HORIZONAL MERGER ANALYSIS

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ABSTRACT

Economic analysis of competition regulation is most developed in the domain of horizontal
mergers, and modern agency guidelines reflect a substantial consensus on the appropriate
template for merger assessment. Nevertheless, official protocols are understood to rest on a
problematic market definition exercise, to use HHIs and HHIs in ways that conflict with standard
models, and more broadly to diverge with how economic analysis of proposed mergers should be
and often is conducted. These gaps, unfortunately, are more consequential than is generally
appreciated. Moreover, additional unrecognized errors and omissions are at least as important:
analysis of efficiencies, which are thought to justify a permissive approach, fails to draw on the
most relevant fields of economics; entry is often a misanalyzed afterthought; official information
collection and decision protocols violate basic tenets of decision analysis; and single-sector,
partial equilibrium analysis is employed despite the presence of substantial distortions (many due
to imperfect competition) in many sectors of the economy. This article elaborates these
deficiencies, offers preliminary analysis of how they can best be addressed, and identifies
priorities for further research.

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1. Introduction

The regulation of horizontal mergers is a central pillar of modern competition regulation. The subject is now receiving increased attention due to concerns about rising concentration and market power in both traditional sectors and regarding new technologies.

The good news is that modern merger policy has substantially converged across jurisdictions, reflected in the similarity of merger guidelines in the European Union, United States, and much of the developed world.[1] Moreover, horizontal merger analysis is, relatively speaking, a state-of-the-art applied field in industrial organization economics, building on longstanding as well as increasingly sophisticated models of competitive interaction, empirical methods to estimate demand and costs that are used for merger simulation, and empirical analysis of mergers that focuses on particular industries (such as health care and airlines) and includes retrospective analyses of previous mergers.[2]

Unfortunately, there is also bad news. It is well appreciated that market definition is a shaky enterprise, predictions of mergers' likely anticompetitive effects are of uncertain accuracy, and efficiencies have been relatively neglected even though their perceived widespread presence is deemed to justify permitting most horizontal mergers.

Much less explored are a range of foundational problems with merger analysis. Standard merger protocols conflict with basic precepts of decision analysis and do little to leverage merging parties' rationality constraint. Various proxies, screens, and shortcuts have never been validated and, on inspection, are deeply problematic. In addition, they do not align with long-run effects that are consequential for welfare and ignore the relevance of first-order distortions in untargeted sectors. Market definition's flaws are much deeper than appreciated, and the standard approach—whether using merger guidelines' hypothetical monopolist test (HMT) and resulting HHIs and ΔHHIs or otherwise—can never help and often substantially undermines the analysis of anticompetitive effects in every core application. (In an illustration to be offered, the U.S. Horizontal Merger Guidelines' (2010) formulation presumptively allows a merger to monopoly that raises price more than thirty-five times as much as another merger in the same setting that is presumptively challenged.) Efficiencies must be merger specific to be credited—which often means that they cannot be achievable by contract—yet standard analysis does not draw on relevant fields of economics on the theory of the firm and organizational economics, which are associated with a number of Nobel prizes. Analysis of ex post entry often engages in misconceived positive analysis and is also normatively problematic because, in many settings, the triggering of entry makes a merger worse for social welfare. Ex ante entry—induced by the prospect of subsequent buyouts—is only recently receiving attention, and its implications in some settings are often ignored or misanalyzed.

A substantial, across-the-board reassessment of horizontal merger analysis is in order. This article is part of a larger project—an in-process book and a series of articles—that begins this task.[3] The focus here is on identifying many of the challenges, presenting preliminary analysis, and providing direction for future research. Two principles should be kept in mind.

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[1] EU Guidelines on the Assessment of Horizontal Mergers (2004), U.S. Horizontal Merger Guidelines (2010).

[2] See, for example, Ashenfelter, Hosken, and Weinberg (2014), Farrell and Shapiro (2010), Hunter, Leonard, and Olley (2008), Kaplow and Shapiro (2007), Kwoka (2015), Peters (2006), Whinston (2007).

[3] Kaplow (2020a,b,c,d; in progress). To streamline the presentation here, I offer an abbreviated treatment of many complex subjects, skip some others, and largely omit voluminous references to relevant literatures on industrial organization economics and competition policy that may be found in these other works.

First, we must ask hard questions even if we cannot answer them well now or anytime soon. Second, the proxies, screens, presumptions, and shortcuts that competition agencies and tribunals inevitably must employ to assess particular mergers should be grounded in the proper analysis, not posited a priori.

Section 2 begins stating the framework for decision-making that, although familiar, conflicts with many aspects of official merger assessment protocols, notably the sequentially siloed analysis of anticompetitive effects and efficiencies. Proper analysis keeps in mind the joint distribution of potential mergers' effects as well as how the conditional distribution is influenced by merging parties' rationality constraint and by evidence bearing directly on only one type of effect. Regarding objectives, many jurisdictions' guidelines focus on consumer welfare, often motivated by distributive concerns. However, taxes and transfers are a dominant strategy for redistribution, one advocated by economists in other regulatory settings. Furthermore, in a long-run (even if imperfectly competitive) equilibrium, all costs are variable and prices with free entry equal average cost, so there is no (ex ante, risk-adjusted) producer surplus and thus no divergence between these two criteria. Considered last is the important second-best problem posed by the significant distortions in many sectors of the economy, rendering incomplete and in some cases highly misleading usual prescriptions grounded in standard, partial equilibrium analysis of mergers' effects.

Section 3 analyzes price effects and market definition. Merger guidelines, court decisions, and other legal edicts often require market definition and, moreover, purport to draw inferences from market shares, but only shares in the so-called relevant market. However, it is impossible to conclude that one market definition is superior to another without already having a best estimate of relevant effects, rendering the entire process circular. Actually, standard methods are worse because they ultimately have to draw mysterious inferences from resulting market shares rather than using our best estimate. These and related deficiencies are developed schematically and more formally (with regard to any market definition and market share inference process). Finally, merger guidelines' HMT and use of HHI and ΔHHI are examined in each of the standard applications (unilateral effects with homogeneous goods and with differentiated products, and coordinated effects). Not surprisingly, this algorithm and these familiar summary measures are substantially inapt and misleading in each setting, reflecting that they are disconnected from (and in conflict with) basic models for merger analysis.

Section 4 assesses efficiencies that, on one hand, are often regarded to be sufficiently ubiquitous to justify permitting most horizontal mergers but, on the other hand, are little analyzed and sometimes said to rarely tip the balance in favor of a merger. No plausible joint distribution of anticompetitive effects and efficiencies can rationalize such a state of affairs. Analysis of efficiencies—merger specificity in particular—is woefully underdeveloped: its relevance to anticompetitive effects is often overlooked, and relevant theory (notably, theory of the firm and organizational economics) bearing on what a merger (a unified firm) can accomplish that a contract cannot has not been applied to horizontal merger efficiencies. Examination of leading potential efficiencies—economies of scale and economies of scope—is cast in a new light. Last, the emerging "efficiency credit" account for existing practice is shown to be problematic despite the difficulties of scrutinizing efficiencies in particular proposed mergers.

Section 5 examines entry, beginning with the usual focus on entry that may be induced by the anticompetitive effects of a merger. It explains how the usual focus on the likelihood, speed, and magnitude of entry that will occur is misplaced: such entry will not typically be sufficient to

eliminate a merger's anticompetitive effects, and it is often associated with its own inefficiency. Instead, the ease of postmerger entry favors permitting mergers because it bears on inferences, via the merging parties' rationality constraint, about the anticompetitive effects that would arise in the first place as well as merger efficiencies. The unduly neglected subject of ex ante entry— that induced by the prospect of subsequent buyout—is examined next. In some cases, easier entry can favor tougher merger policy because such entry is inefficient. More broadly, ex ante incentives for entry and other investment are importantly influenced by the anticipated permissibility of the merger regime. Recent attention to acquisitions that may thwart the disruption of nascent competitors is warranted, but discussions often improperly take the presence of such targets as given rather than as being endogenous to merger policy.

Section 6 offers some concluding remarks, including important reservations regarding policy implications in light of limits to existing empirical knowledge and institutional features of different competition regulation regimes.

2. Framework and objectives

2.1. Decision framework

Although elementary, it is useful to state the decision framework explicitly because official merger protocols and much policy-oriented commentary deviate substantially. For simplicity, a decision-theoretic framing will be employed here. The core takeaways are applicable, mutatis mutandis, to a mechanism design approach that has important lessons of its own for merger analysis.[4]

A merger should be blocked if its expected anticompetitive effects exceed efficiencies— where the proper treatment of efficiencies (notably, whether to count only marginal cost savings that would be passed on to consumers) depends on the welfare standard, considered in the next subsection. Because this assessment is comparative, it is counterproductive to employ the sequentially siloed approach wherein agencies or courts first consider anticompetitive effects, allow the merger if they are not sufficiently large, and only then consider efficiencies (if at all) in other, worrisome cases. The criticized method constitutes the official protocol in some jurisdictions' merger guidelines and court decisions, although it is unclear the extent to which actual investigations and decisions adhere to these dictates.[5]

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[4]Kaplow (2011b) offers a general analysis of the key differences between these two formulations in setting an optimal cutoff for intervention, and various literatures have analyzed implications for merger approval decisions, such as effects on the ex ante selection of merger proposals, how approval decisions affect incentives for future mergers, and how optimal rules depend on agencies' ability to commit. Besanko and Spulber (1993), Gowrisankaran (1999), Mermelstein et al. (2020), Nocke and Whinston (2013). Some important applications to ex ante entry induced by the prospect of subsequent mergers will be examined in Section 5.2. The discussion here also abstracts from administrative costs borne by merging parties, competition agencies, and courts.

[5]See Section 4.3 for further discussion. It is well known that the latest revision resulting in the current U.S. Horizontal Merger Guidelines (2010) softened this approach. U.S. courts purport to adopt it formally, although it is unclear the extent to which it affects practice. Kaplow (2020d). Having discussed the matter with economists and lawyers currently at the U.S. competition agencies, formerly having senior positions in them, and in private practice (as expert witnesses and litigators), I have heard a remarkable diversity of opinion, including confident yet opposite depictions by experienced individuals, suggesting to me that actual practice is often somewhere in between and perhaps varies greatly depending on the particular teams and nature of the case. Deferring or never considering efficiencies is generally regarded to be more common in the European Union than in the United States.

Whether in preliminary screening, deciding what information to collect, or reaching a final decision, it makes no sense to zoom in on one side of a scale when trying to determine which way it tips. Nor can one formally process information in this fashion. For example, using the odds ratio formulation of Bayes' rule, posterior odds equal the prior odds multiplied by the likelihood ratio (the likelihood one would observe the information given one hypothesis divided by the likelihood given the other hypothesis), but it is impossible to determine any ratio without a denominator.

More concretely, the merging parties' rationality constraint—that parties would only propose profitable mergers—is not emphasized in merger protocols and analyses of specific mergers, but it is highly probative.[6] To begin, there exists some joint distribution of expected anticompetitive effects and efficiencies for potential mergers. Absent strong assumptions, information on either one will alter the conditional distribution of the other. The point here is stronger: if parties only propose profitable mergers, the relevant conditional distribution will likely involve substantial interdependence. A significantly anticompetitive merger would be profitable with no efficiencies (or even negative ones, such as diseconomies of scale or costs of integration). A very efficient merger can be profitable with no anticompetitive effects (or even if prices would fall). At early stages of an investigation, a proffered merger with a highly tenuous efficiency justification should be examined more carefully for likely anticompetitive effects compared to one with apparently substantial synergies.

A further interdependence arises because much information itself intertwines the two sides of the balance. Understanding firms' cost functions is relevant to the assessment of upward pricing pressure (margins are an important factor), efficiencies, and entry. Information from inside the firm may illuminate the firms' motives, but it is only possible to resolve disputes over interpretation by having all relevant possibilities in mind.

2.2. Consumer versus total welfare

Merger guidelines in many jurisdictions—including the European Union and United States but not, for example, Canada—state that consumer welfare is the objective in merger decision-making. A central implication is that efficiencies are to be credited only to the extent that they would be passed through to consumers. In broader policy discussions, the primary motivation for this preference is distributive, although even then consumer welfare may deserve greater, context-dependent weight compared to producer surplus rather than exclusive weight.

Optimal regulation does not generally call for regulation-specific consideration of distributive concerns, much less in this particular manner. Typically, it is deemed preferable to focus on total welfare (here, deadweight loss), leaving distribution to be addressed by the tax and transfer system. Indeed, in basic models that strategy is Pareto dominant, which is to say that all income groups can be made better off. This result is formally derived in Kaplow (2019) in a model that allows for any distributive incidence of markups and of profits and that also accounts for labor supply distortion caused by redistributive taxation as well as by markups (which themselves create a labor wedge).

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[6]The discussion here abstracts from other merger motivations relating to agency problems (empire building), behavioral considerations (optimism bias), market misvaluations, and tax savings, all of which may be important explanations for some mergers. This subject warrants significant further study; prior empirical work on the subject tends not to focus on horizontal mergers. Malmendier and Tate (2008), Morck, Shleifer, and Vishny (1990).

A further consideration is that the longer the time period one considers, the less these two welfare standards diverge. For example, although fixed-cost efficiencies may not be passed through in the short run, all costs are variable in the long run. Moreover, in standard models of imperfect competition that allow entry and exit (and abstracting from the integer constraint), price equals average cost in equilibrium. All margins generate quasi-rents; there are no ex ante risk-adjusted profits.[7] Mankiw and Whinston (1986), Ericson and Pakes (1995). (For further exploration, see Section 5 on entry.)

A further question, receiving increased attention of late, is whether competition policy should pursue additional or alternative objectives. Sometimes, it is suggested that competition regulation should preserve or enhance the process of competition (rather than focus on predicted effects), but this objective is often indeterminate, particularly as applied to horizontal mergers, which mechanically eliminate rivalry between the merging firms (and there is no natural aggregate rivalry metric that registers and compares possibly greater rivalry with other firms). Monopsony has become a subject of additional research, although its analysis is analogous to that of competitive effects with sellers. Innovation has long been a focus, the central challenge being prediction. Additional objectives that are also beyond the scope of this article include market integration (for example, across the European Union), employment, small business promotion or protection, and decentralization of political power. Also important but ignored here are institutional concerns regarding specialization and accountability that arise when agencies are tasked with multiple, diverse objectives, many of which are difficult to measure.

2.3. Distortions in multiple sectors

Merger control—along with other competition rules, intellectual property rights, and much other regulation—typically employs partial equilibrium analysis in a single sector. In both modeling and empirical work, this method is often formalized through use of an outside good, implicitly sold at marginal cost, taken to represent expenditures in the rest of the economy. Changes in deadweight loss in the targeted sector then equal changes in total welfare overall and thus are a sufficient statistic for welfare analysis.

For nearly a century, however, economists have recognized an important limitation of this approach, associated with the problem of the second best that arises when there are multiple distortions. Regarding monopolistic markups in particular, Lerner (1934) stated that if all sectors' prices were marked up by the same proportion, there would be no allocative inefficiency; only deviations in markups mattered. For example, if prices in every sector are elevated by 25%, there is no misallocation across sectors.[8] By the time that Lipsey and Lancaster (1956) wrote their famous article, this problem of "degrees of monopoly" was so well known that they felt no need "to review the voluminous literature." Subsequently, however, this critical complication has largely vanished from analysis, including of competition policy.[9]

This problem is formally explored in Kaplow (2020a) in a simple general equilibrium model that allows for arbitrary imperfect competition in each sector. Under some assumptions,

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[7]Relatedly, empirical analysis by Hall and Woodward (2010) suggests that entrepreneurs funded by venture capital approximately break even on an ex ante, risk-adjusted basis.

[8]A key point, also noted (parenthetically) in Lerner (1934), is that, when labor supply is endogenous, leisure needs to be marked up proportionately as well for there to be no distortion. This dimension of the problem is incorporated in Kaplow (2019), which considers distortionary income taxation as well.

[9]It is reflected in a recent strand of literature on international trade. Bilbiie, Ghironi, and Melitz (2019), Epifani and Gancia (2011), and Holmes, Hsu, and Lee (2014).

Lerner's conjecture is validated, and, more broadly, tougher competition policy raises (lowers) welfare when applied to sectors with high (low) markups, a startling contrast to traditional prescriptions.[10] This result is substantially overturned, however, when one introduces free entry and exit with homogeneous goods but tends to be restored in varying degrees when entry enhances product variety or generates innovation spillovers—results that can be related to the partial equilibrium, single sector findings in Mankiw and Whinston (1986) on when entry is socially excessive or inadequate in the presence of imperfect competition.

As industrial organization economists, we do not actually believe that the entire economy except the sector under analysis is well captured by an outside good sold at marginal cost. The assumption is a modeling convenience. However, for designing optimal policy, implicit reliance on this contrivance can lead us astray. Hence (and not just for merger analysis), substantial attention in theoretical work and empirical investigation should be devoted to this dimension of optimal regulatory design.

3. Price effects and market definition

Section 3.1 offers a schematic depiction of the role of market definition in the prediction of price effects, whether using merger guidelines' HMT and thresholds for HHI and ΔHHI or otherwise. This representation makes apparent the circularity and counterproductivity of the enterprise. Section 3.2 presents a complementary, more formal statement that highlights the implausible assumptions and identifies the inevitable failings of this methodology. Section 3.3 illustrates these problems concretely by juxtaposing merger guidelines' official protocols against the proper analysis of unilateral effects—with both homogeneous and differentiated products—and coordinated effects.

It has long been understood that market definition is problematic because "markets" are lumpy, with choices having an all-or-nothing character. The deficiencies, however, are much deeper and more consequential. Warnings have not been adequately heeded. Notably, the methodology does not correspond to any models of mergers' effects, and, long ago, Lerner (1934) developed what is now called the Lerner index precisely because of the vacuity of attempting to define "commodities" and "industries."[11] Modern articles that purport to assess merger guidelines—such as by examining how well HHI or ΔHHI predict price effects—simply omit its market definition apparatus (usually without mentioning it), sticking to what are, in essence, narrow markets that may be represented in various models or employing externally stipulated market definitions (whose connection to HMT markets cannot be ascertained).[12] The current U.S. Horizontal Merger Guidelines (2010), which in 1982 originated the HMT and made standard the use of HHIs and ΔHHIs, remarkably confine nineteen of twenty mentions of "HHI"

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[10]When this result applies, it is optimal for competition regulation to focus (only) on high markup sectors. One might view this point as an indirect, post hoc rationalization for the attention given in merger regulation to the *level* of the HHI (which Section 3 emphasizes is misplaced in standard merger analysis) to the extent that it is a crude proxy for a sector's markup.

[11]Lerner (1934, p. 168) refers to market shares as "irrelevant statistics" and emphasizes the need to "put[] an end to attempts . . . to find a measure of monopoly in terms of the proportion of the supply of a commodity under single control." "It is quite unnecessary, for this purpose, to say anything at all about the 'commodity' which the 'industry' produces . . . . All the difficulties of definition of 'commodity' or 'industry' are completely avoided." Lerner (1934, p. 171).
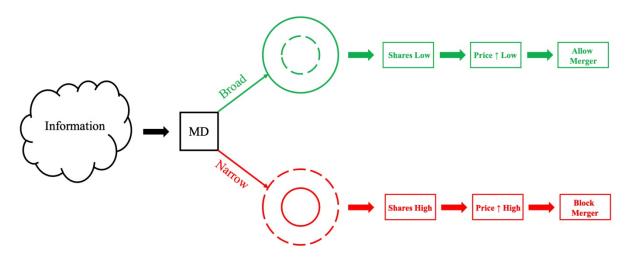
[12]See, for example, Garmon (2017), Kwoka and Gu (2015), Nocke and Whinston (2020).

to the section on market definition and market share threshold tests; the only mention in the sections that actually analyze price effects is a *disclaimer* of the HHI's relevance. The prediction error of sticking to the guidelines' protocols can be huge: in a simple example, a merger to monopoly is presumptively cleared without further analysis even though it raises price by more than thirty-five times as much as another merger that is presumptively challenged.

3.1. Schematic depiction of market definition and inferences from market shares

      Modern merger guidelines begin by defining the "relevant" market using the hypothetical monopolist test (HMT).[13] Next, they compare the HHI and ΔHHI in that market (and, importantly, only in that market) against thresholds that indicate unlikely challenges (safe harbors) for low levels and greater danger (including sometimes presumptive challenges) for high levels. The analysis in this subsection and the next examines the assumptions and implications of this approach in general terms—that is, without regard to the specific use of the HMT, HHI, ΔHHI, or particular thresholds, which are considered in Section 3.3.
      Stated broadly, merger guidelines and many other competition protocols require that one begin by defining markets and then drawing inferences about market power or price effects from the shares in the markets thereby defined. Figure 1 depicts a standard setting in which the market definition dispute involves choosing between two markets, Broad and Narrow.

Starting from the left, some set of information is used to make a decision on market definition. If Broad is chosen, shares (and thus, for example, the HHI and ΔHHI) will be low, so the inferred price increase will be low, so the merger would be allowed. Conversely, if Narrow is chosen, shares will be high, so the inferred price increase will be high, so the merger would be blocked (or subjected to further analysis).
      Inspection of Figure 1 makes apparent a number of fundamental questions that are rarely made explicit. First, what is the nature of the information feeding the market definition decision and how is that information analyzed? Either the information and analysis pertain to the prediction of anticompetitive effects (price increases) or they do not. The latter would be bizarre so is set to the side. But the former is strange as well: Why analyze information in order to

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[13]EU Commission Notice on the Definition of Relevant Market (1997), EU Guidelines on the Assessment of Horizontal Mergers (2004), U.S. Horizontal Merger Guidelines (2010).

determine the predicted price increase in order to define a market in order to obtain market shares in order to use them to draw crude inferences about the likely price increase? This is patently circular. And it is oxymoronic under the so-called structural presumption in the United States, wherein anticompetitive effects are presumed (not even inferred) from market shares—explicitly to avoid the need to have to predict these effects—when one must first define the market by adjudicating conflicting evidence and battles of experts on anticompetitive effects.

The matter is actually worse. If the process were entirely circular, we would at least end up where we started. Instead, we lose information and thus make needless error. To appreciate this point, it is helpful to consider a second, rarely asked question.

What is the *criterion* for defining the market?[14] That is, when we deem one market definition to be better than another or the best available, what do we mean? Here we will take the criterion for the best market definition to be that which generates the best inference about the matter at hand: the predicted price increase. Restated, one market definition is better than another if the expected inference error is smaller under it than under the other market definition.

Once we state this criterion, two problems are evident in light of the fact that we must somehow determine the expected error associated with each market definition. To do this requires that we have: (1) an estimate (from somewhere other than the shares in the not-yet-defined market) of the predicted price effect and (2) an understanding of what price effect will be inferred from each of the market definitions that we might choose.

The former reinforces the circularity of the process: we must already have an estimate of the price effect in order to choose the best market definition, the only point of which is to aid in estimating the price effect. Moreover, we can now see more clearly the nature of the avoidable error. Our criterion asks that we estimate two errors, ξ^{Broad} and ξ^{Narrow}, and then choose Broad if and only if $\xi^{Broad} < \xi^{Narrow}$. This means that our error equals $\min\{\xi^{Broad}, \xi^{Narrow}\}$, measured against our best estimate. But, obviously, if we eschew market definition altogether and stick with our best estimate, we avoid this error. Why choose the market with the smaller prediction error when we can avoid that error entirely by abandoning market definition? (Note further that we would save the effort involved in determining the prediction errors.)

Second, we have a further conundrum. To measure these prediction errors, we not only need to have our best estimate already in hand, but we also somehow have to figure out what price effect we would infer conditional on each market definition we might choose. Yet it has never been explained how that inference is to be determined. The best one can do is to assign our best estimate for both of these, so we draw the same (and best) inference regardless of the market definition that is selected. But no one imagines that this is what intense market definition disputes have been about for the past half century. Section 3.3 will explain that sometimes we can make an inference of sorts in Narrow (essentially, our best estimate), but there is no basis whatsoever for formulating an independent inference in Broad. Hence, this pointless, information-destroying market definition process was never really specified in the first place.[15]

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[14]Note that the HMT is not an answer to this question. The HMT is an algorithm, whereas the question addressed here is: what is the loss function that is taken to be (perhaps approximately) minimized by use of the HMT? That question has never been answered. Further exploration of the HMT appears in Section 3.3.

[15]This analytical vacuum raises a further challenge: it is routinely stated that market shares—in whatever is determined to be the relevant market—are to be interpreted in light of pertinent circumstances, revising the appropriate market power inference upward or downward accordingly. But no basis for the initial inference exists, we do not know the magnitude of that inference, and we do not know the "normal" levels or implications of the factors to be considered, so how can evidence on a particular factor tell us what revision to make—indeed, even the proper sign of any such revision? Kaplow (2010, 2011a).

3.2. Formalization

The foregoing critique is quite general; notably, it is not focused on a particular market definition algorithm (like the HMT) or particular uses of market shares (like the HHI or ΔHHI) or particular thresholds (like those in various jurisdictions' merger guidelines). This subsection presents a complementary, similarly general, and somewhat more formal statement of the foundational failure of the market definition process.

To begin, consider whatever might be our best possible inference of a proposed merger's effects, considering all of the information at hand. Let

$$\Delta MP = h(\boldsymbol{\sigma}),$$

where $\boldsymbol{\sigma}$ is the signal vector representing all of the available information and the function h is our best mapping from that information to an estimate of ΔMP, the predicted change in market power (perhaps price increase) from a proposed merger. This representation is taken to capture the best an analyst could do; familiar illustrations will be examined in Section 3.3.

Contrast this to the market definition approach, which has two steps. It begins by defining a market:

$$\mathbf{s} = g(\boldsymbol{\sigma}),$$

where the function g is some mapping from the signal vector $\boldsymbol{\sigma}$ to a relevant market with associated market share vector $\boldsymbol{s}$. That is, g is our market definition algorithm (perhaps, but not necessarily, the HMT). Next, we have

$$\Delta MP = f(\boldsymbol{s}),$$

where the function f is some mapping from the market share vector $\boldsymbol{s}$ to an inference about the effect of the proposed merger on market power, ΔMP. (For example, merger guidelines' thresholds provide crude categorizations. However, they do not articulate, even approximately, what market power effects are thought to be associated with each category. If the postmerger HHI is 3000 and the ΔHHI is 300, is the typically imagined price increase 18%? 1.8%? 0.18%?[16])

Finally, define the composite function

$$\tilde{h}(\boldsymbol{\sigma}) = f(g(\boldsymbol{\sigma})).$$

It is natural to inquire about the relationship between our best inference function, h, and this composite function, $\tilde{h}$, which indicates the ultimate prediction arising from the market definition process. Relatedly, one might ask how we might choose the market definition function, g, and the market share inference function, f, so as to minimize the misalignment. We could also ask how wide is the gap if g is taken to be the HMT and f the thresholds in some set of merger guidelines. Of course, neither those guidelines nor commentary ever states these questions explicitly, much less attempts to answer them.

It is obvious that there has to be a gap between h and $\tilde{h}$, and that it is likely to be substantial, unless one engages in crass reverse engineering. (For example, one might define g not as a market definition function but rather as a function that outputs as the first element of $\boldsymbol{s}$

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[16]This omission is seriously problematic, particularly under the U.S. structural presumption. For example, after that presumption is triggered, what happens if the merging parties then demonstrate annual marginal cost efficiencies of $75 million that will be passed on to consumers? Do they win (or at least shift the burden back to the government)? Or may the government concede and assert that the parties lose because that is not large enough? (Or does this demonstration now require quantifying, for the first time, the predicted price effects? If that is the implication, does demonstration of $1 annual savings suffice to require this? Or some higher figure? How high?)

the value ΔMP from the correct function h and then define f as an identity mapping of that same element of $\boldsymbol{s}$ to its own output, ignoring the other elements of $\boldsymbol{s}$.) Let us now examine these two market definition functions in turn.

Begin with $\Delta MP = f(\boldsymbol{s})$. Obviously $\boldsymbol{s}$ is not a sufficient statistic for the price effects of a proposed merger. This function does not consider the elasticity of demand, the nature of competitive interaction, and other obviously relevant factors.[17] Indeed, given that anticompetitive effects depend very much on the type of setting and on key features of costs and demand, we cannot imagine that any such function could provide a plausible guesstimate over any significant domain of cases. Note further that this function f needs to be the same regardless of whether the share vector $\boldsymbol{s}$ arose from a narrow market or a broader, redefined one (even though we really have no models for the latter). In addition, for whatever is the best f we might envision, we can ask whether HHI and ΔHHI are the correct summaries of the input vector $\boldsymbol{s}$. (Given that we cannot really imagine a sensible f, this latter question does not have a meaningful answer, but we will nevertheless explore the matter further in Section 3.3's analysis of particular contexts.)

Next, examine $\boldsymbol{s} = g(\boldsymbol{\sigma})$ and consider what might be the best market definition function. The question itself is highly problematic precisely because of the aforementioned point: the function's output is the share vector $\boldsymbol{s}$, which is not what we need to know. Put another way, the notion of a "relevant" market is fundamentally confused because it presumes otherwise.

As explained in Section 3.1, the best we could do is attempt to minimize error: Define $\Delta MP^{Broad} \equiv f(\boldsymbol{s}^{Broad})$ and $\Delta MP^{Narrow} \equiv f(\boldsymbol{s}^{Narrow})$, that is, the market power inferences one would choose to draw, conditional on each market definition. Then, our earlier two error measures are $\xi^{Broad} = |\Delta MP^{Broad} - \Delta MP|$ and $\xi^{Narrow} = |\Delta MP^{Narrow} - \Delta MP|$, where $\Delta MP = h(\boldsymbol{\sigma})$, that is, our best estimate of the merger's effect. Then, under this framework, we have at least succeeded in minimizing the error, which is $\min\{\xi^{Broad}, \xi^{Narrow}\}$. This is precisely the partially reverse engineered, circular result that was mentioned in Section 3.1. As explained there, since we need ΔMP, which requires use of the correct inference function, h, to undertake this exercise, we have confirmed its circularity—actually, that the method is worse due to the loss of information.

This is, in a sense, the least bad we can do—short of complete reverse engineering that renders the entire market definition process devoid of content. We can see that, under any market definition process that looks at all like what is deployed in merger guidelines and is routinely discussed, we have $\tilde{h}(\boldsymbol{\sigma}) \neq h(\boldsymbol{\sigma})$, with the difference, $\tilde{h}(\boldsymbol{\sigma}) - h(\boldsymbol{\sigma})$, constituting the avoidable error. When one considers further that intuitively plausible markets are finite, lumpy, and will involve share vectors that in any given case can take just about any form, we can expect that the errors could be quite large. The problem, it should be emphasized, has nothing to do with the inherent difficulty of predicting proposed mergers' effects. However noisy such predictions are, this limitation is reflected in $h(\sigma)$. The market definition process introduces

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[17]The typical need for the demand elasticity is ironic. The entire market definition exercise—in particular, consideration of broadening initially narrow markets—is motivated by the relevance of substitution. Yet the elasticity of demand (an expenditure-share-weighted sum of all of the cross-elasticities) already measures substitution correctly, both to goods that would be added to the market if it is redefined and to all other goods. Not only does broadening a market fail to capture substitution correctly, but (either way) the analyst will still need the substitution information embodied in the demand elasticity, which is ignored in the standard process of inferring market power effects from market shares.

additional and possibly substantial error on account of employing an incoherent market definition overlay that has never been given an economic justification.

3.3. Applications

The preceding subsections present complementary, general expositions of the deep incoherence of the market definition process. This subsection examines the three main domains of application to show how the identified defects play out in practice.

Building from the ground up, as much economic analysis of mergers does, we seek useful models and empirical evidence that enables us to predict anticompetitive effects from the available information. If any proxies, shortcuts, screens, or rules of thumb are desired, they need to be anchored in such analysis and evidence, not posited a priori.

When analysis is undertaken in a given setting, we can identify the key sufficient statistics: what the analyst needs to know in a given case to predict the merger's effects. Given our subject, we will consider here whether and when market share information (elements or formulas derived from the vector s) is relevant at all. We also wish to know what else is relevant. Finally, when s does matter in some fashion, we want to identify both what market share information is informative (the HHI? and/or the ΔHHI? or something else?) and how so.

Not surprisingly, the answers in each setting will largely be negative. Moreover, the answers in each setting are qualitatively different from those in the others. Hence, any hope that some single market definition function, g, or common inference function, f, would suffice should have been regarded to be in vain a priori, even aside from the above critique.[18]

Two central questions need to be addressed from the outset. First, given the incoherence of market definition (via the HMT or otherwise), just how is it that economists have been able to undertake analyses that use market shares and assess, for example, whether the ΔHHI is a helpful indicator in one context or another? The answer—usually left unstated, even when purporting to address merger guidelines—is that such analyses are not conducted using what *competition law* regards to be *"relevant" markets* but instead using what *economics* regards to be *useful models*. As we will see, these models typically depict what competition regulators would view as narrow markets—that is, the markets one would start with *before* applying the HMT—and the analysis always sticks with that starting point *without regard to what the HMT or any other market definition algorithm would require*. An implication is that thoughtful investigations that purport to assess modern merger guidelines do nothing of the sort; they instead assess an imagined replacement that eliminates market definition entirely.

Second, a puzzle is presented by the demise of the structure-conduct-performance paradigm almost a half century ago (Demsetz 1973) and, relatedly, industrial organization economists' rejection of the use of market shares as explanatory variables on grounds of endogeneity. Specifically, how can modern economists even imagine formulas that include market shares among their inputs (independent variables) when generating predictions of anticompetitive effects as their output (the dependent variable)? Although the answer is well understood by those conducting such research and by careful readers, it is worth stating the explanation explicitly to avoid confusion.

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[18]A further irony is that modern merger guidelines—in particular, the HMT, the use of HHIs and ΔHHIs, and the approximate levels of the thresholds—were designed originally for the prediction of coordinated effects (mainly in settings with homogeneous products) yet currently are used primarily for the assessment of unilateral effects (typically in settings with differentiated products).

The primitives of such models are typically features of demand and of firms' costs, as well as the nature of competitive interaction. One can derive the equilibrium and undertake comparative statics to indicate how the equilibrium would change due to a merger. In such equilibria, prices and quantities are endogenously determined. From those quantities one can determine market shares and, if the model is sufficiently simple, use those relationships to substitute for firms' marginal costs, yielding an expression for a merger's effect on price as a function of some market share information and other parameters. A caveat regarding interpretation (and relating to the endogeneity of market shares) is in order. One might be inclined to ask, for example, how the price effect of a merger would change if the market share of one firm was higher and another correspondingly lower, ceteris paribus, but this question is not well posed. Because the shares are endogenous rather than being parameters, they cannot change if everything else is held constant. Instead, the implicit comparative statics exercise might be to imagine changes in marginal costs such that the premerger market shares would (endogenously) change in the stated fashion and then to ask how those changes (in marginal costs) would alter the price effects of the merger.

3.3.1. Unilateral effects with homogeneous goods

In assessing the unilateral incentive to raise price with homogeneous goods, it is conventional to employ a Cournot model.[19] In a familiar, simple model, the markup is given by HHI/ε, where ε is the elasticity of demand for the homogeneous goods. A naïve analysis accordingly suggests that the merger-induced change in this markup is given by ΔHHI/ε.

A number of implications are apparent. First, this analysis and the resulting formula are only valid for the homogeneous goods market. Moreover, there is no corresponding formula for a redefined (broadened) market. Hence, one must abandon market definition (using the HMT or otherwise) if one is to proceed. (This point is remarkable because it is recognized that the Cournot model is the only one that directly grounds merger guidelines' use of HHIs, and that very model necessarily rejects the guidelines' HMT and thus the use of HHIs that emerges from that algorithm.) Second, the share vector s in this narrow market is not sufficient to predict the price effect. Indeed, because ε can vary substantially, one cannot even obtain a crude approximation using s alone.

Third, regarding the relevance of s, ΔHHI is the sufficient statistic in this case. HHI, despite its prominence in modern merger guidelines, is entirely irrelevant. (Indeed, as Farrell and Shapiro (1990) show, if one is assessing total welfare, which includes productive efficiency across firms and not just price, a higher HHI is actually associated with *higher* welfare.) Note further that, once one leaves the naïve world behind our simple formula, ΔHHI is no longer a sufficient statistic for the two merging firms' market shares, and the relevance of those firms' shares becomes notably more complex as one further relaxes simplifying assumptions. Nocke and Whinston (2020).

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[19]It is useful to keep in mind serious misgivings about the applicability of the Cournot model. Tirole (1988). Furthermore, it is familiar that some mergers that would raise price in the Cournot model are not profitable (they violate the rationality constraint in the absence of efficiencies), although this caveat ordinarily is assessed in a static framework whereas dynamics (reflecting that the merged firms will reduce their investments) often resurrect profitability. Berry and Pakes (1993). In any event, it is not clear that agencies often assess proposed mergers with respect to unilateral effects involving homogeneous goods.

The prediction error from following the standard guidelines' approach can be huge. Consider, for example, a merger with ΔHHI just over 200 that results in a postmerger HHI just over 2500, the floor of the U.S. Horizontal Merger Guidelines (2010) range of mergers "presumed to be likely to enhance market power." Some simple algebra indicates that, if the HMT just passes (a hypothetical monopolist of the homogeneous goods would raise price just over 5%), then our formula (ΔHHI/ε) implies that this merger would raise price by ~0.13%. By contrast, a merger to monopoly that raises price just under 5% requires broadening the market under the HMT, making it quite possible that the firms' shares would then be low enough that this merger would be deemed "unlikely to have adverse competitive effects and ordinarily require no further analysis." That is, in a simple, basic case that is at the core of the Guidelines' approach, the later merger that raises price almost 5%—*more than 35 times as much* as the former merger that raises price ~0.13%—is presumptively allowed without further analysis, by contrast to a presumptive challenge for the one that would cause a relatively negligible price increase. The longstanding failure to stress test standard merger guidelines' prescriptions has kept such massive failure hidden from view.

3.3.2. *Unilateral effects with differentiated products*

In assessing the unilateral incentive to raise price with differentiated products, it is conventional to employ a Bertrand model. It is familiar that the resulting upward pricing pressure depends on the diversion between the merging firms' products and the margins on each because a merger internalizes profits on each merging firm's lost sales to the other.

This analysis also makes no use of the market definition apparatus. If, for example, demand is estimated assuming substitution within a cluster of goods and also between that cluster and an outside good, one does not perform a different analysis on a much broader cluster if substitution to the outside good exceeds some threshold. Furthermore, even if one imposes the restriction that substitution within the cluster is, say, proportional to market share (in that "narrow" market), neither HHI nor ΔHHI appears in the pertinent formulas. Instead, even for simple demand systems, the formulas use (only) the merging firms' market shares in a manner not well captured by ΔHHI; instead, price effects are given by a complex formula in which the two merging firms' shares appear many times and in different ways. Nocke and Whinston (2020). As always, the share vector s is not a sufficient statistic because it is necessary to know the relevant elasticities and also the margins.

Merger guidelines' protocols and the HMT in particular are unrelated to the correct analysis. One could instead attempt to apply part of the HMT: Start with a very narrow market consisting only of the two merging firms' products. Then, ask how much a hypothetical monopolist in that market could profitably raise price. Finally—and crucially—stop! For that is the answer to the question of how much the merger would raise price. In all cases, one must *not* do what the HMT commands: that is, if the price increase is large, we ignore that magnitude and instead compute HHI and ΔHHI in that market (although this would obviously yield 10,000 for the former); and if that price increase is small enough, we again ignore that magnitude (which is the answer we seek), broaden the market, reapply the HMT, and at the end of the day compute HHI and ΔHHI in whatever market we end up with and match them against some predetermined thresholds to determine likely anticompetitive effects.

3.3.3. Coordinated effects

The analysis of coordinated effects requires a qualitatively different approach.[20] Here, we wish to predict the extent to which a merger would facilitate coordinated price elevation and, conditional on success, how much prices would increase.

The latter question is related to one aspect of the HMT because coordinating firms seek to act as if they were a single firm. However, even for this question, the HMT (and market definition in general) is the wrong test. After all, coordination is primarily feared in markets with goods that are homogeneous or nearly so. Hence, we wish to know how much firms in that narrow market would increase price, if they could. This answer, however, is used merely as an input to the HMT, at the first step. The HMT then, if the answer is large, tells us to look at s (the HHI and ΔHHI in particular) in that market and check values against the guidelines' thresholds, essentially throwing out the answer to our actual question. And, if the price increase would not be sufficiently large, rather than returning that answer, the HMT broadens the market, repeats the test, and ultimately (again) has as its output s, instructing us to check the corresponding HHI and ΔHHI against the thresholds. Even in the domain for which it was originally created—coordinated effects—the HMT is entirely inapt.

Nor does this approach directly illuminate the former question of how much a merger would facilitate coordination. It is natural to ask, nevertheless, whether the HHI or ΔHHI (in the homogeneous goods market, that is) bears on that question in some way. These figures both tend to be higher when the number of firms is smaller, and coordination tends to be easier with fewer firms. But the number of firms is most directly relevant, not HHI or ΔHHI as such. Furthermore, symmetry is thought to make coordination easier (Compte, Jenny, and Rey 2002), yet, for a given a number of firms, greater symmetry *reduces* the HHI, so this factor has the wrong sign. ΔHHI is not systematically probative because a larger value may be generated by a merger that reduces symmetry, one that increases it, or one that does not materially alter it (because the merged firm may now be more similar to some firms but less similar to others). Therefore, if we focus directly on factors relevant to coordination—of which symmetry is only one—neither s nor HHI and ΔHHI are particularly useful.

Reflecting on these three cases, we can see that the HMT is bizarre both on its face and on reflection. For assessing mergers, we employ a hypothetical *monopolist* test. Moreover, if we confine attention to the atypical instances that are the closest to mergers to monopoly—in the numerical example for unilateral effects with homogeneous goods; for unilateral effects with differentiated products, where we started with just the two merging firms being in the "market"; or with coordinated effects—the HMT gives flatly wrong answers (and essentially meaningless answers) in all three instances. More broadly, the entire market definition process and the related use of market share threshold tests are orthogonal to sensible analysis of horizontal mergers' competitive effects. Finally, many of the core defects are qualitatively different across the three settings, which reinforces the point that it never made sense to employ a one-size-fits-all algorithm.

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[20]For discussion and extensive references on coordinated effects generally, see Marshall and Marx (2012) and Kaplow (2013).

4. Efficiencies

Merger efficiencies are regarded to be sufficiently ubiquitous that few horizontal mergers are challenged and substantial anticompetitive effects must be demonstrated if a successful challenge is to be made. Yet efficiencies are not often analyzed, and, when they are, it is said that they are rarely found to be sufficient. These understandings are difficult to reconcile, for there does not exist a plausible joint distribution of anticompetitive effects and efficiencies such that virtually always one or the other is clearly larger, with the magnitudes never close. The current approach to efficiencies seems to reflect the underdeveloped state of analysis, difficulties in application of that analysis, and insufficient appreciation of the errors that may ensue. This section addresses these three considerations in turn.[21]

4.1. Analysis

A central challenge to the analysis of efficiencies concerns merger specificity. It is widely and correctly understood that only efficiencies that cannot be achieved without the merger should count, for otherwise we can prohibit the merger and thereby avoid any anticompetitive effects without sacrificing efficiency.

First, note that there is an insufficiently appreciated corollary: anticompetitive effects also should be merger specific to count against a merger. Moreover, this point is often important in practice because nonmerger alternatives can involve similar, even the same, anticompetitive effects as a proposed merger (as will be illustrated in the next subsection). Hence, the proper formulation of the problem concerns the nexus between efficiencies and anticompetitive effects. Taking the easiest case, if the merger is modular—that is, pieces can be severed from each other without separation itself having any effect—then we can allow merger of modules whose efficiencies exceed anticompetitive effects and prohibit combination of the others. This logic is reflected, for example, in disallowing mergers whose proffered efficiencies concern, say, payroll (which could be jointly or independently outsourced) and in imposing spinoff conditions if there is partial competitive overlap. Note, however, that the latter does not make sense if the merger's efficiencies reside in the areas of overlap (for example, distribution economies may arise precisely where there is geographic overlap). Then one must simply weigh efficiencies and anticompetitive effects, as in the basic case.

Second, there is a conundrum underlying the concept of merger specificity that is generally ignored in industrial organization economics as well as in writing on merger policy even though it is central in other fields. An efficiency (or anticompetitive effect) is not merger specific when it can be achieved otherwise, which is often understood to involve some sort of contractual arrangement. Yet ever since Coase (1937), this question has posed a deep challenge: just when and how does bringing a contractual arrangement inside a firm make possible something that could not be achieved by a contract outside the firm?[22] The field known as the theory of the firm—along with other fields, notably organizational economics—has attempted to

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[21]This section draws on the more extensive treatment in Kaplow (2020b). An important omission here—and in the literature more broadly—is the ex ante effect on efficiency associated with an active market for firms, such as the enhancement of managers' incentives due to the threat of being acquired. Ex ante inducement of entry is examined in Section 5.

[22]This quandary is reinforced by Jensen and Meckling's (1976) famous statement that a firm is nothing more than a "nexus for contracting relationships." Alchian and Demsetz (1972) refer to the belief of purported differences as a "delusion."

address this question and, in the process, led in whole or in part to Nobel prizes not only for Coase but also Simon, Williamson, Hart, and Holmström.[23] Interestingly, these scholars—including Williamson, who had previously written about merger efficiencies (Williamson 1968) and was interested in applying his work to antitrust—have made little effort to illuminate horizontal merger efficiencies. Nor do analysts of the latter attempt to draw on this body of work.

There is also an important divergence between conventionally understood differences between activities inside firms and contractual alternatives, the former taken to have more hierarchy and lower-powered incentives. On one hand, firms often feature decentralized internal organization with independent profit centers.[24] Holmström and Tirole (1991), Atalay, Hortaçsu, and Syverson (2014). On the other hand, some contractual arrangements (such as in procurement) have substantial hierarchy built into the arrangement. Stinchcombe (1990), Bernstein (2015). Franchises are a familiar hybrid, wherein the franchisor's contractual governance of its "independent" franchisees can be substantial, whereas company-owned outlets may provide high-powered incentives to local managers. Rubin (1978), Mathewson and Winter (1985), and Lafontaine (1992).

One reason for the gap is that much research on the theory of the firm is thought to illuminate vertical, not horizontal, integration. Yet, if and when the latter generates synergies, there generally will involve complementarities that are vertical in nature or raise analogous issues. (Recall that elimination of double marginalization is akin to addressing the problem of Cournot complements.) To foreshadow one of the applications to follow, it may be that two firms do not need to merge to achieve economies of scale made possible by new technology because they can instead grow internally. However, if these are not stick-figure firms but rather have employee teams, supplier and customer relationships, and so forth, the independently expanding firm may need to replicate those features, at an additional cost, and the independently contracting or exiting firm may have such industry-specific, complementary assets. In this case, the synergy, which may be merger-specific, lies there rather than with the core asset subject to scale economies.

It is difficult to analyze merger specificity without drawing on the most relevant research. Connections among scholars in related fields have tended to atrophy with the advance of specialization in modern economics. The resulting gaps can also lead to counterproductive, self-fulfilling cycles. Agency staff—typically, modern industrial organization economists who are expert at modeling competition, performing demand analysis, and the like—sometimes state that efficiencies (relative to anticompetitive effects) are inscrutable. To some extent, however, this seems to be a product of agencies replenishing their staffs with ever-stronger analysts of anticompetitive effects, whereas in the economy at large we see that firms' managers, venture capitalists, private equity partners, and stock market analysts draw on broader and often differing skillsets to assess investments, decide on mergers, and value all such activities. It would seem that additional research, more academic interconnection, broader agency hiring, and greater use of industry or context-specific expertise offer the most promise for enhancing the analysis of merger efficiencies—and, in respects, of anticompetitive effects as well.

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[23]March and Simon (1958), Williamson (1975, 1985), Grossman and Hart (1986), Hart and Moore (1990), Simon (1991), Holmström and Milgrom (1994), and Gibbons and Roberts (2013).

[24]Wickelgren (2005) analyzes a model in which such decentralization after a merger mitigates the anticompetitive effect by maintaining competition between divisions that is employed internally to preserve incentives for cost minimization.

4.2. Applications

Economies of scale. Economies of scale are the most familiar merger efficiency, and it is also one that has not generally been regarded to be merger specific (Williamson 1968). As alluded to above, the standard analysis is incomplete. First, taking the simple, unrealistic case of stick-figure firms, each consisting of a single plant, we can ask whether or not anticompetitive effects are merger specific as well. Suppose we begin with ten identical, single-plant firms operating at efficient scale, and assume that technological change doubles efficient scale. We could allow five mergers, or instead block them, with the result that half of the ten firms would double in size and the other half would exit. To be sure, either way the efficiencies arise, they are not merger-specific. But the same can be said of anticompetitive effects. In this simple example, the merger is a matter of indifference.

An important reason to disfavor such mergers involves uncertainty and option value. (This argument seems to underlie suggestions that it is better to let the market rather than mergers determine the winners, although without explaining how and why the outcomes might differ.) Suppose that efficiencies, if true (that is, if the new technology really is so great), dominate anticompetitive effects. If the five mergers are allowed, we get both the efficiencies and anticompetitive effects. But if the efficiencies do not materialize (perhaps the parties make a fairly convincing case, but one that an agency or tribunal cannot assess with confidence), we will be stuck with only the anticompetitive effects. By contrast, if the mergers are prohibited, we will tend to get the anticompetitive effects (from the expansion of some firms and exit of others) only if the efficiencies turn out to be real.

Turning now to another dimension of the earlier analysis, real firms are not just plants; they include assemblies of teams of workers, supplier and customer relationships, and more. Firms have going concern value precisely because of these collections of complementary assets. Furthermore, to realize newly available scale economies associated with plants, it may be necessary that more of these related assets be employed as well. This can be accomplished by allowing mergers—or, perhaps a near equivalent, allowing a stand-alone firm building a new, larger plant to buy intact (perhaps in a bankruptcy proceeding) an exiting firm's collection of such assets (many of which are contracts and relationships). The alternative of dissipating those assets while having the expanding firm recreate them from scratch may be more costly. Saving such costs would constitute a merger-specific efficiency in this example. Note further that in this instance it is possible that the anticompetitive effects will not be merger specific whereas the efficiencies are, reversing the conventional framing and concern.

Economies of scope. Suppose that one merging firm is particularly good at activity *A*, which enhances the value of assets of type *B*, and accordingly it proposes to acquire another firm that is weak at *A* and has substantial *B* assets whose value would be increased by the acquirer's application of its *A*. Teece (1980), Panzar and Willig (1981), Wernerfelt (1984), and Collis and Montgomery (2005). Mergers that achieve such economies of scope are typically regarded to generate merger-specific efficiencies. But it requires further analysis to understand whether and when this may be so.

First, the target might simply be able get its act together, perhaps with the aid of consultants, to improve its own *A* activity. That may often be possible, yet this is far from always true; else, any firm could readily imitate the likes of Walmart, Amazon, or Apple.

Second, perhaps the target could instead hire or license the acquirer's *A* assets or skills. Indeed, intellectual property licensing is common, although asymmetric information and other incentive problems sometimes impede such contracting. More broadly, contractual alternatives of this sort raise familiar incentive problems (involving one- or two-way moral hazard). A standard solution is to align incentives such as through profit-sharing, but that softens competition as well, another example in which neither efficiencies nor anticompetitive effects may be merger specific. Often, however, intermediate incentives may remove much of the moral hazard cost while having a lower anticompetitive effect. (Note that, for deadweight loss, the marginal welfare loss is greatest at the profit-maximizing price with full alignment whereas the marginal savings from moral hazard is zero at that point.) Achieving such a result may be socially preferable to allowing a merger but may also pose regulatory challenges. Similar obstacles may arise with other contractual provisions (such as more expenditure on monitoring) that may mitigate moral hazard without significantly softening incentives to compete.

A further set of incentive problems arises when contracting with competitors in particular: each contracting partner may not merely exert insufficient effort (conventional moral hazard) but actively undermine success because, after all, the more helpful a firm is to its competitor, the more successful that competitor will be, which reduces the firm's profits. This incentive problem can arise with licensing and may be more problematic with the sharing of facilities. For example, imagine that competitors with different brands would ideally produce some of their output in each other's plants in order to reduce transportation costs from plants to customers. The owner of each plant might benefit by producing lower quality goods when the production line turns to the competitor's products. Here again, a natural response is to align incentives through profit-sharing (directly, or through royalties, commissions, and other arrangements), which in turn softens competition. The analysis is much like that just presented, but the underlying incentive problem may be sharper on this account, which may reduce the difference between the effects of sensible contractual alternatives and merger.

Third, the acquirer might simply expand its *B* activities instead of acquiring those of the target. This possibility raises the issues addressed with respect to economies of scale, where a central question would be whether the target possesses complementary assets that would be costly to replicate, as assembled, and correspondingly embody value that would be lost if stranded. Again, we must consider as well whether the proposed merger's anticompetitive effects are not merger specific under this internal expansion alternative.

Finally, keep in mind in all of these scenarios the fundamental challenge regarding the theory of the firm. In each instance, it is imagined that a merger may make possible results that could not be achieved by contract, but whether, when, why, and how this may be so are subtle questions that may be quite difficult to answer in particular merger investigations.

4.3. Efficiency credit

Current merger analysis by agencies and courts is sometimes (but informally and unofficially) rationalized by reference to an "efficiency credit," which provides an answer of sorts to this section's opening query regarding how we can reconcile the perceived ubiquity of efficiencies justifying most mergers with efficiency defenses rarely being accepted. Roughly speaking, this efficiency credit rationale begins by noting that efficiencies are often present but hard to scrutinize. Accordingly, in each proposed merger it is simply assumed (credited) that an efficiency of some magnitude, E^*, will arise. Therefore, anticompetitive effects must exceed E^*

to generate a prima facie case for a challenge, and such demonstrations are infrequent. However, when this hurdle is overcome, it is rare for the parties to demonstrate actual efficiencies above E^* for two reasons: first, since E^* has already been credited, only extraordinary efficiencies (above E^*) would suffice, and second, because efficiencies are difficult to assess, it is rare that such high efficiencies could be convincingly established even when they were present.

While perhaps descriptively accurate of current practice, this formulation is problematic for reasons sketched more broadly in Section 2.1. It is simply incoherent to assess anticompetitive effects in a vacuum for a variety of reasons, much evidence and analysis is directly relevant to both in any event, and it makes no sense in determining which way a scale tips to focus on one side while ignoring the other.

To elaborate the last point with respect to the efficiency credit, begin by asking how E^* is set in the first place. The rationale—that efficiencies are difficult to scrutinize—suggests a one-size-fits-all credit, but such would obviously be much too high in some settings and quite low in others. The alternative is to set it, at least crudely, case by case (or by industry, type of merger, and type of efficiency claimed). But then one is scrutinizing to some degree the efficiencies in the case under review. The real question becomes not whether but how much to do so, in what order, and in what combination with the assessment of anticompetitive effects. At this point, one is simply analyzing efficiencies and anticompetitive effects as best one can.[25]

Pushing further, it is unclear how high E^* is taken to be.[26] Note that the foregoing depiction of the operation of the efficiency credit suggests that it is set quite high. But why does that make sense? (For those who regard merger enforcement as having been too weak in recent decades, might this be the culprit?) Note that if E^* were, say, set at the median of the distribution of efficiencies, it would be exceeded in half the cases, which is quite inconsistent with almost never finding that this is so. Furthermore, there is an anti-enforcement asymmetry under the efficiency credit: the merging parties are permitted to demonstrate that actual efficiencies exceed E^*, but the government is not allowed to show the opposite, lessening its burden. As noted in Section 2.1, when proffered efficiencies seem feeble, anticompetitive effects are much more likely, so it makes sense to resolve uncertainty toward prohibition. One might disallow this consideration only if E^* were set quite low, the opposite of what seems to be suggested.

The foregoing, combined with the analysis in Section 2.1 of the appropriate decision framework, suggests that the efficiency credit notion is not part of an optimal approach. That said, progress in the assessment of efficiencies in horizontal merger assessment requires the development of better analysis and deployment of more apt expertise, the subject of the first portions of this section. It also requires better empirical work on typical efficiencies in different classes of horizontal mergers, what those efficiencies depend on, and how they might better be identified in various settings.[27]

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[25]A closely related point concerns the difficulty of distinguishing prior probabilities (requiring case-specific analysis to determine which priors to employ) and their updating via likelihood ratios (requiring an understanding, from prior knowledge, of the likelihood of observing various signals conditional on different hypotheses). In similar spirit, how often would it make sense to engage in substantial argument and analysis concerning which prior to invoke, all the while eschewing consideration of evidence bearing on the likely efficiencies in the actual merger under analysis?

[26]Some analysts posit, for example, 5% of revenue, but that is mostly for ease of exposition rather than an empirically based optimal level.

[27]One source of information is studies of multiple mergers in a given industry, although these do not typically focus on efficiencies. Garmon (2017), Peters (2006). Another uses larger samples and event studies,

5. Entry

Conventional analysis under modern merger guidelines asks whether postmerger entry would be sufficiently likely, timely, and substantial to defeat the price increase that otherwise might result from a merger. Section 5.1 examines mistakes and omissions in this inquiry regarding ex post entry—that induced by the merger. Section 5.2 turns to ex ante entry—that induced by the prospect of a subsequent acquisition—an important subject that has only recently begun to receive attention.[28]

5.1. Ex post

The relevance of the prospect of ex post entry to the analysis of a proposed merger's anticompetitive effects is best understood from the perspective of the merging parties' rationality constraint. The key point is that, if a postmerger price increase would quickly induce substantial entry that would defeat much of the price increase (even if not all of it), such a merger is less likely to be profitable and hence to have been proposed. Easy postmerger entry therefore implies that the merger is more likely to be motivated by the prospect of efficiencies than anticompetitive effects.

It is familiar that under the Cournot model's quantity competition with homogeneous goods, many mergers that would raise prices are unprofitable even if no entry would be induced. The merging parties' quantity reduction is met by rivals' quantity expansion that dampens any price increase, so the merging parties bear all of the cost but share in only some of the benefit of the modestly higher industry price. If that price increase would be reduced further by entry, profits are even lower, further narrowing the set of mergers that would be profitable in the absence of efficiencies.

Under Bertrand price competition with differentiated products, the merging parties' price increases are met by rivals' price increases, so these mergers are profitable even without efficiencies. Here, postmerger entry induced by such price increases does reduce profits, but not usually by enough to render the merger unprofitable. Nevertheless, in updating priors regarding the joint distribution of anticompetitive effects and efficiencies, it remains true that easier postmerger entry indicates that efficiencies more likely motivate the merger.

In merger guidelines and much writing on horizontal mergers—as well as in court opinions that address entry—the relevance of entry is viewed differently: there is an ex post perspective on ex post entry. The question is usually stated as whether, taking as given that (in the absence of entry) the merger would cause a nontrivial price increase, entry would then defeat it.[29] The answer to this question ordinarily is negative because entry that was not profitable in

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which may not help much predicting the effects of a particular merger but may inform priors over classes of mergers. Fee and Thomas (2004), Shahrur (2005). Greater interaction among industrial organization, financial, and other economists on this subject would be valuable.

[28]This section draws on the more extensive treatment in Kaplow (2020c).

[29]The language in the EU Guidelines on the Assessment of Horizontal Mergers (2004) is "deter or defeat," and that in the U.S. Horizontal Merger Guidelines (2010) is "deter or counteract." The reference to deterrence is obscure because limit pricing and related strategic behavior is not usually contemplated. In the absence of information asymmetries and related incentives to signal, limit pricing is not rational to begin with: only the post-entry equilibrium matters to entrants' profitability.

the premerger equilibrium would tend to become profitable postmerger only if prices would be higher.[30] Abstracting from the integer constraint, this point is straightforward under standard assumptions, although with discrete entry this is only a general tendency. As Werden and Froeb (1998) explain and simulations by Caradonna, Miller, and Sheu (2020) indicate, profitable postmerger entry will not typically defeat price increases entirely.

By contrast, the prior discussion of the rationality constraint shows that the prospect of such entry nevertheless reduces expected profitability for the merging parties, leading to different inferences about likely anticompetitive effects and efficiencies.[31] Put another way, if a significant merger-induced price increase would lead to likely, timely, and substantial entry, the implication is not that such entry will in fact occur but rather that we should be skeptical that the merger would generate a substantial price increase in the first place. (Either way, easier ex post entry is favorable to the merger, but it is important to correctly understand the question in order to know how to determine the answer.)

The foregoing analysis focuses on how entry influences anticompetitive effects, notably postmerger prices, but entry also has other impacts on social welfare. Following Mankiw and Whinston (1986), begin with homogeneous goods industries. There, entry tends to be socially excessive because of the business-stealing externality that entrants impose on incumbents (with no offsetting positive externality). As a consequence, Kaplow (2020a) shows that welfare will tend to be lower as a consequence of postmerger entry than if such entry would not occur. With differentiated products, entrants contribute to variety, the benefits of which firms do not fully capture due to their inability to appropriate inframarginal consumer surplus, so there is an offsetting welfare gain. (The same is true with other spillovers, such as from incompletely appropriable innovation.) Accordingly, the welfare loss from entry would be smaller and could be a net welfare gain, notably, when the premerger imperfectly competitive free-entry equilibrium had too few firms. These welfare consequences of entry that may be induced by horizontal mergers are omitted in merger guidelines and in most merger analysis.

5.2. Ex ante

Although long understood in rough terms, until recently the ex ante inducement of entry by the prospect of a subsequent acquisition has been largely neglected in merger analysis. Viewed broadly, mergers are part of the dynamic ecosystem that includes entry, investment, competitive interaction, and exit. Ericson and Pakes (1995). The permissibility of a merger regime can have ex ante effects on entry (and investment more broadly), which has important

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[30]More precisely, entry's profitability depends on the post-entry price and quantity. Because the pre-entry price is higher postmerger to the extent the direct effect of the merger is anticompetitive, this higher starting point suggests that the post-entry price will be greater than it would have been premerger for a given degree of entry.

[31]The present analysis also reinforces the earlier argument against siloed analysis of anticompetitive effects and efficiencies. Here, analysis of entry is relevant to both and to the interplay between them. Moreover, aspects of firms' cost structures and demand can be relevant to each viewed independently as well as to their interaction. Viewed practically, sometimes it may be easiest to determine that rapid, substantial entry would be triggered by even a modest price increase, in which case giving entry early consideration would be more expeditious than postponing it until after a substantial consideration of likely anticompetitive effects (viewed in a vacuum). In addition, arguments about efficiencies and entry can conflict. For example, large scale economies or the need for access to distinctive skills, which may favor permitting the merger, can render entry less plausible, disfavoring the merger. This interrelationship further favors more integrated assessment. None of these connections are identified in either the EU or U.S. merger guidelines, which treat each subject separately.

implications for both competition and efficiencies. This subsection sketches some of the important pathways, all of which present areas for further research.[32]

Rasmusen (1988) focused on entry for buyout. In particular, he showed how entry that may otherwise be unprofitable could become so if, once entry costs were sunk, a dominant incumbent firm would find it profitable to purchase the entrant in order to eliminate its competitive effects. This idea has been developed in more sophisticated models by Gowrisankaran (1999) and Mermelstein et al. (2020). They show that a tougher merger rule may be optimal precisely because it discourages such entry, which tends to be inefficient. In many simulations, such a rule raises total welfare and firms' profits—incumbents would have liked to commit not to buy out entrants and thereby deter their entry—at a modest cost to consumer welfare (consumers lose benefits of temporary competition from such entrants). Here, easier entry can favor a tougher merger policy.

As this literature makes clear, these conclusions are limited in important ways. They arise in a homogeneous goods model (where entry tends to be socially excessive), buyout premiums tend to be paid only by dominant incumbents (because otherwise there is a free-rider problem), and they will be paid only if the timing and frequency of entry is such that buyouts sufficiently protect dominance. In other settings, this sort of inefficient entry for buyout may not arise, and in yet others such entry may raise welfare, such as when it contributes to variety or innovation. Further exploration of dynamic models of entry with mergers is important but challenging.

More recently, particularly with acquisitions of nascent competitive threats in pharmaceuticals and technology, more attention has been given to the problem that mergers with recent entrants may stifle disruptive competition. Cunningham, Ederer, and Ma (2020). A recognized challenge is the difficulty of predicting what the future may bring, particularly when the entrant is acquired early in its development (it may not yet even have a marketable product). If the entrant would otherwise be nonviable, or if its contribution is primarily through a complement, such acquisitions may be efficient. Note that incumbents, on one hand, have incentives to make acquisitions early, to avoid scrutiny, but also to delay acquisitions in order to reduce their own asymmetric information (lest they repeatedly acquire start-ups that assert great promise but have little potential in fact).[33]

A further, more neglected point is that many discussions of such acquisitions take the nascent competitor's presence as given and consider the effects of an acquisition going forward. However, a restrictive regime may render entry unprofitable ex ante and more broadly will rechannel investments.[34] These ex ante effects could be the most important consequences of merger rules in this setting. It is unclear whether greater investment in complements (where merger may be permitted) than substitutes (where merger may be restricted) would be beneficial

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[32]The need of some entrants' owners to cash out is set to the side, in part because private equity markets reduce the need for mergers to accomplish this. It is possible, however, that incumbents in the entrant's sector suffer less from asymmetric information than do private equity buyers.

[33]An agency may accordingly find it optimal to approve some such mergers, wait and see what transpires, and subsequently mount a challenge if the acquisition proves to be detrimental. However, this strategy may influence the merged firms' incentives in the interim and also raises the problem of disentangling now-integrated assets (and the merging parties may accordingly act to as to make effective remedies more difficult).

[34]Compare Letina, Schmutzler, and Seibel (2020), who examine how the permissibility of subsequent acquisition affects both incumbents' and entrants' incentives for innovation, and Kamepalli, Rajan, and Zingales (2020), who suggest that a permissive regime may discourage entry if the prospect of lucrative buyouts dissuades potential customers who are subject to lock-in from dealing with entrants.

(through less focus on duplicative innovation) or detrimental (through the loss of competitive threats or potentially disruptive innovation). Although it is unlikely to be practical to assess the foregoing considerations in any depth for particular merger proposals, the optimal stringency of merger review regarding certain classes of acquisitions should in principle be calibrated with these factors in mind.

A related question concerns which incumbent firms should be permitted to acquire a particular entrant. It is familiar that, ceteris paribus, the most anticompetitive acquirer would often win the auction for the entrant because it stands to gain the most. Gilbert and Newbery (1982). Accordingly, if some acquisition would be better than none, it may be optimal to regulate which matches are permissible. Here, merger-related efficiencies may not be merger specific for one acquirer because they can be obtained at less of a cost to competition through an alternative acquisition.

On the other hand, everything else may not be equal. For example, if an entrant develops a complementary asset or process innovation, it may confer greater value in the hands of some acquirers than others, and a dominant acquirer may generate the largest synergy, creating a tradeoff with anticompetitive effects. Moreover, this possibility has ex ante implications: prospective entrants (or other existing firms) tend to have incentives to create the highest synergies only if they are permitted to partner with the incumbent who would most realize them (which may or may not be the most anticompetitive acquirer).[35] Note also that much of the analysis in this subsection presumes that an acquisition, rather than, say, industry-wide licensing, is necessary to achieve the efficiencies, a subject examined in Section 4. Finally, all of these considerations pose significant practical challenges to analysis, but progress in addressing them is important given the potentially large welfare consequences of merger policy in this realm.

6. Conclusion

Horizontal merger analysis is perhaps the most developed application of industrial organization economics in the competition policy domain, and modern merger guidelines throughout the world reflect a consensus approach. Nevertheless, shortcomings are more numerous and serious than is recognized.

To begin, the core framework—an official protocol that entails a sequential, siloed analysis of anticompetitive effects and then efficiencies—contradicts basic teachings of decision analysis as well as common sense. Nor is it a plausible guide to the collection and processing of information.[36] As an objective, consumer welfare is often regarded to be superior to total welfare on distributive grounds, neglecting that tax and transfers tend to be the dominant instrument set and that, in the long run, the two standards tend to converge (and in a manner that may often be closer to a short-run total welfare standard). The routine use of single-sector partial equilibrium analysis is a useful simplification for many purposes but can be a poor guide for policy in light of substantial distortions in many sectors of the economy.

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[35]Note, for example, that the greatest synergy may arise with a smaller acquirer that would nevertheless be outbid by a larger, more anticompetitive acquirer. In that case, prohibiting the latter merger may both reduce anticompetitive effects and increase efficiency, although the ex ante investment incentive would be smaller because of the lower buyout premium.

[36]For these reasons, it is unclear the extent to which agencies follow them internally. See note 5.

The paradigmatic regulatory approach to analyzing horizontal mergers' price effects relies heavily on market definition. Although widely recognized to be imperfect, the deficiencies are deeper and more dangerous. The method is logically incoherent: circular at best and, as ordinarily contemplated, needlessly sacrifices information so as to introduce avoidable inference error. Whether using the HMT, HHIs and ΔHHIs, and merger guidelines' thresholds or otherwise, the approach (if actually followed) is highly inapt in all core applications, conflicting with the prescriptions of standard models and generating potentially huge assessment errors.

Merger efficiencies have to be merger specific to warrant being credited in favor of a merger, but it is often overlooked that contemplated alternatives to a merger may likewise generate the merger's anticompetitive effects. Current analysis of merger efficiencies does not leverage work on the theory of the firm and organizational economics, the fields that most directly address the question of how the choice of different arrangements—contract versus merger—may matter. Along another dimension, the efficiency-credit rationalization of merger decision-making sharply conflicts with decision analysis and, to the extent it describes current practice, may generate significant decision errors in both directions, depending on the context.

Entry is another stepchild in merger analysis despite its recognized centrality to the operation of a market economy. Ex post entry is not relevant to merger analysis primarily because it might defeat a price increase: it generally will not fully do so and may be inefficient even to the extent that it does. Instead, the prospect of such entry bears on inferences about anticompetitive effects and efficiencies in light of the merging parties' rationality constraint, which is insufficiently emphasized. Ex ante entry—that induced by the prospect of subsequent mergers—has been largely ignored and can have important and sometimes surprising implications. Mergers that may extinguish nascent disruption have recently (and appropriately) received more attention, yet much analysis takes the entrants' presence as given, ignoring how the strictness of the merger regime influences ex ante incentives for entry of different types.

This article addresses the proper form of analysis, not merger policy—which depends in significant part on empirical evidence that is conflicting and not examined here. In practice, due to the complexity of the analysis and limitations on information, proxies, screens, and other shortcuts may well be needed, but it is not possible to know which are most useful without first determining what is correct in principle. Many existing protocols—that sequence analysis, use market definition to assess anticompetitive effects, and employ an efficiency credit—appear to be seriously deficient. To the extent that agencies' internal practices and tribunals' review actually follow official methodology, mergers may be significantly mis-ordered in terms of their competitive threat, and thresholds for intervention may draw the line substantially differently than intended. Future research needs to address a number of questions, including many that often are not asked and may be difficult to answer with confidence anytime soon.

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