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ABSTRACT In 1997, the US Federal Trade Commission challenged the proposed merger of two office supply superstores, Staples and Office Depot in US District Court. Both the government and merging parties presented econometric studies examining the merger’s likely impact on consumer pricing, predicting a price increase of 8.6% and 0.9% respectively. This article uses the extensive public record to provide a detailed discussion of the econometric models used in the case and to show how differences between the models led to the discrepancy between these estimates.

Key Words: Antitrust; Merger Review; Econometrics; Empirical Methods.

JEL Classifications: L11, L40, L81.

Few antitrust challenges to mergers are litigated, and fewer still have involved economic input to the same extent as the Federal Trade Commission’s 1997 challenge to the merger of two office supply superstore chains, Staples and Office Depot. Our article exploits the extensive public record to show how econometric analysis was employed in this well-known merger case.

When Staples proposed to acquire Office Depot in September 1996, the firms were two of the largest office supply retailers in the US. Each had more than 500 stores nationwide and combined annual revenues exceeded $10 billion. Office
supply superstore (OSS) chains – Staples, Office Depot, and a third retailer, OfficeMax – are distinguished from other retailers that carry office supplies, such as Target and Wal-Mart, by the extensive variety of office supplies the OSSs stock. In general, OSSs sell office supplies in larger volumes and at lower prices than other retailers.

Staples and Office Depot competed head-to-head in more than half of the regional markets (mainly metropolitan areas) in which they did business. After an extensive investigation, the Federal Trade Commission (FTC) voted to challenge the proposed merger. On 30 June 1997, after a week-long hearing, the US District Court for the District of Columbia granted the FTC a preliminary injunction blocking the acquisition. Soon after, Staples and Office Depot abandoned the deal.

The central economic question in the court case was the extent to which Office Depot constrained Staples pricing, and vice versa. Both sides relied on documentary and testimonial evidence to address this issue, and both tested that evidence systematically with econometric analysis of pricing data. Our article explains why, and clarifies differences in the empirical approaches employed by each party to the case. Although we were deeply involved in conducting the econometric analysis undertaken by Federal Trade Commission, we do not exempt our side of the case from our critical assessment.

1. Office Supply Retailing

In March 1996, Prudential Securities released an industry update focusing on OSSs. In this study, the analyst compared prices on a basket of goods offered by office superstores in Paramus, NJ, where two OSS chains competed (Staples and OfficeMax), with prices in Totowa, NJ, where three OSS chains competed (Staples, OfficeMax, and Office Depot). The study concluded that prices were approximately 5% lower in Totowa. In investigating the proposed merger, the FTC sought to determine if this observed relationship, of lower prices in cities in which Staples and Office Depot competed head-to-head, represented a systematic pricing difference.

Staples and Office Depot sell many different types of office products, going beyond traditional paper goods and stationery items to include furniture, computers, and business services. The FTC identified “consumable office supplies sold through office supply superstores” as the product market within which to analyze the merger’s potential competitive effects. Consumable office supplies include those items that would be purchased repeatedly by consumers such as paper, pens, pencils, staples, folders or batteries; that is, those office supplies which are “consumed” fairly quickly. More durable office products, such as computers or furniture, were not considered consumable office supplies.

Many retailers sell consumable office supplies. Mass merchandisers like Wal-Mart, Kmart and Target carry between 500-1,500 stock keeping units (SKUs) of these items. Computer superstores such as CompUSA and Computer City also carry many consumable office supplies, in particular those closely associated with technology goods (such as fax paper and toner cartridges). Further, warehouse clubs like Sam’s Club and PriceCostco carry a relatively small number of commonly used consumable office supplies in bulk (such as cartons of paper and toner cartridges). But office supply superstores such as Staples, Office Depot and
OfficeMax specialize in carrying a large variety of consumable office supplies, and selling them at much lower prices than found at independent stationery supply stores.

It was not obvious which types of retailers constrain the pricing of OSSs, and, consequently, whether OSSs like Staples and Office Depot imposed substantial constraints on each other’s pricing. OSSs with their vast collection of SKUs are designed to facilitate “one-stop-shopping” of office supplies for consumers, so could provide the primary constraint on each other’s pricing. However, OSSs are often located in shopping complexes with mass merchandisers, computer superstores, and warehouse clubs. It seemed possible that the proximity of other types retailers selling similar items would exercise some price constraining influence on OSS pricing.

The FTC relied primarily on company documents to determine which types of retailers mattered to OSS pricing. Staples’ documents indicated that the company appeared to view OSSs as much closer competitors than other types of retailers. For example, Staples created price zones corresponding to the number of distinct OSS competitors, Office Depot and OfficeMax in particular, it faced, almost entirely without regard for the extent of rivalry from non-superstore retailers of office supplies. In addition, Staples would reclassify a metropolitan area’s price zone in response to the entry of a competing OSS chain to lower price, but would not do so in response to the entry of non-superstore retailers. Further, Staples tracked the prices it charged for office supplies in different competitive environments. The FTC used price comparisons in Staples’ documents to show that average prices were highest in regions in which Staples was the only OSS chain operating and lower when Staples faced competition from other OSSs.

The observation that average prices were higher in geographic regions with only one OSS chain did not necessarily imply that competition from other OSSs lowered prices. For instance, it was possible that Staples-only markets also had only one mass merchandiser, and that having more mass merchandisers in a market, not having more OSSs, caused the prices that Staples charged to fall. In order to isolate the effect of office supply superstore competition on office supply superstore pricing, it was necessary to hold constant rivalry from office supply retailers employing other formats. Regression analysis was employed to do so.4

2. Price Measurement

To analyze the effect of OSS competition on pricing, and so evaluate the likely competitive effect of merger, the FTC requested pricing information from Staples. Staples provided cash register summaries of the total quantity and revenue sold of each of over 7000 stock keeping units (SKUs) classified as consumable office supplies, for each Staples store on a weekly basis over the time frame requested. Due to the huge amount of data, empirical analysis required the creation of a manageable measure of price. The merging firms’s expert economist, Professor Jerry Hausman, calculated a price index that corresponded to the price charged for the average bundle of consumable office supplies purchased at a Staples store, using a technique he had developed for creating an unbiased price index.5

The price index recognized that Staples, in its internal price analyses, classified all office supplies into one of four categories:
• Price Sensitive Items (PSIs): office supplies that consumers purchased most frequently and constituted a large share of the consumer’s budget, such as copy paper.

• Leadership Items: a subset of PSIs which were primarily low priced and sold at very low margins, such as pencils, pens or tape. These items were priced low in order to attract traffic into the store.

• Invisible Items: office supplies that were purchased very infrequently and comprised a small portion of a customer’s office supply budget, such as green ink pads.

• Non-Price Sensitive Items (Non-PSIs): office supplies that were similar to PSIs, but differed in brand, size of package, or importance to budget.

Staples checked the prices of PSIs most frequently against the prices of its competitors, because it thought that these prices had the most influence on customer choices of retailer. Consumer attention to these goods as well as the Staples price guarantee, in which consumers received 150% of any price difference between the Staples price and a competitor’s lower price for an identical item, made it costly to misprice these items. At the other extreme, since invisible items were likely to be purchased with PSIs and did not have a large budgetary impact on the consumer, the cost of mispricing them was small. Any price index needed to account for Staples’ efforts to price these four categories differently.

The price index developed by Professor Hausman calculated a separate index for each of these four categories. The category price index for each store, i, at time, t, for category of item (PSI, Non-PSI, Leadership, and Invisible), k, was defined as the weighted average,

\[ p_{itk} = \sum_{j \in k} w_j \cdot p_{itj}, \]  

where \( j \) corresponded to the SKUs that make up category \( k \), \( w_j \) was the quantity weight of item \( j \) in category \( k \), and \( p_{itj} \) was the price of item \( j \) in store \( i \)’s price at time \( t \).

The store-wide price index was then defined to be the revenue-weighted average of the four sub-indices. Thus, the Staples price index for store \( i \) was then defined to be

\[ \log(p_{it}) = \sum_k \omega_k \cdot \log(p_{itk}), \]  

where the \( \omega_k \) were the weights corresponding to the proportion of revenue from category \( k \) and \( p_{itk} \) is the price index calculated in equation (1). The resulting price index was used by both the merging parties and the government in the litigation.

Although this method seems straightforward, it led to two anomalies in the price index data that the FTC received from the merging firms. First, stores that did not sell any of a particular item during a given week would show a price of zero. Second, due to returns, in some weeks, prices appeared negative. While these problems affected only a small percentage of items, adjusting the price index data to account for them (by developing a “Recalculated Price Index”) was difficult and time consuming for the FTC staff.
3. Basic Price Model

Both the government and the merging firms used variants of the same model to describe Staples’ pricing. This basic model is given by equation (3):

$$\log(p_{it}) = \alpha_i + f(\text{competition}) + \sum_{t} \gamma_t \cdot D_t + e_{it},$$

(3)

where $p_{it}$ is the price index created above, $\alpha_i$ is a time invariant store dummy, $f(\cdot)$ is a function of the level of retail competition “close” to a Staples store, $D_t$ is a dummy variable for each time period, and $e_{it}$ is a mean zero disturbance term.

The use of store fixed effects in this model allowed the empirical analyses to control for the costs of serving customers that vary from store to store. For example, all else equal, regions in which the costs of retailing were higher than others would expect to have fewer retailers. Thus the cost of retailing and the number of retailers in an area are negatively correlated. The use of the store fixed effect separates the effect of higher store costs from the presence of retail competition. As long as these store-specific costs of retailing do not vary over time periods, the store fixed effects will control for these differences. These fixed effects can be interpreted as measuring differences in average costs across stores.

The use of the time dummy variable allowed for the identification of cost shocks that affected all stores during the same time period. For example, a shock to paper prices, a cost variable, occurred during the time period covered by the data in this investigation. Paper prices initially rose dramatically and then returned to their original price level. When plotted, the time dummies mirrored this inverse U pattern and substitution of the raw paper price for the time dummies did not affect the estimates.

The final component of equation (3) is the competition measure. In order to develop a reliable estimate of the change in prices likely to follow a merger of Staples and Office Depot, it is important to control for the level of competition that each store faces. Both sides controlled for the presence of the three major OSS chains (Staples, Office Depot, and OfficeMax) as well as many non-OSS office supply retailers. Staples documents identified the location and opening dates of OSS competitors. This information was supplemented with data from the Internet and from other sources to determine the location of likely non-OSS competition including mass merchandisers, computer superstores, and warehouse clubs. Specifically, the analysis accounted for the presence of Kmart, Target, Wal-Mart, Bestbuy, Computer City, CompUSA, PriceCostco, BJ’s and Sam’s Club.

Most of the non-OSS retailers stock a relatively narrow set of consumable office supplies (500-1500 SKUs versus 7000 at the typical Staples store). Therefore, the most likely competitor for the “one-stop shopping” feature provided by OSS would be the many independent stationery stores that stocked a similar variety of SKUs. However, due to the limited time period in which to collect data during this merger investigation, it was not possible to collect data on the number and presence of stationery stores operating near a Staples store. Therefore, this potentially important source of competition was omitted from the analysis. It is unlikely that these retailers provided a meaningful constraint on OSS prices, however, as many were being driven out of business by the low prices offered by the OSS chains.
The model described in equation (3) was the basis for the price estimates generated by both sides of the case. Despite the common underlying model, the price estimates generated differed greatly. While the merging firms predicted an average increase in price of 0.9%, the government estimated that the merger would generate an average increase of 8.6%.

The next two sections describe the implementation of this basic model by each side. Subsequent sections explore the differences between the two methods of implementing the basic model and their impact on the price estimates.

4. Merging Firms’ Model

Although both parties used equation (3) as the basis of their econometric work, the price change generated by the merging firms was substantially lower than that estimated by the government.

Looking at the specific models estimated will provide a basis for understanding the difference in estimates.

One model of local retail competition posits that retailers are differentiated in terms of location. Retailers that have relatively few competitors nearby are able profitably to charge their customers higher prices than can those retailers who have many rivals, and, hence, more competition, in close proximity. In this environment, one might imagine a retailer making its pricing decision based on the number of competitors very close to its store, somewhat close to its store, and somewhat distant from its store. In essence, this model implies that the firm’s pricing is primarily constrained by the consumer’s ability to find a competing store. This perspective can be implemented by drawing concentric circles around a particular store and counting the number of competitors within, say, 5, 5–10 and 10–20 miles to determine the competition faced by that store. In the Staples example, this model corresponds to a pricing model in which individual Staples stores set prices based on their particular competitive setting.

This theory of local competition was adopted by the merging firms, and implemented using distance (or circle) measures of competition. Equation (4) represents the pricing equation they employed.

\[
\log(p_{it}) = \alpha_i + \sum_t \gamma_t D_t + \sum_z [\theta_{1z} D5_{zt} + \theta_{2z} D10_{zt} + \theta_{3z} D20_{zt}] + \sum_z [\theta_{4z} \log(\text{Store5}_{zt}) + \theta_{5z} \log(\text{Store10}_{zt}) + \theta_{6z} \log(\text{Store20}_{zt})] + e_{it},
\]

where \(D5_{it}, D10_{it}, \) and \(D20_{it}\) are dummy variables equal to one if retailer does not have a store within 5, 10, or 20 miles, respectively, of store \(i\), and \(\text{Store5}_{it}, \text{Store10}_{it},\) and \(\text{Store20}_{it}\) are equal to the number of retailer \(z\)’s stores within 5, 10, or 20 miles, respectively, of store \(i\). This model allows competing retailers’ stores to have a different effect on a given Staples store’s pricing depending on the distance between the competitor’s store and the Staples store.

The merging firms utilized this model to generate an estimate of the price increase that would arise from a merger of Staples and Office Depot in overlap markets, that is, in markets where these competitors competed head to head. To calculate consumer harm, the merging firms used the estimates generated from estimating equation (4) in the following calculation:
Empirical Methods in Merger Analysis

where $n_1$ is the number of Staples stores which had Office Depots in their MSAs in the final time period (T), $n_2$ is the number of Staples stores that did not have any Office Depots in their MSAs in the final time period, and the sum is taken over all Staples stores in the data set in the final time period. This calculation corresponds to the thought experiment: “How much would prices increase in the average Staples store?” The result of applying this estimation procedure and calculation method was an estimated price increase of 0.9% nationwide.

5. Government’s Model

An alternative model of local retail competition posits that a firm finds it profit maximizing to charge similar prices within a broad geographic area, such as a Metropolitan Statistical Area (MSA), rather than customizing prices to the exact competitive conditions of individual stores. One can imagine a number of reasons why a retailer would create “price zones” where each store in a geographic area charged the same prices, including the following three:

1. It is costly to tailor prices to the exact competitive situation faced at individual stores, particularly when a retailer is dealing with a large number of items.
2. There may be efficiencies in advertising, such as distributing sale flyers in local newspapers. It is costly to customize flyers for individual stores.
3. There may be reputational effects from offering different prices within the same geographic area: individuals may live and work in different parts of a city and experience annoyance to find different prices near the office than advertised at home.

In short, a retailer may efficiently charge the same price in a defined geographic area to minimize reputational, advertising and price setting costs.

Documents from Staples’ files indicated that the firm set prices by price zones and that these price zones corresponded closely with Metropolitan Statistical Areas (MSAs). Therefore, the competition function used by the government reflected a MSA based model of competition. Equation (6) describes the pricing equation used by the FTC.

$$
\Delta p = - \frac{1}{n_1 + n_2} \sum \left[ \beta_{1,OfficeDepot} + \beta_{2,OfficeDepot} \log(Store_{OfficeDepot,i,T}) \right] + n_2 \cdot 0
$$

where $\Delta p$ is the price increase, $\beta_{1,OfficeDepot}$ and $\beta_{2,OfficeDepot}$ are coefficients, $\log(Store_{OfficeDepot,i,T})$ is the log of the number of Office Depots in Staples store $i$’s MSA at time $t$, and $n_1$ and $n_2$ are as defined previously. This model implicitly assumes that all of a retailer’s stores within an MSA have the same effect on Staples’ pricing regardless of the distance between a competitor’s store and a Staples store. For example, all else equal, an Office Depot 10 miles from a Staples store has the same effect on a Staples store’s pricing as an Office Depot next door.
The government utilized this model to generate estimates for use in the calculation of consumer harm likely to result from the merger. These estimates were then used in equation (7) to calculate the estimated price increase.

\[
\Delta p = - \sum_{i,t} [\beta_{1,OfficeDepot} + \beta_{2,OfficeDepot} \log(\text{Store}_{OfficeDepot,i,t})] n_1,
\]  

where \( n_1 \) is the number of observations in which there was an Office Depot in a Staples store’s MSA, and where the sum is taken over all store/time periods in which there was an Office Depot in a Staples store’s MSA. The government’s model sought to answer the question “How much will prices rise at the average Staples store observed in the sample that experienced competition from Office Depot?” To calculate this number it was assumed that all Office Depot stores would be converted to Staples stores. The result of applying this estimation procedure and calculation method was a prediction of an increase in office supply prices of 8.6% on average in the geographic markets in which competitive harm was alleged.

6. Differences Between the Models

The calculations performed by the parties in this case led to dramatically different estimates of the predicted impact of eliminating Office Depot. A comparison of the models presented in the previous sections reveals two major differences between the two sides’ approaches: the theory of retail competition applied and the method of calculating consumer harm. PX-400, the primary econometric exhibit entered into the record by the government (see Table 1), systematically examines the predicted impact on price of these and other differences in econometric model.

Model 7 of PX-400, at the far right end of the table, represents the simulated price change estimated by the government’s experts, the 8.6% figure discussed above. The column indicates that this model included 3038 observations in which the unit of observation was a store month. The aggregation of the weekly observations in the raw data to monthly observations was required in order to employ the MSA variables that the FTC created. Model 7 uses the “Recalculated Price Index” as the dependent variable. The “Recalculated Price Index” was the FTC’s attempt to recreate the price index as calculated by Professor Hausman. The two indices were very similar, but differed slightly for technical reasons, including the handling of missing or negative prices and missing stores. Model 7 includes the MSA based competition variables derived by the government and consistent with their theory of retail competition. Finally, Model 7 uses the “Complete Sample” which means that it includes all Staples stores for which data was provided.

Model 1, at the left end of PX-400, represents the government’s attempt to reproduce the merging firms’ simulated price increase. Model 1 shows an price change of 1.1%. The difference between this estimate and the 0.9% actually reported by the merging parties arises from a difference in the method of calculating of consumer harm. In each model presented in PX-400, consumer harm has been calculated following equation (7) rather than equation (5), which had been employed by the merging firms.

Model 1 was estimated using 6896 observations. The unit of observation was a store week. Model 1 utilized the Hausman Price Index as supplied to the
Table 1. PX-400: simulated impact on Staples office products prices of eliminating Office Depot: Staples stores with some Office Depot competition

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3*</th>
<th>Model 4*</th>
<th>Model 5</th>
<th>Model 6</th>
<th>Model 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simulated Price Change</td>
<td>1.1%</td>
<td>0.8%</td>
<td>2.9%</td>
<td>3.7%</td>
<td>4.0%</td>
<td>3.7%</td>
<td>8.6%</td>
</tr>
<tr>
<td>Observations in Simulation</td>
<td>6,896</td>
<td>1,685</td>
<td>1,817</td>
<td>1,315</td>
<td>1,465</td>
<td>1,395</td>
<td>3,038</td>
</tr>
</tbody>
</table>

Sample is:  
- Hausman Sample: Yes  
- Complete Sample: Yes

Unit of Observation:  
- Weekly/Stores: Yes  
- Monthly/Stores: Yes

Dependent Variable is:  
- Hausman Price Index: Yes  
- Recalculated Price index: Yes

Competitor Variables  
- Hausman**: Yes  
- MSA Based***: Yes

Notes: *Models 3 and 4 are based on the same regression model. Model 3 reports the simulated impact of eliminating Office Depot in markets where either the MSA based competition data or Professor Hausman’s competition data indicate that a Staples store faces Office Depot competition. Model 4 reports the simulated impact of eliminating Office Depot in markets where both the MSA based competition data and Professor Hausman’s competition data indicate that a Staples store faces Office Depot competition.  
**Variables which control for the number of Office Depot, OfficeMax, computer superstores, and warehouse clubs within 5 miles, 5–10 miles, and 10–20 miles of the Staples store.  
***Variables which control for the number of Staples, Office Depot, OfficeMax, Wal-Mart, Sam’s Club, Computer City, Best Buy, Office 1 Superstore, Costco, BJ’s, CompUSA, Kmart, and Target stores in the MSA.
government as the dependent variable and used the competitor variables measured in concentric circles as described in equation (4). Finally, Model 1 used data from a subset of stores, which is referred to as the “Hausman Sample.” The “Hausman Sample” refers to the original set of stores that the merging firms’ expert included in its price study. This included most Staples stores in the US, but it omitted many stores in Pennsylvania and California. The merging firms later submitted a separate price study for a subset of the California Staples stores.

The Models presented between Model 1 and Model 7 (columns 2 through 6) represent the government’s attempt to explain the differences in the estimates of simulated price change and examine the incremental impact of each change. For example, switching from weekly to monthly data (Model 1 to Model 2) caused the estimated price effect to fall from 1.1% to 0.8% in overlap markets. Further, changing from the “Hausman Price Index” to the “Recalculated Price Index” (Model 5 to Model 6) caused the estimated price effect to fall from 4.0% to 3.7%. These are both minor changes in the simulated price change. Other changes had a larger impact. Moving from the “Hausman Sample” to the “Complete Sample” (Model 6 to Model 7) results in the estimated price effect to increase from 3.7% to 8.6%, and moving from the distance (circle) measures of competition to the MSA-based measures (Model 2 to Model 5) caused the price change to increase from 0.8% to 4.0%. (Models 3 and 4 represent an additional experiment which is discussed below.)

In the remainder of the article, we examine more closely the most important of these changes: the differences in the measurement competition, the geographic sample and the calculation of consumer harm.

7. Measurement of Competition

As described above, estimates of the price change expected from a merger between Staples and Office Depot estimates of the price change expected from a merger between Staples and Office Depot varied substantially depending on how competition from rival firms was measured (the distance measure or the MSA-based measure). To determine whether both sets of variables were important in explaining Staples’ pricing behavior, both sides estimated a model that included both the MSA-based and 5, 10, and 20 mile measures of competition. This is equation (8).

\[
\log(p_{it}) = \alpha_i + \sum_t \gamma_t D_t + \sum_z [\beta_{1z} D_{zit} + \beta_{2z} \log(\text{Store}_{z})] \\
+ \sum_t [\theta_{1z} D_{5zt} + \theta_{2z} D_{10zt} + \theta_{3z} D_{20zt}] \\
+ \sum_z [\theta_{4z} \log(\text{Store}_{5zt}) + \theta_{5z} \log(\text{Store}_{10zt}) + \theta_{6z} \log(\text{Store}_{20zt})] + e_{it}.
\] (8)

Using a Chow test, both experts concluded that both measures of competition were important. Thus, in a statistical sense, Staples’ pricing was best explained by including both the “Hausman Competitor Variables” and the “MSA Competitor Variables.”

The results of this exercise are shown in Models 3 and 4 of PX-400. Models 3 and 4 represent the same regression model, but differ in the method of combining
the competition variables. Model 3 reports the simulated impact of eliminating Office Depot in markets where either the MSA or the distance (circle) variables indicate a Staples store faces Office Depot competition, i.e. it is the union of the two sets of variables. In Model 4, only those cases where both sets of competition variables indicate an overlap are used to calculate the price effect. This exercise corresponds to the intersection of the two sets. These estimations indicated a 2.9% and a 3.7% increase in price respectively.

Including both sets of competition variables gave different estimates than either of the methods generated independently. There are two plausible explanations. First, both models control for the effect of retail competition on Staples’ pricing using a non-linear functional form. Specifically, the models assume a concave relationship between the amount of competition from a rival retailer in a market and Staples’ price; that is, having an additional competing store nearby decreased the Staples price at a decreasing rate. If a linear functional form had been used to model the effect of competition, nesting of the two models would have been possible. However, because both measured the impact of having more stores in a region on Staples’ price level using the natural log of the number of stores, it is not possible to nest the models inside each other. For example, one cannot state that if the coefficients on log(Store5lt), log(Store10lt), and log(Store20lt) are all equal, that, in essence, the models were the same. In fact, because of the non-linearity in the way the number of stores enters the pricing equations, it is very difficult to compare the estimated coefficients of the two models. Thus, it is not so surprising to observe different price effects from the different measures of competition.

Second, both measures of retail competition were to some extent mis-measured. One would expect that the typical travel time between competing stores would matter more than the distance between stores in constraining Staples’ pricing within a region. Both measures fail to capture this aspect of retail competition in a systematic way. For example, the FTC’s measure, the number of rival stores in an MSA, implicitly assumes the travel times within all MSAs are the same; e.g., ten stores around Cedar Rapids, IA, constrain price as much as ten stores around Washington, DC. However, MSAs with large numbers of retailers likely have more traffic congestion than MSAs with fewer retailers. Thus, it is likely that in more densely populated (less densely populated) MSAs the measure of retail competition is overstated (understated) by the FTC’s measure of retail competition. There is an additional related problem with the merging firms’ measure. Consider an example where there are two Office Depots within five miles of a Staples store. Suppose that due to local traffic conditions, it takes ten minutes to drive to the first Office Depot and 20 minutes to drive to the second Office Depot. According to the merging firms’ measure, both stores are classified as being “close” to Staples (within 5 miles) even though one store has a much shorter travel time than the other. This type of misclassification bias could be a problem in areas where differences in distances between stores do not closely correspond to differences in travel times. The fact that the measurement problems are somewhat different for the MSA competition variables and the distance competition variables could lead to some of the observed differences in estimated price effects.

8. Geographic Sample

The econometric analyses presented by the two sides in the litigation also differed in how they incorporated geographic differences in Staples’ pricing. Initially, the
government estimated a single price equation using data for the entire US, implicitly assuming that the manner in which Staples responded to competition from other retailers would not differ across regions of the country. Further, the estimation of a single pricing equation was consistent with the Staples’ documents provided to the FTC during its investigation, as they did not indicate that Staples responded in a fundamentally different manner to competition in different regions of the country. However, the merging firms argued that there were important differences in Staples’ pricing throughout the US. In particular, they claimed that Staples faced a unique competitive environment in California. For this reason, the merging firms estimated separate pricing equations for California and the rest of the United States. A statistical test confirmed that the estimated coefficients of the pricing equation were different in California than they were for the rest of the US.

It is not surprising that the pricing equation differed in California from the equation estimated for the rest of the United States. Both models estimated were reduced form pricing equations; that is, they were not based on any structural model of how prices are determined in retail markets. Because the regression models estimated were reduced form equations, they were best viewed as approximations to the true relationship between competition and prices in a market. In addition, the explanatory variables, including the number of OfficeMax and Office Depot stores near Staples stores, took on much higher values in California than in the rest of the US. In the nationwide sample, the approximation likely fit best the lower level of the explanatory variables outside of California, so it is unsurprising that the estimated coefficients of the pricing equation were significantly different in the California sample than in the sample for the rest of the US.

Moreover, the travel times between stores likely differs across regions of the country. For this reason, additional stores in a region might constrain prices in less congested parts of the country more than in more congested parts of the country. For example, if travel times are longer in the Northeast than California, having two Office Depots within ten miles of a Staples store is likely to constrain prices more in California than in the Northeast. To the extent that differences in traffic congestion can be approximated by regions, it appears appropriate to estimate the model separately for different regions of the country. But doing so reduces the sample size, and with it the number of “entries” of other retailers into a Staples store’s market. As the model is estimated for narrower and narrower geographic areas, it thus becomes more and more difficult (and in some cases impossible) to estimate all of the coefficients of the model. While the disaggregation approach better accounts for geographic differences across the US, that benefit is accompanied with a loss of power to isolate the effects of certain changes in competition.

9. Calculation of Consumer Harm

As described above, the alternative methods of calculating aggregate consumer harm from the merger corresponded to different thought experiments. While the merging firms averaged the price change over all Staples stores, the government examined the price change in overlap markets only. Because the price effect calculated by the merging firms includes both overlap stores (which may experience a price increase) and non-overlap stores (which, by construction, will not
experience a price increase), their estimated price effect will always be lower than that calculated by the government. For example, if half of the Staples stores had an Office Depot in their MSAs and half did not \((n_1=n_2)\), then the merging firms’ estimated price effect would be half the size of the government’s estimate.

Both measures have legitimate economic interpretations. The government’s estimated price increase describes how much prices would rise at the average Staples store studied that lost competition from Office Depot. This price effect is a good measure of how much harm those consumers affected by the merger will face. The merging firms’ estimated price effect is better suited for trading off harms to competition against the potential efficiencies from merger. Customers of Staples in non-overlap markets will not lose any competition from the merger, but could potentially gain if Staples lowers its prices because of efficiencies obtained from the merger. Using the merging firms’ measure of the estimated price effect of the merger and a measure of the estimated efficiencies that would be passed on to consumers,\(^{18}\) the court could explicitly weigh the potential loss of competition to consumers in overlap areas from increased prices against the savings that consumers in non-overlaps will experience as efficiencies are passed through to consumers.

A second difference between the calculations was the time frame used to determine the potential price impact of the merger. The merging firms calculated the price change during the last period in the study, rather than over the entire study (the alternative method adopted by the government). The firms argued that their method would take into account the most current measure of the competitive situation in each market; the government argued that its approach best measured the average effect.

10. Conclusion

The FTC’s court challenge to Staples’ proposal to acquire Office Depot shows how empirical analysis can clarify the issues in an antitrust case. The FTC relied on documents from the files of the merging firms showing that they set prices and created price zones primarily on the basis of competition from other OSSs, and that Staples prices were significantly lower in cities where the two competed than in what Staples termed “noncompetitive” price zones, where Staples faced no other superstore chains. Simple comparisons of the average price in cities where Staples competed with Office Depot with the average price in cities without head-to-head competition, not controlling for other variables affecting price, suggested that the merger would raise price on average by approximately 9% in the cities where the two overlapped.

Both parties to the litigation undertook extensive econometric efforts to understand OSS pricing, and evaluate whether that inference was correct. The Staples case likely still holds the record for the most extensive commitment of resources to econometric analysis in government antitrust litigation, and by a wide margin. Expert witnesses for each side explained in court why their empirical approach led to more reliable predictions as to the likely competitive effects of the transaction.

Relative to the attention given to econometrics by the parties, the district court’s opinion in enjoining the proposed transaction is disappointing. Although the decision of the court relied primarily on documentary rather than statistical evidence, and did not refer to the econometric evidence on pricing, the empirical
analysis the two sides conducted undoubtedly shaped the way each party evaluated and described the qualitative evidence on which the court relied. Moreover, the empirical methodology employed in Staples has influenced the way economists have analyzed pricing in other antitrust cases, and in studying pricing in retailing markets more generally. As courts become more comfortable with evaluating systematic statistical studies, econometric evidence will likely become more important in evaluating other antitrust cases in the future.

Notes

1. Ashenfelter et al. 1999, describe the use of econometrics in the analysis of efficiency gains predicted by the merging parties.
2. Empirical analysis for the government was directed by its econometric expert, Professor Orley Ashenfelter of Princeton University. For the merging parties, Professor Jerry Hausman of the Massachusetts Institute of Technology played this role.
3. The FTC also defined forty-two geographic markets, typically metropolitan areas.
4. In the process of delivering goods and services to consumers, retail establishments also provide a variety of distribution services (e.g., Betancourt and Gautschi, 1986, 1993 and Betancourt, 2005). These services include locational accessibility, product assortment, timely delivery, storage and information. Retailers vary in the degree to which they provide these services. For instance, warehouse clubs sell bulk products on a small assortment of goods for lower prices than other retailers, but require the consumer to provide storage. On the other hand, all-night convenience stores provide instant access to goods at higher prices than most other retailers. In the Staples case, information was not available to test how the proximity of competition affected the services provided by a given office superstore, so the economists studying the effects of merger were limited to looking at the effect of the presence of competition on price.
5. See Hausman, 1996.
6. The best measure of price of an item would be the price consumers observe, the weekly shelf price. The measure of price actually used in the econometric studies was the average price of an item, which could differ from the shelf price for accounting reasons, such as returns.
7. The FTC recalculated the missing prices by extrapolating from the prices of the same items from nearby time periods.
8. The panel data also permitted the FTC to undertake empirical analyses of Staples pricing based on cross-sectional comparisons of prices across metropolitan areas where Staples faced different degrees of competition from Office Depot. At trial, the FTC presented estimates of the price effect of merger from the cross-section that were similar to estimates based the time series, derived from a fixed effects model. The merging firms only presented fixed effects model estimates, so we only describe the fixed effects models here. For a discussion of how FTC economists saw the advantages and disadvantages of each approach, see Baker, 1999 and Ashenfelter et al. 2004.
9. Attempts to interact the indicator variables for store and time led to problems of saturation.
10. A small regional OSS chain, Office 1 Superstore, was also included in the study. Office 1 was only located in the Midwest and went out of business in 1997, after the time period studied.
11. A merger likely to generate any price increase, even a small one, could be challenged as an antitrust violation. The merging firms did not claim that 0.9% was too small a price increase to count. Instead they argued that it was so small as to be swamped by the incentive to reduce price arising from the efficiencies they expected from the transaction. (The government’s Horizontal Merger Guidelines specify a 5% price increase in describing its approach to market definition. But this figure is merely a conceptual benchmark for assessing buyer substitution, not a tolerance level for anticompetitive price increases.)
12. We have chosen to write out the change in price using the government’s specification of the model, equation (6) below, to facilitate comparison of the differences in approach the two sides employed.
13. For example, if there are no Office Depots in Staples store i’s MSA at time t, then $D_{Depot_{i,t}}=1$ and $\log(Store_{Depot_{i,t}})$ is set to 0. If there are two Office Depots in Staples store i’s MSA in time t, then $D_{Depot_{i,t}}=0$ and $\log(Store_{Depot_{i,t}})=\log(2)$; when there is only one Office Depot, both measures are set to zero.
14. The government also included the number of Staples stores in the MSA in their pricing equation. The parties model did not. This difference affected the estimate of consumer harm in that the
parties made the Office Depot stores disappear while the government converted them to Staples stores.

15. For example, if all MSAs were no more than 20 miles in diameter and each MSA was separated by more than 20 miles, then the number of stores in any MSA would be equal to Store5 + Store10 + Store20. In this case, if the relationship between the number of stores and price was linear, then one could nest the government’s model in the merging firms’ model and test to see if the coefficients on Store5, Store10, and Store20 were equal. However, because not all MSAs are less than 20 miles in diameter or separated by 20 miles, this nesting approach cannot be employed.

16. The model the merging firms originally estimated already included store level fixed effects that allowed the level of Staples’ pricing to differ across the US.

17. The government also estimated separate models for California and the rest of the US (not shown in PX-400). Based on simulations for the nation as a whole that combined the separate models, The government’s expert, Prof. Ashenfelter, found an estimated price increase from merger of 10.1% assuming Office Depot stores were closed post-merger, and a price increase of 9.8% assuming Office Depot stores became Staples stores post-merger (Plaintiff Exhibit 404). These estimated price effects exceeded those reported in Model 7, indicating that if the use of a nationwide sample (rather than combining regional estimates) biased the government’s results, it did so in the conservative direction of underestimating the price effect of merger.

18. Efficiency claims played a large role in the Staples litigation. However, a discussion of the argument over efficiencies. In deciding the merger case for the government, the court did not credit most of the efficiencies from merger claimed by the firms, on the grounds that those claims were overstated, that the efficiencies could reasonably have been achieved at less harm to competition through means other than merger, and that cost savings were unlikely to be passed through to consumers.

References


