

**The effect of retail mergers on variety:
An ex-post evaluation***
(PRELIMINARY VERSION)

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Abstract: While most retrospective merger studies focus on price effects, we estimate the impact of a merger on product variety too. In particular, we use an original dataset on Dutch supermarkets to assess the effect of a merger that was conditionally approved by the Dutch Competition Authority (ACM) on the depth of assortment. We find that the merging parties reduced the depth of their assortment, thereby reducing consumer choice. This effect seems to be mainly driven by a reduction in variety for the stores that are not rebranded after the merger, suggesting that the merging firms reposition their product offerings in order to avoid cannibalization. We also find that the reduction in variety for the merging parties is partially outweighed by increased variety provided by competitors. The issuance of divestitures seems to have partially outweighed the negative effect of the merger. However, it appears that additional divestitures would have been necessary to remove completely the adverse effect of the merger on the depth of assortment.

JEL codes: L1, L41, L66, L81, D22, K21, C23

Keywords: Mergers, Variety, Ex-post Evaluation, Retail sector, Supermarkets, Grocery.

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1. Introduction

Grocery retail plays a central role in the everyday life and supermarkets have become the key point of sales for buying food and household products in most countries. On average, food spending represents around 15% of household budget in the European Union. In 2011, the total turnover of the food supply chain exceeded 3,500 EUR billion in the European Union and generated around 6% of the EU gross value added (650 EUR billion).¹ The sector has drastically been transformed over the past decades by the interplay of several forces on both the supply and demand sides. On the demand side, consumers' habits have changed so that they tend to do most of their shopping in a single stop, mostly a large supermarket. On the supply side, the creation of large supermarket chains coupled with innovations in logistics and distribution allowed the internalization of economies of scale and scope. These developments brought significant benefits to consumers with lower prices and larger variety.

Yet, competition authorities still have major worries that effective competition in increasingly concentrated grocery markets can be sustained, as underlined by the sector inquiries performed in the UK² and Germany.³ Two main issues are of general concern. First, in most countries few grocery retailers appear to have a strong position in several local markets. Because of potential barriers to entry into these local markets –such as difficulties to find attractive locations as well as scale and scope economies in logistic and distribution networks— regional concentration might lead to increased prices and decreased choice, quality, and service for customers. Second, concentration in downstream markets increases retailers' buyer power. Buyers' power might be beneficial to consumers since retailers might pass on part of the benefits (lower wholesale prices) arising from their strong position in the bargaining process to consumers (e.g., Inderst and Wey, 2007). Yet, various supply chains' practices might help strong grocery retailers to transfer excessive risk and too high costs to their suppliers and this might adversely affect investments and innovation along the entire supply chain (Competition Commission, 2008). This, in turn, might lead to a reduction in product variety, assortment, and quality. Notwithstanding high concentration, retail

¹ See http://ec.europa.eu/competition/sectors/agriculture/overview_en.html.

² An extensive analysis of UK grocery markets can be found here: <http://webarchive.nationalarchives.gov.uk/20140402141250/www.competition-commission.org.uk/our-work/directory-of-all-inquiries/groceries-market-investigation-and-remittal/final-report-and-appendices-glossary-inquiry>.

³ An overview of the work of the Bundeskartellamt on grocery markets can be found here: http://www.bundeskartellamt.de/DE/Wirtschaftsbereiche/LEH/LEH_node.html.

competition still seems to be quite effective partially also due to the increasing competitive pressure exerted by aggressive discounters such as Aldi, Lidl, and Netto.

For these reasons, mergers in grocery markets tend to be scrutinized very carefully by antitrust authorities. While they might constitute a natural and legitimate mean to react to a rapidly changing competitive environment, at the same time they might be the main vehicle for food retailers to increase market power in already highly concentrated regional markets. Mergers and merger control in grocery markets have been a pervasive phenomenon in all European countries over the last decade. It is therefore of crucial importance to understand what the effects of mergers between supermarket chains are and whether the intervention of antitrust authorities is needed, correct, and effective.

This paper analyzes the effects of a merger between two major supermarket chains (C1000 and Jumbo) that was conditionally approved by the Dutch competition authority – Autoriteit Consument & Markt (ACM) – in 2012. Following the existing literature on retrospective merger evaluations (e.g., Ashenfelter et al., 2014 and Ormosi et al., 2015 for an overview), we start by studying the effect of the merger on prices. Yet, non-price strategies such as the choice of assortment and product positioning play a key competitive role in the retailing sector (e.g., Draganska et al., 2009). Despite the potentially relevant welfare implications of non-price effects of retail mergers, there is no paper that considers the mergers' effect on variety among the few empirical papers that analyzed the effects of mergers in the retailing sector (Aguzzoni et al., 2016; Allain et al., 2013; Barros et al., 2005; Hosken et al., 2015). Hence, the analysis of the merger's effect on variety is the main contribution we offer in this paper.

We use a database provided by IRI that contains information on weekly volumes and turnover⁴ for a sample of products sold in 171 stores located all over the Netherlands, for the period 2009-2013. Moreover, for each store we have information on the overall depth of assortment measured as the number of stock keeping units (SKUs) for 125 product categories for the period 2010-2013, which allows us to assess the change in product offerings triggered by the merger. Since we have data not only on the merging parties' stores but also on stores of the two main rival chains, the market leader Albert Heijn and Coop, we are able to assess the effects of the merger on prices and variety both for the merged entity and for her competitors in each of the locations in our sample.

⁴ Price is therefore determined as total turnover over volumes, and is net of promotional measures.

Being able to estimate the rivals' reaction to the merger is relevant for two reasons. First, while the effects of mergers on rivals' prices have been widely studied in the literature, the effects on rivals' price and variety has not been analyzed. Methodologically, this is important as the study of rivals' reactions to a merger might substantially help to identify its competitive effect (e.g., Deneckere and Davidson, 1985 and Farrell and Shapiro, 1990). Second, from the point of view of policy implications, the assessment of how prices and variety changed after the merger for the merging parties and for their main competitors allows us to draw wider implications in terms of consumer surplus.

A final contribution of this paper is to analyze whether and how structural remedies (divestitures) imposed by the antitrust authority in 18 regional markets were effective in alleviating the potentially anticompetitive effect of the merger.

Our results suggest that the merger did not have any effect on prices, neither for the merging parties nor for competitors. However, following the merger, the merged entity reduced the depth of her assortment, thereby reducing consumer choice. This effect is mainly driven by stores that keep operating under the C1000 insignia after the merger. This suggests that the merged entity, when operating under two different insignias, might want to reposition their product offerings in terms of depth of assortment. This finding is consistent with some predictions from the theoretical literature. For instance, Gandhi et al. (2008) find that the merging parties move away from each other in the product space to avoid cannibalization.

The negative effect of the merger on variety is partially outweighed by an opposite effect on rivals' variety, which tends to increase after the merger. However, in areas where the market is very concentrated, the effect on variety is unambiguously negative, as both the merging parties and their competitors reduce the range of assortment after the merger.

We corroborate these findings by also testing econometrically if the issuance of the divestitures alleviated the negative effects on variety. The results obtained suggest that the divestiture only partially outweighed the reduction in variety caused by the mergers and that the ACM should have probably required a greater number or more intense divestitures.

Our paper relates to several strands of literature. First, it contributes to the growing literature on ex-post merger evaluation, and in particular, to the relatively small number of papers analyzing the effect of mergers in retailing sectors. Both Allain et al. (2013) and Hosken et al. (2015) underline the importance of looking at local competition in retail

mergers, although they just analyze price effects. Our empirical strategy, which exploits the local dimension of competition, seems to be particularly appropriate to analyze non-price strategies, which are decided at a local level more than price decisions are.

Within this literature, we are not aware of any paper analyzing non-price effects of mergers. The only exception is Ashenfelter et al. (2013), who analyze in an extension the effects of a merger between home appliance manufacturers on product line length, although the main focus of the paper is on price effects. Finally, Friberg and Romahn (2015) analyze the effects of divestitures, again focusing on price effects. Instead, we consider the effect of divestitures both on prices and on variety.

Our paper is also related to the literature that studies the link between market concentration and product variety. In particular, both Gandhi et al. (2008) and Mazzeo et al. (2014) study the issue of product repositioning after mergers and highlight the importance of considering effects on variety together with price effects. The empirical evidence on this issue is mixed. While Berry and Waldfogel (2001) find that mergers increase variety in US radio broadcast markets, Gotz and Gugler (2006) find evidence of a reduction of variety after mergers in retail gasoline markets. Sweeting (2012) finds that mergers in the music radio industry do not affect aggregate variety, because changes affecting the merging parties and competitors offset. Finally, Watson (2009) finds mixed evidence of the effect of local competition on variety and competition in retail eyeglasses.

The paper is structured as follows. In the next Section we provide some background information on the Dutch grocery market and on the merger under consideration. We present our main empirical analysis in Section 3. Section 4 concludes.

2. The Dutch grocery sector and the merger

2.1 The Dutch grocery markets

The main market players at the time of the mergers included the merging parties and several other supermarket chains. Jumbo is a full-service supermarket formula operating across the country. It used to have a strong position especially in Southern Netherlands, and has considerably expanded thanks to the acquisition of SdB and C1000. The most important characteristic of the Jumbo core marketing proposition is the “every day low price” guarantee (EDLP). Jumbo stores used to run few promotions. In addition, it is generally acknowledged that Jumbo stores are allowed to individually adjust their prices in order to

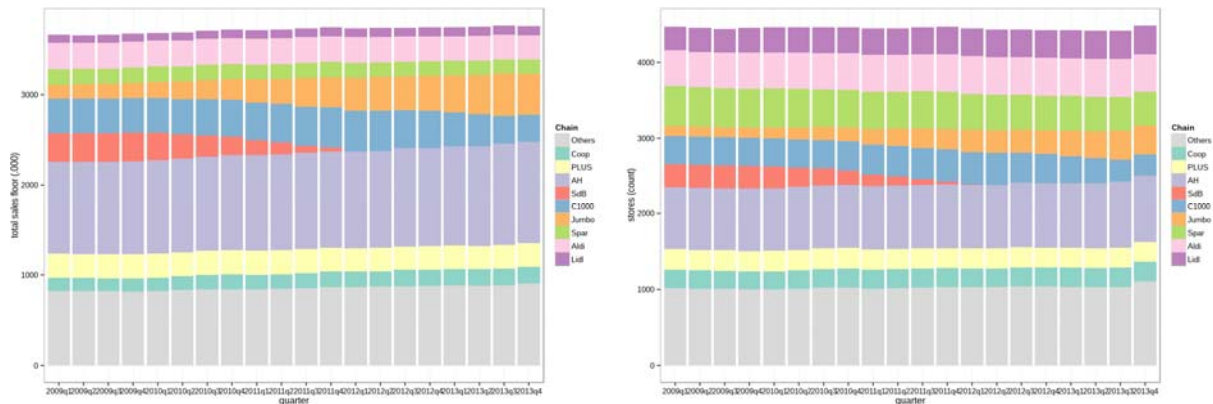
match competitors nearby. Also C1000 was a full-service supermarket formula, which operated across the country. Its core strategy was reportedly focused on deep, short-lived promotions (including on products like beer). Its assortment was reportedly smaller than other major national players. The characteristics of these retailers support the idea that price competition takes place at the local level, at least to some extent.

Among competitors with a national footprint, Albert Heijn is the largest full-service supermarket chain and is perceived as the market leader. It operates across the country adopting various store formats. Its commercial offering is similar to Jumbo’s offering, especially in terms of products’ variety. Moreover, it is the only other major chain of supermarkets operating across the whole Dutch territory.

Two large hard discounters have an important presence in the Dutch market: Aldi and Lidl. During the last five years, hard discounters have progressively increased their assortment, and started selling a (limited) list of branded goods. However, significant differences with traditional supermarket formulas still exist. In general, both Aldi’s and Lidl’s position in the Dutch market has improved thanks both to the upgrade in their portfolio of products and to the general economic situation.

Finally, the market is characterized by a series of other, smaller, regional players. For instance, Coop is a smaller player that attempted to implement a “national formula” even though it operates fewer stores. A number of smaller and regional players also exist, including Detail Group, Spar (part of an international group with a stronger position in other countries), Hoogvliet and Jan Linders.

Figure 1: Stores’ market position (national level) over time: net sales floor area (left) and number of stores (right)



Source: our elaboration on Supermarket Gids data

Figure 1 represents the time evolution of the market shares of all supermarket chains and discounters (at the national level) both in terms of net sales floor area (left panel) and in terms of the number of stores (right panel). Albert Heijn (hereafter also “AH”) is clearly the largest chain. The combination of SdB, C1000, and Jumbo has a net sales area similar to AH. There is a considerable number of stores belonging to chains other than the ones listed. Overall, the total number of supermarkets has remained almost constant from the beginning of 2009 to the end of 2011.

2.2 The merger between Jumbo and C1000

In our analysis, we study Jumbo’s acquisition of over 400 Schuitema locations (the entire C1000 supermarket chain) that took place in February 2012.⁵ C1000 stores initially continued to operate under the C1000 sign, to be rebranded under Jumbo own insignia brand. At the time of the analysis, the relabelling from C1000 to Jumbo was not yet fully completed. The Jumbo-C1000 merger approval was conditional on the divestiture of eighteen stores. Jumbo complied in July 2012 to this set of remedies by selling the eighteen locations – along with additional stores – to Coop and Ahold (owner of the Albert Heijn chain).

The geographic market definition adopted by the ACM was a 15-minutes isochrone around the analyzed stores. However, the ACM noted that Dutch consumers are not inclined to shop outside their neighborhood. Hence in practice, the geographic market definition coincides with the administrative borders of each town. In our analyses, we adopt the definition put forward by the ACM and control for a number of explanatory variables measured at the municipal level to account for local demand and supply drivers as well as levels of competition. In addition, we exclude large cities from our sample due to the difficulty in matching them with a suitable comparator.

With respect to the product dimension, the relevant product markets defined by the ACM include supermarket chains and hard discounters. In our study, we embrace the product market definition adopted by the ACM. However, we restrict our analysis to a particular format (i.e., regular supermarket), in order to maximize the similarity between the

⁵ The merger between Jumbo and C1000 is the last of a series of three mergers that took place in this industry between 2009 and 2012. In a study we did for the ACM (Argentesi et al. 2015), we assess the price effects of all these mergers. In this paper we focus however on the last merger, because it was the most relevant one that concluded the acquisition process started in 2009 and because the data on product assortment are only available for a limited period.

different stores analyzed and make our final sample more homogeneous. Moreover, given the increasing role covered by hard discounters (e.g., Lidl and Aldi) in the Dutch market in recent years, we explicitly control for their presence and strength in the relevant geographic market.

For each separate geographic market, the ACM determined the post-merger combined share of the merging parties in terms of “net sales floor” as a proxy for total turnover. For each area where the combined market share was greater than 50%, the ACM carried out an in-depth assessment of the competitive conditions, accounting for the specificities of each local market and for potential disciplining forces originating from neighboring areas. Following this exercise, the ACM identified a list of some “problematic areas”, for which a divestiture was deemed necessary to solve the anticompetitive concerns. In our sample, we include both problematic and unproblematic areas. Furthermore, we include areas where a divestiture was requested.

3. Empirical analysis

The aim of the study is to analyze the impact of the merger on prices and variety. We implement a difference-in-difference (DiD) approach, in which we exploit both time and cross-sectional variation of prices and product variety to identify the effect of the merger. The basic idea of our empirical strategy is that retail competition in grocery markets works at the local level.⁶ The competitive effects of a merger are expected to be potentially stronger in areas characterized by an overlap between the merging parties (i.e., areas where stores of both insignias were present at the time of the merger) than in areas where the parties did not compete with each other. The former areas, in fact, would be the ones experiencing the stronger change in the competitive conditions: a decrease in the number of competitors. Therefore, we can attempt to identify the potential effect of mergers by comparing prices and variety of assortment of the merging parties in areas of overlap vis-à-vis areas of no overlap.⁷

⁶ In the report we provide strong empirical evidence of the fact that competition among food retailers has a local component, especially for what concerns price discounts and the choice of variety.

⁷ In the study for the ACM (Argentesi et al., 2015) we also perform additional analyses based on different estimation strategies to assess the robustness of our results especially to the fact that some measures of competition (for instance price) might not be set at the local level.

The DiD approach entails a comparison of two properly identified groups: the treated group (which has been affected by the “treatment”, i.e. the merger) and the control group (which has not been affected by the “treatment”), before and after the merger decision. The double differencing removes the time invariant effects of each group (treatment and control) as well as the common time effects that might be otherwise confounded with the effect of the merger. The strength of this method is that it isolates the effect of the merger from any other factors that (i) may affect the trend in price (variety); (ii) may be related to the differences between the treated and the control group.

We separately run the analysis for merging firms and competitors. As an additional robustness check, we then run a specification where we use the competitors as a control group for the merging parties (e.g. Ashenfelter et al., 2013). In our main specification, we compare the change in an outcome variable in a selection of stores belonging to the merging parties that were located in overlap areas, with the change in the same outcome variable before and after the merger in other stores of the merging parties picked from the best-matched non-overlap areas. We estimate the following equation:

$$Out_{ist} = \alpha + \beta overlap_s + \gamma post\ merger_t + \delta post\ merger_t \times overlap_s + \mu Z_{st} + \mu_{is} + \tau_t + \varepsilon_{ist},$$

where Out_{ist} is the price (variety) level for the product (products’ category) i at the store s at quarter t ; $overlap_s$ is a dummy variable that takes on the value of one if the store is located in an overlap area; $post\ merger_t$ is a dummy variable that takes on the value of one if the products’ price (variety) is observed in the post-merger period (i.e. after February 2012 for the price regression and after the first quarter of 2012 for the variety regression); Z_{st} is a set of variables that control for local market features (on the demand and supply side) that change over time.⁸ The fixed-effects μ_{is} are τ_t control for product/category invariant characteristics as well as for time effects that capture aggregate uncertainty, respectively. The error term ε_{ist} is assumed to be heteroskedastic and correlated at the store-product or products’ category levels.⁹

The main variable of interest is ‘ $post\ merger_t \times overlap_s$ ’, whose coefficient measures the effect of the merger on product variety by identifying the additional variation

⁸ For an in depth description of control variables, see Table A.1 in the Appendix.

⁹ We experimented with different τ_t correlation structures but our results were not strongly affected.

in price or variety experienced by the treated stores compared to the control stores moving from the pre-merger to the post-merger period.

Finally, we control for the average difference in the price and product assortment across different product's categories and supermarket chain by including fixed effects for any combination of category and supermarket's insignia. By following this approach, we are able to control for the effect on price and variety determined by the change in insignia.

To effectively implement the DiD approach, one needs to ensure that the difference in the average behavior in the control group adequately represents the counterfactual difference in the average behavior that would have occurred absent the treatment. In practice, we have to properly identify treatment and control groups taking into account the specificities of the market.

An additional important element for the definition of the identification strategy is that three mergers have affected the Dutch market in four years (2009-2012). In order to isolate the effect of the last merger, we had to restrict the choice of the areas and, consequently, of the stores in such a way that the average behavior of the treated and control group could not be biased by the occurrence of the other mergers.

3.1 Data and Sample

For our empirical analysis, we collected store-level data for an appropriately selected sample of stores. The period of analysis goes from January 2009 to December 2013 and the date of the merger is defined by the date of the ACM decision in February 2012. The database for the empirical analysis was provided by IRI, a firm specialized in collecting and analyzing data on retailing.

The supermarkets included in our sample are selected from areas where the merging parties overlap and from *comparable* areas where they do not overlap. To define comparable areas, we pairwise match cities where the merging parties overlap with non-overlap cities by applying a propensity score matching approach, a technique that allows collapsing a set of different characteristics to a single dimension.¹⁰ Within areas of overlap and areas of non-

¹⁰ We assess the level of similarity taking into account a full range of observable factors that could vary across overlap and non-overlap areas such as demand and supply characteristics (for a similar approach see Aguzzoni et al., 2016). Specifically, we use the average density population, average store size, HHI, number of stores, average income, stores' rental cost, and the presence of hard discounters. Moreover, our selection also accounts for a widespread geographic coverage of the Dutch territory and a balanced representation of all merging parties and of the subset of selected competitors. Further details on the propensity score matching procedure used in the analysis are available upon request.

overlap, we select a suitable number of stores both from the merging parties and from competing chains. Our final selection includes over 171 different stores representing the merging parties' chains and two competitors (Albert Heijn and Coop). For this list of stores, we obtained data on a selection of products.

Due to several (mostly budgetary) constraints, we could not collect price data on all products sold in each store. Hence, we based our selection of categories and products on best practices from academic literature and ideas originating from the recent Bundeskartellamt's inquiry in the food retail sector (Bundeskartellamt, 2014). The final list of categories includes coffee, cola, cleaners, diapers, fresh milk, frikandels, mayonnaise, olive oil, sanitary napkins, shampoo, and toilet paper.

Our selection of these categories is based on the following criteria: i) the inclusion of both "food" and "non-food" items; ii) the inclusion of items belonging to the basket of goods typically consumed in the Netherlands; iii) the inclusion of items whose characteristics set them apart from other items, either because we expect lower price sensitivity or due to higher level of differentiation and innovation (e.g. diapers are an especially interesting product, as they are relatively high-tech, differentiated and pricey); iv) the inclusion of more traditional items for which comparisons across geographic markets are easier.

To choose the products within the category, it is important that they are comparable both over time and across stores. Dutch supermarket assortments usually include at least one A-brand item, one private label, and one first-price (i.e. cheapest) item for each product. We exclude first-price items from our sample, as they may significantly differ in quality according to the data provider. Similar problems hold for fresh articles, that we exclude as well. Hence, for each product defined at SKU level, we have three time series: Two SKUs for 'A-brands' and one SKU for private labels. We try to ensure comparability across stores such as same quality and format (e.g., "fresh whole milk, 1 liter bottle") as well as comparability over time (e.g., not mixing different SKU over time unless necessary to ensure a sufficient coverage of the period under scrutiny).

In order to analyze the effect of the merger on product variety, we also collected quarterly data on the number of SKUs per 125 products' category at store level over the period 2010-2013. This variable represents the depth of assortment for each of the 171 stores on our sample, and it measures the product offering available to consumers.

3.2 The Merger Effects on Prices

Our database includes total turnover (euro), volume (sales), promotional turnover (euro) and promotional share (as a percentage of total sales) measured at store level for the period 2009-2013. Measurements are weekly and are provided with a four-week periodicity starting with week 4 of 2009. Hence, our price data is determined as total turnover over volumes, and is net of promotional measures.

Figure 2: Comparison between average price trends in treated and control areas

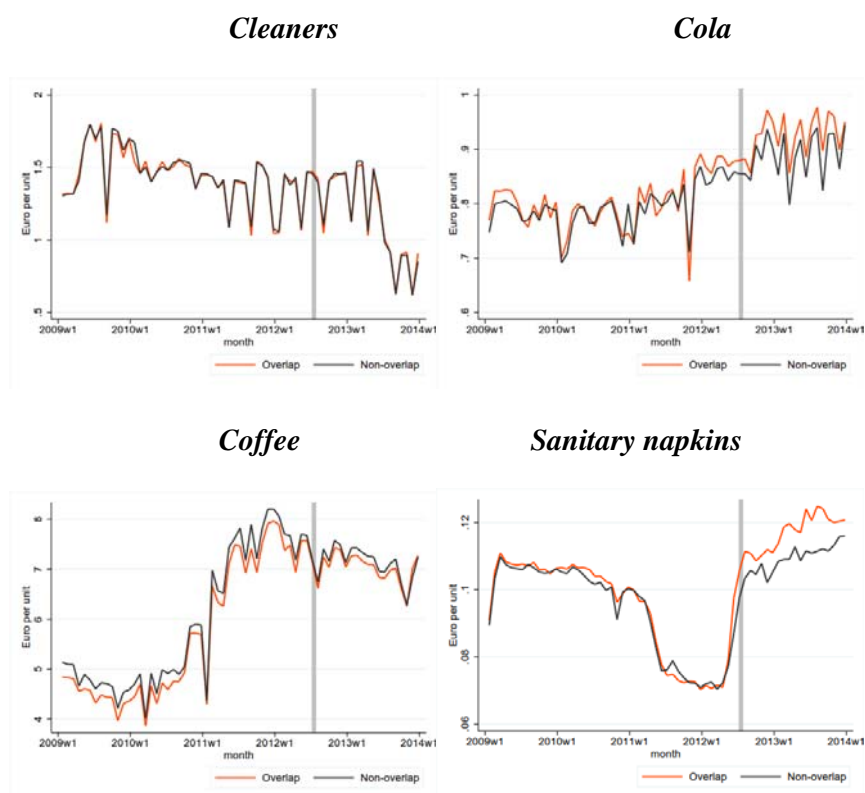


Figure 2 shows the average price trend for the merging stores in the overlap and non-overlap areas for a subset of the analyzed product categories. The graphs show that price evolution in the treatment and control group are quite similar and, more importantly, that they are subject to a same common trend during the *pre-treatment* period. This is a key assumption for the identification of the average treatment effect through the DID approach

which is met in our sample.¹¹ Moreover, the graphs offer a preliminary glimpse of the result of our econometric analysis: prices in the treated and control stores seem to mostly maintain the same trend and level all over the period of the analysis. If the merger had any negative impact on prices, we would have expected the distance between the two price trends to increase in the post-merger period.

To confirm the result of this graphical analysis, we then perform several regressions using the DiD methodology discussed above. We report the results for the main specification for the price analysis in column 1 of table 1. First, there does not seem to be any statistical difference between prices in treated stores located in overlapping areas and control stores located in non-overlapping areas ('Overlap'). Second, prices seem to have significantly increased in the post-merger period for both treated and control stores – the coefficient's estimate for the variable 'post' is positive and significant. However, and more interestingly for this study, this price increase post-merger is not different between stores located in the overlap areas compared to stores located in the non-overlap areas ('Overlap × Post'), i.e., the merger did not have any significant effect in overlap areas. The same holds for competitors' prices (column 2), suggesting that the merger did not have any significant effect on this dimension of competition, at least at an aggregate level.

¹¹ To support this finding, we also estimate a regression where we verify whether the time trends differ between treated and non-treated areas. We do not find any significant difference.

Table 1: Effect of the Merger on Prices

	Merging parties (1)	Competitors (2)
Post-merger	0.199*** (0.025)	0.236*** (0.037)
Overlap	-0.013 (0.014)	-0.016 (0.026)
Overlap × Post	0.004 (0.035)	0.013 (0.052)
Population	-2.59e-07 (0.000)***	2.41e-07 (0.000)
Average income	0.008*** (0.002)	0.026** (0.011)
Discounters market share	0.084*** (0.024)	0.124 (0.146)
HHI	3.68e-06* (0.000)	-1.42e-05 (0.000)
Constant	1.589*** (0.042)	1.201*** (0.243)
Observations	83,736	48,133
R-squared	0.947	0.924
Cluster	Store × SKU	Store × SKU
FE	Chain × SKU	Chain × SKU

Notes: Clustered-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Among the various controls, the most interesting one is probably the variable measuring the discounters' market shares, which captures the competitive pressure coming from the hard-discounters (in particular Aldi and Lidl). The coefficient's estimate is positive and significant, thereby indicating that in the cities where the market share of the discounters is higher, the average price charged by the merging stores is higher. The result we obtain might at first seem counterintuitive: we would have expected that the presence of hard discounters intensifies the competitive conditions in a city, driving prices at lower levels. However, a possible explanation relies on product differentiation. In those areas where competition from hard-discounters is strong, premium supermarkets differentiate themselves by focusing on the high-priced products.

The results of Table 1 are robust to several checks (see Table A.2 in the Appendix). First, since we do not know exactly when the two merging parties became one single entity and because the competitive conditions could have started changing since the notification of

the acquisition, we also run specifications where we exclude from our dataset windows of 3 and 6 months before and after the merger date (columns (1) and (2) of Table A.2). Results do not change.

Second, we evaluate whether the merger had a different impact on the prices of those stores that did not experience a rebranding from C1000 to Jumbo, and we do not find any significant effect (column (3) of Table A.2).

Third, we evaluate whether the merger had a different impact for those merging stores whose combined market share after the merger is higher than 50% (column (4) of Table A.2). Even in this case, the coefficients of the variables of interest are not significant.

Fourth, we evaluate if the requirement of a divestiture alleviates the effect of the merger. For this purpose, we include in our model a dummy that takes on the value one in the post- merger period if the store is located in a city where a divestiture has been made. We then interact the variable ‘Overlap × Post’ with the variable ‘Divestiture’ to explore if the merger had a different effect in the areas where a divestiture has been issued (column (5) of Table A.2). Again, we do not find any significant effect.

Finally, it might still be possible that the merger caused an increase in price throughout the Netherlands in the case in which stores adopt a national pricing policy. Hence, we perform an additional analysis where we use the competitors to the merging parties as a control group.¹² The underlying assumption based on economic theory is that if the merging parties increase their prices after the merger, competitors will increase their prices too but less than the merging parties (e.g., Deneckere and Davidson, 1985). Also in this case we do not find evidence that the merging parties increased their prices more than their competitors.

We perform the same set of robustness checks on competitors’ prices (see Table A.3 in the Appendix). We find no differential effect on competitors’ stores operating in areas where C1000 store were not rebranded, nor in areas where the market was very concentrated (i.e. where the HHI was larger than 4000). Moreover, we find no evidence of a significant effect in areas where there has been a divestiture.

3.3 The Merger Effects on Variety

¹² Results are available in Argentesi et al. (2015).

The previous analysis suggests that the merger did not have any significant effects on prices at the local level. This makes the analysis of the effects on non-price dimensions even more valuable. Along these dimensions, decisions about product assortments and offered variety are key strategic choices in retailing markets. Indeed, according to the questionnaires and the interviews that we performed, supermarket stores have a great degree of freedom on product variety and mostly can set their preferred assortment.¹³ We therefore believe that the analysis looking at the merger's impact on variety across areas might be particularly informative, as this seems to be one of the key strategic decisions at the local level.

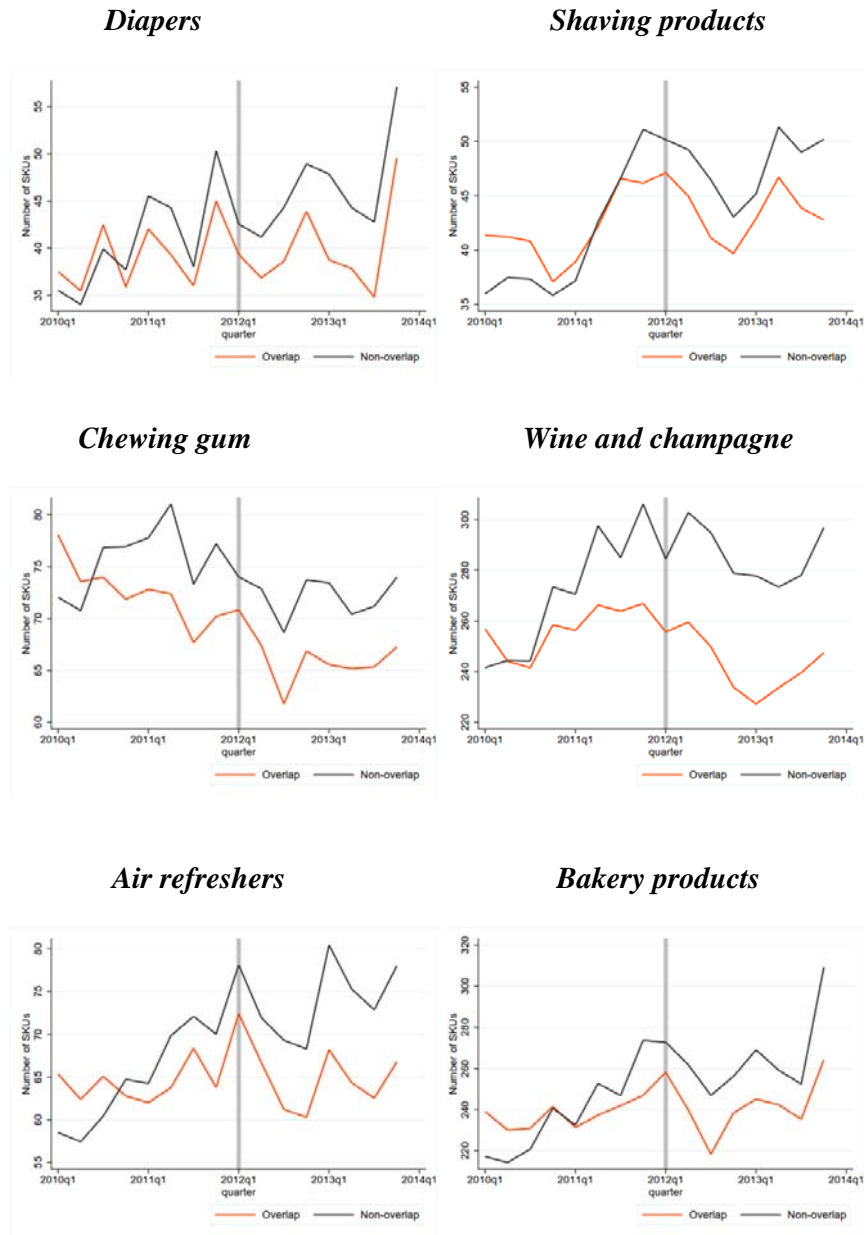
We use the depth of assortment (number of SKUs for 125 products' categories) in each store as a measure of variety. For some selected product categories, figure 3 compares the evolution of the total number of SKUs per store in the overlap areas to the average level of product variety in non-overlap areas.¹⁴ Also in this case, the figures show quite similar trend both before and after the merger.¹⁵ However, almost all series seem to diverge post-merger.

¹³ See Argentesi et al. (2015), part VI.

¹⁴ The sample for this analysis is not exactly the same as we used for the price analysis due to data quality issues that forced us to drop a number of observations. Note that we undertook a separate matching procedure to identify overlap and non-overlap areas for the analysis on variety, since the relevant variable for this analysis is different from the one that is relevant for the price analysis.

¹⁵ Again, we also estimate a regression where we verify whether the time trends differ between treated and non-treated areas. Although the coefficient measuring this difference is on average positive and statistically significant, it is also very close to zero (0.03). According to the regression analysis, there is a negligible discrepancy between the trend in average depth of assortment in the treated and control stores. Considering that the average level of variety in the pre-merger period across all the stores is equal to 90 SKUs per category, the discrepancy would amount to less than one SKU (0.03% in relative terms). Therefore, we can assume that the treated and control stores have a similar trend in variety in the pre-merger period and the stores in the non-overlapping areas are an adequate control group. See the appendix for details.

Figure 3: Comparison between trends in average product variety in treated and in control areas



Overall, the depth of assortment in the treated stores is lower than the level of product variety in the control stores. For some of the categories, the level of variety is higher in the treated stores than in the control stores for the first years of the pre-merger period and then gets lower. This is particularly evident for products such as shaving products and air refreshers. Yet, the level of variety is regularly lower in the treated stores than in the control

stores in the period after the merger and the distance between the two trends increases after the merger date indicated by the vertical line at the first quarter of 2012. This anticipates the results of the econometric analysis: the merger had a negative impact on the level of product variety of the merging parties.

We then perform a more formal econometric analysis to get a precise estimate of these effects. According to our results (column 1 of Table 2), the merger negatively affected the level of the merging parties' product variety. Considering that the average variety level in the control stores in the post-merger period (counterfactual level) is equal to 88 SKUs per category and the coefficient for the treatment effect is -3.8, the merger caused a reduction in variety by 4.3%. The estimated effect of the merger on competitors' variety (column 2 of Table 2) seems instead to go in the opposite direction. In particular, competitors increase their assortment in overlap areas, where the merger is supposed to have produced a stronger effect. These results are suggestive of strategic substitutability in variety, whereby rivals react with an increase in variety to decreased variety by the merging parties. Note, however, that the magnitude of the effect on competitors is much smaller than the first-order effect on the merging parties.

As for the price regression, we run alternative specifications to check the robustness of our results (Table A.4 in the Appendix). First, we drop three and six months around the merger date, respectively. Results are still significant and the effect on variety is even stronger. Second, we exclude from the dataset the products that show seasonality in their variety trend (namely sun protection products, insecticides and greeting cards). Results do not change: the effect of the merger on variety is still significant and negative.

Table 2: Effect of the Merger on Variety

	Merging parties	Competitors
	(1)	(2)
Post-merger	1.881** (0.791)	1.311 (0.799)
Overlap	6.717*** (0.660)	-3.707*** (0.862)
Overlap × Post	-3.842*** (0.790)	0.624** (0.277)
Population	-0.0001*** (0.000)	-4.48e-06 (0.000)
Average income	-0.438*** (0.119)	2.027*** (0.246)
Discounters market share	-7.000*** (2.157)	14.95*** (2.763)
HHI	-0.001*** (0.000)	-0.001*** (0.000)
Net sales floor	0.005*** (0.001)	0.002*** (0.000)
House value	0.037*** (0.005)	-0.013*** (0.004)
Constant	139.5*** (2.455)	138.5*** (4.723)
Observations	166,531	64,691
R-squared	0.867	0.942
Cluster	Category	Category
FE	Category × Insignia	Category × Insignia

Notes: Clustered-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

3.4 Heterogeneous Treatment Effects

In order to explore further the drivers of the previous results, we estimate a set of heterogeneous treatment effects. We show the results of such additional regressions both for the merging parties and for competitors in Tables 3 and 4 respectively.

First, we assess whether the effect on variety is related to rebranding of stores from C1000 to Jumbo. We therefore interact the treatment variable with a dummy that is equal to 1 for stores that were not rebranded (column 1 of Table 3). The negative effect of the merger on variety is mainly driven by stores that keep on operating under the C1000 insignia after the merger. Instead, the merger does not have any significant effect on the variety of stores

that either operate as Jumbo or are relabeled as Jumbo. This evidence suggests that, in areas where the merged entity operates two stores with different insignias, it repositions their product assortment to avoid cannibalization. In order to understand whether this is just a transitory effect, in columns (1a) and (1b) we consider different lengths of the post-merger period. Our findings suggest that C1000's variety decreases over time, in line with the idea that this product repositioning takes some time to be fully realized. This result does not necessarily imply that operating stores under two different insignias is a long-run decision of the merged entity, as we have no information on what happens to these stores after 2013. Our evidence just suggests that, for the stores that were not rebranded (33 out of 49 C1000 stores in our sample), the depth of assortment decreased as a result of the merger.

Second, we investigate whether the effect of the merger varies across areas depending on the level of post-merger concentration (column 2 in Table 3). We find the effect on variety is particularly severe in areas where concentration is high (Herfindal-Hirschmann-Index – HHI – higher than 4,000). Interestingly, in areas that are more concentrated the effect of the merger on variety appears to be particularly negative.

Finally, we explore the impact of divestitures on the variety effect (column 3 in Table 3). While we estimate a significant negative effect for overlap areas in the post-merger period, its interaction with a dummy measuring whether a divestiture took place is positive and significant. This indicates that the negative effect of the merger on variety is weaker in the areas where a divestiture has been issued. These results suggest that the divestitures have been effective: they modified the competitive conditions in the post-merger period in the areas where they have been issued.

In Table 4, we present results for heterogeneous effects of competitors' variety. As for the merging parties, we investigate whether the effect on competitors is different according to market concentration (column (1) of Table 4).

Table 3: Heterogeneous Effects on Variety: Merging Parties

	Non-Rebranded (1)	Non-Rebranded up to 4 quarter 2012 (1a)	Non-Rebranded up to 2 quarter 2013 (1b)	Concentration (2)	Divestitures (3)
Post-merger	2.239*** (0.676)	3.714*** (0.649)	2.633*** (0.653)	2.077*** (0.752)	3.030*** (0.702)
Overlap	6.490*** (0.704)	6.101*** (0.670)	6.192*** (0.683)	7.040*** (0.743)	6.782*** (0.724)
Overlap × Post	0.129 (0.475)	-1.314*** (0.442)	-1.296*** (0.472)	-2.576*** (0.433)	-3.823*** (0.434)
Overlap × Post × Non-Rebranded	-10.65*** (1.141)	-1.474* (0.778)	-6.309*** (0.891)		
Overlap × Post × HHI>4000				-3.369*** (0.885)	
Overlap × Post × Divestiture					1.844*** (0.617)
Population	-0.0001*** (0.000)	-0.0002*** (0.000)	-0.0002*** (0.000)	-0.0001*** (0.000)	-0.0001*** (0.000)
Average income	-0.328** (0.131)	-0.125 (0.128)	-0.227* (0.131)	-0.386*** (0.123)	-0.590*** (0.136)
Discounters market share	-6.652*** (1.812)	-14.19*** (2.385)	-10.33*** (2.113)	-4.244** (1.684)	-8.796*** (1.887)
Non-rebranded (C1000 stores)	4.509*** (0.541)	7.053*** (0.634)	6.851*** (0.631)		
HHI > 4000				-2.101*** (0.701)	
Divestiture					-10.38*** (1.004)
HHI	-0.001*** (0.000)	-0.002*** (0.000)	-0.002*** (0.000)		-0.001*** (0.000)
Net sales floor	0.005*** (0.001)	0.006*** (0.001)	0.005*** (0.001)	0.005*** (0.000)	0.00576*** (0.001)
House value	0.035*** (0.005)	0.026*** (0.004)	0.031*** (0.004)	0.035*** (0.005)	0.0402*** (0.005)
Constant	136.3*** (2.559)	136.7*** (2.603)	136.7*** (2.603)	134.4*** (2.126)	142.1*** (2.411)
Observations	166,531	115,266	135,748	166,531	166,531
R-squared	0.867	0.865	0.868	0.867	0.867
Cluster	Category	Category	Category	Category	Category
FE	Category × Insignia	Category × Insignia	Category × Insignia	Category × Insignia	Category × Insignia

Notes: Clustered-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Interestingly, in areas that are more concentrated the effect of the merger on variety appears to be particularly negative, as we observe a reduction of variety for both the merging parties and their competitors.

Table 4: Heterogeneous Effects on Variety: Competitors

	Concentration (1)	Divestitures (2)
Post-merger	1.255 (0.791)	1.424* (0.793)
Overlap	-3.227*** (0.854)	-3.598*** (0.857)
Overlap × Post	1.177*** (0.289)	1.115*** (0.253)
Overlap × Post × HHI>4000	-6.764*** (1.578)	
Overlap × Post × Divestiture		-7.577*** (1.967)
Population	2.76e-07 (0.000)	-2.09e-05 (0.000)
Average income	1.950*** (0.240)	2.134*** (0.250)
Discounters market share	13.96*** (2.807)	12.10*** (2.747)
HHI		-0.001*** (0.000)
HHI > 4000	0.310 (1.193)	
Divestitures		-4.385*** (0.875)
Net sales floor	0.001*** (0.000)	0.001*** (0.000)
House value	-0.018*** (0.005)	-0.017*** (0.004)
Constant	137.9*** (4.730)	138.3*** (4.719)
Observations	64,691	64,691
R-squared	0.942	0.943
Cluster	Category	Category
FE	Category × Insignia	Category × Insignia

Notes: Clustered-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Finally, we look at whether the effect is different in areas where the merging parties had to divest a store (column 2 of Table 4). We find that competitors reduced their assortment in

areas where there was a divestiture. Yet, divestitures were insufficient to remove entirely the negative effects of the merger on variety as the merger still reduced variety on average.

4. Conclusions

The empirical evidence presented in this paper shows that mergers in retail grocery markets need to be scrutinized very cautiously. Even though we do not find significant price effects, we do show that the merger caused a reduction in the average depth of assortment offered by the merging stores located in the overlapping areas notwithstanding the remedies imposed by the competition authority. We also find that this effect was particularly strong in areas where concentration was high. On average, the increase in variety for competitors might have partially compensated this effect. However, the reduction of competitors' variety in more concentrated areas seems to have reinforced the effect for the merging parties. The reduction in product assortment limits consumers' choice and may ultimately harm them. As a result, it is plausible that a reduction in the depth of assortment reduces consumers' surplus and consequently, the merger negatively affect consumers' welfare.

A different conclusion could only be drawn if the degree of variety offered by the merging stores in the pre-merger period was excessive. In principle, the optimal depth of assortment might not always coincide with the highest number of items per category. Deeper retail assortment gives consumers a wider range of items to choose from, increasing the probability that they will find the item they want. However, deeper retail assortment also increases the time and effort consumers must exert when selecting an item from a category. The items with broadest appeal are usually the first ones included in an assortment and the benefit of adding additional items diminishes as the number of items in the assortment grows. The assortment size generally reflects consumers' cost of shopping (measured as consumers' opportunity cost of time): consumers with low shopping costs prefer larger assortment, whereas consumers with high shopping costs, prefer instead a smaller assortment (Fox and Sethuraman, 2006). The merging stores might have decided to withdraw duplicates items and invest in innovative and higher quality brands or private label. Jumbo and C1000 belong to a common buying alliance – Bijeen. After the merger, they might have decided to exploit their bargaining power at the upstream level and renovate their scale at the downstream level, to invest in alternative brands and private labels.

Unfortunately, we do not have enough information to assess if the degree of variety was excessive before the merger nor to understand how consumers might evaluate a change in the assortment. The only additional data we have concern prices. The price analysis shows that the merger had no impact on the price charged by the merging stores in overlap areas. Therefore, even if the assortment adjustment promoted economies of scale and scope, synergies in marketing, IT, overhead and logistics, the related cost-savings might not have been passed on to consumers (i.e. prices did not decrease in the post-merger period). This crucially depends on whether these cost savings equally affected the merging parties in overlap and in non-overlap areas or whether they were area-specific.

Our comprehensive assessment of the effect of the merger reveals that the merger may have harmed consumers' welfare through a reduction in product variety, although not through an increase in prices. The issuance of divestitures may have partially outweighed the negative effect of the merger: the analysis on divestitures shows indeed that, in the areas in which the divestitures have been issued, the average level of variety decreases less than in similar control areas (where none of the merging stores has been divested). To conclude, if we consider the effect of the merger both on prices and on variety, it appears that the ACM correctly identified areas with potential competitive concerns and the divestitures have effectively removed the anticompetitive effect of the merger (i.e. the reduction of variety) in those areas. However, it appears that additional divestitures would have been necessary to remove completely the adverse effect of the merger on depth of assortment.

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Appendix

Table A.1: List of Control Variables

Control variables	Description	Time reference	Source
Local market features: demand side			
population	number of inhabitants per City	yearly	CBS - NL ¹⁶
population density	average number of inhabitants per square kilometer per City	yearly	CBS – NL
number of households with children	percentage of households with children (unmarried couples with children, spouses, couples with children and single-parent households) per City	yearly	CBS – NL
income	weighted average of income per capita per City (weights equal to number of income recipients per city)	yearly	CBS – NL
Local market features: supply side			
rental price	average value of residential real estate	yearly	VU University Amsterdam ¹⁷
HHI	HHI per city (stores market shares are proxied by the net sales floor)	quarterly	Supermarket Gids
number of stores	number of stores per City	quarterly	Supermarket Gids
average store net sales floor	average net sales floor of all the stores in the City	quarterly	Supermarket Gids
average net sales floor of Aldi	average net sales floor of all the Aldi stores in the City	quarterly	Supermarket Gids
average net sales floor of Lidl	average net sales floor of all the Lidl stores in the City	quarterly	Supermarket Gids
discounter market shares	Sum of the market shares of Lidl and Aldi stores (computed on the basis of the store's net sales floor) in the City	quarterly	Supermarket Gids

¹⁶ Central Bureau Statistics – Statistics Netherlands, please see <http://www.cbs.nl/en-GB/menu/home/default.htm>

¹⁷ Department of Spatial Economics & Spatial Information laboratory.

Table A.2: Robustness Checks on Price Effects: Merging Parties

	3 months window	6 months window	Non- Rebranded	Combined mkt share>50%	Divestiture
	(1)	(2)	(3)	(4)	(5)
Post-merger	0.227*** (0.027)	0.264*** (0.029)	0.199*** (0.025)	0.199*** (0.025)	0.199*** (0.025)
Overlap	-0.013 (0.014)	-0.011 (0.014)	-0.015 (0.014)	-0.016 (0.015)	-0.013 (0.014)
Overlap × Post	0.007 (0.038)	0.005 (0.041)	-0.018 (0.038)	0.005 (0.038)	0.006 (0.036)
Overlap × Post × Non-rebranded			0.050 (0.040)		
Overlap × Post × Combined mkt share>50%				-0.005 (0.055)	
Overlap × Post × Divestiture					-0.015 (0.050)
Population	-2.70e-07*** (0.000)	-2.42e-07** (0.000)	-2.78e-07*** (0.000)	-2.47e-07*** (0.000)	-2.55e-07*** (0.000)
Average income	0.007*** (0.002)	0.006*** (0.002)	0.008*** (0.002)	0.009*** (0.002)	0.008*** (0.002)
Discounters market share	0.071*** (0.024)	0.058** (0.024)	0.090*** (0.024)	0.087*** (0.025)	0.082*** (0.026)
HHI	2.97e-06 (0.000)	2.74e-06 (0.000)	4.16e-06** (0.000)	3.75e-06** (0.000)	3.67e-06* (0.000)
Non-rebranded C1000 stores			0.011 (0.008)		
Combined mkt share>50%				0.008 (0.022)	
Divestiture					0.004 (0.011)
Constant	1.630*** (0.041)	1.652*** (0.040)	1.573*** (0.044)	1.583*** (0.043)	1.589*** (0.043)
Observations	74,198	64,592	83,736	83,736	83,736
R-squared	0.948	0.949	0.947	0.947	0.947
Cluster	Store × SKU	Store × SKU	Store × SKU	Store × SKU	Store × SKU
FE	Chain × SKU	Chain × SKU	Chain × SKU	Chain × SKU	Chain × SKU

Notes: Clustered-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.3: Robustness Checks on Price Effects: Competitors

	3 months window (1)	6 months window (2)	Non-rebranded (3)	HHI (4)	Divestitures (5)
Post-merger	0.267*** (0.039)	0.291*** (0.043)	0.233*** (0.037)	0.241*** (0.037)	0.235*** (0.037)
Overlap	-0.015 (0.027)	-0.016 (0.028)	-0.014 (0.026)	-0.014 (0.026)	-0.016 (0.026)
Overlap × Post	0.010 (0.057)	0.018 (0.062)	0.024 (0.053)	-0.003 (0.054)	0.012 (0.053)
Overlap × Post × Non-rebranded			-0.076 (0.097)		
Overlap × Post × HHI > 4000				0.060 (0.101)	
Overlap × Post × Divestiture					0.038 (0.137)
Population	3.02e-07 (0.000)	4.20e-07 (0.000)	2.74e-07 (0.000)	5.00e-07 (0.000)	4.28e-08 (0.000)
Average income	0.025** (0.011)	0.026** (0.012)	0.029** (0.012)	0.025** (0.011)	0.026** (0.011)
Discounters market share	0.123 (0.154)	0.159 (0.169)	0.084 (0.137)	0.158 (0.148)	0.110 (0.145)
HHI	-1.51e-05 (0.000)	-1.29e-05 (0.000)	-1.72e-05 (0.000)		-1.72e-05 (0.000)
Non-rebranded C1000 stores			-0.025 (0.042)		
HHI > 4000				-0.039 (0.074)	
Divestiture					-0.057 (0.038)
Constant	1.231*** (0.253)	1.204*** (0.281)	1.156*** (0.256)	1.174*** (0.239)	1.212*** (0.242)
Observations	42,613	37,126	48,133	48,133	48,133
R-squared	0.922	0.921	0.924	0.924	0.924
Cluster	Store × SKU	Store × SKU	Store × SKU	Store × SKU	Store × SKU
FE	Chain × SKU	Chain × SKU	Chain × SKU	Chain × SKU	Chain × SKU

Notes: Clustered-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.4: Robustness Checks on Variety Effects: Merging Parties

	3 months window	6 months window	Seasonal products excluded
	(1)	(2)	(3)
Post-merger	1.447* (0.796)	1.357 (0.892)	1.881*** (0.683)
Overlap	6.900*** (0.752)	7.095*** (0.774)	6.717*** (0.720)
Overlap × Post	-5.603*** (0.590)	-5.330*** (0.604)	-3.842*** (0.441)
Population	-0.0001*** (0.000)	-0.0001*** (0.000)	-0.0001*** (0.000)
Average income	-0.440*** (0.132)	-0.457*** (0.135)	-0.438*** (0.131)
Discounters market share	-7.062*** (1.799)	-7.970*** (1.836)	-7.000*** (1.794)
HHI	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
Net sales floor	0.005*** (0.001)	0.005*** (0.001)	0.005*** (0.001)
Housevalue	0.036*** (0.005)	0.038*** (0.005)	0.037*** (0.005)
Constant	137.7*** (2.461)	139.4*** (2.511)	139.5*** (2.455)
Observations	134,752	113,879	166,531
R-squared	0.866	0.863	0.867
Cluster	Category	Category	Category
FE	Category × Insignia	Category × Insignia	Category × Insignia

Notes: Clustered-robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.