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ESTIMATING CONSUMER DAMAGES IN CARTEL CASES

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ABSTRACT

We use consumer panel data to calculate the damage suffered by German consumers due to a detergent cartel that was active between 2002 and 2005 in eight European countries. Applying before-and-after and difference-in-differences estimations we find average overcharges between 6.7 percent and 6.9 percent and an overall consumer damage of about 13.2 million euros over the period from July 2004 until March 2005. Under the assumption that the cartel-induced share on turnover is representative for the entire cartel period and for all affected markets, the overall consumer damage would even sum up to about 315 million euros. Our results further suggest that the retailers reacted to the price increases of the cartel firms via price increases for their own detergent products, resulting in significant umbrella effects. We quantify the damage due to this umbrella pricing to a total of about 7.34 million euros. With respect to the discussion whether special procedures for bringing collective actions should be available in the EU, our results are important in that we show how consumer associations can use consumer panel data in order to claim damages before national courts and thereby actively fulfill their mandate of consumer protection.

JEL: L13; L41; L44

I. INTRODUCTION

Whereas cartel damages of purchasers are already widely discussed in both academia and practice, consumer harm has only played a minor role in the context of cartel damage claims so far. This is due to obvious reasons. The damage suffered by an individual consumer generally falls below the legal expenses needed to receive compensation. Furthermore, in contrast to firms, final consumers are not obliged to keep receipts and are therefore often neither

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able to prove the fact that they bought the cartel product during the collusive period, nor at which price. This is especially the case when considering groceries, where several cartels (for example, coffee roasters, chocolate manufacturers, flour) have recently been discovered. Last but not least, current European competition law does not favor the exercise of class-action lawsuits as allowing to effectively bundle the individual claims of final consumers could (at least) partially mitigate some of the aforementioned obstacles.

Despite these hurdles, during recent years the question of legal standing of consumer associations in the course of private damage claims has increasingly attracted attention within the European Commission (EC). The European Consumer Consultative Group (ECCG), a sub division of the EC for end consumer interests, adopted an opinion on private damages actions in November 2010. It contains several proposals to improve private damages actions by consumer associations, amongst others, such as (1) the facilitation of the burden of proof for consumer organizations and (2) the assurance of redress for all consumers. In this context, the ECCG states that "innovative and practical solutions to the calculation of damages are needed to replace the often impossible task of calculating the exact loss."[1] In particular, the ECCG argues that "it should be possible to rely on a reasonable estimate of an overcharge."[2]

Against this background, we contribute to the current discussion by showing how final consumer damages can be quantified empirically. In particular, we estimate the damage suffered by German consumers due to the European detergent cartel. The cartel lasted from January 2002 until March 2005 and covered the markets of eight European countries. The three largest producers of heavy laundry detergents, who collect about two thirds of the sales and volume in Germany, were involved in this cartel.[3] For the estimation, we use survey data of consumer transactions from *The Nielsen Company*. The data set covers the last nine months of the cartel period and additionally 15 months after the breakdown of the cartel, which we use as a competitive counterfactual benchmark.

We find average overcharges between 6.7 and 6.9 percent and an overall consumer damage of about 13.2 million euros over the period from July 2004 until March 2005. Under the assumption that the cartel-induced share on turnover is representative for the entire cartel period and for all affected markets, the overall consumer damage even accounts for about 315 million euros. Our results further suggest that the retailers reacted to the price increases of the cartel firms via price increases for their own detergent products, resulting

[1] *See* EUROPEAN CONSUMER CONSULTATIVE GROUP, OPINION ON PRIVATE DAMAGES ACTIONS (2010), § 2.3, http://ec.europa.eu/dgs/health_food-safety/dgs_consultations/docs/eccg/eccg_opinion_on_actions_for_damages_18112010_en.pdf.

[2] *Id.*

[3] *See* Press Release, European Commission, Antitrust: Commission Fines Producers of Washing Powder €315.2 Million in Cartel Settlement Case (Apr. 13, 2011), http://europa.eu/rapid/press-release_IP-11-473_en.htm?locale=en.

in significant umbrella effects. We quantify the damage due to this umbrella pricing to a total of about 7.34 million euros.

The article is organized as follows. Part II reviews the theoretical background of cartel damages and describes the potential harm that could emerge on the final consumer stage. Part III summarizes the cartel case under scrutiny and gives a description of the data set. Part IV then describes our estimation approach and the calculation of the overall damage to German consumers. The article concludes with a summary of the main results and a discussion of policy implications in Part V.

II. RELATED LITERATURE

The quantification of cartel damages is usually not straightforward. Especially when considering multi-layer markets in which one product is used as an input in the production process of the adjacent stage, it is demanding to examine and allocate the various effects that percolate through the upstream and downstream layers after cartel formation. In general, the emergence of a cartel at some stage of such a supply chain leads to a higher price and less output in comparison to the prior competitive situation. That is, purchasers are confronted with higher input costs and may react to this change via own price increases, leading to further passing-on effects in the downstream layers. These price increases are generally accompanied by demand restrictions ("output effects") that detract from firm specific profits.[4] If one were to estimate the exact loss suffered by one specific purchaser due to cartelization, all of these effects must be taken into account.

Within such a multi-layer market, final consumers take a special position as they cannot pass on the price increase from which they suffer. Thus, they can either accept the loss in consumer welfare or change their buying behavior and buy cheaper substitutes. Those substitutes, however, may themselves be overpriced due to possible umbrella effects, implying that consumers are particularly in need of protection towards antitrust infringements.

Starting with the theoretical strand of literature, Han et al. show in one article that the loss in consumer surplus is composed of two parts, the overcharge effect that equals the price increase of the product from the adjacent layer above multiplied by the quantity purchased, and the output effect, which reflects foregone consumer purchases due to the higher price.[5] The authors further analyze the impact of the level of competition at one layer on the magnitude of the passing-on effect as well as the size of the consumer damage relative to the direct purchaser overcharge. If perfect competition exists on each downstream layer, the incidental price increase of cartelists is completely

[4] *See* Theon Van Dijk & Frank Verboven, *Quantification of Damages*, 3 ISSUES COMPETITION L. & POL'Y 2331 (2005).

[5] *See* M. A. Han, M. P. Schinkel & J. Tuinstra, *The Overcharge as a Measure for Antitrust Damages* (Amsterdam Ctr. for L. & Econ., Working Paper No. 8, 2008).

passed on to final customers. The overall damage suffered by them can then even be larger than the direct purchaser overcharge. Conversely, if there is substantial market power in the intermediate layers the direct purchaser overcharge overestimates consumer harm.

Boone and Müller use a market model with three layers to analyze the distribution of overall harm in terms of lost profits and lost consumer welfare between cartel purchasers and final consumers for the cases of homogenous and heterogeneous products.[6] They find that the consumer harm share (CHS) is negatively related to (1) the industry aggregate price-cost margin and (2) the pass-through elasticity, which measures the percentage change in output price in response to a one–percent increase in input costs. In addition, they show that the CHS is independent of the number of downstream firms that are directly affected by cartelization.[7]

In sum, theoretical literature shows that in vertically related markets final consumers might face substantial cartel damages even if several intermediate layers are interposed between cartel stage and final consumers. The size of the damage, however, depends on the number of intermediate layers and their corresponding levels of competition. The fewer the number of intermediate layers and the higher the degree of competition, the higher the price overcharge for final consumers. Given the detergents market considered in this article, there are generally two intermediate layers placed between cartelists and consumers: wholesalers and retailers, which are typically integrated. Hence, effectively there is only one intermediate layer, suggesting that higher cartel prices should be directly passed on to the retailers. Retailers set prices based on the wholesale price increased by a margin, which is based on the costs of retailing. Thus, a substantial fraction of the cartel–induced cost increase might have been passed on to final consumers, suggesting remarkable damages.

Turning to the empirical strand of literature, various articles have either analyzed the determinants of cartel overcharges within different geographical regions[8] and industries,[9] or explored the price overcharges enforced by

[6] Jan Boone & Wieland Müller, *The Distribution of Harm in Price-Fixing Cases*, 30 INT'L J. INDUS. ORG. 265 (2012).

[7] *Id.*; *see also*, George Kosicki & Miles B. Cahill, *Economics of Cost Pass Through and Damages in Indirect Purchaser Antitrust Cases*, 51 ANTITRUST BULL. 599 (2006); Frank Verboven & Theon Van Dijk, *Cartel Damages Claims and the Passing-On Defense*, 57 J. INDUS. ECON. 457 (2009); Leonard J. Basso & Thomas W. Ross, *Measuring the True Harm From Price-Fixing to Both Direct and Indirect Purchasers*, 58 J. INDUS. ECON. 895 (2010). However, these articles do not explicitly deal with final consumer damages but rather focus on direct and indirect purchasers.

[8] *See, e.g.*, John M. Connor & Yuliya Bolotova, *Cartel Overcharges: Survey and Meta-Analysis*, 24 INT'L J. INDUS. ORG. 1109 (2006); Yuliya Bolotova, John M. Connor & Douglas J. Miller, *Factors Influencing the Magnitude of Cartel Overcharges: An Empirical Analysis of the U.S. Market*, 5 J. COMPETITION L. & ECON. 361 (2008); Yuliya Bolotova, *Cartel Overcharges: An Empirical Analysis*, 70 J. ECON. BEHAV. & ORG. 321 (2009); Florian Smuda, *Cartel Overcharges and the Deterrent Effect of EU Competition Law*, 10 J. COMPETITION L. & ECON. 63 (2014).

[9] *See, e.g.*, Yuliya Bolotova, John M. Connor & Douglas J. Miller, *Factors Influencing the Magnitude of Cartel Overcharges: An Empirical Analysis of Food Industry Cartels*, 23 AGRIBUSINESS 17 (2005).

cartelists in specific price-fixing cases.[10] Those articles, however, exclusively concentrate on direct purchaser overcharges and ignore the price setting reaction of competitors, which might result in significant umbrella damages. We bridge both of these gaps in the empirical literature by estimating the price overcharges suffered by final consumers, taking into account the competitive behavior of the non-cartel firms in the relevant market. The article thereby provides new insights with respect to the quantification of cartel damages, which might be important for the current discussions on umbrella pricing and private damages claims of consumer associations.

III. DESCRIPTION OF THE CARTEL CASE AND THE DATA SET

A. The European Washing Powder Cartel

Procter & Gamble (Ariel and Lenor brands), Unilever (Coral brands) and Henkel (Persil brands) are the leading producers of washing powder in Europe. According to the EC, these three firms engaged in a cartel from at least January 2002 until March 2005, which was aimed at stabilizing market positions and at coordinating prices in violation of EU and EEA antitrust rules (Article 101 of the EU treaty and Article 53 of the EEA agreement).[11] The agreement covered the markets in Belgium, France, Germany, Greece, Italy, Portugal, Spain, and the Netherlands and concerned heavy-duty laundry detergent powders used in washing machines (HDD low suds powder).[12] The cartel started when the companies implemented an initiative through their trade association to improve the environmental performance of detergent products (AISE initiative).

After the cartel breakdown in 2005 and three further years of silence, Henkel applied for leniency at the EC in 2008 and revealed the anti-competitive practices. The EC carried out inspections in June 2008 and subsequently, Procter & Gamble and Unilever also applied for leniency under the EU's Leniency Notice.[13]

On April 13, 2011, the EC fined Procter & Gamble and Unilever a total of 315.2 million euros. Henkel received full immunity in terms of a 100–percent fine reduction because it was the first to inform the EC. Procter & Gamble and Unilever were granted leniency reductions of 50 and 25 percent, respectively. Moreover, they also benefited from a 10–percent reduction due to their agreement to a settlement procedure that allowed the EC to simplify and reduce the

[10] *See, e.g.*, Yuliya Bolotova, John M. Connor & Douglas J. Miller, *The Impact of Collusion on Price Behavior: Empirical Results From Two Recent Cases*, 26 INT'L J. INDUS. ORG. 1290 (2008); Kai Hüschelrath, Kathrin Müller & Tobias Veith, *Concrete Shoes for Competition—The Effect of the German Cement Cartel on Market Price* (ZEW Discussion Paper No. 12-035, 2012).

[11] *See* Press Release IP/11/473, European Commission, Commission Fines Producers of Washing Powder € 315.2 Million in Cartel Settlement Case (Apr. 13, 2011).

[12] Boone & Müller, *supra* note 6, at ¶ 15.

[13] Boone & Müller, *supra* note 6.

length of the investigation.[14] Thus, the information about the workings of the cartel given in the decision document is scarce. The Commission does not provide any information regarding the reasons for the cartel breakdown.

According to the EC the three firms were involved in various anti-competitive practices that had been coordinated in the course of meetings during the AISE environmental initiative. First, they agreed on indirect price increases. This means that prices were not lowered when the product volume or the number of wash loads per package was downsized, or when the products were compacted in terms of reduced weight.[15] Furthermore, the firms agreed to not pass on cost savings from reduced raw materials, packaging, and transport costs to consumers.[16] Second, the three cartelists agreed on a direct price increase in specific markets towards the end of 2004. These anti-competitive markups were realized via price leadership, in which the market leader implemented the excessive pricing pattern first and the other firms followed.[17] Last but not least, Henkel, P&G, and Unilever collectively restricted their promotional activity by excluding specific types of promotions during the implementation of the different phases of the environmental initiative.[18]

In the course of this article we primarily focus on the former anti-competitive practice. That is, we analyze the indirect price increases that were realized during the cartel period, followed by the quantification of the monetary damage suffered by consumers.

B. Data Set

The econometric estimation is based on a consumer panel data set for the detergent category provided by *The Nielsen Company*. About 16,000 German customers reported which products they bought on a daily basis. The data set is at the product code level and includes characteristics like washing purpose, package type and size, detergent consistency, scent, and concentration. For consumers, typical socio-demographic variables and a scaling factor for representativeness are given.

The data set contains information on 1,145 different product codes, reflecting the heterogeneity of detergent products. The detergents can be distinguished with respect to light-duty, heavy-duty, wool, cold, and drape detergent; additional product characteristics are sensitive, color, unconcentrated, and concentrated detergents. Regarding consistency it is further possible to differentiate between powder, liquid, tabs, wash nuts, and gel. According to the EC the cartel only targeted heavy-duty detergents in powder form. We therefore restrict

[14] *Id.*
[15] *Id.* at ¶ 25.
[16] *Id.*
[17] *Id.*
[18] *Id.*

the data set to this distinct subcategory only, resulting in 35,000 observations that are attributed to 494 different product codes and 27 brands.

With respect to the classification of brands, the following three groups of brands can generally be distinguished: (1) Cartel brands: Products of Henkel, Procter & Gamble, and Unilever, (2) Competitive private brands by the retailers: for example, Tandil from Aldi, or (3) Competitive manufacturer brands. It is worth noting that unlike in other product categories the private detergent brands are not produced by the major manufacturers, which, in our case, would be the cartel firms. It can be assumed that the non-cartel firms in the same relevant market somehow react to the price-setting behavior of the cartel firms via price adjustments of their own detergent products. They may either slip under the price umbrella of the cartel and increase prices for their products in order to profit from higher price-cost margins, or they may decrease prices with the objective to further stimulate the redirection of demand in favor of their own market shares. In order to investigate whether such umbrella pricing is observable in the detergent market, we apply the before-and-after overcharge estimation separately to all three groups of brands. This additionally allows for the identification of a possible reference (brand) category, which can be used for difference-in-differences estimations.

Another aspect worth discussing is the level of data aggregation in the course of damage estimations. We use data on a highly disaggregated level in terms of single purchase acts of the observed consumers. This has mainly two reasons. First, the product is highly differentiated and the various product characteristics of washing powder lead to price differences between product categories. When using aggregated prices and analyzing their changes, one cannot distinguish between substitution effects and price changes on the product level. Second, in aggregated figures information on the numerous discounts that consumers obtain due to promotional activities are lost, which can bias the estimation. Due to these issues, single purchase acts are used as the observation unit and the data are not further aggregated on a weekly or monthly basis.

The observed time period is from July 2004 until June 2006. Following the decision of the EC, March 2005 is defined as the end of the cartel. Thus, the data set covers the last nine months of the cartel period and additionally 15 months of the post-cartel period. It is worth noting that after a cartel breakdown prices might not immediately return to the competitive level. In particular, cartels may try to stay on a higher price path after cartel breakdown by implementing some forms of tacit collusion.[19] This results in an overestimation of the but-for price and a corresponding underestimation of the overcharge. Our overcharge estimates are therefore conservative and should provide lower bounds of the real overcharge.

[19] *See*, Joseph E. Harrington, Jr., *Post-Cartel Pricing During Litigation*, 52 J. INDUS. ECON. 517 (2004); Joseph E. Harrington, Jr., *Cartel Pricing Dynamics in the Presence of an Antitrust Authority*, 35 RAND J. ECON. 652 (2004).

C. Descriptive Statistics

Table 1 displays the descriptive statistics of the data set. Variables that refer to the period of collusion are marked with CP. 58 percent of the purchase acts during the entire observation period concern cartel firm products and 39 percent of the observations refer to retailer brands. By contrast, manufacturer brand products contribute 3 percent of the data.

The shares of purchase acts during the cartel period (CP) are 19, 12, and 1 percent for cartel, retailer and manufacturer brands, respectively. Hence, 32 percent of all purchase acts in the data set occurred during collusion, which is consistent with the 9 out of 24 months of the observation period.

29 percent of all detergents were sold in at least one form of promotion, that is, a price-flag, feature, handbill, or display. As for most observations those different activities occur simultaneously, they are combined in the control variable "*Promotion.*" The binary variable "*Gimmick*" captures whether the product was sold with a giveaway and accounts for 7 percent of the transactions.

Regarding product characteristics, 62 percent of the purchase acts concern *concentrated* and 34 percent *color* detergent. *Sensitive* detergents by contrast merely represent 3 percent of the data. In concentrated detergents the effective amount of detergent is higher, which in turn leads to a higher price. With respect to the type of packaging, most detergents are bought in *refill bags* (54 percent), followed by *boxes* (33 percent) and *carry packs* (13 percent).

The average per–kilogram price of powdered laundry detergent is 1.98 euros. The per–kilogram price varies considerably between 60 cents for the cheapest and 6.33 euros for the most expensive product. The average package size of detergents in the data set is 2.97 kilogram. As Figure 1 reveals, the average per–kilogram price nonlinearly declines with package size. In order to see whether this nonlinear pattern is still observable if it is controlled for by different product characteristics, both the *package size* and its square are included as independent variables in the model.

Table 1. Descriptive statistics

Variable	Mean	Std. dev.	Variable	Mean	Std. dev.
Price/kg	1.98	0.78	Concentrated	0.62	0.49
Cartel brands share	0.58	0.49	Color	0.34	0.47
Retailer brands share	0.39	0.49	Sensitive	0.03	0.18
Manufacturer brands share	0.03	0.17	Packaging: Box	0.33	0.47
Cartel brands share (CP)	0.19	0.39	Packaging: Bag	0.54	0.50
Retailer brands share (CP)	0.12	0.32	Packaging: Carry pack	0.13	0.33
Manufacturer brands share (CP)	0.01	0.10	Package size	2.97	2.30
Promotion	0.29	0.45	Package size (sq)	14.07	23.06
Gimmick	0.07	0.26			
$n = 35.225$					

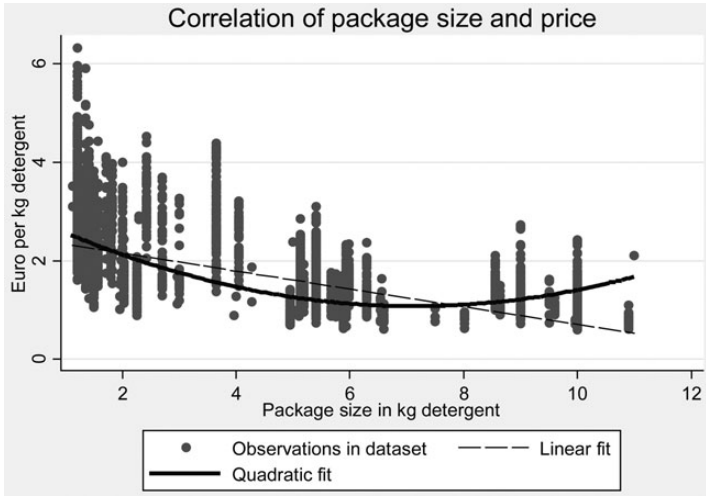

Figure 1. Linear and quadratic fit of price vs. package size

Table 2 summarizes price statistics for the cartel products as well as for competitive manufacturer and retailer brands during the cartel period and the non-cartel period (NCP). In general, cartel products are the most expensive ones, followed by retailer and competitive manufacturer brands. For cartel brands, both average and median per–kilogram prices are slightly higher during the period of collusion. By contrast, the mean prices of retailer and competitive manufacturer products are lower during the cartel period. However, whereas the price reduction of retailer brands is negligible, competitive manufacturer brands are considerably cheaper during collusion. This is at least partly due to the fact that input costs distinctly decreased during the cartel period and increased afterwards, thereby reducing production costs for all (cartel and non-cartel) detergent producers.

IV. OVERCHARGE ESTIMATION

A. Estimation Methods

The most challenging issue in the quantification of cartel damages lies in the identification of a suitable counterfactual situation describing how the market outcome would have evolved in a competitive environment. Econometric damage estimation mainly follows either the so–called "before and after," the "yardstick," or the "difference-in-differences" approach.[20] The former method compares for the same market pre- and/or post–cartel prices to the prices paid

[20] OXERA, QUANTIFYING ANTITRUST DAMAGES: STUDY PREPARED FOR THE EUROPEAN COMMISSION (Eur. Comm'n 2009), http://www.oxera.com/Oxera/media/Oxera/Quantifying-antitrust-damages.pdf?ext=.pdf.

Table 2. Price statistics (in €/kg) during cartel and non-cartel period

Price	Mean	Median	Std. dev.	Min	Max
Cartel Brands (NCP)	2.28	2.41	0.85	0.64	6.32
Cartel Brands (CP)	2.33	2.46	0.87	0.67	5.91
Manufacturer Brands (NCP)	1.45	1.03	0.76	0.61	3.70
Manufacturer Brands (CP)	1.34	0.85	0.83	0.60	3.79
Retailer Brands (NCP)	1.55	1.55	0.23	0.60	3.76
Retailer Brands (CP)	1.54	1.60	0.19	0.76	2.43
All	1.98	1.62	0.78	0.60	6.33

Table 3. Difference-in-differences approach

	Non-cartel period	Cartel period	Overcharge estimation
Cartel firms	A	B	$(B-A)-(D-C)$
Non-cartel firms	C	D	

by purchasers during collusion. It is assumed that the competitive situation in the market during the cartel would have been similar to the situation before and/or after collusion. Regressing the price of the product in question on a binary variable for the cartel period and a number of control variables allows us to determine the average cartel–induced price increase during collusion and, thus, the identification of a suitable benchmark price. The damage is then calculated as the difference between the observed cartel price and the corresponding but-for price, multiplied by the quantity of the product sold in the cartel period.[21] By contrast, the yardstick method uses data on the cartelized market and specific yardstick markets that are comparable to the cartel market in terms of demand and cost factors, as well as product characteristics, but not affected by cartelization. That is, one uses, for instance, the same product market in other countries as benchmarks for the same time period.

The difference-in-differences approach combines the two formerly described methods. It compares the price changes of the cartel products with benchmark products during and outside the cartel period in order to identify anti-competitive price deviations. Following Oxera,[22] the basic idea of this approach can be described as follows:

Let A and B be the average prices charged by the cartel firms outside and during the cartel period for the cartel product, and C and D the average prices charged by non-cartel firms for the same product outside and during the cartel period. The difference $(B-A)$ then captures the price change of the cartelized

[21] *See* Peter Davis & Eliana Garcés, Quantitative Techniques for Competition and Antitrust Analysis 357 (Princeton 2010).

[22] OXERA, *supra* note 20.

product between the cartel and non-cartel period. As this difference may not be completely driven by the cartel but at least partly due to other factors, the difference $(D - C)$ is used as a benchmark. It reflects the price change of the same product produced by non-cartel firms between both periods of time. As both cartel and non-cartel firms should be confronted with the same market and input cost variations over time, the difference in the differences $(B - A) - (D - C)$ should separate those factors and capture the cartel–caused price increase, provided that cartel and non-cartel firms similarly react to demand, supply, and general market changes. In the following section, we estimate a before-and-after model not only for the cartel brands but separately for all three groups of brands. This enables us to identify whether retailer brands and/or competitive manufacturer brands are suitable reference categories for a subsequent difference-in–differences estimation. Precisely, both non-cartel brand categories only provide a suitable benchmark, if—after having controlled for all relevant price drivers—a significant price reaction for these products during the collusive period is not observed.

B. Before-and-After Approach: Implementation and Results

The before-and-after approach is implemented in a reduced-form framework and given by the following panel data model:

$$log(p_{it}) = \beta_0 + \beta_1' Characteristics_i + \beta_2' Costs_t + \beta_3' Retail_{it} + \beta_4 Cartel_t + \varepsilon_{it}$$

In all of the estimations the dependent variable is the logarithm of the price for one kilogram of heavy-duty detergent of a specific product type i at time t. Note that since we estimate separate models for cartel, retailer, and competitive manufacturer brands, different product types refer to the same main brand but differentiate with respect to package size, package type as well as other product characteristics (for example, color, sensitive, and concentrated detergents). We use the relative price instead of the full package price because, even for the same brand, up to five different package sizes are observed during the observation period. Thus, using the price per–quantity makes products more comparable, eases interpretation, and additionally allows us to account for the fact that the cartel agreed on indirect price increases rather than on fixed overcharges. Furthermore, we use the logarithm instead of the absolute value of the kilogram prices as it allows us to measure relative effects of the independent variables. Concerning retailer margins, it can be assumed that retailers add an amount relative to the wholesale price instead of adding a fix sum; the same assumption applies for discounts.

The price differences of detergents are explained by their characteristics, cost development over time, the conduct of the retailers, and the effect of the upstream cartel. We do not control for demand drivers, as the consumption of washing powder is relatively stable in the long-term per household.

Nevertheless, in the short-term, consumers might be sensitive with respect to price changes and special offers. However, those substitution effects primarily occur between products that are similarly perceived by consumers and are already accounted for by the brand categorization.

1. Cross-Sectional Product Characteristics

We expect cross-sectional product characteristics to be important determinants of price differences between product types. Included characteristics are indicator variables for *color*, *sensitive*, and *concentrated* detergents, respectively. In addition, binary variables for the type of *packaging* as measures for packaging costs are included and it is controlled for *package size* and its square, as it can be observed that smaller packages are sold at an over-proportionally higher per–kilogram price; this can coevally be explained by price discrimination of second degree and economies of scale. Last but not least, fixed effects for the various types of products are included, reflecting the fact that products might have a different popularity due to differing advertising intensities. In addition, the fixed effects control for different margins of the manufacturers as well as differences in production and marketing costs.

2. Time-Varying Factors

To control for non-cartel–induced price differences over time, six cost measures are included, capturing input and production costs for the detergent producers. We use monthly price indices for *palm oil*, *raps oil*, *rock phosphate*, *industrial power*, *chemical base materials*, and *retail prices* provided by the German Statistical Office and the platform *Index Mundi*.[23] As the detergents are not produced the same day they are sold, the logarithm of all of these variables lagged by one month is included.

3. Retailers Conduct

Considering the retailers' conduct, we account for different retailer margins and costs by including indicator variables for each of the 15 biggest chains represented in the data set. The reference chain is given by *LIDL* as consumers can find both manufacturer and retailer brands there. The chain fixed effects are not interacted with the cartel period indicator variable because retailer margins and costs do not seem to change due to the upstream cartel. The inclusion of the interaction terms (which is not reported here) results in insignificant coefficients for all terms and testing for joint significance also results in favor of the null hypotheses of no joint significance. For retailer brands, all chain indicator variables are set to zero. This is due to the fact that most retailers only sell one retailer brand in the detergent category, resulting in perfect collinearity with the brand fixed effects. Furthermore, one can conceptually

[23] *Index Mundi* collects detailed country statistics, charts, and maps compiled from multiple sources. *See* INDEX MUNDI, http://www.indexmundi.com.

argue that there is only one margin, which is already accounted for by the fixed effects of the product types. We further include the binary variable *Promotion*, which controls for the fact that some products were occasionally promoted via price tags, features, and handbills or separately displayed. Last but not least, the binary variable *Gimmick* is included into the regression, equal to one if a product was sold with a give-away and zero otherwise.

4. Cartel Effect

To measure the overcharge caused by the cartel, the binary variable $Cartel_t$ is incorporated into the model. The variable is equal to one during the cartel period and zero otherwise, and the corresponding estimated coefficient captures the average percentage price change during the cartel period compared to the competitive phase.

Table 4 summarizes the results of the before-and-after estimation for all three group of brands. Due to the inclusion of binary variables for each brand, the estimations are identical to fixed–effects (panel-) estimations. Furthermore, the reference group is always a non-concentrated, non-color, and non-sensitive detergent. Please also note that since the dependent variable is transformed by the logarithm function, the (percentage) marginal effects must be calculated as the exponentiated coefficients minus one (not reported in the table).

The indicator variables for concentrated, color, and sensitive detergent do not significantly influence the logarithm of the per–kilogram price of cartel products. By contrast, we observe significantly higher prices for sensitive retailer brands (32.7 percent) and concentrated competitive manufacturer brands (23.6 percent) than the respective reference group of detergents. With respect to the package size, the results confirm the expected nonlinear pattern for all three groups of brands. Furthermore, whereas the type of packaging does not seem to influence the relative prices of cartel and competitive manufacturer brands, retailer brands sold in bags priced significantly higher than brands sold in boxes (7.36 percent). In addition, on average promotional activities decrease the per–kilogram prices by 10.6 percent (cartel and competitive manufacturer brands) and 1.40 percent (retailer brands), respectively. Cartel products sold with gimmicks do not show a significantly different price than products without gimmicks; however, competitive manufacturer detergents sold with gimmicks are priced significantly lower than the respective reference group of detergents. As the data set does not contain retailer products that were sold with gimmicks, no "gimmick"-effect can be estimated for this detergent group.

Turning to the mean effect of the cartel on prices, significant positive overcharges for cartel and retailer brands are observable, but no significant price increase is observed for competitive manufacturer brands during the period of collusion. On average, cartel products are priced 6.72 percent higher during the collusive period than in the competitive state after cartel breakdown. The

Table 4. Before-and-after estimation results

	Cartel Brands	**Retailer Brands**	**Comp. Man. Brands**
Concentrated	0.073	0.006	0.212***
	(0.065)	(0.013)	(0.026)
Color	0.008	–0.015	–0.003
	(0.008)	(0.016)	(0.010)
Sensitive	–0.001	0.283***	–0.004
	(0.008)	(0.024)	(0.032)
Package size	–0.178***	–0.175***	–0.260***
	(0.016)	(0.048)	(0.009)
Package size(sq)	0.009***	0.010*	0.014***
	(0.001)	(0.005)	(0.001)
Packaging: Bag	0.033	0.071***	
	(0.029)	(0.012)	
Packaging: Carry Pack	–0.031	–0.001	0.068
	(0.017)	(0.055)	(0.013)
Gimmick	–0.026		–0.056***
	(0.020)		(0.018)
Promotion	–0.112***	–0.014*	–0.112***
	(0.008)	(0.007)	(0.010)
Chem. base mat. (L1)	0.150	–0.664***	–1.616***
	(0.259)	(0.086)	(0.309)
Retail prices (L1)	1.244**	1.853***	7.085***
	(0.515)	(0.324)	(2.013)
Industrial power (L1)	1.190**	0.560***	2.291***
	(0.447)	(0.125)	(0.679)
Palmoil (L1)	0.289***	0.181***	0.143
	(0.048)	(0.035)	(0.169)
Rapsoil (L1)	0.019	0.129***	–0.118
	(0.051)	(0.014)	(0.075)
Rock Phosphate (L1)	–0.135*	–0.250***	–0.283
	(0.065)	(0.047)	(0.323)
Cartel period	**0.065*** **	**0.026*** **	**0.027**
	(0.010)	**(0.005)**	**(0.023)**
Constant	–12.027***	–8.338***	–33.682***
	(2.979)	(0.866)	(7.875)
Chains	Yes	No	Yes
Brands	Yes	Yes	Yes
Observations	20.352	13.813	1.060
Adj. R2	0.80	0.57	0.76

Notes: *** Significant at 99-percent confidence level, ** Significant at 95-percent confidence level, * Significant at 90-percent confidence level. Robust and clustered standard errors (among brands) reported in parentheses.

overcharge of retailer brands (2.63 percent) additionally indicates that retailers indeed reacted to price changes by the market leaders via their own price adjustments, leading to significant umbrella effects during collusion. Hence, using retailer brands as the control group for difference-in-differences estimations would result in an underestimation of the true damage. However, apart from the fact that competitive manufacturers did not react to elevated cartel

prices with their own price changes, there are several other reasons why they constitute a more appropriate benchmark group than retailers. First, the price setting of cartel brands and competitive manufacturer brands is comparable since, in both product groups, producer margins as well as retailer margins are imposed, whereas retailer brand products merely include a retailer margin. Second, cartel brands and manufacturer brands are promoted similarly as the producing firms do costly national advertising in order to build up a certain image. Private retailer brands by contrast are commissioned by the retailers via subcontracts and do not get advertised in public media. Finally, whereas private retailer brands are only sold in the corresponding stores they are produced for, both cartel brands and competitive manufacturer brands are generally offered in all kinds of shops. Due to these aspects, as well as the fact that we do not observe a significant overcharge of competitive manufacturer brands, this brand category is used as the counterfactual in the subsequent difference-in-differences estimation. This additionally provides a robustness check with respect to our results. A large deviation in the results between both approaches would either indicate that the before-and-after model is flawed due to missing explanatory variables, or that the benchmark brands in the difference-in-differences estimation do not constitute an appropriate product counterfactual. On the other hand, if both approaches reveal similar cartel overcharges, it can be concluded that the before-and-after model is already sufficiently specified and accounts for all relevant price drivers. In particular, it implies that there are no substantial common unobserved effects that we have not controlled for in the before-and-after estimation.

C. Difference-in-Differences Approach: Implementation and Results

In order to implement the difference-in-differences estimation, the before-and-after model from the previous section is extended by the interaction term *cartel_brands* × *cartel_period*. It captures the price increase of cartel firms during the period of collusion compared to the price development of our benchmark brands (competitive manufacturers). Precisely, the estimated coefficient of the underlying interaction term corresponds to the above mentioned price difference in the differences of cartel and competitive manufacturer brands during and outside the cartel period. Table 5 summarizes the results.

The estimation reveals no general significant price change between the collusive and the competitive period. However, relative to the reference group of manufacturer brands who capture the competitive pricing behavior over time, a significant overcharge of 6.93 percent for cartel brands can be observed, which is close to the 6.72 percent overcharge from the previous before-and-after estimation. This suggests that the before-and-after model is already sufficiently specified in the sense that competitive manufacturer brands do not add additional explanatory power to the development of per kilogram prices over time.

Table 5. Difference-in-differences estimation results

Variable	Coefficient	Std. Err.	Variable	Coefficient	Std. Err.
Concentrated	0.072	(0.063)	Chem. base mat. (L1)	0.074	(0.245)
Color	0.007	(0.007)	Industrial power (L1)	1.230**	(0.397)
Sensitive	–0.003	(0.007)	Retail prices (L1)	1.639**	(0.565)
Package size	–0.183***	(0.016)	Palmoil (L1)	0.276***	(0.045)
Package size(sq)	0.009***	(0.001)	Rapsoil (L1)	0.011	(0.044)
Packaging: Bag	0.030	(0.028)	Rock Phosphate (L1)	–0.121*	(0.059)
Packaging: Carry Pack	–0.026	(0.016)	Cartel Period	–0.001	(0.037)
Gimmick	–0.025	(0.019)	**Cartel Brands*CP**	**0.068***	(0.036)
Promotion	–0.113***	(0.008)	Constant	–13.593***	(3.054)
Chains	Yes		Observations	21.412	
Brands	Yes		*Adj. R²*	0.80	

Notes: *** Significant at 99–percent confidence level, ** Significant at 95–percent confidence level, * Significant at 90-percent confidence level. Robust and clustered (among brands) standard errors reported in parentheses.

D. Quantification of Consumer Damages

Given the overcharge estimates of the before-and-after estimation, this section now turns to the quantification of consumer harm. Since each cartelist offers numerous products of washing powder that differ regarding package type and size (and therefore also with respect to the per–kilogram price), the absolute overcharge for each single product type is individually calculated as a first step. If we had estimated the model without log, then we could have calculated the absolute overcharge by multiplying the estimated coefficient by price per kilogram (our dependent variable). However, as the dependent variable in the estimation is in the logarithmic form, it is necessary to estimate an auxiliary regression in order to get a consistent adjustment factor.[24] In order to extrapolate the damages for the entire German population, we weight each purchase act by the representativeness of the buying household. For this purpose, we use scaling factors that were provided along with the data set. Since the previous estimations revealed that the retailers reacted to the price increase of the market leaders via price adjustments of their own detergent products, the monetary effect of this umbrella pricing is also calculated. Table 6 summarizes the respective results.

[24] Following Jensen's inequality, the expected logarithm of price and the logarithm of the expected price do not coincide ($E(log(p)) \neq log(E(p))$). Hence, it is necessary to predict $log(p)$ using the estimated model, calculate the exponential of it and use it as explanatory variable for a regression on the real price itself, without a constant. The calculated adjustment factors for the cartel and retailer regressions are 1.0274 and 1.0038, respectively. *See* JEFFREY M. WOOLRIDGE, INTRODUCTORY ECONOMETRICS: A MODERN APPROACH 202 (Cengage Learning 2d ed. 2003).

Table 6. Consumer harm and umbrella effect between July 2004 and March 2005

	Cartel damage	**Umbrella effect**
Overcharge (%)	6.72	2.63
Damage (Mil. €)	13.210	1.738
Turnover in CP (Mil. €)	183.471	63.693
Damage as % of CP Turnover	7.20	2.73

The results suggest that the overall monetary consumer damage caused by the three cartel firms in the relevant product category between July 2004 and March 2005 amounts to 13.210 million euros. Compared to the turnover generated by the cartel firms during this period in the respective product category, the damage corresponds to 7.20 percent of turnover.

Under the assumption that both cartel pricing and consumer behavior during these last nine months of collusion are representative for the entire cartel period, the overall damage suffered over the entire cartel period from January 2002 until March 2005 amounts to 55.775 million euros.

It is important to note that this calculated damage solely refers to the German detergent market. According to the EC, eight other European markets such as France, Spain, and Italy were affected by the cartel. Following the decision document of the EC, the total annual cartel member sales in the eight affected countries sum up to at least 1.385 billion euros for the relevant category.[25] Calculating 7.20 percent for 38 months would then result in a rough estimate of the overall consumer damage of 315.78 million euros. Interestingly, this number is pretty close to the 315.2 million euro fine imposed by the EC in 2011.

Turning to the umbrella pricing, this effect amounts to 1.738 million euros for the last nine months of the cartel agreement. Under the assumption that the reaction of the retailers during this period is representative for the entire cartel duration, the umbrella effect amounts to 7.34 million euros. Although not directly caused by the cartel firms, this harm led to an additional decrease in consumer welfare, raising the overall monetary damage for consumers in Germany to a total of 63.115 million euros.

V. CONCLUSION

Motivated by the current discussion whether special procedures for bringing collective actions to protect consumer interests should be available in the EU, we showed in this article how consumer panel data can be used in order to estimate overcharges and to quantify consumer damages from price-fixing

[25] *See* Commission Decision of 13 April 2011, Case Comp/39579—Consumer Detergents 19 (2011), http://ec.europa.eu/competition/antitrust/cases/dec_docs/39579/39579_2633_5.pdf.

agreements. Our estimations for the European detergent cartel suggest average overcharges between 6.7 and 6.9 percent and an overall consumer damage of 13.2 million euros in Germany over the period from July 2004 until March 2005. Under the assumptions that the pricing behavior of cartelists and buying behavior of consumers during the last nine months of cartelization are representative for the entire cartel period, the overall consumer damage accounts for about 55.7 million euros. If we further assume that the estimate is relevant for all affected markets, we observe an overall damage of about 315 million euros.

Although our results indicate that it is straightforward to quantify consumer damages, several obstacles remain for consumer associations to implement our approach in practice. Firstly, on the EU level there is no clear authorization for such organizations to claim consumer damages so far. The implementation of such a regulation, however, would not only enable consumer associations to actively fulfill their mandate of consumer protection, but would even contribute to increased cartel deterrence, since the fact that any individual or entity can claim damages hampers the possibility for cartels to *ex ante* predict the financial success of a potential cartel agreement. Precisely, without effective private enforcement, firms can use the EU Guidelines on the method of setting fines in order to *ex ante* approximate the success of a potential cartel participation. With private enforcement on the other hand, it is almost impossible to predict who is going to claim damages in case of cartel detection and what the overall fine will be at the end. Hence, although it is ambiguous whether this undermines existing leniency programs, such an uncertainty should generally reduce firms' enthusiasm regarding cartel participation and thereby increase deterrence.

Secondly, it is essential for claimants to get access to evidence. Apart from general case information—which in the detergent case is rather scarce—it is particularly important to have the opportunity to gather relevant data that can be used for damage estimations. Whereas consumer panel data are easy to obtain from firms who are specialized in collecting scanner data, wholesale prices are usually impossible to get without the help of public authorities. The availability of consumer panel data along with wholesale data however would allow for a more in-depth analysis of consumer damages. In particular, one could compare the overcharges on the retailer and final consumer layer and thus analyze passing-on effects and the distribution of harm between the different layers more accurately.

Last but not least, since the incentive for every single consumer to claim damages is relatively low due to the small individual loss, it is necessary to provide a practical system that effectively bundles individual claims. It is doubtful whether an opt-in procedure as proposed by the European Commission is sufficient or whether an opt-out redress system is the preferred option. As noted by the European consumer consultative group, recent experience in Europe showed that the rate of consumer participation of the opt-in procedure is

extremely low (less than 1 percent) in comparison to an opt-out regime (between 97 and 100 percent).[26] The latter would therefore certainly increase incentives to sue and therefore facilitate consumer organizations to represent consumers' interests.

[26] *See* EUROPEAN CONSUMER CONSULTATIVE GROUP, *supra* note 1, § 2.3.