



Economics at the FTC: Multi-level Marketing and a Coal Joint Venture

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Abstract

Economists in the Federal Trade Commission's Bureau of Economics support the Commission's dual missions of protecting consumers and maintaining competition by performing economic analyses. This article provides two examples of such work product: The first is a description of an analytical framework that FTC consumer protection economists use to assess multi-level marketing organizations. The second is a description of economic analysis that was undertaken to assess the effect of a joint venture between two coal companies that ultimately was challenged by the Commission.

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1 Introduction

The Bureau of Economics (BE) mainly supports the Federal Trade Commission's (FTC's) consumer protection and antitrust activities by providing economic analysis for investigations. This article discusses some of the modes of analysis that BE uses to assess the consumer impact of multi-level marketing (MLM) business opportunities, and also those used to determine how competition in coal markets would be affected by a proposed joint venture of coal companies.

While economic analysis in support of the FTC's enforcement activities comprises most of the work done by BE staff—which currently consists of 81 Ph.D. economists, 11 research analysts and statisticians, six administrative professionals, and five financial analysts—BE makes a variety of additional contributions to the missions of the FTC. For instance, BE economists also provide the Commission and other government entities feedback on the potential effects of legislation and regulation on competition and consumer well-being. BE engages the academic economics community in a variety of ways, including an annual microeconomics conference.

BE—together with co-sponsor, the Tobin Center for Economic Policy at Yale—hosted the first fully online FTC Microeconomics Conference on November 5 and 6, 2020.¹ The topics that were covered in keynote addresses and paper presentations included: bias in machine learning; competition in pricing algorithms; consumer impact of retailer scale and concentration; the effect of health care prices on wages; price discrimination and big data; merger effects on variety, and the effect of consumer ratings on competition. The next FTC Microeconomics Conference—again co-sponsored by the Tobin Center—will be held online on November 4–5, 2021.²

BE economists regularly perform economic analysis in connection with virtually all consumer protection matters that are considered by the Commission while working alongside the legal staff on investigations. They also frequently serve as expert witnesses. Additionally, BE economists conduct original economic research on important consumer protection questions in order to improve the understanding of consumer protection problems. In their casework, economists help to evaluate a diverse set of potentially unfair or deceptive practices that harm consumers, including: identity theft; imposter scams; fake reviews in connection with online shopping; deceptive advertising; and unfair data-security practices. The Commission filed actions in 82 consumer protection matters and obtained orders in 97 cases in 2020.³ Section 2 of this article describes some aspects of how BE economists assess the economic incentives that are put into place by MLM organizations, and the potential for harm to participants.

¹ Copies of the papers that were presented along with a video of the conference are available at <https://www.ftc.gov/news-events/events-calendar/thirteenth-annual-federal-trade-commission-microeconomics-conference>.

² Details are available at: <https://www.ftc.gov/news-events/events-calendar/fourteenth-annual-federal-trade-commission-microeconomics-conference>.

³ See FTC Annual Highlights 2020, Stats & Data at <https://www.ftc.gov/reports/annual-highlights-2020/stats-data-2020>.

BE's antitrust economists fulfill similar duties when working with their attorney colleagues on investigations of horizontal and vertical mergers and other potentially harmful transactions, in addition to investigations of single-firm conduct that may violate the antitrust laws. The FTC in 2020 entered into consent orders for 12 mergers and filed suits that challenged nine transactions, while the FTC staff investigated 11 proposed transactions that subsequently were abandoned by the merging parties.⁴ Section 3 of this article describes the economic questions that confronted BE economists in the course of the FTC's investigation of a proposed joint venture of two coal companies in Wyoming, as well as the work that was done in support of the FTC's testifying expert in the court challenge that sought a temporary restraining order and preliminary injunction.

2 Multilevel Marketing and Consumer Protection

2.1 Background

A multi-level marketing (MLM) firm is a business that raises special consumer protection concerns due to the role of participant recruitment. MLMs supply products (or provide services) and grant independent distributors the opportunity to earn income by selling the products directly to consumers and by recruiting other distributors. The MLM concept was developed in the United States in the mid-twentieth century as an offshoot of traditional door-to-door selling and has since spread around the world.⁵ Its broad reach is due to relatively low entry barriers and startup costs, as well as the self-propagating nature of participation through recruitment. Well known U.S.-based MLMs include Amway, Herbalife, Avon, Mary Kay, Neora, and Vemma.

Accurate data on the scale of MLM activity is challenging to obtain. Globally, the leading international MLM trade group estimates 125.4 million distributors and \$179.3 billion in retail sales for 2020, with 16.7 million distributors and \$40.1 billion in retail sales in the United States.^{6,7} The sales figures are difficult to interpret though, since they largely reflect wholesale purchases by distributors (valued at suggested retail price) rather than verifiable retail sales for end-use consumption. MLMs generally do not track retail sales by their distributors in the field, and MLM

⁴ Ibid.

⁵ Biggart (1989), Fitzpatrick (2020), Keep and Vander Nat (2014).

⁶ World Federation of Direct Selling Associations (2021). While the aggregate U.S. figures cited above suggest that per-distributor retail sales averaged approximately \$2400 in 2020, we warn against assigning too much significance to that average for the reasons mentioned in the above paragraph. Moreover, MLM records examined by BE show significant variation in purchasing across distributors—in part because of differing product prices and purchasing requirements—suggesting that national averages do not reflect “typical” distributor experiences.

⁷ According to the Direct Selling Association, the leading U.S. trade group for MLMs, approximately three-quarters of MLM distributors in the U.S. are women. (Direct Selling Association, 2018, 2021).

participation often creates incentives for distributors to purchase product independent of consumption demand, as will be discussed below.

This section highlights some aspects of BE's approach to analyzing MLMs and their potential for consumer harm. While far from comprehensive, this overview provides an introduction to some of the key concepts and methods employed.

2.2 Introduction to MLM

A distributor's pursuit of an MLM business opportunity typically begins with signing a distributor agreement and paying a signup fee. Doing so gives the distributor the right to sell products, recruit other distributors (who sign the same agreement and pay the same signup fee), and earn commissions ("rewards") on the activity of those recruits, and the recruits of those recruits, etc.—potentially down many levels of what is called the distributor's "downline". Because distributors are independent contractors with no salaries or benefits, their revenues depend entirely on their own retail sales, their recruiting of a downline, and the activity (purchasing, selling, and recruiting) of their downline. Expenses that are borne by the distributor include: the wholesale cost of products; attending MLM trainings and events; marketing and recruiting expenses (e.g., hosting parties); shipping; taxes; and the opportunity cost of one's time.

The retail side of the MLM business involves the opportunity to sell the MLM's products to the public.⁸ MLMs market exclusively through their distributors, which means distributors do not face competition in the same branded products from retail outlets. MLMs often do not limit recruitment, however, which means distributors may face competition from other distributors in their local area or online. MLMs also set rules around permissible retailing, which can govern the venues, online channels, marketing practices, sale prices, efficacy claims, return policies, and other terms that are connected with selling to customers.⁹ Among other objectives, these rules aim to limit retailing to the distributor's social network.

The recruiting side of the MLM business opportunity is more complicated, but the basic structure relies on two ideas: "downline volume" and "qualification." To a first approximation, an MLM pays commissions to a distributor in proportion to her downline volume: the total product volume that is purchased or sold by her direct recruits and the recruits of her recruits, etc. In general, bigger downlines who generate more volume will produce higher commissions for the distributor; but there can be non-linearities in the way that this volume translates to commissions.

⁸ Historically, distributors have purchased product from the MLM at a wholesale price—the suggested retail price less a discount—which (in principle) provides them with a potential retail markup. This wholesale model remains the norm, although there are now some exceptions.

⁹ Many MLMs offer distributors some kind of return, or "buyback," policy for product. These policies often have had various restrictions on when and how product may be returned, and they often require a distributor to quit the business. A particular buyback policy's effectiveness in mitigating potential consumer harm has to be analyzed in the context of the totality of the MLM's practices and its participants' behavior.

The second concept—qualification—refers to a distributor meeting performance thresholds that secure for her the right to earn *at* certain percentages *on* certain downline volume. In the simplest instance, qualifying might require that, to be eligible for any rewards, the distributor herself must purchase or sell a certain minimum volume each month. However, qualification requirements can get considerably more complicated as a distributor advances in the opportunity. For instance, qualifying for ranks with higher earning potential can entail satisfying multiple independent thresholds on the volume, recruiting and rank advancement of other distributors in the recipient’s downline.

2.3 MLMs and Chain Letters

The FTC has a history—dating back to the 1970s—of enforcement actions against MLMs that engage in deceptive or unfair practices, under the broad authority of Sect. 5 of the FTC Act.¹⁰ In the case of these MLMs, one allegation has been that their structure and messaging have deceived participants with respect to the nature of the opportunity and the potential for income. Often, a central concern of the FTC staff’s economic analysis is the potential that an MLM is incentivizing behavior that is similar to that of a “chain letter”: a scheme that puts forth a false promise that all participants can earn recruitment-based wealth.

In a chain-letter scheme, a participant pays some amount to obtain the right to recruit other participants. When recruits are found, they make the same payments to join, and a portion of their payments go to the original participant as a recruiting “commission”. The right to earn commissions may extend through multiple levels, with the original participant receiving commissions when her recruits, and her recruits’ recruits, etc., bring in successive new cohorts. A chain letter thus operates as a transfer scheme, with money from new recruits flowing upward to (earlier) successful recruiters. In other words, all new participants initially lose money as their payments are transferred to earlier entrants into the scheme. Furthermore, because participants expend time and resources in recruitment efforts, and because the scheme’s creators may also siphon a fraction of the payments, the structure is a negative-sum transfer scheme.

A participant’s success in such a scheme typically requires recruiting multiple other individuals, who each, in turn, face the identical situation as their recruiter. Consequently, the scheme relies on unending geometric growth in order for each generation of participants to profit. If current participants are all able to successfully recruit multiple other individuals, the un-recruited population will quickly dwindle. Recruiting must eventually stop, and the majority of participants, who lack recruits, will not earn their initial payments back. When condemning chain-letter schemes, law enforcement agencies have often relied on this kind of framing, with its emphasis on rapid expansion, saturation, and collapse. This scenario illustrates the inevitability of widespread failure in a chain-letter scheme.

¹⁰ See, for example, FTC in the matters of: Bestline (1971), Ger Ro Mar (1974a), Holiday Magic (1974b) and Koscot Interplanetary (1975).

However, such a scenario assumes that, up to the point of collapse, participants generally succeed at recruiting multiple participants each. In practice, recruiting others is likely to be hard, and many participants at every stage may routinely fail to meet the plan's recruiting objectives. In that case, a scheme may avoid collapse indefinitely, with most participants never recruiting enough other participants to break even, but enough recruitment happening for the organization to continue on. In other words, collapse need not happen in a chain letter scheme. The ongoing difficulty of meeting recruiting goals can mean both the failure of most participants *and* the organization's ability to persist over a long time horizon.

To hide the structural inevitability of widespread failure and negative average outcomes, those who run or participate in such schemes typically engage in deceptive messaging when attempting to recruit. Such messaging often has common themes: that anyone can succeed at recruiting; that anyone can receive significant income; and that now is the time to "get in early" while the organization is growing. Because some successful recruiters do receive significant income, they can be presented as examples of what is possible, even if it is mathematically impossible for more than a tiny fraction of participants to achieve their level of success.

The MLM structure poses a risk of chain-letter-style harm: The risk comes from offering—in return for one's own purchases from the company—the right to earn commissions on the purchases of recruits who face the same inducement. The transfer scheme, if present, is less direct than a chain letter's because of products changing hands, but it can also be more economically wasteful as a result.

2.4 Analyzing MLMs

MLMs can vary in the features of their compensation, products, and marketing. There is no single template for BE's analytical approach in MLM investigations. Below, we describe three types of analyses that have been frequently used in past cases as appropriate.

2.4.1 Compensation Plan, Promotional Materials, and Distributor Training

The starting point for analysis is to understand the financial incentives and messaging that distributors face. Of particular importance is the MLM's "compensation plan": a document that lays out the rules for earning income in the organization.

To figure out whether a plan may be encouraging the type of chain-letter behavior of concern, there are a number of important questions: First, with respect to retailing, does a real retailing opportunity exist? Given the wholesale price, retail demand conditions, and potential competition from other distributors, could retailing be profitable, and—if so—at what scale? Another area of interest is the rules around the payment of recruitment-related commissions ("rewards," for short):

- Are rewards paid only when distributors sell product to retail customers, or are they also paid when distributors make wholesale purchases?

- Do wholesale purchases count towards qualifying the purchaser for earning rewards on her own recruits?
- Are rewards paid only in connection with direct recruits, or is it possible to earn on recruits of recruits many levels below in the downline?
- Are rewards substantial—both in absolute terms and relative to potential retailing income?
- Finally, do elements of the plan create convexity of rewards in downline volume? E.g., do commission percentages increase when certain downline volume thresholds are met? Do rewards increase discontinuously at certain recruitment thresholds?

In all, the questions about the compensation plan aim to uncover the extent to which a plan incentivizes the pursuit of transfer payments from recruits. Where answers to these questions suggest that wholesale purchases amount to de facto participation payments and that rewards amount to bounties on those payments, it raises concerns that the MLM depends on a continual chain of recruitment to fulfill its promise of positive returns. In such cases, the chain letter model becomes an increasingly likely explanation of the dynamic driving distributors' investment of time and money.

Many of these questions relate to the idea of “duplication”: where a distributor is encouraged to succeed by meeting volume requirements and recruiting multiple distributors who will then approach the opportunity with the same goal: recruiting recruiters. Such an approach, if successful, can potentially create a large downline for the original distributor, and—depending on the rewards structure—substantial earnings. At the same time, the concept of duplication implies unending recruitment—regardless of the actual demand for the MLM's product.

FTC economists also consider representations that the MLM and recruiters make about the opportunity. Questions asked include:

- What income or lifestyle claims are used to attract prospective distributors, and how truthful are they?
- What recruiting tactics are used, and who is targeted?
- What do distributors tell new recruits to do after joining, and what is the relative emphasis on recruiting a downline versus retailing to customers?
- Are new recruits told that duplication is the way to earn a high income?
- Are distributors told that consuming the product at a high level is part of pursuing the business?

Income representations and promotional messages help BE infer distributors' reasons for joining and their income aspirations. (MLMs sometimes dispute that distributors are seeking income, claiming instead that they are mainly interested in product discounts.) Distributor training can reflect how the MLM works (or is meant to work) in practice, by highlighting what the organization really wants new recruits to focus on. Training may be developed and conducted by high-level distributors rather than the firm, and may be propagated through the downline. The hierarchical, networked structure of MLMs may elevate recruiters or high-level distributors into a downline distributor's (or prospective distributor's) most important contact point;

she exemplifies success and sets expectations around income and the level of investment that is required.

2.4.2 Simulated Participation Scenario

Analyzing an MLM may require synthesizing the many explicit and implicit incentives and messages that are contained in compensation plans, income representations, and training materials. One technique that is used by the FTC is to simulate a participation scenario. A simulated participation scenario lays out a best-case hypothetical that models the activity of a distributor and her downline in pursuing the MLM's income opportunity. The time period that is modeled by the scenario can vary, but the objective is to follow a representative distributor's advancement through the MLM's hierarchy, and to map the recruiting, purchasing, and retailing activity that one would expect, given plan guidelines.

An approach to building the scenario that the BE staff has used in the past is to assume that all distributors follow the path of participation that the MLM presents as optimal and that they face no practical constraints along the way: e.g., weak product demand, a shortage of recruits, time constraints, etc. These assumptions are often unrealistically optimistic, but imposing them makes it easier to determine the extent to which an MLM, under the best possible circumstances, could deliver on its promises of potential income. It also allows an understanding of the relative strength of incentives in the compensation structure and clarifies where a distributor should focus her time and money if she wants to maximize her net income.

One benefit of the scenario analysis is that it produces a transparent accounting of the links between particular features in the compensation plan and their downstream effects on behavior and welfare. It can identify which plan features (if any) risk creating a harmful chain-letter dynamic: such as certain kinds of minimum purchase requirements, minimum recruiting requirements, or "deep" rewards on downline activity that discourage retailing and incentivize duplication.

Another benefit to the scenario analysis is that this type of analysis provides a characterization of the business opportunity that is comprehensive and internally consistent. It does so by assuming that all distributors seek the kind of income that is advertised, and by factoring in the outcomes for all distributors—not just the most successful—in its assessment of the plan's overall impact on welfare. This approach is in contrast to some MLM marketing materials that highlight the potential earnings of a single hypothetical recruiter, while assuming tacitly that their recruits are content to earn significantly less or even to lose money.

Finally, where the analysis shows that an MLM is operating like a chain letter, the scenario can illustrate the magnitude of ongoing consumer losses and the urgency for enforcement action. MLMs that have been prosecuted by the FTC sometimes contend that distributors are not injured so long as the MLM has not collapsed. However, a scenario may demonstrate in a salient way that for a given MLM—even under best-case circumstances—while individuals may move up the hierarchy and into positions of high net earnings, the vast majority of distributors at any point in time will reside at the organization's bottom levels and in a position of financial loss. Consequently, total losses accumulate over time, as the profits of the small fraction

of successful distributors are more than offset by the losses sustained by newer recruits.

Because the simulated scenario assumes all distributors achieve the same benchmarks of success, it can be a poor predictor of actual distributor outcomes. When analyzing an MLM's distributor database, it may turn out, contrary to the scenario's predictions, that a substantial majority of distributors fail to meet required levels of recruiting and volume, and fail to earn recruitment-related rewards.

2.4.3 Distributor Data

In the course of an investigation, the FTC may subpoena from the MLM its data on distributors and their purchasing, recruiting, and commission earnings. These panel datasets allow us to look for patterns in distributors' behaviors and outcomes, which can complement the analysis of the compensation plan and other materials.

One area of interest is the degree and profitability of retail activity. If distributors do not earn significant income from retailing products, then that strongly suggests that the business opportunity rests on *de facto* recruitment rewards rather than productive retail sales. The empirical challenge is that many MLMs do not keep records of retail sales by their distributors. Distributor wholesale purchases, in general, do not necessarily reflect consumption demand, because the former could reflect motivations unrelated to customer demand: e.g. spending to qualify for commissions. Thus, it may be that both quantity and price of retail sales are not observable from the data.

Nevertheless, wholesale purchasing data can provide an upper bound on distributors' retailing revenue. It can be useful to start with that upper bound and then to consider progressively more pessimistic scenarios. To impute retail earnings that paint the most positive picture for the retail opportunity, a simple approach is to assume that distributors sell all of their wholesale purchases at 100% suggested retail price (SRP) and then subtract their wholesale product costs, so as to calculate their gross retail profit. This type of analysis can show in practice that virtually no distributor could have made anywhere close to the advertised level of earnings through retailing alone.

To reiterate: The imputation methodology above relies on assumptions about the ability to retail that are most favorable to the company. If product sells below SRP, or if portions of wholesale inventory go unsold, then gross retailing earnings will be lower than in these projections. When the evidence suggests doing so, imputed earnings can be estimated based on less than 100% SRP, or less than 100% of product sold. Deducting non-product costs and unobserved expenses (such as storage or transportation) will cause net retailing earnings to be even lower.

Another focus is recruitment-related commissions, which, unlike retailing earnings, often are fully observed in the data. The distribution of commissions shows who receives recruitment-based earnings and how much; in particular, it sheds further light on the probability of success in the business opportunity and the extent to which recruitment rewards are concentrated among a small number of unusually successful recruiters or more broadly distributed. A highly unequal distribution is

consistent with commission flows within a chain letter scheme and within MLMs that have been found to be deceptive in the past.

Moreover, these retailing and recruitment earnings can be combined to estimate total distributor income. Statistics based on these estimates can be compared to the MLM's representations to evaluate the accuracy of such claims. The same data can also give a sense of the importance of recruitment earnings in the overall opportunity. How are the most successful distributors making their money, and what does that imply about the way that other aspiring distributors will approach the two parts of the business: recruiting and retailing?

Beyond earnings, another empirical question is how long distributors participate in the MLM before quitting the business opportunity. Survival analysis techniques can be used to estimate the probability that a distributor persists in the business for specific lengths of time, and to diagnose the factors that predict longer tenure (such as early recruiting success). Survival data provides further evidence on whether distributors find the MLM opportunity worth pursuing.

Another area of particular interest is the size and timing of wholesale purchases, and what that timing may indicate with regard to the motivations for purchasing. If purchasing is driven primarily by the idiosyncrasies of retail demand that face each distributor, then it seems reasonable to expect little to no correlation in the amounts or timing of wholesale purchasing across distributors. On the other hand, if purchasing is driven by the desire to qualify for commissions, then one might expect that purchases would be made in the amounts and at the times needed to meet those qualification requirements.

For example, in many compensation plans, the volume that is needed to qualify is the sum of a distributor's own purchases and those of her downline. A distributor who wishes to reach a qualifying volume threshold while minimizing her own out-of-pocket spending may choose to time her wholesale purchases towards the end of the period over which qualifying occurs, so as to maximally rely on already-booked downline purchases. Moreover, these own purchases would be in amounts that enable her just to surpass the qualifying threshold; this purchasing strategy would result in mass points in the density of volume amounts at or just above qualifying thresholds.

2.5 Discussion

MLMs can put distributors at risk because their compensation structures share features of a chain letter. Chain letters promise the impossible by purporting to offer all participants the ability to generate profit from the payments of other participants. MLMs risk making the same impossible promise when they structure compensation to incentivize a pay-to-qualify dynamic.

While each MLM investigation is different, BE's economic analysis focuses at a high level on the strength of resemblance to a chain letter—and in particular on the relative balance of retailing and recruiting incentives. This balance determines the extent to which distributors seek their income through accumulating

recruitment-based commissions from their downline, and ultimately whether the compensation structure relies on the false promise of an unending chain of recruitment.

3 Market Definition and Competitive Effects in the Peabody Energy/ Arch Resources Joint Venture

3.1 Introduction

In February 2020, the FTC issued an administrative complaint challenging a proposed joint venture (JV) between Peabody Energy Corporation and Arch Resources. The transaction would have combined the firms' coal mining operations in the Southern Powder River Basin (SPRB), which is located in northeastern Wyoming.¹¹

The FTC complaint alleged that the JV would eliminate competition between Peabody and Arch: two major firms that mine thermal coal, which is a type of coal that is burned to generate electricity.¹² The complaint alleged that, if completed, the proposed JV would substantially lessen competition for the production and sale of SPRB coal, which would likely result in significant harm to SPRB coal customers. Higher SPRB coal prices would be passed through to electricity customers throughout a sizeable portion of the U.S.

The FTC filed an administrative complaint to block the JV and authorized the legal staff to seek a temporary restraining order and preliminary injunction in the U.S. District Court for the Eastern District of Missouri to maintain the status quo pending an administrative trial. Prior to and during the trial, BE economists supported the FTC's economic expert witness in developing the economic theories of harm that were ultimately presented to the court, and assisted in identifying defenses of these theories from attacks by the defendants' multiple expert witnesses.

In September 2020, the U.S. District Court for the Eastern District of Missouri granted the FTC's request for a preliminary injunction. Shortly thereafter, the parties abandoned the proposed JV and pursued independent and somewhat divergent business strategies.¹³

Economic modeling to determine the relevant antitrust market—based on customers' ability and willingness to substitute away from one product to another—and quantitative approaches to balancing potential effects and efficiencies played substantial roles in the investigation and the subsequent litigation, and formed the principal basis for the court's decision.¹⁴ Below, we discuss how FTC economists and

¹¹ For details on the FTC action, see <https://www.ftc.gov/news-events/press-releases/2020/02/ftc-files-suit-block-joint-venture-between-coal-mining-companies> last visited 5/6/2021.

¹² For the full complaint, see https://www.ftc.gov/system/files/documents/cases/d09391_peabody_energy-arch_coal_administrative_complaint_0.pdf, last visited 5/6/2021.

¹³ For a description of the parties' reaction to the judge's decision see, <https://www.bizjournals.com/stlouis/news/2020/09/29/coal-pact-is-abandoned.html> (visited on 6/7/2021).

¹⁴ For a legal summary of the decision see, <https://www.natlawreview.com/article/peabody-and-arch-coal-walk-away-joint-venture-after-district-court-grants-ftc-s>. For the complete decision see, <https://>

the expert economic witness for the FTC and the parties and their expert economic witnesses approached these issues, as well as how they disagreed over the appropriateness of different analytical methods and the interpretation of the results.

First, we describe the evidence and methods that were used by the FTC and its expert to define the relevant product market with the use of various measures of the own-price elasticity of coal.¹⁵ FTC economists and the government's expert witness spent considerable effort estimating the own-price elasticity with the use of multiple data sources and methods.

Second, we describe the parties' experts' aggregate diversion analysis and event studies, as well as their more detailed criticisms of the FTC's evidence on product market.¹⁶ Many of these criticisms involved the complexity of downstream competition in electricity. We then describe some of the additional analysis that were done by the FTC and its expert in response to these criticisms.

All parties agreed that the demand for coal for electricity generation was declining. It was unclear, however, why the declining demand and the factors that caused the decline should not be incorporated in the estimates of the own-price elasticity of coal. Ultimately, the product market question hinged on whether competition between coal-fired generation and other methods of generating electricity was sufficiently intense so that even a monopolist (or a dominant firm) in SPRB coal would have little ability to profitably raise the price of SPRB coal.

Third, we describe the application of the Cournot model of oligopolistic competition to this proposed transaction and, more specifically, the use of the model to balance potential anticompetitive effects and efficiencies. The parties claimed that they would be able to achieve significant efficiencies from joining the adjacent Peabody and Arch SPRB mines, but the FTC disputed the magnitude of these efficiencies. In order to determine the ultimate effects of the transaction, we had to simulate the potential anticompetitive effects of the transaction and balance those against the credible efficiencies.

3.2 The Use of Elasticities to Define the Relevant Market

The *Horizontal Merger Guidelines (Guidelines)* (US DOJ and FTC, 2010) point out that a key part of a merger investigation is defining the relevant market(s). The *Guidelines* discuss the need to determine the product or the line of commerce and the geographic market that may be affected by a given transaction. Once the relevant product and geographic markets have been defined, one can then identify the

Footnote 14 (continued)

[law.justia.com/cases/federal/district-courts/missouri/moedce/4:2020cv00317/178907/449/](https://www.law.justia.com/cases/federal/district-courts/missouri/moedce/4:2020cv00317/178907/449/) (visited on 6/7/2021).

¹⁵ For the FTC findings of fact submitted to the court see, https://appliedantitrust.com/14_merger_litigation/cases_doj/peabody_arch_coal2020/1_section13b/peabody_edmo_pff_ftc021_01_28redacted.pdf (visited on 6/11/2021).

¹⁶ For the parties' findings of fact submitted to the court see, https://appliedantitrust.com/14_merger_litigation/cases_doj/peabody_arch_coal2020/1_section13b/peabody_edmo_pff_def021_01_28redacted.pdf (visited on 6/11/2021).

market participants, measure their market shares, and compute market concentration. Though these measures do not by themselves completely determine a transaction's likely effects, antitrust case law (as discussed in the judge's decision) gives them significant weight.

The judge's decision also discusses how a product market is defined by the "reasonable interchangeability" of use (that is, the cross elasticity of demand) between the candidate product itself and its substitutes. This was a crucial issue in this case. The parties' experts pointed out that electricity producers had been switching from coal to natural gas, solar and wind, and that this trend would continue. The parties were essentially arguing that there existed a high cross elasticity between coal-fired generation and other methods of generating electricity. If true, this might imply that an attempt by a coal monopolist anticompetitively to increase the price of coal would be rendered unprofitable as electricity producers switched from coal to other raw energy sources.

The FTC and its expert emphasized that current purchasers of SPRB coal were not particularly sensitive to the price of coal and that they would be reluctant to switch from coal to other methods of electricity generation given the need for capital investments for a small price increase. We were in effect arguing that the demand for SPRB coal for electricity generation was relatively inelastic for small price changes and that previous switching was not due to small changes in relative prices.

This disagreement in emphasis raised the issue of the relationship between own and cross-price elasticities and their relevance for market definition and competitive effects. A cross-price elasticity is the percentage change in quantity of a good in response to a percentage change in the price of a substitute good. Upon initial examination, cross-price elasticities sound like an appropriate measure for product market definition. After all, cross-price elasticities measure substitution among products based on changes in price.

However, there are number of issues with using a cross-price elasticity in market definition. First, since cross-elasticities are measured in percentages, the product with the highest positive cross elasticity may not be the one with the largest absolute quantity change. In other words, a product with small absolute sales may see the greatest level of percentage diversion. Second, for any pair of products there are two cross-price elasticities of demand and these cross-price elasticities can be, and often are, very different from one another. Equation (1) defines both cross-price elasticities of demand between products i and j , clearly illustrating that $\epsilon_{i,j}$ is not necessarily equal to $\epsilon_{j,i}$.

$$\epsilon_{i,j} = \frac{\partial q_i}{\partial p_j} \frac{p_j}{q_i} = \frac{\% \Delta q_i}{\% \Delta p_j} \neq \frac{\% \Delta q_j}{\% \Delta p_i} = \frac{\partial q_j}{\partial p_i} \frac{p_i}{q_j} = \epsilon_{j,i} \quad (1)$$

Most important, an own-price elasticity measures the willingness of consumers to switch from the current good given a price increase of that good, which is a direct measure of market power. The cross-price elasticities measure the goods to which consumers switch when they switch. As Werden (1998) notes, "Although there is a direct relationship between the own-elasticity of demand for a product and the potential to exercise market power over that product, the same cannot be said for

the cross elasticity of demand between that product and any other product. Except through their effect on the own-elasticity, cross-elasticities have nothing to do with market power.”¹⁷

The *Guidelines* advise that both product and geographic markets be defined using the “Hypothetical Monopolist Test” (HMT). The HMT is a measure of the own-elasticity of the product(s) in question. The HMT asks whether a hypothetical monopolist of a set of products (in specific areas) could profitably increase prices by a small but significant and non-transitory amount (SSNIP). Typically, this increase is defined as a 5–10% increase in price. In practice, the parties and antitrust agencies are looking for real world data to evaluate the sensitivity of the amount of purchases of the candidate product or products to variations in the price(s). Depending on the availability of data or qualitative information, standard econometric tools for analyzing observational data are combined with other sources of information from market participants to assess market definition.

The FTC complaint in this case specified the relevant market as the sale of SPRB coal from the SPRB. The SPRB is a large coal-bearing geological formation that is located in northeastern Wyoming. The firms mine the coal and sell to power plants, which burn the coal to generate electricity. SPRB coal is attractive to electric power producers because its delivered price is relatively inexpensive (which, in turn is largely due to the low costs of extraction, as well the efficiencies of unit-train rail transportation), and because the coal’s low sulfur content allows power plants to burn it without violating environmental regulations. These attributes of SPRB coal distinguish it from coal that is mined elsewhere in the United States.

There are seven firms that mine coal in the SPRB. Together, Arch and Peabody mine over two thirds of the coal in the SPRB.¹⁸ The other five firms, split the other one-third of the coal sales from the SPRB. Two of those firms, Western Fuels Association and Black Hills Corporation, are vertically integrated companies that utilize their SPRB production to supply their own captive power plants. The other three producers are Navajo Transitional Energy Company, Eagle Specialty Materials, LLC, and Peter Kiewit Sons’ Inc. A combined Arch and Peabody would have been five times as large as the next largest competitor.

The FTC’s market would not be valid if customers could defeat the hypothetical 5–10% price increase by buying alternative types of coal, or by switching to other fuels, to generate electricity. To support its market definition, the FTC relied on a combination of qualitative and quantitative evidence. The qualitative evidence included testimony from customers about their purchases and the parties’ documents and analysis. Quantitatively, market definition was addressed with a variety of analyses, including econometric analyses of the own-price elasticity used in a critical elasticity test to answer the HMT.

¹⁷ The own elasticity of demand for a product is a weighted sum of the cross elasticities of demand for other products with respect to the first product’s price. Werden (1998, p. 398).

¹⁸ See FTC findings of fact at page 25, https://appliedantitrust.com/14_merger_litigation/cases_doj/peabody_arch_coal2020/1_section13b/peabody_edmo_pff_ftc021_01_28redacted.pdf (visited on 6/11/2021).

To implement the HMT, our expert estimated the own-price elasticity of demand for SPRB coal using total shipments of SPRB coal and the average industry-wide mine-mouth price. Also included in the estimation were other factors that may affect demand for SPRB coal, such as the price of natural gas and the variation in temperature. The expert then compared the estimated elasticities to the critical elasticity that was computed as the average variable cost margin from Arch's and Peabody's accounting data classifying specific costs as fixed or variable and concluded that a monopolist of SPRB coal could profitably raise the price.¹⁹ Our expert used the parties' accounting data as the average industry variable cost margin to be conservative, since the other firms in the industry were less profitable..

The FTC argued that the estimated own-price elasticities accounted for the competitive pressures from potential substitutes like natural gas, and renewables such as wind and solar. The previous economic literature estimated the own-elasticity of demand for coal and suggested relatively inelastic demand.²⁰ The parties' experts argued that these estimated elasticities did not sufficiently incorporate dynamic long-run substitution.

The FTC also used information from the parties' own documents to gauge the own-elasticity of demand for SPRB coal. Peabody paid a consulting firm in 2019 to analyze how many additional tons of coal—both North and South Powder River Basin coal—would have been sold in 2018 if rail rates were reduced by 10, 20, or 30 percent. We used the estimates in this study to compute a range of demand elasticities that also implied that the SPRB was a relevant market.

The parties' main objection to the use of this study was that it considered only a price decrease and that a price increase may not have a symmetric effect. The reason given for this potential asymmetry was electricity capacity issues in the electricity dispatch process. In some parts of the country, there are wholesale electricity markets that are run by Regional Transmission Organizations (RTOs)/Independent System Operators (ISOs) that dispatch electricity from those generating plants that are willing to provide it at the lowest cost. The RTO/ISOs conduct day-before and spot auctions to dispatch sufficient electricity to meet demand.

The parties argued that these auctions force coal prices to be competitive.²¹ If the price of coal makes electricity from coal plants too expensive, the coal plants are not dispatched, they will not purchase coal, and they may exit. The parties' expert argued that price increases could lead to permanent decreases in demand for coal from plants exiting, but price decreases would not lead to a permanent increase in coal demand. However, Peabody's consulting report suggested that the demand

¹⁹ For a discussion of this method of market definition, see Werden (1998).

²⁰ Similar results for the price elasticity of demand for coal appeared in the economics literature; see EIA (2012).

²¹ In some parts of the U.S., regulated monopoly utilities supply electricity. In those areas the decision of the plants or fuels to use is determined by the firm and/or the regulator. Even in parts of the country with RTO/ISOs, utilities can inform RTOs/ISOs that the coal plants "must run" at minimum levels. Some electricity generating companies will also "self-commit" megawatts from their coal plants in excess of minimum required levels.

increase would be permanent given a sustained decrease in the delivered price of coal.

The Judge in her opinion found the FTC's evidence from the company's documents compelling, especially given that this approach may have overstated the demand elasticity since it included North Powder River Basin coal. North Powder River Basin coal might have a higher own-price elasticity than SPRB coal because its attributes are more similar to other types of coal.

3.3 The Parties' Response on the Own Price Elasticity and Downstream Competition

The parties maintained that utilities could and would switch to other fuels to generate electricity in the face of an increase in the price of SPRB coal; this switching would occur with sufficient magnitude that it would defeat a price increase.

To support this position, the parties relied on a mix of qualitative and quantitative evidence. On the qualitative side, the parties emphasized documents and testimony that pointed out that the demand for coal was declining in the face of cheap natural gas and the increased use of wind and solar to generate electricity. On the quantitative side, the parties' experts did multiple analyses. One analysis used an aggregate diversion calculation to show that a price increase for SPRB coal would be unprofitable. Their second set of analyses looked at event studies to infer that coal prices were not being determined by coal competition but by other factors.

One of the parties' experts presented an aggregate diversion analysis and concluded that SPRB coal was not a product market.²² In implementing this test, the parties' expert used a 5-percent price increase and his estimate of SPRB coal margins to calculate the "critical loss." He then calculated the aggregate diversion ratio: the share of sales that would be retained by [all] SPRB coal firms when the price of SPRB coal increases. He calculated this diversion by assuming proportional diversion between all methods of generating electricity. Since SPRB coal is approximately one-fifth of electricity generation, a 5 percent price increase of SPRB coal would not be profitable.

The main problem with this approach is the assumption that aggregate diversion is proportional to shares of electricity generation: This assumption essentially guarantees a finding that SPRB could not constitute a relevant product market. The aggregate diversion methodology has been applied in prior cases where actual data about diversion—switching in response to actual price increases—exists; when such data are available, it is possible meaningfully to estimate (rather than assume) the aggregate diversion ratio.²³

²² For a discussion of using aggregate diversion as a proxy for elasticity, see: Katz and Shapiro (2003), Moresi and Zenger (2018), Conlon and Mortimer (2018).

²³ In this case there was evidence contrary to proportional diversion among fuels and methods of generating electricity. When a competitor in SPRB coal declared bankruptcy and stopped selling coal, customers testified that they switched to other SPRB coal producers and paid a higher price rather than using other fuels or ways to generate electricity. There was additional evidence with respect to mine outages

The parties' other economic expert admitted that the data that were necessary to estimate diversion ratios reliably do not exist in this case. Assuming that aggregate diversions in electricity generation are determined purely by shares assumes that each of the fuels can sustain a proportionate diversion from SPRB coal. There is not sufficient surplus generating capacity for a proportionate increase in electricity generation using solar, wind, or nuclear power.

A second series of analyses that the parties presented relied on several natural experiments: or event studies, to support their claim that the SPRB coal competed very closely with natural gas in electricity generation and that the HMT that was performed by the FTC's expert did not comport with real world facts. The first of these studies compared SPRB coal prices and margins before and after the sharp drop in natural gas prices that occurred around 2014; it used the pre- and post-periods of 2010–2011 and 2018–2019 to measure the effect of “a precipitous drop in natural gas prices” on SPRB coal prices and margins. One of the parties' experts showed that natural gas prices, coal prices, and coal margins were all falling as SPRB production became more concentrated. She concluded that the changing price of natural gas explained these real world facts.

The FTC countered that there were no specific events during these periods; that the pre- and post-time periods were chosen arbitrarily; and that there were a number of other potential causes of the decline in coal margins. New environmental regulations were put in place during this period; moreover, strip ratios at the mines—the amount of waste relative to the amount of coal—increased during the post period. Both of these changes would lead to higher mining costs and lower margins. In addition, using a different control period, the FTC's expert showed that the coal margins declined while natural gas prices were very similar.

The judge concluded “rather than conduct a regression analysis to determine how natural gas prices affect SPRB coal margins, Defendants rely on a flawed ‘event’ study that fails to prove that Dr. Hill’s HMT analysis diverges from real-world facts.”

The second event study that was presented by the parties analyzed the competitive impact of a supply disruption on SPRB coal prices. In particular, the parties analyzed the competitive impact of a temporary production outage during May–June 2018, which was caused by heavy rains that disrupted operations at several of the mines that were not operated by Arch. Arch's operations were relatively unaffected by the weather. One of the parties' experts compared SPRB coal spot prices during May–June 2018 to SPRB coal spot prices in April 2018 and argued that if Arch's direct competitors were the SPRB coal producers we should expect to observe an increase in prices during the outage. She found that spot prices did not increase during the outage.

There were two main issues with this study: First, if a different time period—May–June 2017—was used as the control period, there was an increase in the price of coal during the 2018 outage. The parties argued that their control was the correct

Footnote 23 (continued)

that suggested less-than-proportional diversion among fuels and methods of generating electricity as well.

one. However, showing that a plausible alternative control period leads to different results suggested that the Dr. Bailey's findings and conclusions were not robust.

The second issue was that Arch's sales of coal increased when their competitors were suffering an outage and a number of customers testified that they were not able to substitute other fuels or methods of producing electricity.

In addition to putting forward their own analyses, the parties criticized the FTC's expert's approach(es) to estimating the demand elasticity for SPRB coal because those approach(es) did not sufficiently incorporate the complications of downstream competition in the electricity market. In particular, the parties argued that Dr. Hill did not sufficiently account for dynamic changes in the fuels and/or technologies that were used to generate electricity. In anticipation of these criticisms, FTC economists worked with our expert to identify additional analyses that could rebut such arguments.

Electricity power producers and RTO/ISOs use simulation models to make decisions in the ordinary course of business. One of these models and associated data set is called PROMOD. PROMOD has also been relied upon by economists, courts, and federal agencies for a variety of purposes. PROMOD includes all sources of electricity generation—not just SPRB coal units—and includes detailed data on electricity-generation costs, operating constraints, transmission constraints, and predictions about future prices of various inputs, and expected plant additions and retirements. Power producers use PROMOD for coal burn forecasting.

We contracted with an energy consulting firm to use PROMOD to simulate the effect of a 5-percent mine-mouth price increase for SPRB coal on how often SPRB coal units would run in RTO/ISO auctions, with the use of the consulting firm's own default price forecasts for SPRB coal, natural gas, and other inputs; additional scenarios included Peabody's March 2020 forecasts for SPRB coal and natural gas prices, along with the consulting firm's forecasts for other input prices. Based on the price elasticity of demand that was derived from the resulting PROMOD data, our expert concluded that SPRB coal satisfied the HMT and was a properly defined relevant antitrust market.²⁴

A second response to the parties' criticism that the demand elasticities did not incorporate dynamic considerations was a coal plant retirement study. The FTC's expert used data on the retirement of electricity plants that used SPRB coal to analyze the factors that drove the closures and then to estimate the price elasticity of demand for SPRB coal. Using this approach, he concluded that SPRB prices had only a modest effect on plant closures and SPRB demand. Based on the price elasticity of demand that was derived from the plant retirement data, SPRB coal again satisfied the HMT and was a relevant product market.

One of the parties' experts asserted that since this elasticity estimate was based on a price increase in one year that caused a plant closure in the following year the plant closure elasticities should be multiplied by at least 10 to account for the

²⁴ The FTC's expert also analyzed publicly available electricity dispatch data. He used these data to show that a five-percent price increase in SPRB coal would result in a small decrease in the dispatch of electricity plants that used SPRB coal.

long-run effect of plant closures. However, as was pointed out by the FTC expert, plants that close due to a small price increase are plants that were already operating at the margin of closure, likely due to their small size or age. A plant that survived a year of higher input prices would be relatively unlikely to close in subsequent years since its survival suggests that it was not a marginal plant.

The FTC provided further evidence in support of the SPRB market by considering the effect of an increase in the Black Lung Excise tax (BLET). In January 2020, Congress increased the BLET on coal. While this increase was somewhat less than the normal five-percent SSNIP—it was three percent—the coal companies directly passed the price increase through to customers as a surcharge. The FTC presented a number of customers as witnesses who testified that they did not reduce their coal purchases in response to this price increase. Weighting the totality of the FTC’s and the parties’ arguments, the judge concluded that SPRB coal was a relevant product market. Ultimately, the parties’ arguments were not enough to persuade the court to ignore the standard analytic and economic tools that were used by the FTC.

3.4 Unilateral Effects Using the Cournot Model Incorporating Efficiencies and Discounts

As we referenced in a previous FTC paper in this *Review* concerning merger analysis, (Greenfield et al., 2019), the Cournot model is a standard model to simulate merger effects in homogenous product industries where quantity is a strategic variable.²⁵ With the use of demand and cost curves calibrated by prices, market shares, and margins we can generate predictions of optimal post-merger pricing. Since mergers often produce both cost savings and incentives for higher pricing, merger simulation can be used to calculate the implied marginal cost reduction that is needed to offset the merging firms’ incentives to increase price (Froeb & Werden, 1998). The model can also directly incorporate claimed marginal cost efficiencies to see if those efficiencies are enough to offset the merged firm’s incentive to reduce output and increase price.

In this case, the parties were planning to join two adjacent mines, Peabody’s North Antelope Rochelle and Arch’s Black Thunder. These mines had been operating separately; but under the JV, they would be operated as one mine by Peabody. The parties estimated cost savings of the unified operation of the mines of approximately \$120 million per year. In February 2020, Peabody and Arch offered customers a reduction in the base price of already contracted coal volumes of 15 cents per ton, an approximately 1.2 percent discount, from the time the JV was approved until December 31, 2022. The parties suggested this was a down payment on future efficiencies.

The FTC’s expert used a Cournot model to predict the effects of the transaction with the use of the variable cost efficiencies that were claimed by the parties: a 5.5 percent marginal cost reduction. He also incorporated the 15-cents-per-ton

²⁵ For more information on using the Cournot model in merger simulations, see Werden and Froeb (2008), Farrell and Shapiro (1990).

discount that the parties had offered customers. In addition, he allowed consumers to switch to an outside good based on the elasticity of demand for coal that was estimated as part of the product market definition analyses. The baseline version of the model assumed that coal demand remained constant. Despite the efficiencies, this simulation showed consumer harm of \$1.7 billion over the next decade.

The parties' expert objected to this static model of demand. The parties again argued that the model missed the important dynamic risk of coal-plant closure, and that if the FTC's expert had incorporated this concern, there would be no anticompetitive effects of the JV. Having anticipated this critique, the FTC's expert considered a version of the model that used declining demand for coal over the 10-year period based on the parties own projections of SPRB coal demand. Under this version of the model, the amount of harm from the JV was smaller but was still \$1 billion over the 10-year period. The parties' documents made clear that their predictions of coal demand over this period incorporated the dynamic competition with other fuels such as natural gas.

The FTC's expert included in his simulations various demand forecasts based on multiple Peabody projections of SPRB coal demand going forward. The judge accepted the results of the effects analysis and suggested that it sufficiently incorporated the parties' own data, which included their projections of declining demand for coal due to dynamic competition.

3.5 Discussion

The market definition exercise and the modeling of harm in Peabody Energy/Arch Coal JV reflect a common dynamic in FTC merger cases: The government submits to the court an affirmative case against the proposed transaction (as is described in its complaint); and in support of that complaint, the FTC also submits one or more expert reports that present an economic analysis of the potential harm that would result from the transaction. The defendants raise issues with the complaint and expert report(s); the parties suggest, for example, that the markets are much more complex than the simple calculations or estimates suggest.

In this case, the parties focused on the declining demand for coal and the complexity of the market for electricity generation. However, the economic analysis that was presented by the FTC's expert incorporated these issues—at least to some extent—and the parties' experts were left suggesting that these issues were more significant and would ultimately undermine the FTC's product market and estimated effects.

In the Peabody/Arch case, neither critique was sufficient to dissuade the judge from granting the preliminary injunction. This may indicate that the parties were never able to demonstrate to the court's satisfaction that incorporating these issues would lead to significantly more elastic demand for SPRB coal or to merger simulations that would suggest that the merger was procompetitive on net.

4 Conclusion

This article has highlighted just two of the significant efforts of BE economists to contribute to the work of the FTC in 2020 to protect consumers and maintain competition by providing objective economic analysis. The business practices of MLM firms represent a topic that has not previously been covered extensively in the economics literature, but it is a topic that clearly lends itself to the fundamental tools of microeconomics: exploring how contracts create incentives that promote particular behaviors. Viewing these firms through that lens can help us to understand better the objectives of the organization, and the likely impact on those who participate in these ventures. The coal investigation demonstrated how BE economists must be prepared not only to provide an initial analysis of the economic effects of a proposed transaction, but also to anticipate and address the counter-arguments that are made by the parties' economists—such as the impact of the dynamic nature of the coal market.

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