The Role of Diversion Ratios and Surveys in Horizontal Mergers

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Executive Summary

We provide some comments related to the questions (1h, 2a, 2b, 2c, 4a, and 6) from the RFI. We summarize some of the recent results in the economics literature pertaining to the measurement and estimation of diversion ratios and the implications for merger policy going forward.

Our most important point is that most goods and services are differentiated, and merger policy should aim to directly measure the extent to which differentiated offerings of competing firms are substitutes. Doing so might involve either survey evidence or econometric evidence, or a combination of the two. The most controversial and least scientific aspect of many merger cases involve disputes over market definition and delineation. Binary definitions of whether firms are "in the market" or "not in the market" are often high-stakes, and strictly speaking, incorrect: not all firms "in the market" produce products that are equally good substitutes; and some firms "outside the market" may produce products that compete.

As an example, an evaluation of the merger between *Whole Foods Market, Inc., and Wild Oats Markets* should never hinge on whether Wal-Mart or Costco is "in the market." Instead, it should depend on whether Whole Foods customers are likely to switch to Wild Oats (or vice versa) if prices were to increase, quality were to be reduced, or stores were to close. When this fraction of customers is large, this should be sufficient to determine that a merger will "substantially lessen competition." It may be the case that in some cities where Costco is present, less substitution is observed between Whole Foods and Wild Oats, but the extent of substitution between the merging parties should be what determines the outcome of the merger investigation. Put simply, if survey or econometric evidence suggests that for example, 30% of Wild Oats customers are likely to switch to Whole Foods, then the status of Costco, and thus market share analysis, becomes irrelevant.

In this sense, proposals that seek to codify bright lines around market shares (both safe harbors and merger bans) represent a step in the wrong direction. Insofar as merging parties understand they are

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closer competitors than market share analysis would predict, an increased focus on market share will lead to systematic under-enforcement. For these proposals to make any economic sense, the offerings of firms would have to be identical or consumers would have to substitute in proportion to existing market shares. Historically, the focus on market shares may have made more sense in highly commoditized markets (i.e., agricultural products, steel, energy) or when agencies lacked access to quantitative data on substitution. In these cases, market share may have served as a proxy for the fraction of consumers that would switch between the merging parties. We know that a merger will "substantially lessen competition" if it occurs between two close competitors, and today we have the tools to quantify "closeness of competition" without taking a stand on whether non-merging parties are "in the same market."

A related point is that economists have made significant progress in understanding how to estimate diversion ratios from different kinds of data, and in most cases, these estimates do not require pre-specifying the relevant market. This involves both "conventional observational data" in which consumer prices vary, and less conventional settings without price variation, such as social media and digital apps. One challenge is that price changes, quality changes, and changes in product assortment may identify different kinds of diversion ratios. However, recent academic research has made it possible to relate diversion measures from one context to the other and determine how far apart they are (Conlon and Mortimer, 2021). In the discussion surrounding the 2010 Horizontal Merger Guidelines (HMG's), there was some concern among economists that diversion ratios and econometric simulation of mergers would act as *substitute* methods of analysis; however, the recent academic literature has shown them to be *complementary*. That is, it is entirely possible to incorporate individual customer surveys with aggregate sales data in order to estimate diversion ratios and simulate merger effects.

Theoretical Background: Evaluating Mergers

The economic underpinning of the *structural presumption* is that all else equal, mergers among close competitors tend to raise prices or lead to otherwise worse outcomes for consumers.[1]

One of the best tools economists have to measure the closeness of competition between horizontal firms is the *diversion ratio*. The diversion ratio asks: if we raise the price of good j, what fraction of the consumers who substitute away from j switch to k? The idea is that when the diversion ratio is large we think that two products are "close substitutes" and when the diversion ratio is small enough we think the two products may not be in same market.

The idea of using diversion ratios to inform the evaluation of horizontal mergers is a not a new idea and dates back as far as the 1992 Horizontal Merger Guidelines.[2] However, the 2010 Horizontal Merger Guidelines saw a significant expansion in the role of diversion ratios. One of the innovations in the 2010 revision was a focus on Upward Pricing Pressure (UPP). The economic motivation for this measure is to consider a firm that chooses price to maximize profits in a setting where products are differentiated. In this framework the firm equates *marginal revenue* to *marginal cost*:

$$p_j \left[1 + \frac{1}{e_{jj}}\right] = mc_j + \sum_k D_{jk} \cdot (p_k - mc_k). \tag{1}$$

[1] See Shapiro and Hovenkamp (2018) and *Philadelphia National Bank* (1963).
[2] See Willig et al. (1991); Werden (1996) for an early discussion.

The right-hand side augments the firm's production cost mc_j with the *opportunity cost* that arises when firms own multiple products. This is meant to illustrate that when the owner of product j also owns products with high diversion ratios D_{jk} (close substitutes) it behaves as if it has a higher cost and sets higher prices. It also highlights the role of both the elasticity e_{jj} which gives us some insight into the level at which the firm sets the markup, and the right-hand side which tells us the "effective cost" to which the markup is applied and depends on the diversion ratios to other products owned by the firm. Upward Pricing Pressure (UPP) asks how a merger between the producer of product j and the producer of product k changes the right-hand size of (1). To see this, we include product k in j's pricing decision and compare it to any potential marginal cost reduction Δmc_j that might result from the merger. The first cost-saving term Δmc_j puts downward pressure on price, and the second term $D_{jk'}(p_{k'} - mc_{k'})$ puts upward pressure on price with higher diversion ratios $D_{jk'}$ leading to greater upward pricing pressure:

$$UPP_j = \Delta mc_j + D_{jk'} \cdot (p_{k'} - mc_{k'}). \tag{2}$$

Much of the discussion (and controversy) around the 2010 HMG's was what to do with (2). Some of the main proponents of the UPP approach (Farrell and Shapiro, 2010) presented it as possibly replacing early screens based on market share analysis. For example, if we expected Δmc_j to be less than 5%, then one could identify a *critical loss* or *critical diversion ratio* above which the merger is likely to raise price.

One of the concerns at the time was that UPP analysis in (2) would displace more sophisticated exercises in structural merger simulation. Indeed, one set of complaints pointed out that the easiest way to estimate both elasticities e_{jj} and diversion ratios D_{jk} was to estimate a flexible demand system like the workhorse Berry et al. (1995) model from the academic literature. Given full estimates of the demand system, one could solve the full system of equations defined in (1) as in Nevo (2000) rather than simply consider UPP.[3] This critique remains valid, although estimation of diversion ratios remains perhaps the most important deliverable of a demand system.

Another concern with the approach in (1) is that it is a *unilateral effects* measure, and captures only how the merger affects the static incentives of the merging parties (in the case of UPP) or all firms (in the case of structural merger simulation), without necessarily capturing the potential for coordinated effects among non-merging firms.

What have we learned since the 2010 HMGs?

1. As we illustrate in Conlon and Mortimer (2021), diversion ratios can be interpreted and estimated in many more contexts than: "the probability that a consumer who leaves j switches to k in response to an increase in the price of j." One can define diversion ratios in terms how consumers respond to changes in quality, increases in the quantity of advertising on a digital app, or as "second choices" in response to changes in assortment.

   This enables researchers to quantify "closeness" of competition in markets without prices, or without price variation. Because this will always give us a number between 0 and 100%, it is always interpretable, and the interpretation doesn't depend on the intervention. If 20% of consumers switch from j to k when j is unavailable, or when the quality of j declines, then this implies the products are close

[3] See Hausman (2010); Pakes (2011) for example.

substitutes and mergers are likely to "substantially lessen competition" independent of the margin on which firms compete. A significant concern only arises when diversion ratios measured via different interventions give conflicting results (e.g., if second-choice data suggests products are close substitutes, but small price changes suggest they are not). What we lose in the non-price context is the ability to link diversion ratios directly to price effects and UPP.

2. One of the main concerns regarding the UPP measure in (2), is that it measures the effect the merger has on marginal costs, but not necessarily prices. The subsequent economics shows how additional information using additional information on the pass-through matrix maps the change in the opportunity cost into predicted price changes (see Jaffe and Weyl (2013)).

3. The alternative approach of full merger simulation, where one solves the *system of equations* in (1) for all products, to generate predicted price effects of horizontal mergers, has also become much easier since 2010. This was due to efforts by FTC BEA and DOJ EAG staff in the development of the `antitrust` `R` package for simple models of demand (linear, log-linear, plain logit).[4] Further efforts by academic researchers expanded the ability to do full merger simulation on a broader and more flexible class of models in `PyBLP` (see Conlon and Gortmaker (2020)). This means that, given estimates of demand (including shares, elasticities, and diversion ratios), simulating the price effects of mergers is a relatively fast and straightforward exercise that can be performed in minutes.

4. Much of the economic debate around the 2010 update to the HMG has been made moot. Work by former DOJ EAG staff in Miller et al. (2016, 2017), demonstrated that by augmenting the UPP calculation in (2) with simple assumptions on the pass-through relationship (with a single parameter) one can provide approximations that generally coincide with the full merger simulation approach. Meanwhile the development of tools like `antitrust` and `PyBLP` means that simulating price effects of mergers is relatively straightforward as long as one can estimate elasticities and diversion ratios (and sometimes cost pass-through).

5. Academic research has extended the framework in (1) to allow for coordinated effects from mergers as well. For example, Miller and Weinberg (2017) consider a generalization which allows f to partially internalize its impact on the profits on the non-merging firm g:

$$p_j \left[1 + \frac{1}{e_{jj}} \right] = mc_j + \sum_{k \in \mathcal{J}_f} D_{jk} \cdot (p_k - mc_k) + \kappa_{fg} \cdot \sum_{k' \in \mathcal{J}_g} D_{jk} \cdot (p_{k'} - mc_{k'})$$

   where κ_{fg} represents the extent to which firm f internalizes firm g's profits. Further work has tried to provide a foundation for analyzing cases in which κ_{fg} is nonzero (Miller et al., 2021) from coordinated effects or cases in which firms have overlapping financial ownership (Backus et al., 2021).

6. Exercises in Critical Loss and market definition can be shown to depend on the "aggregate diversion ratio" or substitution from one firm to all other firms "in the relevant market." This means that collecting data on diversion ratios and substitution patterns can address some of the flaws with critical loss analysis and market definition, particularly in cases where already high markups are taken as

[4] See Taragin and Sandfort (2021).

evidence that firms have "more to lose" from raising prices (O'Brien and Wickelgren, 2003; Katz and Shapiro, 2003).

Estimating Diversion Ratios in Practice

One limitation of the 2010 HMG's was that it wasn't entirely clear where estimates of diversion ratios were meant to come from. In part, the hope was that diversion ratios (or something similar to diversion ratios) would be obtained in the "normal course of business" such as in internal company documents turned over during discovery or as part of an investigation (Farrell and Shapiro, 2010). In practice this has meant one of the following ways:

1. A longstanding assumption among antitrust practitioners is to assume "diversion proportional to share" in the absence of better data or information (Willig et al., 1991). This is in many ways not helpful, as it negates the primary purpose of diversion ratios —to measure which products are closer substitutes than others. The larger problem is that it reduces the task of measuring closeness of competition between products to old disputes about market definition.

2. Collect observational data on prices, quantities, and marginal costs (if possible) and estimate a model of consumer demand (as in Berry et al. (1995) or a similar framework). In this case, if the full demand system is estimated, any merger can be simulated, and elasticities and diversion ratios can be computed as necessary.

3. Use existing third-party survey data on customer second-choices. For example, MaritzCX has surveyed new automobile buyers for over fifty years and has asked them questions along the lines of: "if you had to purchase a different model, what would you choose?". These data were used by Grieco et al. (2021) in combination with a Berry et al. (2004) framework in order to estimate the evolution of markups in the automobile industry over the past forty years.

4. Use available data on "customer churn" or "win-loss" data on customer switching. In many cases, these data may be available only for merging parties. For example, Qiu et al. (2021) analyze such data in the case of customer switching in the proposed *Anthem/Cigna* merger (Dranove, 2016). Their model is complicated by the possibility that consumers are inattentive or otherwise face switching costs when changing insurers.

   The FCC had access to data on number porting to estimate the fraction of consumers switching between Sprint and T-Mobile, etc. One challenge in this case is that we don't necessarily know why consumers might have switched (i.e. changing address, price increases, competitor promotions, quality changes, etc.).

5. Use specially designed surveys to elicit second choices of consumers, or consumer responses to hypothetical price increases. These were controversially used by the merging parties in the FTC case *Whole Foods Market, Inc., and Wild Oats Markets*.[5] The CMA in the UK routinely employs surveys to elicit second-choices from consumers. For example, the CMA asked: "where would you have made your purchases today if this store were closed for six months" in their challenge to the Sainsbury's/ASDA

[5]See Guniganti (2019) for a discussion.

merger. Other surveys ask how consumers might respond to a 5% or 10% price increase. Indeed, the design and deployment of these kind of surveys is commonplace in retail mergers and has been for some time (see Reynolds and Walters (2008)).

6. Design purpose-built field experiments or re-purpose "A/B tests" used by firms. Many firms, particularly online retailers, aggressively run "A/B tests" that randomize the set of products displayed to consumers. These kind of data are rarely analyzed in merger proceedings but may prove extremely valuable in estimating diversion ratios, particularly when combined with other data.

An important caveat is that the diversion ratios one measures may vary depending on the intervention (i.e. a 5% price increase, a 10% quality reduction, or removing the product from the assortment entirely). We provide a formal demonstration of this point in Conlon and Mortimer (2021) for an intervention that changes $z_j \to z_j'$:

$$D_{jk}(z_j, z_j') = \sum_i D_{jk,i} \cdot w_i(z_j, z_j')$$

Under relatively general conditions the diversion ratios of individuals $D_{jk,i}$ are constant and don't depend on whether we change prices, quality, or assortment. What does change are the relative weights $w_i(z_j, z_j)$ that we place on different individuals (i.e., small price changes place additional weight on the most price-sensitive individuals, etc.). This is an important insight both for interpreting diversion data from different (observational) sources and in designing surveys.

In many cases, except when demand is very elastic, it will be preferable to design surveys, experiments, or other interventions to measure *second choice data* versions of diversion ratios, rather than responses to small price changes. The second choice diversion ratio measures can be easily adjusted and re-weighted. The challenge of asking consumers how they might respond to a 5% price change is that even if demand is relatively elastic, the majority will likely not change behaviors; thus, stated preferences in response to small hypothetical price changes may not be reliable.

Since the 2010 HMG's were released, economists have made substantial progress in incorporating aggregate data on price and quantity with individual demographic data and survey data on second-choices. In this sense, survey data and econometric models serve as complementary inputs into merger analysis.[6]

Recommendations

1. The UK CMA is a leader in designing and deploying purpose-built customer surveys across a variety of markets in order to measure the second choices of consumers. With some additional investment of personnel and resources, the DOJ EAG and FTC BEA could also develop the capacity to design and commission surveys to measure substitution patterns.

2. In many cases, survey evidence, customer switching data, or internal A/B tests alone may not be sufficient, but these data can be combined with econometric analyses and quantitative merger simulation. If such evidence becomes routinely used in merger investigations in the United States (as it is abroad), agencies should be cautious in analyzing internal switching data on its own. The econometric toolkit

[6]See Conlon et al. (2022); Grieco et al. (2021); MacKay and Miller (2021) for examples.

for analyzing various measures of diversion and customer switching data and combining these with aggregate measures of output, prices and costs is well developed and easily accessible in 2022.

3. Quantitative data on substitution is more useful than qualitative data turned over in discovery (i.e. internal emails or presentations: "How are we responding to Apple?"). Such qualitative definitions introduce issues of selection and are likely to define markets more widely than quantitative evidence (i.e., is every potential competitor mentioned by email included in the market definition?).

4. In cases where one can precisely quantify diversion ratios between merging parties, market definition is neither necessary nor helpful. Defining markets and calculating market shares is helpful only as a proxy for measuring substitution. If better or more direct measures of substitution exist, agencies should rely on those.

5. The existing practice of merger enforcement already appears to consider variety, convenience, product quality, and innovation in addition to the price effects of mergers. Even in markets without prices or without price variation, we can still construct measures of diversion ratios to measure the "closeness of competition" between products. Mergers among "close competitors" should be presumed to be illegal regardless of whether the relevant strategic variable is price or something else.

6. We are not advocating for bright lines in diversion ratios, and the usual caveats apply: large efficiency gains, or the potential for firms to fail, may affect the merger analysis. However the guidelines should be clear that any countervailing merger benefits should be *merger-specific*.

7. The worst course of action for the DOJ and FTC would be to increase the emphasis on market share and market definition. This would include bright lines for mergers based on market shares. In 2022, we have much better ways to measure competition and substitution among competing firms than arguing about which firms are "in the market" or "out of the market." If we can demonstrate that 20% of customers would switch between the merging parties, then the question of which non-merging parties are "in the market" is of limited value for determining the potential harms of a proposed merger.

   The difficulties faced by the FTC in the *Whole Foods* case highlight the challenges of over-reliance on market share and market definition. The best response that agencies have to merging parties who say they compete with Wal-Mart or Amazon is to provide clear quantitative evidence that a significant fraction of customers are likely to substitute between the merging parties.

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