



## A Practical Guide to the Implementation of the As-Efficient-Competitor (AEC) Test

*Hitesh Ram Makhija<sup>1</sup>, Julian Manasse-Boetani<sup>2</sup>,  
Maria Garibotti<sup>3</sup> Dennie B. Zastrow<sup>4</sup>*

### Introduction

A leading firm (which in some instances may be classified as a dominant firm) may employ a price-based exclusionary strategy by offering prices that cannot be profitably matched by smaller rivals. These price-based exclusionary strategies can potentially foreclose rivals, which in turn may harm competition and consumers. For example, a leading firm may offer its product at a price that is below the costs incurred by the leading firm and its rivals to manufacture the product. Customers will therefore only purchase products from the smaller rival if the smaller rival prices the product below its cost. Since the smaller rival is selling the product at a loss, it may decide to leave the market. The foreclosure of the smaller rival could harm competition and consumers if the leading firm eventually raises its price after the smaller rival leaves the market.

The As-Efficient-Competitor (AEC) test, which was first proposed by Areeda and Turner (1975),<sup>5</sup> is typically used to evaluate whether the discounts

offered by leading firms (e.g., loyalty discounts, bundle discounts, etc.) foreclose smaller rivals. Antitrust analysis of price-based exclusionary strategies must look to balance two competing factors. First, the leading firm must be encouraged to lower prices in response to competitive pressures from smaller competitors. Second, the leading firm should be deterred from lowering prices to a level where its competitors are foreclosed. The AEC test aims to balance these two competing factors by evaluating whether the prices offered by the leading firm, net of all discounts, can be profitably matched by a competitor that is as efficient as the leading firm.<sup>6</sup> An equally (or more) efficient competitor can impose stronger competitive constraints on a leading firm than a less efficient competitor. For example, an equally (or more) efficient competitor can constrain the leading firm's ability to increase prices more effectively than a less efficient competitor. Consequently, a price-based strategy that forecloses an equally (or more) efficient competitor is more likely to harm competition and consumers than a strategy that forecloses a less efficient competitor.

<sup>1</sup> Hitesh Ram Makhija is a Vice President at Analysis Group. The views expressed are those of the authors and do not necessarily reflect those of Analysis Group.

<sup>2</sup> B.A. 2016, The University of Chicago; J.D. 2023, The University of Chicago Law School.

<sup>3</sup> Maria Garibotti is a Vice President at Analysis Group. The views expressed are those of the authors and do not necessarily reflect those of Analysis Group.

<sup>4</sup> Dennie B. Zastrow is an Associate at Morgan, Lewis & Bockius LLP. The views expressed are those of the authors and do not necessarily reflect those of Morgan, Lewis & Bockius LLP.

<sup>5</sup> Areeda, Phillip, and Donald F. Turner. "Predatory Pricing and Related Practices Under Section 2 of The Sherman Act." *Harvard Law Review* 88, no. 4 (1975).

<sup>6</sup> The AEC test is also referred to as the "discount-attribution test."

In the U.S., AEC tests have been used by several Circuit Courts of Appeals to evaluate whether bundled rebates constitute anticompetitive tying<sup>7</sup> and, with less frequency, whether contracts containing loyalty rebates constitute anticompetitive exclusive dealing contracts.<sup>8</sup> Given the legal landscape, a leading firm can use the AEC test in the normal course of business to manage and monitor antitrust risk. For example, a leading firm can use the AEC test to evaluate the antitrust risk associated with the prices and discounts offered to customers. If the leading firm fails the AEC test, then the pricing strategy used by the firm increases the antitrust risk of the firm being investigated for exclusionary pricing practices. In this scenario, the leading firm may consider modifying its prices and discount structures in a way that mitigates antitrust risk of being investigated or found liable for exclusionary pricing but meets the firm's business objectives. Note that failing the AEC test does not automatically imply that the leading firm is engaging in exclusionary pricing. The AEC test is just one of the several factors that a court may consider while evaluating allegations of predatory pricing.<sup>9</sup>

A smaller firm that is not able to capture market share from a larger rival may also use the AEC test to evaluate whether the larger rival is engaging in predatory pricing. If, under reasonable assumptions, the smaller firm concludes that the larger rival is failing the AEC test, then the smaller firm may consider bringing the larger rival's conduct to the attention of the relevant competition

authorities or pursuing private action against the larger rival.

Several academic papers have noted that the AEC test is difficult to implement.<sup>10</sup> In Section 2 of this paper, we provide a practical guide to the implementation of the AEC test and discuss how this test can be used by a leading firm in the normal course of business to manage and monitor antitrust risk.

## Framework for the Implementation of the AEC Test

### A. Concept of Contestable Demand

As discussed in Section 1, the AEC test evaluates whether a competitor that is as efficient as the leading firm can profitably match the prices and discounts offered by the leading firm for contestable units. To perform the AEC test, we therefore need to make assumptions about the volume of sales that are contestable.

Competitors of the leading firm may compete with only a subset of the products offered by the leading firm. In this paper, these products are referred to as "contestable products." For instance, consider a leading firm that manufactures two types of widgets. Let *widget<sup>A</sup>* and *widget<sup>B</sup>* denote the two types of widgets. Assume that the leading firm is the only producer of *widget<sup>B</sup>*. Further, assume that both the leading firm and a smaller competitor manufacture *widget<sup>A</sup>*. In this hypothetical example, *widget<sup>A</sup>* is a contestable product and *widget<sup>B</sup>* is a non-contestable product. While *widget<sup>A</sup>* is contestable, it may be the case

<sup>7</sup> See, e.g., *Cascade Health Sol'ns v. PeaceHealth*, 515 F.3d 883, 903 (9th Cir. 2008) (applying AEC test); *Collins Inkjet Corp. v. Eastman Kodak Co.*, 781 F.3d 264, 273–74 (6th Cir. 2015) (same); see also *Ortho Diagnostic Sys., Inc. v. Abbott Lab'ys, Inc.*, 920 F. Supp. 455, 469 (S.D.N.Y. 1996) (similar to AEC test, but also requiring proof that plaintiff is as or more efficient in producing the contested product).

<sup>8</sup> See, e.g., *Eisai, Inc. v. Sanofi Aventis U.S., LLC*, 821 F.3d 394, 406 (3d Cir. 2016) (suggesting proper frame of analysis for single-product loyalty rebates is whether an "equally efficient competitor" would be able to compete). But see *In re EpiPen (Epinephrine Injection, USP) Mktg., Sales Pracs. & Antitrust Litig.*, 44 F.4th 959, 1003 (10th Cir. July 29, 2022) (suggesting but not deciding that loyalty rebates should be evaluated under a simple price-cost test, rather than under the AEC test or under more permissive standards), *petition for cert. filed sub nom. Sanofi-Aventis U.S., LLC v. Mylan, Inc.* (U.S. Jan. 9, 2023) (No. 22-628).

<sup>9</sup> Courts and agencies recognize that there can be pro-competitive reasons for a firm to price at a level that fails the AEC test, including promotional pricing meant to enter a new market, or an expansion in production to accelerate learning-by-doing and achieve cost reductions. See, e.g., Kaplow, Louis. "Recoupment and Predatory Pricing Analysis." *Journal of Legal Analysis* 10 (2018): 46-112; and Elzinga, Kenneth G., and David E. Mills. "Predatory pricing and strategic theory." *Geo. LJ* 89 (2000): 2475.

<sup>10</sup> Salop (2017) argues that an incremental price-cost test in the context of loyalty discounts is "complicated to implement and likely leads to measurement errors." See Salop, Steven C. "The Raising Rivals' Cost Foreclosure Paradigm, Conditional Pricing Practices, and The Flawed Incremental Price-Cost Test." *Antitrust Law Journal* 81, no. 2 (2017): 371-422, at 406.

that the smaller competitor is only able to compete over a subset of the volume of sales of the contestable products. For instance, a smaller competitor of the leading firm may have lower capacity than the leading firm and may not be able to supply all of the units demanded by a customer. The leading firm and the smaller competitor only compete on the subset of consumer demand that can be satisfied by the smaller competitor. In this paper, we use the term “contestable units” to denote the volume of sales of the contestable products over which the leading firm and the smaller rival compete. For instance, assume that a customer is looking to purchase 10,000 units of *widget*<sup>A</sup>. The leading firm can supply all 10,000 units to the customer. A smaller rival can only supply 5,000 units to the customer. Consequently, even though *widget*<sup>A</sup> is a contestable product, only 50% of the *widget*<sup>A</sup> purchased by the customer are contestable. In this example, the contestable volume is 5,000 units.

### **B. The AEC Test is Effectively a Price-Cost-Test**

A competitor that is as efficient as the leading firm faces the same costs as the leading firm. The AEC test therefore boils down to a price-cost-test (PCT). If the price offered by the leading firm for contestable units, net of all discounts (“net price per contestable unit”) is lower than the cost, then an equally efficient rival cannot profitably match the prices and discounts offered by the leading firm. In this case, the leading firm fails the AEC test, and the prices and discounts offered by the leading firm increase the antitrust risk of the firm. If the net price per contestable unit is greater than the cost, then an equally efficient rival can profitably match the prices set by the leading firm. In this case, the leading firm passes the AEC test. In Section 2.C., we describe the methodology that can be used to calculate the net price per contestable unit. In Section 2.D., we discuss cost

metrics that are typically used to perform the AEC test.

### **C. Calculation of Net Price Per Contestable Unit**

The net price per contestable unit can be calculated using equation (1) below. The net price per contestable unit denotes the net price that a rival needs to offer in order to match the prices and discounts offered by the leading firm.

$$\begin{aligned} \text{Net Price Per Contestable Unit} \\ &= \text{List Price Per Unit} \\ &\quad - \text{Discount Per Contestable Unit (1)} \end{aligned}$$

In equation (1), the *List Price Per Unit* denotes the list price charged by the leading firm for the contestable units.<sup>11</sup> The list price per unit term in equation (1) represents the product price without the conditional discount, while the discount per contestable unit term in equation (1) represents the total amount of the conditional discount, divided by the contestable units. The *Discount Per Contestable Unit* is calculated by dividing the discounts lost by the consumer if it did not purchase the contestable units from the leading firm (“total discount on contestable units”) by the number of contestable units.

$$\begin{aligned} \text{Discount Per Contestable Unit} \\ &= \frac{\text{Total Discount on Contestable Units}}{\text{Number of Contestable Units}} \quad (2) \end{aligned}$$

Table 1 below walks through a hypothetical example that illustrates the calculation of net price per contestable unit. Consider a customer that is looking to purchase 10,000 widgets. Assume that the leading firm is able to supply all 10,000 widgets to this customer. The leading firm offers the widgets to the customer at a list price of \$100 per widget. The leading firm offers the customer a lump-sum discount of \$100,000, which is

<sup>11</sup> When customers receive discounts off of a posted “list price” that are *not* conditional on exclusivity or a bundled purchase, these non-conditional discounts should be treated as reductions to the list price and should not be included in the calculation of discount per contestable unit. The list price per unit term in equation (1) represents the product price without the conditional discount, while the discount per contestable unit term in equation (1) represents the total amount of the conditional discount, divided by the contestable units. See *Universal Surveillance Corp. v. Checkpoint Sys., Inc.*, No. 5:11-CV-1755, 2015 WL 6561241, at \*13 (N.D. Ohio Oct. 19, 2015) (confronting, but not deciding, this issue).

conditioned on the customer purchasing widgets only from the leading firm.

Assume that a smaller rival is only able to supply 5,000 widgets to this customer. The smaller rival is not able to supply all 10,000 widgets to the customer because its manufacturing capacity is lower than the leading firm's. Even though the customer is looking to purchase 10,000 widgets, the leading firm and the smaller rival are only competing over 5,000 widgets. That is, only 5,000 widgets are contestable. If the customer purchased the 5,000 contestable units from the smaller rival, then the customer would lose the \$100,000 lump-sum discount offered by the leading firm. In this example:

- i. The *List Price Per Unit* is \$100, *Number of Contestable Units* is 5,000 and the *Total Discount on Contestable Unit* is \$100,000.
- ii. From equation (2), we can see that the *Discount Per Contestable Unit* is equal to 
$$\frac{\text{Total Discount on Contestable Units}}{\text{Number of Contestable Units}} = \frac{\$100,000}{5,000} = \$20.$$
- iii. From equation (1), we can see that the *Net Price Per Contestable Unit* = *List Price Per Unit* – *Discount Per Contestable Unit* = \$100 – \$20 = **\$80**.

Table 1

List Price Offered by Leading Firm	Lump-Sum Discount Offered by Leading Firm	Contestable Units	Discount Per Contestable Unit	Net Price Per Contestable Unit
[a]	[b]	[c]	[d]=[b]/[c]	[e]=[a]-[d]
\$100	\$100,000	5,000	\$20	\$80

As noted above, the net price per contestable unit denotes the net price that a rival needs to offer in order to match the prices and discounts offered by the leading firm. To see this, consider the following two scenarios.

**Scenario #1:** Consider the scenario where the customer purchases all 10,000 units from the leading firm. The customer's total expenditure will be (\$100 List Price\*10,000 units) – (\$100,000 lump sum rebate) = **\$900,000**.

**Scenario #2:** Consider the scenario where the customer purchases 5,000 units from the leading firm and 5,000 units from the smaller rival. In this scenario, the customer's expenditure at the leading firm will be (\$100 List Price \* 5,000 Units) = **\$500,000**. Note that since the customer purchases units from the smaller rival, the customer loses out on the \$100,000 lump-sum rebate offered by the leading firm. In order to match the prices and discounts offered by the leading firm, the smaller rival will have to offer a price that ensures that the total expenditure of the customer is the same as Scenario #1 where the customer purchased all 10,000 units from the leading firm. As discussed above:

- a. The customer's total expenditure in Scenario #1 was \$900,000.
- b. In Scenario #2, the customer's expenditure at the leading firm is \$500,000.

To match the prices and discounts offered by the leading firm, the smaller rival will have to offer to sell the 5,000 contestable units for a total revenue of \$900,000 - \$500,000 = \$400,000. This works out to a net price of \$400,000/5,000 = \$80 per unit.

As we can see from Table 1, the number of contestable units has a significant impact on the discount per contestable unit, which in turn impacts the net price per contestable unit. If the leading firm overstates the number of contestable units in the AEC test, then it will understate the antitrust risk associated with the prices and discounts offered to customers. To see this, note that in the example in Table 1, if the contestable units were 1,000 instead of 5,000, then the discount per contestable unit would have been \$100 and the net price per contestable unit would be \$0. See Table 2. The leading firm would pass the AEC test if the contestable units were 5,000 but fail the AEC test if the contestable units were 1,000. The hypothetical examples in Tables 1 and 2 illustrate how the estimate of contestable units impacts the results of the AEC test.



Table 2

List Price Offered by Leading Firm	Lump-Sum Discount Offered by Leading Firm	Contestable Units	Discount Per Contestable Unit	Net Price Per Contestable Unit	Cost
[a]	[b]	[c]	[d]=[b]/[c]	[e]=[a]-[d]	[f]
\$100	\$100,000	1,000	\$100	\$0	\$75

#### D. Cost Metric Used in AEC Test

As discussed in Section 2.B., the AEC test boils down to a PCT that compares the net price per contestable unit to a measure of cost. Economists, courts, and regulators have not developed consensus on a single cost metric that should be used to perform the AEC test. The cost metrics used most frequently in AEC tests include (a) average variable cost, (b) average avoidable cost, (c) long-run average incremental cost, and (d) average total cost .

Average variable cost (AVC) is calculated by dividing the total of all the costs that vary when there is a change in the quantity of a particular good produced by the quantity of the goods produced.<sup>12</sup> This cost metric has two shortcomings. First, it measures the average cost of the entire output, not just of the contestable output that is the focus of the predation claim. Second, calculation of the AVC metric frequently requires difficult determinations of whether a particular cost is fixed or variable.

Average avoidable cost (AAC) is the average of the costs, including both variable costs and product-specific fixed costs, that could have been avoided if the leading firm had not produced the contestable output.<sup>13</sup> Since AAC includes both variable costs and product-specific fixed costs, it does not require difficult determinations of whether a particular cost is fixed or variable. AAC omits all

fixed costs that were already sunk before the period of the alleged exclusionary pricing.

Average total cost (ATC) is the average cost of producing the contestable output and includes *all* fixed costs, even if those costs were incurred before the period of the alleged predatory pricing.

Long-run average incremental cost (LRAIC) is the average cost of producing the contestable output whenever such costs are incurred.<sup>14</sup> Unlike AAC, it includes *all product-specific* fixed costs, “even if those costs were sunk before the period of the alleged predatory pricing.”<sup>15</sup> LRAIC is typically greater than AAC. In contrast with ATC, only the incremental costs for the product impacted by the alleged predatory pricing are included in the calculation of LRAIC.<sup>16</sup> That is, there may be production costs shared with other products that do not increase as production of the contestable output increases, and such costs would be counted as part of ATC but not as part of LRAIC. This is why for multi-product companies LRAIC may be lower than ATC.<sup>17</sup>

In the normal course of business, a leading firm may not maintain cost data that corresponds exactly to the AVC, AAC, LRAIC, and ATC cost metrics. As noted above, ATC is typically greater than LRAIC. LRAIC is typically greater than AAC, which in turn is typically greater than AVC. It would therefore be conservative to perform the AEC test using a metric that is closest to the ATC. If the leading firm passes the AEC test conducted using ATC, it will also pass the AEC test conducted using AAC, LRAIC and AVC.

<sup>12</sup> Areeda, Phillip, and Donald F. Turner. “Predatory Pricing and Related Practices Under Section 2 of The Sherman Act.” *Harvard Law Review* 88, no. 4 (1975): 697-733, at 697 (“Variable costs, as the name implies, are costs that vary with changes in output. They typically include such items as materials, fuel, labor directly used to produce the product, indirect labor such as foremen, clerks, and custodial help, utilities, repair and maintenance, and per unit royalties and license fees. The average variable cost is the sum of all variable costs divided by output.”)

<sup>13</sup> See “Communication from the Commission — Guidance on the Commission’s enforcement priorities in applying Article 82 of the EC Treaty to abusive exclusionary conduct by dominant undertakings,” European Commission, 2009.

<sup>14</sup> See “Predatory Pricing: Strategic Theory and Legal Policy,” Patrick Bolton, Joseph F. Brodley and Michael H. Riordan, March 2000.

<sup>15</sup> See *id.*

<sup>16</sup> See “Competition Law and State-Owned Enterprises,” OECD, November 2018, available at [https://one.oecd.org/document/DAF/COMP/GF/WD\(2018\)54/en/pdf](https://one.oecd.org/document/DAF/COMP/GF/WD(2018)54/en/pdf).

<sup>17</sup> See *id.*

## Conclusion

In the U.S., AEC tests have been used by several Circuit Courts of Appeals to evaluate whether bundled rebates constitute anticompetitive tying<sup>18</sup> and, with less frequency, whether contracts containing loyalty rebates constitute anticompetitive exclusive dealing contracts.<sup>19</sup> Given the legal landscape, a leading firm can use the AEC test in the normal course of business to manage and monitor antitrust risk. In this paper, we provide a practical guide to the implementation of the AEC test and discuss how this test can be used by a leading firm in the normal course of business to manage and monitor antitrust risk.

The AEC test boils down to a price-cost-test. If the net price per contestable unit is lower than the cost, then an equally efficient rival cannot profitably match the prices and discounts offered by the leading firm. In this case, the leading firm fails the AEC test, and the prices and discounts offered by the leading firm increase the antitrust risk for the firm. Net price per contestable unit can be calculated from information on list prices and discounts, and an estimate of what share of production is contestable. We describe multiple alternative cost metrics, and we show that one can take a conservative approach by taking average total cost, which is practical to calculate based on information available from the normal course of business.

### About the Authors



*Hitesh Ram Makhija is a vice president at Analysis Group, Inc. He specializes in the economic analysis of antitrust and competition issues in the US and EU.*



*Julian Manasse-Boetani is a recent graduate of the University of Chicago Law School. In Fall 2023 Julian will be joining Gibson, Dunn & Crutcher's San Francisco office.*



*Maria Garibotti is a vice president at Analysis Group, Inc. She specializes in the application of economics and statistics to questions arising in a variety of settings, including antitrust, finance and commercial litigation. Dr. Garibotti has been deposed and has provided expert testimony at trial.*



*Dennie B. Zastrow is an associate at Morgan, Lewis & Bockius LLP. His antitrust practice ranges from regulatory counseling on mergers and acquisitions to private antitrust litigation in US federal and state courts.*

<sup>18</sup> See, e.g., *Cascade Health Sol'ns v. PeaceHealth*, 515 F.3d 883, 903 (9th Cir. 2008) (applying AEC test); *Collins Inkjet Corp. v. Eastman Kodak Co.*, 781 F.3d 264, 273–74 (6th Cir. 2015) (same); see also *Ortho Diagnostic Sys., Inc. v. Abbott Lab'ys, Inc.*, 920 F. Supp. 455, 469 (S.D.N.Y. 1996) (similar to AEC test, but also requiring proof that plaintiff is as or more efficient in producing the contested product).

<sup>19</sup> See, e.g., *Eisai, Inc. v. Sanofi Aventis U.S., LLC*, 821 F.3d 394, 406 (3d Cir. 2016) (suggesting proper frame of analysis for single-product loyalty rebates is whether an "equally efficient competitor" would be able to compete). But see *In re EpiPen (Epinephrine Injection, USP) Mktg., Sales Pracs. & Antitrust Litig.*, 44 F.4th 959, 1003 (10th Cir. July 29, 2022) (suggesting but not deciding that loyalty rebates should be evaluated under a simple price-cost test, rather than under the AEC test or under more permissive standards), *petition for cert. filed sub nom. Sanofi-Aventis U.S., LLC v. Mylan, Inc.* (U.S. Jan. 9, 2023) (No. 22-628).

