Using Retail Data for Upstream Merger Analysis*

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ABSTRACT

The typical situation faced by antitrust authorities is to analyze a proposed manufacturer merger using scanner data at retail-level. Starting with a benchmark model of manufacturers' and retailers' sequential Bertrand-Nash pricing behavior, I perform counterfactual experiments to explore the relationship between downstream retailer pricing models and the resulting estimates of upstream mergers, in the absence of wholesale prices. Looking at scanner data for the ground coffee category sold at several retail chains in Germany I find that not considering retail pricing explicitly when analyzing the potential consequences of an upstream merger, implies simulated changes in welfare that are significantly different given the underlying model of retail pricing behavior. These findings are relevant for competition policy, and authorities should consider incorporating the role of retailers in upstream merger analyzes, especially in the presence of an increasingly consolidated retail food industry.

JEL Classifications: C13, L13, L41. Keywords: Merger Analysis, Vertical relationships, multiple manufacturers and retailers.

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1. Introduction

One of the current discussions by antitrust authorities is to consider including vertical relationships between manufacturers and retailers when analyzing proposed mergers between manufacturers. Referred as one of the current economic issues of the Federal Trade Commission (FTC), *(...)estimates from scanner data provide, at best, reliable estimates of demand at retail. But the purpose (...) is to determine whether a merger of manufacturers is likely to be anticompetitive (...)* (Scheffman and Coleman, 2002). This paper presents a simple framework to do so and accesses merger welfare effects in a market where both upstream and downstream firms make pricing decisions. As a first step, this requires the researcher's estimation of the underlying model of manufacturers' and retailers' pricing behavior, and of a model of vertical relationships between manufacturers and retailers. The second step is to use this vertical pricing model for merger analysis to access welfare effects of a merger between upstream manufacturers.

I focus on a national retail market for ground coffee in Germany, where a group of the leading manufacturers were allowed to merge by the German antitrust authority (the Bundeskartellamt) in the late nineties. Performing this analysis in a food-market vertical chain is of particular importance given the empirical evidence on the process of consolidation in place both at the food processing level (manufacturers) and at the retailer level (Sexton 2000), and understanding the implications for market power and for welfare resulting from this process of consolidation is of growing importance in these markets. I use a retail level scanner data set on quantities and prices for the top selling ground coffee products sold at a variety of large retail chains in Germany.

The research plan is as follows. First I estimate a model of consumer demand for ground coffee as a random coefficient discrete choice model for differentiated products where a product is defined as a coffee brand sold at a certain retail chain. Given the estimates of the demand model, I estimate the implied price cost margins for the retail chains and for the post merger manufacturer equilibrium, without observing data on wholesale prices, in a sequential pricing game based on a structural model of vertically related markets as in Manuszak (2001), Mortimer (2004), Goldberg and Verboven (2005), Villas-Boas and Zhao (2005), Villas-Boas and Hellerstein (2006) and Villas-Boas (2007a). Following this literature stream I assume that manufacturers compete as Nash-Bertrand in wholesale prices and the manufacturers that have merged maximize joint profits. Given the wholesale prices, retail chains follow setting retail prices in a Nash-Bertrand fashion. Given the estimated margins for all manufacturers and for all retail chains I then recover marginal costs by subtracting the estimated margins from the observed retail prices. The third step consists of simulating the Nash equilibrium that was in place before the firms did merge, and this is performed by finding the implied pre-merger Nash equilibrium prices given upstream and downstream Bertrand Nash-competition and vertical Stackelberg linear pricing model. In this exercise I assume that there were no cost savings resulting from the mergers and also that the product choice set before and after the merger of the manufacturers involved remained the same. Finally, I am able to compute the resulting change in consumer surplus and changes in profits for manufacturers and for retailers. The final step is to perform simulations for estimated welfare changes under alternative models of retail competition: (i) the previous literature assumption that retailers add no retail margins (and are not modeled); (ii) and in the other extreme retailers behave collusively and add a retail margin resulting from downstream collusion. The goal is to compare the estimated welfare effects assuming linear pricing with the two above counterfactuals varying the degree of ability of retailers to mark-up over the wholesale prices.

The previous and recent literature considers effects on prices and quantities sold resulting from mergers among horizontally competing firms (as in Baker and Bresnahan 1985, Berry and Pakes 1993, Werden and Froeb 1994, Nevo 2000, and Dubé 2005). The objective there is to, relying on estimates for a demand model and a model of firm pre-merger competitive behavior, simulate the welfare effects of a potential merger between the two or more manufacturers involved. The present paper follows this methodology but its contribution is to incorporate a vertical interactions model into the merger analysis. In this model manufacturing firms who merge sell through retailers, who in turn decide retail prices consumers have to pay. The goal is to assess the welfare effects of these mergers on consumer surplus, on manufacturer and on retailer surplus without observing wholesale prices (following Villas-Boas 2007a). Not considering retail pricing decisions is an assumption that is reasonable for vertically integrated industries, but it is a simplifying assumption for most markets in general, because the merging manufacturers typically do not sell directly to consumers and the implicit assumptions of passive or perfectly competitive firms in the production stage that is not being directly analyzed (such as the retailers, for example) is also a limitation (Sexton 2000). A recent paper by Allain and Souam (2006) analyzes the incentives to merger of retailers vis a vis the incentives to merge of manufacturers, while a closely related study by Manuszak (2001), simulates the downstream retail price level effects of upstream mergers of refineries in the Hawaiian gasoline market, arguing that, in that industry, the assumption of vertical integration is not reasonable and hence one should consider a vertical supply chain in the merger simulations of upstream gasoline producers. I follow this approach for a grocery retail market where the assumption of vertical integration or of no retail strategic pricing may not reasonable given industry evidence and related studies. In particular, there are two studies that combine these same scanner data with additional data sources to empirically examine the determinants of retail and manufacturer margins in this market (Draganska and Klapper (2007) and Draganska, Klapper and Villas-Boas (2007)), while the focus of this present paper is different from the previous two, by empirically assessing mergers within that market in the context of vertical relationships between manufacturers and retailers.

From analyzing the effects of the consolidation that occured between manufacturers of ground coffee sold at the major four retail chains in Germany, there are two main findings. First, not considering retail pricing explicitly implies simulated changes in welfare that are significantly different from those when retail pricing behavior is formally included in the analysis and that behavior departs from Bertrand Nash pricing. Second, by performing what if counterfactual scenarios, I find that welfare conclusions are significantly affected by the retail pricing behavior considered, as are consequently the merger policy recommendations.

The next section sets up the problem by describing the market and the available data. Section three describes the demand model and then the supply model is solved for imperfectly competing manufacturers selling through imperfectly competing retailers. The fourth section discusses the estimation method and counterfactual procedures. Section five presents and discusses the results and section six concludes by also discussing implications of the analysis and avenues for future research extensions.

2. The Set Up: The Market and the Available Data

The empirical focus is on the coffee market in Germany, where there are presently a small number of manufacturers producing coffee and selling to a small number of large retail chains. This market consists of an interesting and empirically attractive setup to study imperfectly competitive retailers and the effects of merging manufacturers. The relatively small number of major firms in this industry is also attractive from a modeling and empirical perspective. In fact, there are slightly more than a handful of manufacturers producing coffee and selling it to consumers via a small set of national retailers. At the retail level there are four major retail chains that have several retail stores throughout Germany, and they are called Edeka, Markant, Metro, and Rewe. Aldi is another player in the retail distribution, as the largest German discounter but unfortunately Aldi does not make their data available. For the coffee market Aldi sales represent less than 5 percent for the years in the data, and the included retailers capture over 95 percent of sales in the market, and thus the data used are very representative of the whole German coffee market.

These coffee brands described next, and that are part of the analysis, are mainly sold to consumers via the above retail chains, and less through vertically integrated coffee shops. At the manufacturer level there are seven major national brands in the coffee market, and these are Jacobs, Onko, Melitta, Idee, Dallmayr, Tchibo, and Eduscho. These brands capture more than 95% of the market, while the rest consists of private label brands and a few minor brands. Jacobs and Onko are produced by Kraft, while before they merged in the nineties and became part of Kraft they were produced by two separate manufacturers Onko and Jacobs Suchard AG.[1] Another merger that took place in mid 1997 was between Tchibo and Eduscho, who are now brands of the same main firm Tchibo.[2]

The empirical analysis is based on a weekly data set on retail prices, aggregate market shares and product characteristics for seven coffee products produced by five manufacturers sold at four retail chains. Note that there are seven brands at the manufacturer level that are sold through the different four retailers and thus creating the choice set equal to twenty eight products at the retail-consumer level. The price, advertising and market share data used in the empirical analysis were collected by MADAKOM, Germany, from a national sample of retail outlets belonging to the four major retailers Edeka, Markant, Metro, and Rewe, during the years of 2000 and 2001. These data contain weekly information on the sales, prices, and promotional activity for all brands in the ground coffee category. I focus on the 7 major national brands of modal package size of 500 grams: the largest being Jacobs with 28% market share, Onko (20%), Melitta (16%), Idee (12%), Dallmayr (12%), Tchibo (9%), and Eduscho with 3 percent. Private label brands (1.71% market share) and a few minor brands (combined share of 2.57%) were dropped from the analysis.

Table 1 describes the data summary statistics broken up for each of the four retail chains, for each of the seven brands in the data. For the retail chains considered, the data obtained to perform this analysis were already aggregated across the different stores for each chain. Combined market shares for the products sold in Metro represent over forty six percent of the market, Markant comes next with twenty nine percent, then Edeka with fourteen percent and finally Rewe with 11 percent. Among the retail chains not considered in the data there is the German version of Walmart, called Aldi, who in fact does not provide detailed scanner data to researchers, but estimates of the market share of this chain were obtained and are used to compute the outside option not modeled. Looking at brand presence per retail chain, Jacobs is the market leader, followed by Melitta and Tchibo. However, Tchibo is the top-selling brand at Rewe. In terms of descriptive statistics for prices, Markant seems to be offering the lowest overall prices. Melitta, Jacobs, Onko, and Eduscho are somewhat lower-priced at all retailers, whereas Idee, Dallmayr and Tchibo occupy the upper end of the market. Price data are expressed in Deutsch Marks per 500 grams. Most of the quantity time

[1] http://www.fundinguniverse.com/company-histories/Kraft-Jacobs-Suchard-AG-Company-History.html.
[2] http://www.allbusiness.com/manufacturing/food-manufacturing-food-coffee-tea/605147-1.html.

series variation may be attributed to temporary price discounts. This is particularly true for the leading brands in the market, Jacobs, Tchibo and Melitta.

In terms of promotions data, the dataset contains a dummy variable for the presence of store-front advertisements, display and feature advertising, and this variable varies by brand and by retailer. Auxiliary data on total advertising expenditures by brand (but not by brand by retailer) varies by year.

The quantity data consist of quantities sold for each brand of coffee at the different retailers. A unit in this data set corresponds to 500 grams of coffee, the modal package size of the products sold. To calculate the market share of each brand allowing for no purchase option (also called outside good option), one needs a measure of the size of the potential market. Market size per key account is calculated based on individual consumer panel data obtained from GfK , which records panelists' shopping trips. Given that the panel is representative, for each chain, the number of shopping trips in a given week is defined as the total market potential. I then use this measure of market size to calculate the share of the outside good and the brand shares. Given the largest other retailer not included in the data, Aldi, I include the potential impact of Aldi by adjusting the weekly market size, i.e., the magnitude of the outside good, to account for the percentage of consumers who made their coffee purchases there (3% in 2000 and 4.5% in 2001).

The consolidations that took place in this market were twofold: the merger between Jacobs and Onko, and the merger between Tchibo and Eduscho. These two mergers occurred before the start of our data-set, and therefore this paper has only post-merger market data and no pre-merger data. Furthermore, I do not observe wholesale price data, that is the price charged by the manufacturers to the retail chains. What I observe are retail level price, quantity and promotional post-merger data, and the goal is to assess the changes in welfare, in producer and consumer surplus, that resulted from these two mergers occurring. If retailers have a constant mark-up or no mark-up I can use standard merger analysis techniques to compute the welfare changes. The remainder of this paper addresses when this simplifying approach may be more or less problematic in the context of simulations given an estimated demand and supply model.

3. The Model

This section sets up the model of demand and supply. The economic-econometric model is a standard discrete-choice demand formulation (McFadden 1984, Berry, Levinsohn and Pakes 1995) and a Stackelberg linear pricing model between multiple Bertrand-Nash competing manufacturers and Bertrand-Nash competing retail chains. This section derives first expressions for the total sum of retail and manufacturer price-cost margins as functions of demand substitution patterns for the supply model specified. Then it presents the alternative supply scenarios of passive retailers and of collusive downstream retailers and derives the resulting wholesale and retail margins again as functions of demand substitution patterns (for more technical details see Villas-Boas 2007a and Villas-Boas and Hellerstein 2006).

3.1. Demand

We assume that consumers choose among N different products indexed by j that consist of a variety of brands sold at different retail chains denoted by k, or decide to make no purchase in the category. Note that, if a certain brand is sold at two different retail chains it results in two products at the consumer choice level, since a brand A at chain 1 is different from the same brand sold at chain 2. The indirect utility U_{ijt} of consumer i from purchasing product $j = 1, 2, \ldots, N$, in time period $t = 1, 2, \ldots, T$ is given by:

$$U_{ijt} = \alpha_j - \beta_i p_{jt} + \gamma X_{jt} + \xi_{jt} + \varepsilon_{ijt}, \quad (1)$$

where α_j is a product-retailer fixed effect capturing the intrinsic preference for product j (where a product is defined as a brand sold at a particular retailer). The shelf price of product j at time t is denoted by p_{jt}. We include retailer promotions, manufacturer advertising and a time trend are included in X_{jt}. The term ξ_{jt} accounts for factors such as shelf space, positioning of the product among others that affect consumer utility, are observed by consumers and firms but are not observed by the researcher. ε_{ijt} is an i.i.d. type I extreme value distributed error term capturing consumer idiosyncratic preferences.

To allow for category expansion or contraction, we include an outside good (no-purchase option), indexed by $j = 0$, whose utility is given by:

$$U_{i0kt} = \varepsilon_{i0kt}. \quad (2)$$

The price coefficient β_i is assumed to vary across consumers according to $\beta_i = \beta + \sigma_p v_i,\ v_i \sim N(0, 1)$, where σ_p is a parameter to be estimated. As in Nevo (2000) we rewrite the utility of consumer i for product j as:

$$U_{ijt} = \delta_{jt}(p_{jt}, X_{jt}, \xi_{jt}; \alpha, \beta, \gamma) + \mu_{ijt}(p_{jt}, v_i; \sigma_p) + \varepsilon_{ijt}, \quad (3)$$

where δ_{jt} is the mean utility, while μ_{ijt} is the deviation from the mean utility that allows for consumer heterogeneity in price response.

Let the distribution of μ_{ijt} across consumers be denoted as $F(\mu)$. The aggregate share S_{jt} of product j at time t across all consumers is obtained by integrating the consumer level probabilities:

$$S_{jt} = \int \frac{\exp(\delta_{jt} + \mu_{ijt})}{1 + \sum_{n=1}^{N} \exp(\delta_{nt} + \mu_{int})} dF(\mu). \tag{4}$$

This aggregate demand system not only accounts for consumer heterogeneity, but also provides a more flexible aggregate substitution patterns than the homogeneous logit model.

3.2. Linear Pricing Supply Model

On the supply side let us assume a Manufacturer Stackelberg model in which M manufacturers set wholesale prices p^w first, in a Bertrand-Nash manufacturer-level game, and then R retailers (chains) follow setting retail prices p in a Bertrand-Nash fashion.[3] Let each retail chain r marginal costs for product j be given by c_j^r, and let manufacturers' marginal cost be given by c_j^w. We also assume that the manufacturers who have merged behave as if they are the same manufacturer by maximizing joint profits over the set of products both produce.

Assume each retail chain r maximizes his profit function defined by

$$\pi_r = \sum_{j \epsilon S_r} \left[p_j - p_j^w - c_j^r \right] s_j(p) \quad \text{for} \quad r = 1, ...R, \tag{5}$$

where S_r is the set of products sold by retail chain r,and s_j is defined, given a potential market, as the market share of product j. The first-order conditions, assuming a pure-strategy Nash equilibrium in retail prices, are:

$$s_j + \sum_{m \epsilon S_r} T_r(m,j) \left[p_m - p_m^w - c_m^r \right] \frac{\partial s_m}{\partial p_j} = 0 \quad \text{for} \quad j = 1, ...N \tag{6}$$

where matrix T_r has the general element $T_r(i,j) = 1$, if a retail chain sells both products i and j and equal to zero otherwise. Switching to matrix notation, let us define $[A * B]$ as the element-by-element multiplication of two matrices of the same dimensions A and B. Let Δ_r be a matrix with general element $\Delta_r(i,j) = \frac{\partial s_j}{\partial p_i}$, containing retail chain level demand substitution patterns with

[3] The several stores in the same chain have price correlation very close to one and they do appear to perform chain level retail pricing.

respect to changes in the retail prices of all products. Solving (6) for the price-cost margins for all products in vector notation gives the price-cost margins m_r for all the products in the retail chains under Nash-Bertrand pricing:

$$\underbrace{p - p^w - c^r}_{m^r} = -[T_r * \Delta_r]^{-1} s(p), \tag{7}$$

which is a system of N implicit functions that expresses the N retail prices as functions of the wholesale prices. If retail chains behave as Nash-Bertrand players then equation (7) describes their supply relation.

Manufacturers choose wholesale prices p^w to maximize their profits given by

$$\pi_w = \sum_{j \epsilon S_w} [p_j^w - c_j^w] \; s_j(p(p^w)), \tag{8}$$

where S_{wt} is the set of products sold by manufacturer w during week t and c_{jt}^w is the marginal cost of the manufacturer that produces product j, and knowing that retail chains behave according to (7).[4] Solving for the first-order conditions from the manufacturers' profit-maximization problem, assuming again a pure-strategy Nash equilibrium in wholesale prices and using matrix notation, yields:

$$\underbrace{(p^w - c^w)}_{m^w} = -[T_w * \Delta_w]^{-1} s(p), \tag{9}$$

where T_w is a matrix with general element $T_w(i,j) = 1$, if the manufacturer sells both products i and j and equal to zero otherwise, Δ_w is a matrix with general element $\Delta_w(i,j) = \frac{\partial s_j}{\partial p_i^w}$ containing changes in demand for all products when wholesale prices change subject to retail mark-up pricing behavior assumed in (7), and $*$ represents the element-by-element multiplication of both matrices.[5]

Under the above model, given the demand parameters $\theta = [\ \alpha\ \beta\ \sigma\ ]$, the implied price-cost margins for all N products can be calculated as $m^r(\theta)$ for the retailers and $m^w(\theta)$ for the manufacturers.

[4]Note that in this market manufacturers may, if they choose to, set different wholesale prices for the same brand sold to different retailers. In another study, Villas-Boas (2007b) considers the welfare effects from imposing uniform wholesale pricing restrictions in this market.

[5]See Villas-Boas (2007a) and Villas-Boas and Hellerstein (2006) for the derivation of Δ_w.

3.3. Passive Retailers Model

Under this assumption, given retail and manufacturer marginal costs, and using the same notation as above, retailers are passive and therefore retail mark-ups are just covering their retail costs,

$$p - p^w = c^r. \tag{10}$$

Manufacturers margins are then given by

$$\underbrace{p^w - c^w}_{m^w} = -[T_w * \Delta_r]^{-1} s(p) \tag{11}$$

where T_w is the manufacturer matrix of product ownership, with elements equal two one when the manufacturer sells both products in row and column, as previously defined.

3.4. Model of Linear Pricing with Collusive Retailers

Under the assumption that there is downstream collusion, retailers' margins are given by

$$\underbrace{p - p^w - c^r}_{m^r} = -\Delta_r^{-1} s(p), \tag{12}$$

given that retailers are choosing retail prices to jointly maximize profits. Manufacturers margins are given by (9), but where now Δ_w is a matrix containing changes in demand for all products when wholesale prices change subject to retail mark-up pricing behavior assumed in (12).

4. Estimation and Merger Simulations

With the data sample discussed in section 2, we estimate demand and use the estimates to compute price-cost margins for retailers and manufacturers. Given demand and assuming the model of sequential Bertrand-Nash linear pricing as starting point, I simulate the resulting equilibrium from imposing pre-merger wholesale pricing practices, and derive expressions to compute estimates of welfare, consumer surplus and producer surplus changes. This allows me to compute welfare changes, in the context of imperfectly competitive retailers, to gain insights into the role of downstream retail market power in horizontal upstream merger analysis.

4.1. Demand Estimation

When estimating demand, the goal is to derive parameter estimates that produce product market shares close to the observed ones. This procedure is non-linear in the demand parameters, and prices enter as endogenous variables. The key step is to construct a demand side equation that is linear in the parameters associated with the endogenous variables so that instrumental variables estimation can be directly applied. This follows from equating the estimated product market shares[6] to the observed shares and solving for the mean utility across all consumers, defined as

$$\delta_{jt}(\alpha, \beta, \gamma) = \alpha - \beta p_{jt} + x_{jt}\gamma + \xi_{jt}. \tag{13}$$

For the mixed Logit model, solving for the mean utility (as in Berry 1994) has to be done numerically (see Berry, Levinsohn and Pakes 1995). Finally, once this inversion has been made, one obtains equation (13) which is linear in the parameter associated with price. If we let θ be the demand side parameters to be estimated, then $\theta = (\theta_L, \sigma_p)$ where θ_L are the linear parameters (α, β, γ) and σ_p is the non-linear parameter. In the mixed Logit model, θ is obtained by feasible Simulated Method of Moments (SMOM) following Nevo's (2000) estimation algorithm, where equation (13) enters in one of the steps.[7]

4.2. Instruments and Identification of Demand

The first step is having consistently estimated demand parameters. In the demand model consumers choose between different coffee products over time, where a product is perceived as a bundle of attributes, among which one is price. Since prices are not randomly assigned, I use coffee input price changes over time that are significant and exogenous to unobserved changes in product characteristics to instrument for prices. These cost instruments separate cross-coffee-brand variation in prices due to exogenous factors from endogenous variation in prices from unobserved product characteristics changes. Instrumental variables in the estimation of demand are required because when retailers consider all product characteristics when setting retail prices, not only the ones that are observed. That is, retailers consider both observed characteristics, x_{jt}, and unobserved characteristics, ξ_{jt}. Retailers also account for any changes in their products' characteristics and valuations. A product

[6]For the random coefficient model the product market share in equation (4) is approximated by the Logit smoothed accept-reject simulator.

[7]The aim is to concentrate the SMOM objective function such that it will be only a function of the non-linear parameters. By expressing the optimal vector of linear parameters as a function of the non-linear parameters and then substituting back into the objective function, it can be optimized with respect to the non-linear parameters alone.

fixed effect is included to capture observed and unobserved product characteristics/valuations that are constant over time, furthermore, a time trend captures trending unobserved determinants of demand. The econometric error that remains in ξ_{jt} will therefore only include the (not-trending) changes in unobserved product characteristics such as unobserved promotions and changes in shelf display and/or changes in unobserved consumer preferences. This implies that the prices in (13) are correlated with changes in unobserved product characteristics affecting demand. Hence, to obtain a precise estimate of the price coefficients, instruments are used. We use, as instruments for prices, direct components of marginal cost, namely manufacturer input prices, interacted with product-specific fixed effects as in Villas-Boas (2007a). The price decision takes into account exogenous cost-side variables, such as input prices. It is reasonable to assume that the prices of inputs are uncorrelated with changes in unobserved product characteristics, ξ_{jt}. For example, changes in shelf display are most likely not correlated with raw coffee prices. The intuition for interacting input prices with product dummies is to allow raw coffee average price to enter the production function of each product differently, maybe because products use different blends or purchase from different regions in the world the raw coffee. The identifying assumption is that changes in unobserved product characteristics ξ_{jt}, such as changes in shelf display, are most likely not correlated with changes in raw coffee average prices. The raw coffee cost measure used in the analysis is the trade-volume weighted average of the five most traded contracts at the New York Stock Exchange, where these dollar prices were adjusted for the exchange rate and for the tax in the amount of 2.169 Deutsch Marks per 500 grams of coffee. The production and roasting of coffee is quite simple, all input factors are used in fixed proportions (the main input being coffee beans, given that each of the others individually represents less than five per cent of costs) and economies of scale in production are limited (see Bettendorf and Verboven, 2000).

4.3. Simulation of Pre-Merger Nash Equilibrium

Given demand and assuming the model of no uniform pricing as starting point, where retail and manufacturer mark-ups are given by (7) and (9), respectively, we recover the marginal costs under such model by

$$\underbrace{c^w + c^r}_{\hat{c}_{4.2}} \;=\; p \;-\Big[\;-[T_r * \Delta_r]^{-1}q(p) - [T_w * \Delta_w]^{-1}q(p)\Big]. \tag{14}$$

Note that we recover the sum or retail and manufacturer marginal costs in (14) without the need to observe wholesale prices, once we have estimated demand. Then we simulate the equilibrium (N by 1) vector of retail prices under pre-merger wholesale pricing practices and assuming that retailers follow in a Nash Bertrand pricing game, as the prices that solve

$$p^* = \hat{c_{4.2}} - (T_r * \Delta_r)^{-1} q(p^*) - [\ (T_w^{\text{Pre-Merger}} * \Delta_w)]^{-1}[s(p^*)], \tag{15}$$

again without the need to observe wholesale prices.[8]

We access the changes in the welfare components (consumers', manufacturers' and retailers' surplus) resulting from the changes of the simulated counterfactual equilibrium prices p^* of pre-merger wholesale game from the observed equilibrium prices p after the merger occurred. Given the demand model utility maximization primitives, expected consumer i's surplus (Small and Rosen 1981) is defined as $E\left[CS_i\right] = \frac{1}{|\beta_i|} E\left[max_j(u_{ij}(p)\forall j)\right]$, where β_i denotes the marginal utility of income in (1) that is assumed to remain constant for each household. Given the extreme value distributional assumptions and linear utility formulation, the change in consumer surplus for individual i is computed as

$$\Delta E\left[CS_i\right] = \frac{1}{|\beta_i|}\left[ln\left(\sum_{j=1}^{N} e^{\alpha_j + x_j\gamma_i - \beta_i p_j^*}\right) - ln\left(\sum_{j=1}^{N} e^{\alpha_j + x_j\gamma_i - \beta_i p_j}\right)\right]. \tag{16}$$

This measure of consumer valuation is computed using the estimated demand model parameters and the simulated counterfactual retail equilibrium prices. Total change in consumer surplus is obtained adding this over the individuals. The change in the sum (given that we do not observe wholesale prices) of manufacturers' and retailers' producer surplus is given by

$$\Delta E\left[PS\right] = \left[\sum_{j=1}^{N}\left(\pi_j^r\left(p^*\right) + \pi_j^w\left(p^*\right)\right) - \sum_{j=1}^{N}\left(\pi_j^r\left(p\right) + \pi_j^w\left(p\right)\right)\right]. \tag{17}$$

where we assume that manufacturer and retailer marginal costs remain unchanged as do the set of products sold. The change in total welfare is the sum of total change in consumer surplus, manufacturers' producer surplus and retailers' producer surplus.

The final simulations start from the benchmark recovered costs and consider the effects of the same upstream merger analysis as before but now assuming that retailers are (i) passive or (ii) collusive in the counterfactuals. I am able, in doing so, to assess the role of retail pricing behavior on the welfare estimates for these two extreme retail behavior cases.

[8]Common to related papers, one limitation of this paper is that it does not consider the possibility of potential efficiency gains due to joint production and distribution of the merging manufacturers, as well as changes in products made available to consumers pre and post merger.

5. Results

5.1. Demand and Benchmark Supply Model Results

The demand model estimates are presented in Table 2. The first set of columns presents the OLS estimates without instrumenting for price, the second set of columns presents the Logit model estimates where prices are instrumented for. In the last set of columns consumer heterogeneity is considered by allowing the coefficient on price to vary across consumers as a function of unobserved consumer characteristics, and the Generalized Method of Moments estimates of the random coefficient specification are presented, where the individual choice probabilities are given by (4). The first stage R-squared and F-Statistic are high suggesting that the instruments used are important in order to consistently estimate demand parameters. Also when comparing the first two set of columns corresponding to no instrumentation (OLS) with the other columns to the right, when price is instrumented for, one notices that the estimates of the other variables affecting utility are robust to instrumentation, and the price parameter does increase slightly when instrumenting, in absolute value. On average price has a significant and negative impact on utility and, moreover, when comparing the Logit with the random coefficient specification, it appears that unobservable characteristics in the population seem to affect the price coefficient significantly. Promotion and advertising coefficients are significant and positive, and are thus estimated demand expanding factors. There is a significant and negative time trend effect, which is in line with the evidence in the market that the overall attractiveness of the category has been diminishing over time in the German coffee market.[9]

The demand estimates from the random coefficient specification are used to compute the implied estimated substitution patterns, which in turn are combined with the model of retail and manufacturer behavior to estimate the retail and wholesale margins. In Table 3 the summary statistics for the estimated margins are presented under the benchmark model of no uniform wholesale pricing. Subtracting the estimated margins from retail prices I also recover the sum of retail and manufacturer marginal costs of all products for both models, and summary statistics for those are provided in the bottom of the table. The average estimated recovered cost of 4.3 Deutsch Marks per unit is very plausible, according to industry research, and also within the ball-park when comparing with the average raw coffee price after adjusting for the expected loss in volume when produced. Starting with an average raw coffee price including tax per unit (500 grams) of slightly over 4 Deutsch

[9]Industry evidence from Germany shows that yearly consumption, measured as kilograms per capita per year, has fallen by ten percent from over 7.4 in the twelve year period of 1990-2002.

Marks, and given that there is a 15 to 25 % weight loss in the process of roasting the coffee which also needs to be taken into account when calculating the cost per unit of coffee, one obtains an average estimate of 5.37 Deutsch Marks per 500 grams, higher but not significantly different from the average recovered cost estimate (given the t-statistic of 0.7 and p-value of 0.5). According to the German Coffee Association, roasters' cost in 1995 for a 500 gram household pack were estimated to be in the order of 4.8 Deutsch Marks.[10] Furthermore, non nested tests among the above estimated linear pricing model and alternative models following the methodology in Villas-Boas (2007a) yield that the model that cannot be rejected is the linear pricing model. This paper henceforth considers this to be the benchmark model and presents the results of welfare analysis of mergers for a variety of what if scenarios, varying the degree of downstream retail pricing competition.

5.2. Merger Analysis

The changes in retail prices that resulted from the upstream mergers are obtained as the difference between observed retail prices and simulated pre merger Nash equilibrium prices. With these simulated prices I am able to estimate the resulting pre-merger manufacturer and pre-merger retailers margins using the above price cost margin equations with pre-merger T matrices, and thus also compute the manufacturer and retailers pre-merger profits, using the profit functions in equations (8) and (5), respectively.

Table 4 presents the average changes in prices and also the implied average changes and the percent changes in quantities as a result of the upstream mergers, and all these computations are based on the demand estimates previously described, and are performed for all weeks in the data-set. The simulated price increases are economically small but significant and the quantity sold for all brands decreases on average.[11]

While the previous table reports results on equilibrium prices and quantities, the implied changes in welfare are of importance for merger analysis. Table 5 presents changes in producer profits and consumer surplus and overall changes in welfare resulting from the mergers. It also presents a breakdown of the resulting changes in profits for manufacturers and for retailers separately, without the need to observe wholesale prices. Total change in Consumer Surplus is obtained by averaging the computed compensated variation for each individual draw and them multiplying by the market

[10] Coffee roasters costs were 2.2 Deutsch Marks plus another 2.60 Deutsch Marks in coffee tax (Tea and Coffee Trade Journal, Wednesday, January 1, 1997).

[11] The analysis starts with the observed post merger data and compares those to simulated pre-merger equilibrium data. Since the pre-merger situation actually occurred one important check would be to compare actual with simulated pre-merger prices and quantities, but unfortunately I could not obtain pre-merger data.

size. Changes in profits are computed as the variable profits in the post merger minus the variable profits in the pre merger situation. According to the surplus estimates, the mergers between Jacobs and Onko, and between Tchibo and Eduscho, lead to an overall significant decrease in total welfare. This is mostly due to a significant decrease in retailer surplus, while manufacturer surplus changes are negative but not significant. Another contributor to a drop in welfare is a significant decrease in consumer surplus due to the upstream mergers. In summary, the recommendation would be to challenge the mergers, given that welfare would significantly decrease (point estimate of -421 and p-value of 0.01).

5.3. Merger Simulations without Considering Retailers

This subsection replicates merger analysis that does not consider at all retail pricing and the ultimate goal is to compare the resulting welfare estimates to the welfare changes from the previous subsection, where retail pricing is explicitly modeled and included in the upstream merger calculations. First I estimate the margins from manufacturers pricing model without any retailers, and am able to recover post merger underlying implied costs. Given these costs, I then simulate pre merger Nash equilibrium prices and compute the resulting welfare estimates and compare whether those are different to the welfare estimates when considering retail model explicitly. This analysis is presented in Table 6.

Not considering retailers at all leads to significantly different changes in quantity and prices, in particular estimated changes in prices are smaller than those estimated when considering retailers and the estimated average decrease in quantity is also significantly smaller than the one estimated when considering retailers. When comparing estimated price and quantity changes in Table 6 and Table 4 we reject the null hypothesis that the estimated changes are similar at the five percent level for both prices and quantity changes.

In terms of estimated average surplus changes, and comparing to those in Table 5, they are overall smaller in magnitude, although the differences are not statistically significant at the one percent level for the data used. When comparing the estimated producer surplus changes, by manufacturer, in the bottom of Table 6, with the ones in Table 5, we conclude that the estimated changes in producer surplus are mostly not significant and moreover they are not significantly different from those estimated when considering retailer's Bertrand Nash pricing model explicitly, at the one percent level. One exception is manufacturer Onko where the estimated drop in manufacturer surplus is smaller than the average drop estimated in Table 5 at the ten percent significance level. In terms of overall changes in manufacturer and consumer surplus we cannot reject at the one percent significance level that they are equal to the estimated changes in Table 5. However, estimated point estimates for retailer's surplus are negative and significant, leading to an overall estimated average change in total welfare that is larger in absolute value when considering retailers in the analysis. One implication is that one would infer smaller welfare changes, and thus in this case smaller losses, if one would not to include the retailers in the welfare computations. The mergers analyzed were authorized by the Bundeskartellamt given that the German coffee market was considered highly competitive among the largest manufacturers (roasters) and no threat to decreased competition was in question.[12] Although both merging entities would have each roughly thirty percent of the market post merger, there was equally high substitutability of the merging roaster's products to the other coffee manufacturers not involved in the mergers.[13] This would be the policy conclusion if one were to use the estimates in Table 6 for assessing the mergers. In fact, although the welfare point estimates are negative, they are not significantly different from zero at the one percent level. Interestingly, however, including the retailer leads to larger (in absolute value) point estimates surplus losses and, as previously mentioned, from Table 5 the recommendation for the Bundeskartellamt would be to challenge the mergers.

5.4. Sensitivity of Welfare Estimates to Retail Pricing Counterfactual

What I conclude from comparing the results of the two previous subsections is that considering retail pricing behavior in the upstream merger welfare calculations does affect welfare estimates for the underlying supply model considered. In order to investigate how different retail pricing behavior models may affect welfare estimates, the final analysis accesses the sensitivity of welfare calculations to departures from the retail Bertrand Nash pricing model previously considered, in a counterfactual what-if simulation. More precisely, in the case of a more collusive retail sector, what would one miss in terms of welfare computations resulting from the same upstream merger analysis, from not including the retail strategic behavior?

Table 7 presents the welfare computations from this what if exercise. I start here with the pre-merger prices computed above, and simulate what would be the resulting equilibrium prices if the upstream merger had occurred in the presence of collusive retailers. Table 7 reports the resulting changes in prices, quantities, and average estimated changes in consumer, producer, and total surplus of the same upstream merger analysis as before but now assuming that retailers are

[12] Tea & Coffee Trade Journal, January 1997.

[13] In fact, according to the demand estimates in this paper, the estimated cross price elasticities are not statistically different when looking among non merging and among merging manufacturers. For example, the point estimate for the cross price elasticity between Eduscho and Tchibo is 0.027 and between Eduscho Melitta is 0.025.

collusive in the counterfactual scenario. The goal is to compare the estimates with the benchmark model of Bertrand Nash retail pricing estimates (Tables 4 and 5) but also compare the estimates with the ones obtained when ignoring completely retail behavior in the analysis as in Table 6. The p-values from these comparisons are in the two most right columns (labeled, Diff. Table 5 and Diff. Table 6, respectively) of Table 7. I find there to be a significant role of departures from Nash-Bertrand retail pricing behavior on the producer surplus and overall welfare estimates. First, departures from Nash Bertrand scenarios at the retail level have no estimated differential effects on consumer surplus estimates. As before, and as a result of the merger, retail prices increase and thus this hurts consumer surplus. The estimated change in consumer surplus is negative although not statistically significant, as in all scenarios considered. The estimates in terms of changes in producer surplus resulting from the merger are now positive and significant, both for the manufacturers and for the retailers. On the one hand, downstream collusion pricing maximizes profits relative to Bertrand Nash downstream pricing. On the other hand, due to the merger, upstream pricing decisions are also more coordinated than before the merger. In this case prices for the merging firms increase as do prices for the non merging firms, but final retail prices are set to maximize downstream profits rather than in a simultaneous Bertrand Nash fashion. If one were to include retailers in the welfare calculations, in the case where they behave very collusive downstream the merger recommendation would be to not challenge the merger, given that it does not negatively affect welfare estimates.

In summary, the inclusion of retail strategic behavior in upstream merger analysis does impact welfare estimates, and the impact is significantly different for different levels of downstream market power. According to our what-if merger counterfactuals, the less downstream competition (the greater the departure from Bertrand Nash), the more positive the effect on welfare due to an increase in producer surplus. The more competitive downstream, the changes in producer and consumer surplus are of the same sign and negative, according to the counterfactual estimates in the paper. Antitrust policy should thus incorporate the strategic role of retailers in the analysis of upstream mergers, especially in situations where retailers may have significant market power.

6. Conclusions and Implications

This paper develops a useful way for antitrust authorities to incorporate relationships between manufacturers and retailers in assessing upstream merger proposals. The conventional practice has used retail level scanner data and a Bertrand manufacturer oligopoly model as a benchmark for predicting the consequences of a horizontal merger at the manufacturer level. The fact that vertical linkages among manufacturers and retailers relate to horizontal interactions and vice versa has been long recognized in the food distribution channel (Handy and Padberg, 1971). Considering downstream behavior when studying upstream merger proposals is a concern of antitrust authorities (Froeb, Hasken and Pappalardo, 2004). Building on recent advances in vertical pricing modeling and estimation this paper presents a first stab and a simple framework to do so and help antitrust authorities take decisions when analyzing proposed upstream mergers given that they most typically only have access to downstream market level data. This is the typical situation in terms of scanner data accessibility at the retail level in grocery markets, for instance, and harder to get data sets on wholesale or upstream markets, where mergers may be proposed.

For the market analyzed, this paper finds that overall welfare predictions and policy implications resulting from merger analysis, if researchers' were to ignore retail pricing models, would be different from those obtained when incorporating retail behavior in the analysis formally. There are important implications of the results for competition authorities, in the context of the market at hand. Furthermore, given the counterfactual what-if simulation, one can derive implications for antitrust beyond this market. For the upstream merger cases analyzed here, the estimated consequences in terms of welfare and in terms of merger challenge recommendation would be different, if the researcher used retail data and ran a merger simulation analysis ignoring retail behavior explicitly. In either approach to merger analyzes, the merger would be welfare reducing, ignoring the retailer would led to negative but not significant welfare losses, including the retailer would exacerbate the welfare losses and recommend the mergers to be challenged. The negative point estimates of welfare stem from the reduction both in consumer surplus resulting from higher prices, as well as from a reduction in producer profits. The implications for merger decisions, in this particular market, would be affected if authorities missed to incorporate retail decisions in the formal analysis. Moreover, counterfactual simulations show that, if retail behavior departs from Bertrand Nash pricing, the resulting welfare estimates from upstream merger analyzes ignoring retail behavior would be even more different than before. Although the implications for estimated effects in consumer surplus are not affected by the retail scenarios (consumers always have a negative point estimate loss), the implications for estimated changes in welfare and in producer surplus are affected by the retail strategic role and departure from Nash pricing. Considering the role of retailers as strategic players is discussed recently as increasingly important when analyzing markets, and this paper argues that one should also incorporate retailers' strategic role in upstream merger analyzes, especially the more market power retailers have.

One extension of the present paper is to consider the implications of the firms using nonlinear pricing for this analysis, along the lines of the current research by Rey and Vergé (2004), Bonnet et al. (2004), and Bonnet and Dubois (2006). Another application and extension of the present paper using this same structural modeling of vertical relationships is to consider theoretically and empirically the effects of non-horizontal mergers. While related literature studies vertical mergers (see Chen 2001), mergers when there is both upstream and downstream buyer concentration (Hendriks and McAffee 2006), the effects of vertical integration on downstream prices (Hastings 2004), on upstream pricing (Hastings and Gilbert 2005), and on the possibility of upstream collusion (Nocke and White 2003), there are many reasons to study vertical issues. This is particularly of interest in the retail food sector where downstream consolidation may increasingly lead to strategic role of retailers and to buyer power issues. According to a report produced to the European Commission, a leading German branded manufacturer in the grocery retail sector estimates that over seventy five percent of its sales went to the top five customers, being the four leading retail chains in this study and Aldi.[14] The inherent consequences for buyer power, quality and provision of variety, foreclosure, and many other issues involving the vertical marketing channel (for a thorough survey see Cotterill 2006) are important research avenues.

7. References

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	Prices	std p	Shares	Promotion	Advertising
Retailer Edeka					
Jacobs	6.815	0.325	30.359	1.277	2.335
Onko	5.980	0.564	8.547	1.057	0.224
Melitta	6.241	0.320	12.706	1.018	1.776
Idee	8.008	0.638	4.989	0.726	0.302
Dallmayr	7.314	0.421	15.820	1.166	1.618
Tchibo	7.893	0.422	17.951	0.661	1.640
Eduscho	6.960	0.499	9.628	0.932	1.465
Retailer Markant					
Jacobs	6.537	0.523	30.619	1.024	2.335
Onko	5.978	0.541	7.306	1.033	0.224
Melitta	5.965	0.440	19.581	1.290	1.776
Idee	7.779	0.697	3.709	0.783	0.302
Dallmayr	7.304	0.491	12.248	0.939	1.618
Tchibo	7.826	0.446	15.845	0.684	1.640
Eduscho	6.916	0.553	10.692	0.904	1.465
Retailer Metro					
Jacobs	7.093	0.724	27.485	0.921	2.335
Onko	6.557	0.808	10.172	0.577	0.224
Melitta	6.669	0.808	23.375	0.857	1.776
Idee	8.093	0.930	3.735	0.536	0.302
Dallmayr	7.818	0.666	11.091	0.710	1.618
Tchibo	7.738	0.512	11.841	0.694	1.640
Eduscho	6.958	0.603	12.301	0.910	1.465
Retailer Rewe					
Jacobs	7.039	0.537	23.350	0.688	2.335
Onko	6.296	0.397	7.157	0.578	0.224
Melitta	6.565	0.392	15.892	0.863	1.776
Idee	8.279	0.480	2.812	0.410	0.302
Dallmayr	8.109	0.817	7.806	0.448	1.618
Tchibo	7.912	0.444	28.434	1.025	1.640
Eduscho	6.919	0.528	14.549	1.134	1.465
By Retailers					
Edeka	7.017	0.721	13.528	0.866	9.360
Markant	6.769	0.829	29.072	0.991	9.360
Metro	7.117	0.864	46.697	0.805	9.360
Rewe	7.260	0.829	10.703	0.842	9.360

Table 1: Summary Statistics for the 28 Products in the Sample.

The mean of the variables in the data is reported. Prices are in Deutsch Marks per 500 grams, Quantity in units sold of 500 grams, and Advertising in Million Euros. Source: MAKADOM, Germany.

	$OLS(1)$		$Logit(2)$		$GMM(3)$	
Parameter	Estimate	Std	Estimate	Std	Estimate	Std
Price	−0.678	(0.016)	−0.753	(0.035)	−0.772	(0.065)
Constant	−2.137	(0.137)	−1.534	(0.284)	−1.619	(0.411)
Promotion	0.482	(0.015)	0.435	(0.025)	0.466	(0.033)
Trend	−0.002	(0.000)	−0.002	(0.000)	−0.002	(0.000)
Advertising	0.032	(0.008)	0.032	(0.008)	0.027	(0.007)
Onko in Edeka	−1.849	(0.052)	−1.922	(0.061)	−1.897	(0.064)
Melitta in Edeka	−1.172	(0.049)	−1.227	(0.054)	−1.202	(0.051)
Idee in Edeka	−0.678	(0.052)	−0.615	(0.058)	−0.663	(0.055)
Dallmayr in Edeka	−0.373	(0.048)	−0.340	(0.050)	−0.362	(0.047)
Tchibo in Edeka	0.612	(0.049)	0.664	(0.053)	0.632	(0.048)
Eduscho in Edeka	−0.858	(0.047)	−0.863	(0.048)	−0.862	(0.038)
Jacobs in Markant	0.620	(0.047)	0.587	(0.050)	0.604	(0.047)
Onko in Markant	−1.266	(0.052)	−1.340	(0.061)	−1.315	(0.065)
Melitta in Markant	−0.351	(0.049)	−0.414	(0.056)	−0.388	(0.058)
Idee in Markant	−0.454	(0.051)	−0.405	(0.055)	−0.444	(0.058)
Dallmayr in Markant	0.260	(0.047)	0.280	(0.048)	0.266	(0.043)
Tchibo in Markant	1.184	(0.049)	1.232	(0.053)	1.202	(0.046)
Eduscho in Markant	−0.034	(0.048)	−0.044	(0.048)	−0.041	(0.037)
Jacobs in Metro	1.086	(0.047)	1.090	(0.047)	1.085	(0.051)
Onko in Metro	−0.931	(0.052)	−0.984	(0.056)	−0.966	(0.089)
Melitta in Metro	0.301	(0.048)	0.270	(0.050)	0.283	(0.064)
Idee in Metro	0.001	(0.052)	0.061	(0.058)	0.015	(0.056)
Dallmayr in Metro	0.442	(0.049)	0.491	(0.053)	0.459	(0.069)
Tchibo in Metro	1.289	(0.048)	1.331	(0.051)	1.305	(0.045)
Eduscho in Metro	0.554	(0.047)	0.547	(0.048)	0.549	(0.040)
Jacobs in Rewe	−0.122	(0.047)	−0.134	(0.048)	−0.125	(0.044)
Onko in Rewe	−1.845	(0.053)	−1.917	(0.061)	−1.887	(0.075)
Melitta in Rewe	−0.960	(0.048)	−0.998	(0.051)	−0.980	(0.052)
Idee in Rewe	−1.161	(0.052)	−1.093	(0.060)	−1.142	(0.062)
Dallmayr in Rewe	−0.720	(0.050)	−0.663	(0.055)	−0.700	(0.057)
Tchibo in Rewe	0.666	(0.050)	0.736	(0.058)	0.692	(0.057)
Eduscho in Rewe	−0.833	(0.047)	−0.832	(0.048)	−0.836	(0.043)
Std. Deviation Price (Υ)					0.098	(0.035)
First Stage						
F(28,2766) (p-value)			50.78	(0.000)	50.78	(0.000)
R Squared			0.842		0.842	

Table 2: Demand Results.

OLS (in columns (1)), Logit (in columns (2) and Random Coefficients (in columns (3)) GMM estimates and White standard errors are in parenthesis. Source: Author's calculations.

	Linear Pricing Model		
	mean	std	Percent of Price
Manufacturer Margins			
Jacobs	1.411	(0.078)	20.7%
Onko	1.399	(0.074)	22.9%
Melitta	1.383	(0.067)	22.0%
Idee	1.397	(0.077)	17.5%
Dallmayr	1.397	(0.076)	18.5%
Tchibo	1.422	(0.088)	18.2%
Eduscho	1.405	(0.077)	20.4%
Retailer Margins			
Markant	1.415	(0.087)	20.4%
Edeka	1.429	(0.092)	21.1%
Metro	1.445	(0.096)	20.2%
Rewe	1.417	(0.088)	19.7%
Total Margins	2.829	(0.167)	40.4%
Recovered Costs	4.299	(0.921)	p-value
t-statistic(recovered costs=raw Coffee Estimate Costs)	0.705		0.5

Table 3: Price-Cost Margins and Recovered Costs for Benchmark Linear Pricing Model. PCM=$(p-c)/p$ where p is price and c is marginal cost and all data are expressed in Deutsch Marks per 500 grams. Recovered Costs=$p-PCM$ where p is retail price and PCM are the estimated margins, also in Deutsch Marks per 500 grams. Std: Standard deviation. Source: Author's calculations.

	Price		Quantity		
	Average Change	std	Average Change	std	Percent Change
Overall	0.045	0.006	−5.05	0.91	−3.73
By Retailer					
Edeka	0.044	0.012	−2.20	0.91	−2.71
Markant	0.046	0.012	−7.19	1.91	−3.83
Metro	0.048	0.013	−9.00	2.79	−3.99
Rewe	0.044	0.012	−1.81	0.75	−2.71
By Manufacturer					
Jacobs	0.043	0.016	−10.48	4.30	−3.94
Onko	0.061	0.015	−3.54	1.10	−6.37
Melitta	0.034	0.014	−4.44	2.34	−2.64
Idee	0.037	0.018	−1.54	0.81	−2.94
Dallmayr	0.035	0.018	−4.49	1.39	−4.51
Tchibo	0.050	0.017	−6.99	2.51	−3.47
Eduscho	0.057	0.016	−3.87	1.95	−2.76

Table 4: Estimated Changes in Retail Prices and Quantities due to Upstream Mergers.
Prices are expressed in Deutsch Marks per 500 grams; Changes are computed as Data that are Observed Post Merger Minus Simulated Pre Merger Data. Average change is computed for each brand over the time period and std reports bootstrapped standard errors of the changes. Source: Author's calculations.

Change in Producer Surplus	Mean Estimate	std	Percent Revenues
Retailers			
Edeka	−26.10	14.16	0.57
Markant	−83.43	42.65	0.82
Metro	−107.02	54.39	0.90
Rewe	−21.40	10.19	0.56
Manufacturers			
Jacobs	−60.72	36.22	0.74
Onko	−13.56	7.57	0.96
Melitta	−27.55	20.25	0.66
Idee	−9.64	6.33	0.52
Dallmayr	−27.03	12.13	0.79
Tchibo	−33.89	27.92	0.47
Eduscho	−13.70	17.74	0.33
	Mean Estimate	std	Percent Total Revenues
Change in Producer Surplus	−224.98	120.76	1.08
Change in Consumer Surplus	−196.26	106.55	0.95
Change Welfare	−421.24	161.04	2.03

Table 5: Estimated Changes in Surplus due to Upstream Mergers.
All data are expressed in Deutsch Marks per week; Average change was computed for each brand over the time period. std: Standard deviation. Source: Author's calculations.

	Price		Quantity	
	Average Change	Diff. Table 4 p-value	Average Change	Diff. Table 4 p-value
Overall	0.03	0.01	−2.67	0.03
Change in Producer Surplus	Mean Estimate	std	Percent Revenues	Diff. Table 5 p-value
Jacobs	−29.87	21.11	0.14	0.45
Onko	−6.99	3.92	0.03	0.08
Melitta	−15.13	11.56	0.07	0.46
Idee	−4.56	3.37	0.02	0.14
Dallmayr	−14.03	6.84	0.07	0.32
Tchibo	−18.19	16.55	0.09	0.44
Eduscho	−6.92	9.25	0.03	0.18
Change in Producer Surplus	−95.70	64.05	0.46	0.23
Change in Consumer Surplus	−103.31	63.28	0.50	0.30
Change Welfare	−199.02	90.04	0.96	0.12

Table 6: Merger Analysis Without Retailers in the Model.
All data are expressed in Deutsch Marks per week; Prices are expressed in Deutsch Marks per 500 grams. Average change was computed for each brand over the time period; Diff. Table X p-value: reports the p-value for the differences in the average changes estimated between the present table and Table X; std: Standard deviation; Source: Author's calculations.

	Collusive Retailers				
	Price		Quantity		
	Average Change	Diff. Table 4 p-value	Average Change	Diff. Table 4 p-value	
Overall	0.06	0.06	−2.72	0.06	
	Mean Estimate	std	Percent Revenues	Diff. Table 5 p-value	Diff. Table 6 p-value
Change in Producer Surplus	236.58	62.03	1.14	0.00	0.00
Change in Consumer Surplus	−98.44	98.68	−0.47	0.26	0.49
Change Welfare	138.14	116.56	0.67	0.00	0.02

Table 7: Varying Downstream Model and Upstream Merger Analysis.
All data are expressed in Deutsch Marks per week, prices are expressed in Deutsch Marks per 500 grams; Diff. Table X p-value: reports the p-value for the differences in the average changes estimated between the present table and Table X; std: Standard deviation; Source: Author's calculations.