between consumers and stores of the removed chain. For instance, inconveniences due to revamping stores (e.g., store layout) or the replacement of private labels by another brand may induce consumers to visit rival stores. It may thus affect demand at the stores of rivals, who face a rebranded store in their catchment area. These rivals may gain new customers disappointed by the changes, or lose some customers wishing to change. We can interpret resulting changes in prices at rivals when there is rebranding without any drop in the number of names as due

to the pure rebranding effect. Column (2) of Table IX shows a positive (though barely statistically significant) effect of the pure rebranding on rivals' prices.

VII. THE MERGER EFFECT ON HOUSEHOLD EXPENDITURES

Basically, if the merger has raised prices at rivals' stores that compete with one of the merging firms (i.e., the affected rivals according to Definition 2), one would expect to observe a rise in the expenditures at rivals' stores for the households living in affected markets, compared to households living in comparison markets, *ceteris paribus*.

To quantify the merger expenditure effect, we use all the household purchases recorded in the *TNS Worldpanel* database. Compared to the price analysis run previously, we are no longer constrained to perform comparisons on a sample of identical UPC's, because we are now working at different level of aggregation–the total expenditure of a household, which extends the scope of our analysis. Furthermore, it is no longer necessary to determine the exact location where the purchases were made, which means that this approach depends less on the allocation of the households to particular stores (i.e., our matching procedure between purchase data and stores).

We first delineate the set of stores that a household can visit, assuming that the household is living at the center of its city, and using the baseline definition of a catchment area (i.e., 20/10km). We then define an affected household according to the stores this household can visit. A household is defined as affected when at least one of the stores it can visit belongs to a merging firm, or if it can visit only rivals' stores and at least one of these rivals' stores is affected by the merger, following Definition 2. As previously, we aggregate the household expenditures at a six month period. To limit measurement errors, we exclude from the sample those households that do not shop every month, as well as those which changed their place of residence between 1998 and 2001. Finally, because the 'local' price merger effect is driven by rivals' stores, we require that half of the expenditures of a household are made at rivals' stores.[42] Overall, we select 1,954 households living in 1,211 cities, among which 1,476 households are in the affected group, while 478 households are in the comparison group. The average household expenditures during a six-month period is 7,990.62 French Francs (around 1,198€ or $1,363), with a standard deviation of 4,108.74 (around 616€ or $701).

To formally quantify the merger effect on household expenditures, we estimate the following regression using the log of household expenditures as the dependent variable:

$$\ln EXP_{ht} = \alpha_1 + \alpha_2 PostMerger_t + \alpha_3 T_h + \alpha_4 Rival_{ht}^{visit}$$

[42] Note that the results are similar when using other thresholds, except when we include households that spend less than 5% of their budget in rival stores. For this case, the merger effect on household expenditures becomes negative in Column (1).

$$
\begin{aligned}
&+ \alpha_5 MergingFirm_{ht}^{visit} \\
&+ \beta_1 \left(PostMerger_t \times T_h \times Rival_{ht}^{visit}\right) \\
&+ \beta_2 \left(PostMerger_t \times T_h \times MergingFirm_{ht}^{visit}\right) \\
&+ \phi' \mathbf{H}_{ht} + \mu_h + \tau_t + \varepsilon_{ht}
\end{aligned} \tag{4}
$$

where EXP_{ht} denotes the average expenditure (in centimes of Francs) of household h during the half-year t, $PostMerger_t$ is a dummy variable that identifies the post-merger period, T_h is a dummy variable equal to one for affected households, and $Rival_{ht}^{visit}$ ($MergingFirm_{ht}^{visit}$, resp.) is a dummy variable equal to one if the household visits a rival (merging) store at least once during period t. The average merger effect on household expenditures is captured through the coefficients β_1 and β_2, which measure the average expenditure change for affected households that go shopping at a rival or/and a merging store, relative to comparison households. The regression also includes a set $\mathbf{H}_{ht}$ of time-varying household characteristics (i.e., the household income per capita, the number of persons per household, the age of the youngest infant less than three years old, the number of infants less than three years old, the age of the youngest child, the presence of a cat, and the presence of a dog), as well as household and time fixed-effects (μ and τ).

The results of the estimation of Equation (4) are presented in Column (1) of Table X. Though the coefficients β_1 and β_2 are of expected signs, we obtain non-statistically significant point estimates and we cannot conclude that the merger has modified household expenditures. In Column (2), we focus on expenditures made exclusively at rivals' stores; for each household we remove purchases made at merging stores whose prices are supposed to have evolved identically post-merger between the affected and comparison groups. The point estimate β_1 is more precisely estimated but still statistically non-significant. In Column (3), we exclude all the households that shop at a merging store, so as to focus on households that visit only rivals' stores. We still find no statistically significant effect of the merger on household expenditures, though the point estimate is more accurate. One reason that could explain this absence of effect may be that households visit multiple rival chains that have changed their prices differently post-merger. In Columns (4)-(5), we narrow the scope of the analysis by looking at expenditures made in the households' primary shopping destinations (i.e., the store in which a household spends the most). We use our store-product dataset, and we focus on primary shopping destinations that represent at least 25% of the household's total expenditures. In Column (4), we consider indifferently expenditures made at merging and rival stores, whereas in Column (5) we only account for rivals' stores as primary shopping destinations. Again, we find that the households that visit a rival store affected by the merger have raised their expenditures in their primary shopping destination, relative to comparison households. However, the point estimates are not statistically significant.

TABLE X
MERGER AND HOUSEHOLD EXPENDITURES

Dependent variable: (log) of household expenditures (by half-year)					
				Primary shopping destination	
Variable	Household expenditures	Household expenditures in rival stores	Household expenditures if rival stores only	Household expenditures	Household expenditures if rival store
PostMerger × T × Rival^{visit}	0.0171	0.0240	0.0356	0.0182	0.0192
	(0.0159)	(0.0160)	(0.0224)	(0.0180)	(0.0210)
PostMerger × T ×	−0.0149	−0.0043		−0.0149	0.0062
Merging Firm^{visit}	(0.0134)	(0.0139)		(0.0156)	(0.0188)
Household characteristics FE	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes
Half-year FE	Yes	Yes	Yes	Yes	Yes
Affected households	1476	1476	308	1713	1278
Comparison households	478	478	261	487	465
R^2	0.897	0.890	0.901	0.873	0.870
Observations	11724	11724	3414	13200	10458

Notes: Data for the year 2000 are removed (i.e., event windows). Affected and comparison groups are defined according to Definition 2. The standard errors, shown in parentheses, are clustered by city. *, **, *** indicate significance at the 10%, 5%, 1% level, respectively.

Though we find no statistically significant 'local' effect of the merger on household expenditures, it is interesting to study whether, at the national level, consumer habits have changed post-merger.[43] Using the *TNS Worldpanel* dataset, we compute the market shares for the merging and rival firms; we report the yearly figures in Table XI. Note that these market shares must be considered an estimate of the real market shares because they are based on a consumer panel. Recall that the merging firms have higher price positioning than the rivals, as discussed in Section IV(i)., and this remains so even after the merger, which means that a 7% price increase by the rivals together with a 4% increase from the merging firms does not reduce the price gap sufficiently to reverse the price positioning. As all prices go up, merging firms lose market shares, to the benefit of rivals. This means that, post-merger, households have spent relatively more at rivals' stores than at merging stores. Furthermore, we see that the market share of the merging firms drops for the hypermarkets and increases for the supermarkets. This is consistent with Column (2) of Table V, which shows that most of the price increase at the merging firms came from their hypermarkets.

Altogether, these results confirm that the price increases observed after the merger have mostly benefited the rivals in that, despite a greater percentage price

[43] The absence of a statistically significant merger effect on household expenditures can be rationalized by several explanations. After the merger, affected households could have changed their purchasing habits by visiting cheaper chains or buying lower quality brands, for instance. Even if households always buy the same shopping basket, it is likely that demand is not inelastic and that households have reacted to the merger by dropping quantities purchased. While this last point is a key issue in the appraisal of merger effects, we do not have sufficient data to estimate how much product quantities vary between affected and comparison households due to the merger.

TABLE XI
MARKET SHARES BEFORE AND AFTER THE M1 – M2 MERGER

Retail chain	1998	1999	2000	2001	Mean change (98-01)
$M1_H + M2_H$	16.80	16.48	15.43	14.76	−02.04
$M1_H$	*11.68*	*11.19*	*12.25*	*14.76*	
$M2_H$	*05.12*	*05.29*	*03.18*	–	
$M1_S + M2_S$	07.49	08.28	08.63	08.45	+00.96
$M1_S$	*03.71*	*04.29*	*03.50*	–	
$M2_S$	*03.78*	*03.99*	*05.13*	*08.45*	
Rivals (R1-R6)	56.46	56.78	57.34	57.73	+01.27
Other rivals	19.25	18.46	18.60	19.06	−00.19

Notes: The market shares are computed using the *TNS Worldpanel* dataset.

increase than that of the merging firms, they gained a larger share of household expenditures.

VIII. CONCLUSION

In this paper, we take advantage of a national merger between two French retailers, which impacted market structure differentially across local markets, to estimate how merging firms and rivals reacted to this merger in terms of retail prices. Our findings are along the lines of the related literature analysing mergers retrospectively, which often concludes that prices increase after mergers.[44] In the supermarket industry, previous research finds that mergers are associated with price increases, especially when they occur in already concentrated markets (Hosken *et al*. [2012]). Our empirical evidence supports this. Moreover, we are able to separate the price effects for: (i) the merging firms, for which we estimate a significant price increase after the merger of about 4%; (ii) the rivals, for which we identify a significant local effect of the merger, which translates into a price increase of about 2% in the rivals' stores that are affected by the merger, compared to the rivals' stores in comparison markets.

The estimated price increase has important implications for consumer welfare. Because food expenditures amount to approximately 12.9% in the European Union (on average, as of 1999), and because supermarket chains represent around 70% of total food sales in France (74% in 2011, INSEE), a back-of-the-envelope calculation shows that a 1.14% increase in supermarket food prices represents roughly a 0.1% drop in consumer purchasing power. Obviously such a simple calculation has to be taken with caution, as we do not take into account the effect on private labels and non-food prices or other services, but it gives an idea of the possible impact of such a merger on welfare.

An important contribution is that we are able to empirically assess potential economic forces behind the price changes post-merger. We find that the merging firms increase prices in all local markets and that the pricing behavior is not

[44] Many retrospective analyses have examined mergers, in airlines, banking, oil, consumer goods, and the hospital industry (see Hunter *et al*. [2008], for a review).

related to local changes in retail competition. We interpret this as the merging firms deciding prices at a larger scale than local markets. However, for the rivals, the price increases are larger in local markets, in which concentration increased and differentiation changed after the merger, along the lines of the theoretical predictions of price effects of mergers.

Our findings are also important for retrospective merger analysis in a methodological sense. Before defining the relevant markets for the analysis of the merger's effect on final prices, competition authorities should also analyze whether the retailers' pricing responds to local market conditions and especially to changes in concentration. Given the local dimension of competition in the retail sector, any merger analysis should focus on the effects of the proposed merger on local markets. In terms of policy implications, the main lesson from this analysis is that the way the relevant local markets are usually defined in the retail industry (for instance, the definition used by the EC or by the French CA in the present case) may lead competition authorities to misestimate the price effect of the merger. In particular, we show that, with this usual definition, some local markets would be considered comparison markets, because the merger does not induce a change in their local concentration, even though we observe that they are affected by price changes. Including these markets as comparisons may create a bias in the merger effect estimate, and the direction and the magnitude of this bias depends on how prices vary in these markets relatively to other markets.

Finally, one of the major challenges of competition policy is to predict the potential price effects at the time when antitrust authorities are notified of a merger, in order to impose relevant remedies and to protect consumers better. In this setting, a retrospective merger analysis is not possible. Using our detailed data, we can take a first step in that direction, by providing a simple prediction of how the local concentration changes induced by the merger would affect local market retail prices. Using the estimation results of Table III (Column 4), we perform an out-of-sample price prediction, given the post-merger local HHI levels. We find a predicted price increase of 1.19% with the new HHI, with a standard error of 0.01%. We conclude that these simple predictions based on the variation in the local HHI are rather close to the 1.14% price increase obtained with the standard definition of affected markets (i.e., Definition 1; see Column 1 in Table VI). Although using the HHI as a preliminary screen for merger analysis is an attractive tool (a finding consistent with Hosken *et al*. [2012]), it should be complemented with an analysis of the pricing strategies of the merging firms and rivals as a function of changes in local competition. This calls for a more complete structural approach, which we leave for future work.

REFERENCES

Aguzzoni, L.; Argentesi, E.; Ciari, L.; Duso, T. and Tognoni, M., 2016, '*Ex Post* Merger Evaluation in the U.K. Retail Market for Books,' *Journal of Industrial Economics*, 64, pp. 170–200.

Allain, M.L. and Chambolle, C., 2011, 'Anti-Competitive Effects of Resale-Below-Cost Laws,' *International Journal of Industrial Organization*, 29, pp. 373–385.

Allain, M.L.; Chambolle, C. and Turolla, S., 2016, 'Local or National Pricing: What Consequences for Merger Control in the Food Retail Sector?,' *Revue Economique*, 67, pp. 53–67.

Allain, M.L.; Chambolle, C. and Vergé, T., 2008, 'La Loi Galland sur les Relations Commerciales. Jusqu'où la Réformer? ' Opuscule du CEPREMAP. (Editions Rue d'Ulm 15 rue d'Ulm, Paris, France).

Angrist, J.D. and Pischke, J.S., 2010, 'The Credibility Revolution in Empirical Economics: How Better Research Design is Taking the Con Out of Econometrics,' *Journal of Economic Perspectives*, 24, pp. 3–30.

Ashenfelter, O.C. and Hosken, D.S., 2010, 'The Effect of Mergers on Consumer Prices: Evidence from Five Mergers on the Enforcement Margin, *Journal of Law and Economics*, 53, pp. 417–466.

Ashenfelter, O.C.; Hosken, D.S. and Weinberg, M.C., 2013, 'The Price Effects of a Large Merger of Manufacturers: A Case Study of Maytag-Whirlpool,' *American Economic Journal: Economic Policy*, 5, pp. 239–61.

Ashenfelter, O.C.; Hosken, D.S. and Weinberg, M.C., 2014, 'Did Robert Bork Understate the Competitive Impact of Mergers? Evidence from Consummated Mergers,' *Journal of Law and Economics*, 57, pp. S67–S100.

Ashenfelter, O.C.; Hosken, D.S. and Weinberg, M.C., 2015, 'Efficiencies Brewed: Pricing and Consolidation in the U.S. Beer Industry,' *The RAND Journal of Economics*, 46, pp. 328–361.

Asplund, M. and Friberg, R., 2002, 'Food Prices and Market Structure in Sweden,' *Scandinavian Journal of Economics*, 104, pp. 547–66.

Barros, P.P.; Brito, D. and de Lucena, D., 2006, 'Mergers in the Food Retailing Sector: An Empirical Investigation, *European Economic Review*, 50, pp. 447–468.

Basker, E. and Noel, M., 2009, 'The Evolving Food Chain: Competitive Effects of Wal-Mart's Entry into the Supermarket Industry,' *Journal of Economics & Management Strategy*, 18, pp. 977–1009.

Biscourp, P.; Boutin, X. and Vergé, T., 2013, 'The Effects of Retail Regulations on Prices: Evidence from the Loi Galland,' *The Economic Journal*, 123, pp. 1279–1312.

Björnerstedt, J. and Verboven, F., 2015, 'Does Merger Simulation Work? Evidence from the Swedish Analgesics Market,' *American Economic Journal: Applied Economics* (forthcoming).

Choné, P. and Linnemer, L., 2012, 'A Treatment Effect Method for Merger Analysis with an Application to Parking Prices in Paris,' *Journal of Industrial Economics*, 60, pp. 631–656.

Cleeren, K.; Verboven, F.; Dekimpe, M.G. and Gielens, K., 2010, 'Intra- and Interformat Competition among Discounters and Supermarkets,' *Marketing Science*, 29, pp. 456–473.

Commission Hagelsteen, 2008, 'La Négociabilité des Tarifs et des Conditions Générales de Vente. (La Documentation Française, Paris, France).

Competition Authority, 2007, 'Avis Relatif à la Législation Relative à L'équipement Commercial, Report 07-A-12, (Competition Authority, Paris, France).

Davis, D.E., 2010, 'Prices, Promotions, and Supermarket Mergers,' *Journal of Agricultural & Food Industrial Organization*, 8, (Received 26 July 2017 from https://doi.org/10.2202/1542-0485.1312).

Dobson, P.W. and Waterson, M., 2005, 'Chain-Store Pricing Across Local Markets. *Journal of Economics & Management Strategy*, 14, pp. 93–119.

Dziuda, W. and Mastrobuoni, G., 2009, 'The Euro Changeover and its Effects on Price Transparency and Inflation,' *Journal of Money, Credit and Banking*, 41, pp. 101–129.

Einarsson, A., 2007, 'The Retail Sector in the Nordic Countries: A Comparative Analysis,' *Bifröst Journal of Social Science*, 1, pp. 31–42.

Focarelli, D. and Panetta, F., 2003, 'Are Mergers Beneficial to Consumers? Evidence from the Market for Bank Deposits,' *American Economic Review*, 93, pp. 1152–1172.

Hastings, J.S., 2004, 'Vertical Relationships and Competition in Retail Gasoline Markets: Empirical Evidence from Contract Changes in Southern California, *American Economic Review*, 94, pp. 317–328.

Hastings, J.S. and Gilbert, R.J., 2005, 'Market Power, Vertical Integration and the Wholesale Price of Gasoline', *Journal of Industrial Economics*, 53, pp. 469–492.

Haucap, J.; Heimeshoff, U.; Klein, G.J.; Rickert, D. and Wey, C., 2013, 'Inter-Format Competition among Retailers – The Role of Private Label Products in Market Delineation', DICE discussion papers 107. (Heinrich-Heine-Universität Düsseldorf, Düsseldorf Institute for Competition Economics (DICE), Düsseldorf, Germany).

Hausman, J. and Liebtag, E., 2007, 'Consumer Benefits from Increased Competition in Shopping Outlets: Measuring the Effect of Wal-Mart,' *Journal of Applied Econometrics*, 22, pp. 1157–1177.

Hirano, K.; Imbens, G.W. and Ridder, G., 2003, 'Efficient Estimation of Average Treatment Effects using the Estimated Propensity Score,' *Econometrica*, 71, pp. 1161–1189.

Hosken, D.S.; Olson, L. and Smith, L., 2012, 'Do Retail Mergers Affect Competition? Evidence from Grocery Retailing', technical report. (Federal Trade Commission, Bureau of Economics, working paper no. 313 Washington, D.C., U.S.A.)

Houde, J.F., 2012, 'Spatial Differentiation and Vertical Mergers in Retail Markets for Gasoline'. *American Economic Review*, 102, pp. 2147–2182.

Hunter, G.; Leonard, G.K. and Olley, G.S., 2008, 'Merger Retrospective Studies: A Review'. *Antitrust*, 23, pp. 34–41.

Imbens, G.W., 2004, 'Nonparametric Estimation of Average Treatment Effects under Exogeneity: A Review,' *Review of Economics and Statistics*, 86, pp. 4–29.

Inderst, R. and Shaffer, G., 2007, 'Retail Mergers, Buyer power and Product Variety'. *The Economic Journal*, 117, pp. 45–67.

Kantar Worldpanel, 1998-2001, *Extraction via Hindex. Traitements Aliss-Dasi* (Kantar Worldpanel Cami de Can Calders 4, Spain).

Levy, D.T. and Reitzes, J.D., 1992, 'Anticompetitive Effects of Mergers in Markets with Localized Competition,' *Journal of Law, Economics and Organization*, 8, pp. 427–440.

Maican, F. and Orth, M., 2015, 'Entry Regulations, Product Differentiation and Determinants of Market Structure', mimeo, (Research Institute of Industrial Economics, Stockholm, Sweden).

Nevo, A., 2000, 'Mergers with Differentiated Products: The Case of the Ready-to-Eat Cereal Industry,' *RAND Journal of Economics*, 31, pp. 395–421.

Nevo, A. and Whinston, M.D., 2010, 'Taking the Dogma Out of Econometrics: Structural Modeling and Credible Inference,' *Journal of Economic Perspectives*, 24, pp. 69–82.

Smith, H., 2004, 'Supermarket Choice and Supermarket Competition in Market Equilibrium,' *Review of Economic Studies*, 71, pp. 235–263.

Taylor, C.T. and Hosken, D.S., 2007, 'The Economic Effects of the Marathon-Ashland Joint Venture: The Importance of Industry Supply Shocks and Vertical Market Structure,' *Journal of Industrial Economics*, 55, pp. 419–451.

Turolla, S., 2016, 'Spatial Competition in the French Supermarket Industry,' *Annals of Economics and Statistics*, 121/122, pp. 213–259.

Weinberg, M.C., 2011, 'More Evidence on the Performance of Merger Simulations,' *American Economic Review*, 101, pp. 51–55.

Weinberg, M.C. and Hosken, D.S., 2013, 'Evidence on the Accuracy of Merger Simulations,' *Review of Economics and Statistics*, 95, pp. 1584–1600.

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