The Pros and Cons
of Vertical Restraints

3   The Antitrust Treatment of Vertical Restraints: Beyond the Possibility Theorems

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3.1   Introduction

The appropriate treatment of vertical restraints may be the most controversial subject in antitrust. This paper argues that much of the controversy would disappear if the application of economics to vertical restraints policy followed a more scientific approach than is commonly taken.

The foundation for the antitrust treatment of mergers and contracts between firms was laid by Cournot (1838). His two models of pricing, one by firms producing substitutes and another by firms producing complements, are canonical and formed the basis for a theoretical literature on the effects of vertical practices under fixed proportions that some would say was relatively settled by the 1980s. Over the last 25 years, new tools from game theory have led to models of vertical control that challenge the 1980s Synthesis. Unfortunately, this literature is comprised mostly of *possibility theorems*, with little careful discussion of when the possibility theorems are likely to apply in practice.

There is a desperate need for an *applicability* discussion to take place. Without this discussion, practitioners motivated by private or political objectives can select from a long menu of economic models

the one that supports their position, and these positions may or may not be consistent with social objectives. The applicability vacuum also leaves well-intentioned practitioners little basis for determining how and when to intervene to achieve their objectives.

This paper takes the position that applicability should be determined by following established principles of science. Section 3.2 discusses the principles of science that I believe are appropriate for the application of economics to antitrust questions. Section 3.3 reviews the theoretical and empirical developments in the relevant science, economics, about the effects of a particular class of vertical practices – resale price maintenance (RPM), exclusive territories (ET), and forward integration by upstream firms in the fixed proportions case. While the discussion is motivated by these practices, it also touches on the role of nonlinear payments schedules and other contracting practices, as it is not possible to treat these other practices separately. Section 3.4 discusses the implications of the scientific approach for the analysis of vertical integration/restraints based on the theoretical and empirical literature. Section 3.5 concludes the paper.

3.2   Science and Antitrust

The basic approach of science is to develop theories, test them through the analysis of empirical evidence, refine or replace theories that do poorly, retest refined theories, and repeat this process perpetually, retaining as the best theory at any given time the one that is most consistent with empirical observation.[1] The branch of science

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[1] The word "theory" is sometimes reserved for hypotheses that have been successfully tested, at which point they become "theories." I follow much of the literature and ignore this distinction in this paper. I also use "theory" and "model" interchangeably. Both refer to frameworks used by scientists to describe phenomena we observe. Sometimes the term model refers to a construct within a theory that abstracts from factors that are not essential

applicable to antitrust is economics, the science consistently called on in virtually every aspect of antitrust analysis, including the development of Guidelines, the analysis of antitrust questions by staff at competition authorities, and the analysis and presentation of evidence by economic experts at trial. While some might object to calling economics a science, it unquestionably satisfies the modern definition of a science[2], it satisfies Popper's key demarcation of generating falsifiable theories,[3] and prominent members of the economics profession see themselves as scientists.[4]

Although economics is less far along in its development than, say, mechanical physics, the fundamental principles that govern its practice are no different than the principles that govern the practice of any science. In particular, the primary criterion for assessing a scientific theory is its consistency with the phenomena it seeks to

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for explaining observed phenomena. I do not make this distinction. The view taken here is that all theories in science are essentially models that do not reflect truth, but rather useful abstractions for explanation and prediction.

[2] Webster's dictionary defines a science as ``knowledge or a system of knowledge covering general truths or the operation of general laws especially as obtained and tested through scientific method.'' It defines the scientific method as ``principles and procedures for the systematic pursuit of knowledge involving the recognition and formulation of a problem, the collection of data through observation and experiment, and the formulation and testing of hypotheses.'' Economics clearly uses the scientific method as defined to develop a system of knowledge covering general truths and therefore is clearly a science by Webster's definition.

[3] Popper (1959).

[4] See, for example, http://findarticles.com/p/articles/mi_m2267/is_2_71/ai_n6157387/pg_3, http://gregmankiw.blogspot.com/2006/05/is-economics-science.html, http://kuznets.harvard.edu/~aroth/econsci.html, and http://kuznets.harvard.edu/~aroth/Plott.html.

explain. This principle is fundamental to all of science, and it applies equally well to economics.

While consistency of theory with evidence is paramount, it must be admitted that this principle is harder to apply in economics than in some of the better-developed physical sciences. There are probably two reasons for this. First, the empirical literature in some areas of economics is underdeveloped, so some theories have not been adequately tested.[5] Second, the best economic theory for a particular situation may depend on institutional details specific to the situation. To the extent the environment in an investigation differs from the environments in which empirical work has been conducted, the relevance of the empirical work for the investigation may be weakened. It is even possible that the best theory has not been developed because the specific institutional details have not previously presented themselves, in which case the most relevant theory will not have been tested.

These factors mean that policy authorities face significant uncertainty in determining which theory is likely to make the best predictions in a given case. A useful, and widely-accepted, scientific approach to decision-making in uncertain environments is Bayesian decision theory. Under this approach, the policy authority begins with a prior belief about the likelihood that a business practice is anticompetitive. This "prior" should be informed by existing empirical literature. The authority then updates this belief based on evidence gathered during the course of an investigation. Finally, the authority makes a decision based on the updated likelihood that the

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[5] A key issue is the difficulty of conducting controlled experiments. Although the use of experimental methods in economics is progressing, most empirical work still relies on the econometric (statistical) analysis of historical data. Econometric tests based on historical data are typically subject to greater uncertainty than experimental work in the physical sciences.

practice will be anticompetitive by minimizing a loss function that accounts for losses associated with type I and type II errors.[6]

In conducting the second step – updating the prior beliefs – at least two types of evidence seem relevant. First, the investigation itself may present empirical information about the likely effects of the practice. For example, if RPM was adopted because of a change in the law, its adoption may offer a "natural experiment" useful for evaluating the effects of the practice.[7] Consistent with the principles of science, I would argue that case-specific empirical evidence, such as that obtained from a good natural experiment, should take precedence over other case-specific criteria in choosing among competing theories.

Of course, good natural experiments are rare. A second type of evidence relates to the *reasonableness* of the assumptions that form the basis of the theory. This criterion is less objective than good empirical evidence because it may not be obvious which assumption is most reasonable. However, when the only theories available for decision-making have not been convincingly distinguished by empirical work, the reasonableness criterion seems useful.

Two additional factors have a role in choosing among competing theories. The first is Occam's razor, or the "principle of parsimony," which recognizes benefits from keeping theory as simple as possible. Among theories that predict equally well, the simplest is preferred. Of course, "theory should be as simple as possible, but not simpler."[8] Another factor is the *robustness* of the theory to small changes in the assumptions, especially over the set of assumptions that seem equally reasonable. Other factors equal, it seems reasonable to argue

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[6] See Cooper et al. (2005) and Heyer (2005) for discussions of the role of Bayesian decision theory in the analysis of vertical integration/restraints.

[7] This example assumes that the change in the law is exogenous, or that its potential endogeneity is treated with an appropriate econometric technique.

[8] This paraphrases a famous statement by Einstein.

that theory A is better than theory B if it is more robust to changes in assumptions that are equally plausible.

3.3 A Condensed History of Scientific Developments in the Analysis of Vertical Integration/Restraints under Fixed Proportions

3.3.1 1776-1838 – The Fundamental Theorem of Antitrust

The foundation for modern antitrust was formed concurrently with the development of modern economics, beginning with the work of Smith (1776) and Cournot (1838). The work of Cournot, in particular, implies what I like to refer to as the fundamental theorem of antitrust: *Combining substitutes is bad, and combining complements is good, unless demonstrated otherwise.*[9] Today, 170 years after Cournot's book was published, Cournot's research remains the most influential and most important work in the history of antitrust. The relevance of this theorem for the antitrust treatment of vertical restraints and integration will become clear.

The idea for which Cournot is most famous is now known as Cournot oligopoly. In this theory, two or more firms compete by independently choosing quantities. The market price is determined from an inverse demand function assumed to be decreasing in aggregate quantity. In a Cournot equilibrium (now known as a Nash equilibrium to the Cournot game), each firm chooses its quantity to maximize its profits given the quantities chosen by rivals. Since demand is downward sloping, an increase in quantity by one firm

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[9] This is intended to be a colloquial statement of the idea that in the first, simplest, and now canonical models of oligopoly, collusion (or merger) between substitutes tends to raise price, while collusion (or merger) between complements tends to lower price.

lowers the market price, reducing rivals' profits. Each firm ignores this *horizontal externality* when choosing its own quantity, so in Cournot equilibrium, aggregate quantity is higher and joint profits are lower than they would be if firms chose quantities collusively, or if a fully integrated monopolist chose all quantities.

Despite its age, the Cournot model is a pillar of modern antitrust economics. It was the first and remains the simplest rigorous explanation why horizontal mergers and collusion tend to raise price and reduce welfare. It provides the motivation for one of two classes of unilateral effects discussed in the U.S. Merger Guidelines.[10] It provides the underlying stage game for the theory of collusion that motivates the discussion of coordinated behaviour in the U.S. Merger Guidelines.[11] It underlies many of the models in the most recent rigorous survey of the theoretical literature on oligopoly, which refers to the new models as integrating "old ideas and new tools."[12]

The other idea for which Cournot is famous, though perhaps less so, is the theory of Cournot complements.[13] In this theory, two or more firms produce products that are perfect complements with each other, meaning that consumers derive benefits only if they consume the bundle of all products. The demand for each product is the same as the demand for the bundle and depends on the "full price" of the bundle, which is the sum of prices of the individual products. In the

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[10] Section 2.22 of U.S. Merger Guidelines (1997) discusses the unilateral effects of mergers among firms distinguished primarily by their capacities. The ideas in that section can be motivated by a model of Cournot oligopoly with capacity constraints.

[11] Much of the discussion of coordinated effects in Section 2.1 of the U.S. Merger Guidelines is motivated by ideas in Stigler (1964). Friedman (1971) and Green and Porter (1984), have developed models of repeated Cournot oligopoly that formalize and substantially expand on Stigler's ideas about tacit collusion.

[12] Vives (1999).

[13] Cournot complements arise frequently in the patent literature (e.g., Shapiro, 2001).

two product case, the full price is $P_F = P_A + P_B$, where P_A and P_B are the prices of products A and B respectively. In Cournot complements equilibrium, each firm chooses its price to maximize its profits given the price chosen by the other firm. Since an increase in either P_A or P_B increases the price of the bundle, it reduces demand and profits of the complementary producer. Each firm ignores this *vertical externality*[14] when choosing its price to maximize its own profits, so prices are higher and profits are lower in Cournot complements equilibrium than they would be if firms colluded, or if a fully inte-grated monopolist set all prices. Note that this is precisely opposite of the outcome that arises under Cournot oligopoly with substitute products. Under Cournot oligopoly, joint pricing raises price; under Cournot complements, it lowers price.

Despite its age, the Cournot complements model is also a pillar of modern antitrust economics. It was the first and remains the simplest rigorous explanation why conglomerate mergers between producers of complements are less likely than horizontal mergers to harm competition. It is closely related to the simplest model of vertical integration discussed below.

Cournot's canonical models are most important for the fundamental principles they imply, principles that have empirical support[15] and have stood the test of time. The fundamental insight of Cournot oligopoly is that independent pricing by rivals leads to lower prices and greater output than joint pricing, other factors equal. Although Cournot demonstrated this principle for environ-ments in which firms compete by choosing quantities, we now know that this insight is robust to whether firms compete by choosing

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[14] The rationale for calling this a "vertical" externality is that it is closely related to the externality that arises with linear pricing in the typical vertical model, as explained in more detail below.

[15] See Pautler (2003) for a survey of the empirical work on horizontal mergers. Evidence that the joint pricing of complements reduces price is found in Baron and Umbeck (1984), (1985); Shepherd (1993); Vita (2000); and Mortimer (2008).

quantities or prices.[16] The fundamental insight emerging from of the Cournot complements model is that independent pricing by producers of complements leads to higher prices and lower output than joint pricing. Although Cournot demonstrated this principle for environments in which the only strategic variable is price, subsequent work has shown that analogous results emerge when firms make independent investment decisions that enhance the value of the bundle. In such cases, firms invest less when they make investment decisions independently than when they do so jointly.[17]

The fundamental principles that emerge from Cournot's canonical models form the basis for the fundamental theorem of antitrust. I obviously think this is an important principle, or I would not have spent so much time on it. The next two subsections show that this principle remained unscathed 150 years after Cournot's work.

3.3.2 1838-1950 – The Basic Vertical Relationship

There is a close relationship between Cournot complements and the simplest vertical relationship – successive monopoly. Suppose that instead of selling complementary products to final customers, firms A and B are in a vertical relationship, with firm A producing an input used by firm B in fixed proportions to produce a final product. If A's price is P_A and B's markup over P_A is $P^R_B(P_A)$, then the full price

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[16] See, e.g., Bertrand (1883), Kreps & Scheinkman (1983), Hotelling (1929), Davidson & Deneckere (1985). It is well-known that price and quantity competition have differences that are important in some contexts. For example, quantities are normally considered *strategic* substitutes, while prices are normally *strategic* complements (See Fudenberg & Tirole, 1984, and Bulow et al., 1985). However, this difference does not affect the nature of the horizontal externality driving the result that the joint pricing of substitutes tends to raise price.

[17] See, e.g., Holmstrom (1982).

paid by consumers is $P_F=P_A+ P^R{}_B(P_A)$. Observe that an increase in either P_A or the *schedule* $P^R{}_B(P_A)$ raises the full price paid by consumers, reducing the quantity demanded of the final product, and thus reducing the demand and profits of the other component of the bundle. The nature of this *vertical externality* is qualitatively similar to the externality that arises under Cournot complements, and the effect of the externality is qualitatively similar. Note further that $P^R{}_B(P_A)$ is increasing, so that an increase in the upstream price P_A induces the downstream firm to raise its price P_B. This fact combined with the vertical externality means that the full price will be higher when firms A and B set prices independently than when they set prices jointly or if a fully integrated monopolist set both prices.

This result is generally credited to Spengler (1950), who was the first to examine successive monopoly rigorously. Spengler showed that vertical integration between successive monopolists eliminates the vertical externality ("double-marginalization"), leading to lower prices.[18]

Although Spengler did not draw the connection, the relationship between his model of successive monopoly and Cournot's model of complements is very close. In game theoretic language, Spengler's model is a game in which producers of perfect complements set prices sequentially, while Cournot's model is a game in which the

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[18] Spengler's article was motivated by what he saw as a mis-treatment of vertical integration by antitrust authorities:

"Recent decisions suggest that the United States Supreme Court is beginning to look upon integration as illegal *per se*, under the antitrust laws. It may be presumed, in so far as this inference is valid, that the Court believes that integration necessarily reduces competition "unreasonably"… Horizontal integration may, and frequently does, make for higher prices…Vertical integration, on the contrary, does not, as such, serve to reduce competition and may, if the economy is already ridden by deviations from competition, operate to intensify competition. "

same producers set prices simultaneously.[19] While these games make slightly different quantitative predictions, the nature of the externalities and the qualitative predictions are similar.

Spengler's model has three implications for vertical practices, only one of which he explained in his paper. First, vertical integration between successive monopolists eliminates the vertical externality and lowers price – Spengler's result.

Second, one can think of a two-part tariff contract with a marginal price equal to firm A's marginal cost as effectively selling firm A to firm B at a price equal to the fixed fee. This contract gives firm B the right to produce product A at marginal cost, just as if it were integrated. In the language of the modern agency literature, this type of contract makes the agent (firm B) the residual claimant to the joint profits of the principle (firm A) and the agent, so that firm B has an incentive to maximize joint profits, just as would an integrated firm. The effect of this two-part tariff is analogous to a merger between A and B – it lowers price.[20] More generally, a wide range of nonlinear

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[19] Machlub and Taber (1960) credit Zeuthen (1930) for being the first to recognize this equivalence. Formally, in the vertical model, firm A's profits are $\pi_A = (P_A - c_A)D(P_B^R(P_A))$ where c_A is firm A's marginal cost and $P_B^R(P_A)$ is firm B's reaction to P_A. Firm B's profits are $\pi_B = (P_B - P_A - c_B)D(P_B)$. In equilibrium, firm B chooses P_B to maximize π_B, and firm A chooses P_A to maximize π_A. Consider a change of variables with $M_B = P_B - P_A$ and $M_B^R(P_A) = P_B^R(P_A) - P_A$. Substituting these into the profits of firms A and B gives $\pi_A^* = (P_A - c_A)D(P_A + M_B^R(P_A))$ and $\pi_B^* = (M_B - c_B)D(P_A + M_B)$. Under this change of variables, the set of prices that maximize π_A^* and π_B^* are the same as the set of prices that maximize π_A and π_B. Note further that the former set of prices gives the solution equilibrium to the sequential complements game, with firm B's markup being its component of the price, while the latter set gives the solution to the vertical game. Therefore, the two games are equivalent.

[20] Machlup and Taber (1960) credit Henderson (1940) for this result.

contracts can be used to induce the fully integrated outcome, including quantity forcing, an all or nothing quantity offer, or volume discounts.

Third, the vertical externality arises because firm B adds an additional margin to the price of component A. Firm A can eliminate this extra margin by using resale price maintenance to constrain firm B's margin to zero. Under this constraint, firm A effectively becomes an integrated monopolist because firm B's product will be sold at marginal cost. (RPM effectively sells firm B to firm A, the flipside of using a two-part tariff to sell firm A to firm B.) The effect is again analogous to a merger between A and B, i.e., RPM lowers price.

The biggest contribution of the successive monopoly model to the literature, in my view, is to show that Cournot's insight that the joint pricing of complements leads to lower prices extends to the sequential pricing of complements that occurs between firms in a vertical relationship. The state of the scientific literature as of Spengler's 1950 paper was consistent with the fundamental theorem of antitrust. It appears that the only significant insights in the more than 100 year period between Cournot and Spengler were that integration and certain more complex contracts – nonlinear pricing and RPM – can solve the double mark-up problem.

3.3.3 1950-1984 – The Circa 1984 Synthesis (The "Chicago" Synthesis)[21]

Through the time of Spengler's paper, the literature did not systematically address the motivation for vertical restraints/ integration in situations in which either the upstream or downstream market was competitive. Thus, the literature associated with the fundamental theorem could not explain exclusive territories. In addition, Spengler's model explains price ceilings (*maximum* RPM), but it does not explain why manufacturers would impose price floors (*minimum* RPM). Indeed, in Spengler's model, a binding retail price floor would hurt the manufacturer by reducing its sales.

1. Early "Chicago School" Contributions.

Around the time of Spengler's paper, a group of economists and lawyers at the University of Chicago associated with the teachings of Aaron Director began publishing articles in law and economics journals discussing the effects of vertical integration and restraints. Bork (1954) appears to have been the first to articulate carefully the idea that an upstream monopolist selling a product used in fixed proportions by competitive downstream suppliers has nothing to gain by integrating forward.[22] The idea is that the monopolist can

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[21] I am reluctant to follow the literature and use the phrase "Chicago Synthesis" because it has wrongly come to be associated with an unscientific, "non-interventionist" view toward the antitrust treatment of vertical practices. In fact, the Chicago Synthesis is nothing more than a collection of implications of rigorous economic models of vertical control. So I will simply refer to the state of the literature at the end of the period discussed in this section as "Circa 1984 Synthesis."

[22] Bork is credited for this point by McGee and Bassett (1976), although they and Bork note that seeds of the ideas were at least partly developed by Aaron Director, Adelman (1949) and a student comment in the University

charge the wholesale price that induces the fully-integrated mono-poly price as the outcome of downstream competition. Since down-stream firms are competitive, the profits accrue to the upstream monopolist. This line of reasoning is sometimes referred to as the "one-monopoly-rent" idea, since the intuition for the result is that there is only one monopoly rent available, and the upstream firm can capture it by charging the appropriate wholesale price. There is no incentive for vertical integration or vertical restraints in this situation other than potential efficiency gains.

The work of Spengler and Bork (along with others influenced by Aaron Director) forms the basis for the early Chicago reasoning on vertical control under fixed proportions, which was as follows. A monopoly manufacturer may wish to vertically integrate or write contracts more complex than linear prices if it sells to a downstream firm with market power. Such integration, whether explicit or through contract, is efficient (because it eliminates the vertical externality). If the monopolist sells to a competitive downstream market, it has no incentive to integrate unless doing so results in cost savings. So under the early Chicago reasoning, apart from possible regulatory evasion motives or adverse horizontal consequences, vertical integration under fixed proportions (explicit or through contract) was deemed good.

2. Non-price Retailer Decisions

The early Chicago models still could not explain why manufacturers would want to use minimum RPM or ET. In a famous paper titled "Why Would Manufacturers Want Fair Trade," Telser (1960) pointed out that if retailers provide costly point-of-sale services that increase the demand for the product, and if customers can obtain these services from a retailer other than the one from whom they purchase

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of Chicago Law Review (Comment, 1952) that undoubtedly reflected Director's teachings.

the product, then unfettered retail competition causes a free-rider problem that can lead to the under-provision of services.[23] The problem is that if retailer A provides a service and charges a price that covers the cost of the service, then a rival retailer B can offer the product without providing the service at a lower price and attract customers that obtain the service from retailer A. This gives rise to what Mathewson and Winter (1984) and Winter (1993) refer to as another *horizontal externality* in models of vertical control: retailer A does not appropriate the change in total system profits that results from the cross elasticity effects of it service provision. All retailers that might provide the service face the same issue. In equilibrium, service provision ends up below the amount a fully integrated monopolist would provide, since an integrated firm would internalize the horizontal externality.

Telser pointed out that a non-integrated manufacturer can avoid this problem by imposing minimum RPM. If retailer B cannot charge a lower price than retailer A, then it cannot attract customers that obtain services from retailer A. Presumably, such customers would also purchase the product from retailer A if there were any cost of visiting a second retailer. Using minimum RPM, the manufacturer can select margins that give retailers the same incentives to produce services as a fully integrated firm, inducing them to choose the joint profit-maximizing level of service.

Note that in Telser's model, nonlinear contracts alone do not solve the horizontal externality problem, and if retailer services were not an issue and the downstream market was competitive, nonlinear contracts would not be needed either. So in the literature through Telser's contribution, the only known role for nonlinear contracts was to solve the vertical externality (double marginalization) problem.

Subsequent literature formalized the role of nonlinear contracts by examining environments with downstream oligopoly (or

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[23] Telser notes that Yamey (1954) and Bowman (1955) developed aspects of the services argument.

monopolistic competition). In such environments, linear wholesale pricing still leads to double-marginalization, albeit not as severe as in successive monopoly. An implication of the framework developed in Mathewson and Winter (1983a, 1983b, 1984) is that if oligopoly retailers compete in prices but do not make demand-enhancing investments, then *observable, take-it or leave-it two-part tariff* contracts are sufficient to induce the fully integrated outcome.[24] The idea is that an n-dimensional vector of wholesale prices is sufficient to induce the optimal n-dimensional vector of retail prices, and fixed fees (e.g., franchise fees) are sufficient to transfer surplus. In a sense, this result extends the early Chicago work regarding the effects of vertical control by a monopolist to the case of downstream oligopoly. The manufacturer does not benefit from vertical integration or other vertical restraints in this environment if observable two-part tariffs (more generally, observable nonlinear contracts) are feasible.

Mathewson and Winter (1984), and later Winter (1993), also generalized Telser's results regarding the role of vertical restraints when retailers make both price and service decisions. When retailers compete as oligopolists in such an environment, two-part tariffs are no longer sufficient to induce the fully integrated outcome. As in Telser, additional restraints are needed. Mathewson and Winter distinguish two cases, one in which a retailer's service investment affects only its own demand ("no-spillovers"), and one in which the investments increase rival demand (spillovers). When there are no spillovers, they find that exclusive territories (ET) with a franchise fee or quantity forcing (i.e., ET with a non-linear contract), or minimum RPM with a per-unit wholesale price are sufficient to achieve the fully integrated outcome. When there are spillovers, they find minimum RPM in conjunction with franchise fees achieves the fully integrated outcome, but that ET does not. Note that the spillovers case is analogous to the free-riding case that Telser focused on. In both cases, rival retailers benefit from an increase in service by a particular retailer.

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[24] See also Dixit (1983).

An extremely important implication of this literature, and one that is often forgotten in policy discussions, is that *non-price retail decisions do not have to be subject to free-riding to explain vertical restraints*. As Mathewson and Winter showed, a manufacturer has an incentive to use either minimum RPM or ET to induce demand-enhancing investments even when these investments do not spill-over to rivals, i.e., when they are not subject to free-riding. The motivation for vertical restraints arises when two conditions are satisfied: 1) retailers make costly, non-contractible decisions that affect demand (or cost, though the literature has focused on demand); and 2) retailers face competition, so that their price-cost margins differ from those of a fully integrated firm.[25] Under these conditions, the horizontal non-price externality – failure of retailers to appropriate the change in total system profits that results from their non-price decisions – will be present. Typically, this externality will cause retailers to invest less in demand-enhancing activities than would a fully integrated firm. Minimum RPM or ET can be used to give retailers a sufficient profit stream to induce them to choose the same investments a fully integrated firm would make.

Other non-contractible, non-price retailer decisions have also been shown to motivate vertical integration and restraints. RPM may be used to induce retailers to make investments in quality certification.[26] RPM may be used to influence the number retail entrants or the amount of product variety at the retail level. The idea is that the retail margin affects incentives for retailers to make the investments necessary to enter the market.[27] RPM can also be used to

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[25] Downstream competition is not required if the upstream firm also makes costly, non-contractible decisions that affect demand, in which case the situation is one of "double moral hazard" (see 2.3.4.5 below).

[26] Marvel and McCafferty (1984).

[27] For an early treatment, see Gould and Preston (1965). For rigorous economic treatments, see Mathewson and Winter (1983b), Dixit (1983), and Perry and Groff (1985). These studies focus on the retailer entry decision,

encourage retailers to hold higher inventories to avoid stock-outs in the presence of uncertain demand.[28]

The welfare effects of vertical restraints used to encourage non-price retail effort are ambiguous for reasons that are well-understood in the product selection literature. The problem is that there is no guarantee a firm with market power will choose the socially optimal level of demand-enhancing activities.[29] However, it is hard to imagine condemning vertical restraints used to increase retailer effort because of concerns that this effort might harm welfare.[30] A

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but it seems clear that a similar analysis would apply to the incentives of existing retailers to stock a manufacturer's product.

[28] See, e.g., Deneckere et al. (1996).

[29] See Spence (1975).

[30] In a recent Amicus Brief to the United States Supreme Court, Comanor and Scherer (2007) state: "The assertion that output-expanding resale price maintenance enhances consumer welfare, often cited as a defense of RPM, should be recognized as a special case not applicable under plausible conditions." This statement is technically correct for reasons that have been known since the work of Spence (1975), but it hard to see its practical relevance. Just as a firm with market power may choose a socially excessive level of demand-enhancing effort (quality, point of sale service, etc.), so may an upstream firm using RPM induce retailers to engage in socially excessive effort. However, the determination of whether effort is excessive requires *global* information on demand, including how retail effort affects *all* consumers, including the "inframarginal" consumers whose purchase decisions would not change in response to small changes in price and retail effort. It is difficult to imagine that such estimates could be developed in an antitrust investigation, and even if they could be, the prospect that they would be sufficiently precise and robust to draw conclusions about whether retail effort was too high or too low is exceptionally dim. For this reason, antitrust authorities ought not prohibit RPM on the grounds that a firm might induce socially excessive retail effort, just as they ought not (and do not) condemn firms for potentially excessive private investments.

similar argument would justify condemning investments in quality made by any firm with market power.

An important implication of this class of models is that the competitive effects of vertical integration or restraints used to motivate retail effort cannot be determined from evaluating the effects on the retail price alone. In fact, in these models, minimum RPM can raise or lower the retail price. If the additional retailer effort induced by RPM makes demand more (less) elastic, then RPM will reduce (raise) the retail price.[31]

3. Collusion

The Circa 1984 Synthesis did not imply that vertical integration or restraints could never be associated with anticompetitive behaviour, but rather suggested that anticompetitive consequences of vertical practices would arise from regulatory evasion or horizontal effects. One possible anticompetitive horizontal effect is collusion.[32]

Telser discussed one role RPM may play in helping to sustain collusion among manufacturers, now referred to as the "manu-facturer cartel theory." His main argument was that if RPM is enforced, manufacturers have less incentive to deviate from a cartel agreement because a wholesale price reduction cannot be passed on by retailers. He argues that RPM helped sustain collusion in the

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[31] Mathewson and Winter (1984) and Marvel and McCafferty (1985), (1986) all observed that RPM used to motivate retailer effort has an ambiguous effect on price.

[32] Another potential horizontal effect not treated in this paper is the foreclosure of upstream rivals through the monopolization of distribution. This type of foreclosure was recognized by the early Chicago School (see, e.g., Comment (1952), p. 613) and in the 1984 U.S. Non-Horizontal Merger Guidelines and is sometimes referred as the "two-level entry" story of harm from vertical mergers. The modern literature recognizes this as a possible effect from vertical integration, exclusive dealing, or tying when there are economies of scale in the upstream market. See Cooper et al. (2005).

conspiracies among manufacturers of light bulbs and ethyl in the early 1900s.[33] Telser's ideas about the potential collusive effect of RPM were formed without the benefit of game-theoretic literature on the requirements for successful collusion. Another argument frequently made in informal discussions, and which has recently been formalized by Jullien and Rey (2007) (discussed in more detail below), is that RPM makes it easier to detect deviations from a collusive agreement. The idea is that if retail prices are easier to observe than wholesale prices, then RPM may make it easier to detect and punish defections from a collusive agreement.

Telser also mentions what has become known as the "retail cartel theory" of RPM, which holds that retailers that cannot collude by themselves may be able to do so if they can convince a manufacturer to enforce RPM at collusive prices. This theory may have intuitive appeal, but it begs the question of why the manufacturer would want to help to enforce such a cartel, since its profits increase when retailers violate the RPM agreement. For the manufacturer to have an incentive to enforce RPM, it would have to fear retaliation for failing to do so. But if retailers can punish the manufacturer for failing to enforce RPM, it is not clear why they would not also be able to punish each other for cutting price in a cartel enforced without RPM. Thus, is not obvious what RPM contributes to retailers' abilities to enforce a retail cartel. To my knowledge, the retail cartel argument has not been examined formally in the literature.[34]

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[33] See United States v. General Elec. Co., 272 U.S. 476 (1926) and Ethyl Gasoline Corp. v. United States, 309 U.S. 436 (1940).

[34] Scherer and Ross (1990) observe that examples in which RPM facilitates cartels are few and far between. In discussing the manufacturer cartel theory, they note "[a]lthough the logic is persuasive, there are few documented cases of the use of RPM to strengthen manufacturer cartels" (p. 550). The only example they cite is the U.S. electric lamp manufacturer's cartel, and they label this a "prominent probable exception" (p. 551). In discussing the retail cartel theory, they state, "studies of numerous RPM cases suggest that only a minority, and perhaps a small minority, of the

4. State of Science through the Circa 1984 Synthesis

The fundamental theorem of antitrust remained intact through the Circa 1984 Synthesis nearly 150 years after Cournot. The state of the scientific literature was as follows. Absent cost savings, horizontal integration (through merger or contract) in concentrated markets with barriers to entry was deemed likely to be anticompetitive. On the other hand, vertical integration, through merger or contract, was deemed likely to be procompetitive. The post-Cournot developments supporting this conclusion include 1) establishing the qualitative equivalence between the Cournot complements and vertical relations (Zeuthen, Spengler), 2) allowing for different types of rivalry in the downstream market (Director/Adelman/Bork, Dixit, Mathewson and Winter), and 3) allowing for observable, nonlinear contracts offered by the manufacturer on a take-it or leave-it basis (Dixit, Mathewson and Winter). To be sure, the theories supporting these conclusions at the time of the Synthesis had not been subjected to rigorous testing; empirical work came later. However, the theories presumably were built on the set of assumptions that seemed most reasonable at the time they were developed.

It is instructive to understand the fundamental theorem by the nature of externalities that motivate it. Cournot identified the horizontal and vertical pricing externalities that explain why joint pricing by producers of substitutes raises price and joint pricing by producers of complements lowers price. One can describe the literature on vertical control over the next 150 years as examining what happens when these externalties are combined in models with a single seller distributing through multiple retailers who also face

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adoptions for particular products came as a primary consequence of organized dealer pressure" (p. 550). See Ippolito (1991) for a survey of empirical evidence from cases. She concludes that collusion theories were potentially applicable to at most 15% of the cases in her sample.

horizontal and vertical externalities relating to non-price decisions. The literature explains that a seller may use vertical restraints to internalize these externalities and achieve the same outcome it would achieve it were fully integrated.

3.3.4 1984 – Present: The Last 25 Years

Advances in the theory of vertical restraints since the Circa 1984 Synthesis have arisen from analyses that consider different assumptions about the nature of upstream and downstream competition, the contracting process, non-price retailer decisions, and the information structure. I will describe the main themes in this literature.

1.   Cost and Demand Uncertainty/Retailer Risk Aversion

Rey and Tirole (1986) examine the private and social effects of RPM, ET, and retail competition when a monopoly manufacturer offers take-it or leave-it two-part tariffs to retailers prior to the realization of demand or retail cost uncertainty. Two new aspects of vertical contracts become important in this uncertain environment: 1) risk sharing, and 2) the ability of firms to respond optimally to changes in market conditions. Rey and Tirole point out that retail competition with no restraints transfers risk to the manufacturer, but does not allow retailers to respond optimally to changes in demand. Weighing these factors, the manufacturer chooses competition when retailers are extremely risk averse because the risk sharing benefits outweigh the cost of suboptimal responses to changes in market conditions. This is also the socially optimal choice in this case. However, when retailers are risk neutral, the manufacturer imposes ET, and welfare is lower than it is under retail competition. The manufacturer prefers ET because combining it with an efficient two-part tariff allows retailers to respond to cost and demand shocks in the same way as a vertically integrated monopolist. Welfare is higher under retail

competition than ET because consumption is more responsive to cost and demand uncertainty under competition, and consumer surplus is convex and therefore increasing in the variance of consumption.

2. Strategic Motives for Vertical Integration

In the late 80's a literature emerged examining the effects of vertical mergers and restraints when there is rivalry in both the upstream and downstream markets. Salinger (1988) examined vertical mergers in a market with Cournot oligopolists at both stages of production. In this model, a vertical merger eliminates the double-marginalization distortion between the integrating firms, which tends to increase output, other things equal. A merger may or may not lead to higher input prices for non-integrated downstream firms. If it does, the net effect of the merger depends on the size of this effect relative to reduction in double marginalization. If the merger does not lead to higher input prices for non-integrated downstream firms, then it lowers the final price and increases welfare.

Subsequent work examines vertical integration by oligopolists under different assumptions about the oligopoly game at each stage. Ordover et al. (1990) model the effects of vertical integration assuming homogeneous Bertrand duopolists upstream and differentiated Bertrand duopolists downstream. They argue that integration between one upstream and one downstream firm raises final good prices. Their results have been criticized as relying on the assumption that the vertically integrated entity can somehow commit to competing less aggressively for sales to the non-integrated downstream firm in the post-merger environment. Without this assumption, the predictions of higher prices no longer hold.[35] Subsequent work related to the Ordover et al. model focuses on factors that effectively endogenize firms' abilities to commit to compete less aggressively following integration.[36]

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[35] See Reiffen (1992) and Hart and Tirole (1990).

[36] See, e.g., Choi and Yi (2000) and Chen (2001).

Reiffen and Vita (1995) examine the case of N Cournot oligopolists in the upstream market and differentiated Bertrand duopoly in the downstream market. Under linear demand, constant marginal cost, and symmetry, they find that a vertical merger: 1) decreases the final price of the integrating firm, 2) may increase or decrease the cost (input price) and/or the final price of the non-integrated rival, and 3) always raises consumer surplus. In this model, the down-ward pressure on final prices from eliminating the double mark-up more than offsets the effects of higher prices (when they arise) to non-integrated rivals. In this model, vertical integration is unambiguously good for consumers.

3. Strategic Motives for Vertical Separation and Restraints

The trade-off from vertical integration in the Salinger and Reiffen/Vita models is typical whenever upstream margins are positive, which is typical in imperfectly competitive markets. The use of nonlinear contracts can mitigate double-marginalization, but it does not necessarily eliminate it. One reason is that the mark-ups in nonlinear contracts can be used strategically by rivals to influence the competition between them. The literature on strategic agency (e.g., Ferhstmann and Judd, 1987; Sklivas, 1987; Bonanno and Vickers, 1988) compares the profitability and price effects of vertical integration versus vertical separation (purchasing from an independent supplier) when firms can write observable two-part tariff contracts with exclusive agents. Bonanno and Vickers, for example, consider the case of differentiated Bertrand competition. For this case, vertical separation typically is more profitable and leads to higher prices than vertical integration. The idea is that vertically separated firms can write observable two-part tariffs with wholesale prices above marginal cost that induce less aggressive competition by their rivals. Integrated firms, on the other hand, transfer the input internally at cost.

Drawing on work in the strategic agency literature, Shaffer (1991) and Rey and Stiglitz (1995) examined the effects of RPM (Shaffer)

and ET (Rey and Stiglitz) in an environment in which competing manufacturers sell through downstream retailers with market power. Both papers find conditions under which vertical restraints may be used to soften competition. In Shaffer, two differentiated retailers purchase from a competitive upstream market. Absent restraints, if contracts are restricted to linear wholesale prices, or if two-part tariff contracts are feasible but unobservable, the equilibrium yields wholesale prices equal marginal cost. The outcome is the same as would occur if the downstream firms were each vertically integrated. However, if observable two-part tariff contracts are feasible, the equilibrium involves slotting allowances (negative fixed fees) and wholesale prices above marginal cost, leading to higher retail prices than when slotting allowances are not allowed. The competition-softening role of slotting allowances is analogous to the role of two-part tariffs and vertical separation in the strategic agency literature, although the rents accrue to retailers instead of the manufacturers in Shaffer's model because he assumes upstream competition. Finally, if wholesale prices are unobservable but RPM is observable, equilibria exist in which RPM is imposed on one retailer, committing it charge the Stackelberg leader price. RPM softens competition between retailers, leading to higher prices. The welfare cost slotting allowances and RPM appears to be small, however. In Shaffer's linear demand example, it is always less than 3 percent for slotting allowances and always less than 1.5 percent for RPM.

In the strategic agency literature, the ability to soften competition with observable contracts requires that the downstream firms have market power. Absent market power, a contract with a higher wholesale price would not soften competition because retailers would face too much competition. Rey and Stiglitz exploit this idea and show that observable two-part tariff contracts accompanied by ET, which gives downstream firms market power, lead to softer competition than without ET. Again, the idea exploits the insights of the strategic agency literature. If retailers use two-part tariffs and wholesale prices are observable, ET softens competition. If wholesale

prices are linear, ET can lead to higher prices even if wholesale prices are unobservable, although ET is unprofitable in this case if the double marginalization problem is severe enough.

The results in the strategic agency literature are quite fragile. In Shaffer, RPM is profitable only if wholesale prices are unobservable and the retail prices specified in the RPM contracts are observable. A retailer with an RPM contract would gain if it could secretly dispense with or fail to enforce RPM. In Rey and Stiglitz, ET has no effect if firms can write unobservable two-part tariffs, and it would be procompetitive if downstream firms' strategies were strategic substitutes rather than complements (e.g., if they were Cournot competitors instead of differentiated Bertrand competitors).

4.   Contracting Externalities I – Unobservable Contracts

Hart and Tirole (1990), O'Brien and Shaffer (1992), McAfee and Schwartz (1994), and Rey and Vergé (2004) examined an environment in which manufacturers write non-linear contracts with downstream firms that are *unobservable* to intrabrand rivals. These authors find that this seemingly minor change in the contracting environment – making contracts private information – has large implications for the set of equilibrium outcomes, with potentially important implications for the effects of vertical integration and restraints.

O'Brien and Shaffer explore the role of vertical restraints by an upstream monopolist selling through differentiated Bertrand competitors. Their model is similar to that of Mathewson and Winter (1984) except that retailers do not make any non-price decisions and contracts are unobservable to rivals. In this environment, they point out that there are multiple equilibria to the take-it or leave-it game that vary according to each retailer's beliefs about its rivals' contract offers when it receives an out-of-equilibrium offer. To circumvent this problem, they define a *contract equilibrium* as a set of contracts

that are immune from profitable bilateral renegotiation.[37] Consider the contracts that induce the vertically integrated outcome. Conditional on its contract with retailer A, the manufacturer and retailer B wish to maximize their bilateral profits, which excludes the rents that accrue to retailer A. This is an example of a *contracting externality*,[38] which occurs when bilateral contracting between the supplier and one retailer affects the rents that accrue to other retailers. Here the externality causes the supplier and retailer B to negotiate a lower wholesale price than the one that would induce the fully integrated outcome. It works out that the incentive to cut the wholesale price bilaterally exists for all wholesale prices above marginal cost. The incentive to cut the wholesale price disappears when wholesale prices equal the manufacturer's marginal cost, since at that point the bilateral profit of the manufacturer and retailer B is equal to the profit of an integrated retailer B, so they behave as if they were vertically integrated (i.e., set a wholesale price equal to marginal cost and split the surplus with a fixed fee). So the unique contract equilibrium involves wholesale prices equal to marginal cost.

The rather stark conclusion from this literature is that private, bilateral negotiations of nonlinear contracts can prevent the upstream firm from exercising *any* of its market power. O'Brien and Shaffer point out that vertical restraints can solve this problem. In particular, maximum RPM can be used to set retail margins to zero, eliminating the contracting externality. Minimum RPM can also work, although as O'Brien & Shaffer explain, it has to be a commitment to an industry-wide minimum price enforced by some mechanism outside the model. Absent such a commitment, the contracting externality remains. A variant of exclusive territories, closed territory distribution, can also solve the problem if the ET

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[37] The contract equilibrium concept is due to Cremer and Riordan (1987).

[38] See Whinston (2006), Chapter 4 for a detailed discussion of contracting externalities.

contracts can be enforced.[39] ET works by preventing the rent shifting associated with lower wholesale prices, thus eliminating the contracting externality.

Other authors examine noncooperative games in different contexts in which the manufacturer makes unobservable take-it or leave-it offers and show that the contract equilibrium is equivalent to the perfect Bayesian equilibrium of the take-it or leave-it game when retailers have *passive beliefs*. Under passive beliefs, a retailer that receives an unexpected offer believes that its rivals' offers have not changed. The passive beliefs assumption has some intuitive appeal when downstream firms are Cournot competitors; in that case, the supplier has no incentive to alter its contract with retailer B if it makes an out-of-equilibrium offer to retailer A because doing so does not affect A's sales. However, with Bertrand competition in the downstream market, a new contract with B (in response to a deviant contract with A) generally does affect A's sales, and the supplier generally would want to alter its offer to B in response to a deviant offer to A. To capture this idea, McAfee and Schwartz and Rey and Vergé examine "wary" beliefs, under which a retailer that receives an unexpected offer believes that the manufacturer will change its offer with other retailers to maximize its profits given the other retailers equilibrium strategies and beliefs. Under wary beliefs, the equilibrium in the absence of restraints is not as competitive as it is under passive beliefs, but it still yields prices below the fully integrated level.

It is not difficult to show that there exist out-of-equilibrium beliefs in the take-it or leave-it game that support the fully integrated outcome. Under retailer symmetry, for example, "symmetry beliefs" (the belief that a deviate offer made to one retailer will be made to all others) leads to the integrated outcome. One can also come up with retailer beliefs that sustain equilibrium prices *above* the fully integrated price, as occurs under double-marginalization. The

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[39] See Alexander and Reiffen (2005) for a detailed discussion of enforcement issues raised by this and other motivations for vertical restraints.

dependence of the predictions of this class of models on out-of-equilibrium beliefs is clearly a weakness.[40]

5. Double Moral Hazard

Romano (1994) examines a model of successive monopoly in which both the retailer and the manufacturer make non-contractible, non-price decisions that affect demand ("double moral hazard"). In this environment, a two-part tariff alone is insufficient to induce efficient investment and pricing. If the contract makes the retailer the residual claimant, the manufacturer will under invest. If the contract specifies a higher wholesale price to increase the manufacturer's own investment incentives, it introduces double marginalization.

This model features three vertical externalities, one relating to price, and two relating to the firms' non-price decisions. RPM (sometimes maximum and sometimes minimum) typically mitigates the problem somewhat, but it does not induce the fully integrated outcome. Even with RPM the manufacturer has only a two-dimensional incentive device (the wholesale price and retail price) to control three targets of interest (upstream investment, downstream investment, and the retail price).

Romano does not examine the welfare effects of RPM in his model, but it seems clear that they would be ambiguous for the usual reasons in models that involve product selection. However, it is clear

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[40] Rey and Vergé (2004) argue that the equilibrium with wary beliefs is attractive in part because an equilibrium with passive beliefs sometimes fails to exist. On the other hand, an equilibrium with wary beliefs is not immune to profitable bilateral renegotiation of the type considered in O'Brien and Shaffer (1992). That is, in an equilibrium with wary beliefs, a retailer could make a profitable counter-offer that the manufacturer would have no incentive to refuse. In my opinion, the question of which set of beliefs is most compelling, or, more generally, the most appropriate extensive form and equilibrium concept in this class of models is unsettled. Ultimately, it is an empirical issue.

that RPM will often enhance efficiency. For example, in the special case of no downstream moral hazard, a maximum RPM contract that squeezes the retail margin to zero will eliminate double marginalization and induce the fully integrated level of upstream investment, which will often enhance welfare.

6. Price Discrimination

Chen (1999) models an upstream manufacturer charging two-part tariff contracts to downstream retailers engaged in price discrimination in the final market. If retailers sell to, say, two different classes of customers and charge them different prices, then an input contract designed to maximize the fully integrated profits would require wholesale prices that vary by customer class. However, the manufacturer typically cannot condition the wholesale price on customer class, so two-part tariff contacts alone fail to induce the fully integrated outcome. Chen shows that either maximum or minimum RPM (depending on certain parameters) increases the manufacturer's profits. RPM alters the nature of price discrimination in the retail market, which generally has ambiguous welfare effects.

7. Contracting Externalities II – Linear Price Bargaining

Dobson and Waterson (2007) examine the effects of RPM in a model in which two differentiated manufacturers negotiate linear wholesale prices with two differentiated Bertrand retailers. They compare two regimes: industry-wide RPM, and no RPM, both with negotiated linear wholesale prices. In the regime without RPM, each wholesale price remains below the level the upstream firm would choose if it had all the bargaining power, even as the intensity of downstream competition (measured by the closeness of downstream substitution) increases. In fact, with differentiated Bertrand competition, they show that each wholesale price falls to upstream marginal cost as downstream competitors become homogenous. As

in O'Brien (1989) (discussed below), this leads to retail prices below the level upstream firms would charge if they were vertically integrated, even when the downstream market is competitive. Dobson and Waterson find that when interbrand competition is weak, or when retailers have sufficient bargaining power, RPM may raise prices, especially if intrabrand competition is intense. On the other hand, if retailers have little bargaining power and intrabrand rivalry is weak, then RPM lowers prices.

Dobson and Waterson do not endogenize firms' decisions about whether to use RPM. It is an open question when RPM would emerge in equilibrium if manufacturers made these decisions independently. They also assume that the RPM contracts are fixed prices rather than maximum or minimum prices. In their model, it is clear that the RPM constraint would bind in only one direction, but we do not know when maximum or minimum RPM would be required.

In a related model, O'Brien (1989) examines an upstream monopolist bargaining over linear input prices with N downstream Cournot oligopolists. In this model, regardless of the number of downstream firms, the equilibrium wholesale price is bounded below the price the upstream firm would unilaterally set if it had all the bargaining power. That is, downstream firms retain bilateral bargaining power irrespective of the number of firms. The intuition is that a firm's bargaining power derives from its ability to impose a loss on its bargaining partner by delaying agreement. As the number N of downstream firms grows, the loss each downstream firm can impose on the upstream firm falls, but so does the loss the upstream firm can impose on the downstream firm (since downstream profits are declining in N). For N sufficiently large (greater than 2 under linear demand), the equilibrium wholesale price is below the level that would induce the fully integrated outcome. Vertical integration restores the integrated outcome, raising price.[41] In this model,

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[41] O'Brien never bothered to try to get this result published because he initially thought the assumption of linear input pricing made it unattractive. (Why would bargaining parties sign a contract that is inefficient given the

observable nonlinear contracts and maximum RPM can also restore the integrated outcome, and both raise price.

8. Formalization of Collusion Arguments

Jullien and Rey (2007) develop a repeated game model to examine formally the long-held intuition that RPM may make it easier for manufacturers to sustain collusion. Their argument is somewhat different Telser's however, as they focus on a special case in which manufacturers distribute through exclusive retailers. In this special case, a defection from a collusive RPM arrangement by cutting only the wholesale price (Telser's focus) is meaningless, as manufacturers have nothing to gain from such defections if RPM is enforced (because they cannot attract other retailers). A defection from a collusive agreement in Jullien and Rey is a defection from the agreed-upon retail price, or a decision not to use RPM at all.

The role of RPM in Jullien and Rey's model is as follows. Absent RPM, retail prices will respond not only to changes in wholesale prices, but also to changes in retailers' information about costs and demand, making it difficult to draw inferences from changes in retail prices about whether firms have defected from a collusive agreement. Under RPM, by contrast, changes in retail prices are known to be defections from the collusive agreement, so a break down in collusion easier to detect. This can make it easier for manufacturers to sustain collusion. RPM may also make it harder to sustain collusion, however, because it turns out that the short run gain from defection is higher and long run cost from defection is lower with RPM than without it. This effect arises because retailers respond more efficiently to demand shocks without RPM.

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information structure?) Twenty years later, with greater perspective on full range of abstractions made in models like this one, he is less convinced about this point.

The welfare effects of RPM in Jullien and Rey's model are ambiguous. The reason for this is that consumers prefer stable prices over fluctuating prices in the presence of demand shocks, and RPM leads to more stable, albeit higher, prices. Depending on the parameters, the benefits of the additional stability may outweigh the cost of a higher average price. However, Jullien and Rey do find that RPM reduces welfare in environments in which firms have significant market power in the absence of RPM.[42] This suggests that in the exclusive retailer case, the concern that RPM may enhance the scope for collusion is highest when firms have significant market power and the prospect for coordination is high even without RPM.

9. Empirical Literature

Through the Circa 1984 Synthesis there was very little empirical work on the effects of vertical restraints/integration. The Synthesis was primarily theoretical. During the theoretical expansion the past 25 years, however, empirical work also began to emerge, albeit at a slower pace than the theory. Ironically, this literature provides more support for the key insights of the Circa 1984 Synthesis than it does for predictions of the models developed over the last 25 years.

Cooper et al. (2005) reviewed 24 empirical papers published between 1984 and 2004 on the effects of vertical integration, RPM, and ET.[43] They make three main observations based on their review. First, there is little support in the literature for the proposition that vertical restraints or integration are likely to harm consumers.[44]

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[42] Specifically, in Jullien and Rey's linear demand example, RPM reduces welfare when the equilibrium price in the absence of RPM exceeds the midpoint between marginal cost and the monopoly price.

[43] Cooper et al. limited their review to articles in peer-reviewed economics journals.

[44] Of all the studies they examined, only one (Ford and Jackson, 1997, a study of vertical integration between cable television franchises and cable programmers) purports to find unambiguously an instance where vertical

Second, several papers find that vertical restraints/integration benefit consumers with efficiencies plausibly attributed to the elimination of double mark-ups or cost savings. Third, some studies provide at least indirect evidence that vertical restraints sometimes are used to induce the provision of demand-increasing activities by retailers. Some of these studies also find evidence consistent with both pro-competitive and anticompetitive motivations, but none find evidence consistent only with anticompetitive motivations.

Lafontaine and Slade (2005) reviewed 23 papers on vertical integration/restraints, some of which overlap with those reviewed by Cooper et al.[45] Their sample includes 15 papers on vertical inte-gration, RPM, and ET. All but two of these papers conclude that the restraints either benefit consumers or do not harm them. Two of the papers find that exclusive territories led to higher prices, but as Lafontaine and Slade point out, it is not possible to conclude that ET reduced welfare from this evidence because the higher prices could be associated with a higher level of dealer services, which were not measured in the studies. Summarizing the evidence they reviewed, Lafontaine and Slade state: "[I]t appears that when manufacturers choose to impose [vertical] restraints, not only do they make themselves better off, but they also typically allow consumers to benefit from higher quality products and better service provision... The evidence thus supports the conclusion that in these markets, manufacturer and consumer interests are apt to be aligned, while [government] interference in the market is accomplished at the expense of consumers (and of course manufacturers)."

Three recent papers provide additional evidence that firms have employed nonlinear or other contracting practices to mitigate double marginalization and have used vertical restraints to promote retailer

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integration was harmful to consumers. And in this instance, the losses are minuscule ($0.60 per cable subscriber per year).

[45] They include some papers that are unpublished and some published in law journals and books, which Cooper et al. did not review.

effort. Villas-Boas (2007) develops a structural model of demand and vertical contracting between manufacturers and retailers (super-markets) of yogurt. Using a non-nested testing procedure to select from among different models of contracting, she concludes that models that predict zero margins in the wholesale market perform better than models that involve double-marginalization. This finding is consistent with the use of nonlinear pricing to eliminate the vertical externality associated with double-marginalization.[46]

Mortimer (2008) studies the introduction of revenue sharing contracts between video distributors and retailers in the video rental industry. Prior to 1998, videos were sold via simple linear price contracts. Beginning in 1998, revenue sharing contracts were widely adopted. She finds that revenue sharing reduced prices and in-creased upstream and downstream profits by 10 percent. This is consistent with the theoretical prediction that revenue sharing mitigates the vertical externality associated with double-marginal-ization.

In a forthcoming paper, Zanarone (2009) studies the effects of a 2002 European regulation that prohibited the use of ET in auto-mobile franchise contracts in Italy. Following the prohibition, automobile manufacturers introduced standards on verifiable marketing and service inputs, such as advertising and sales people. He concludes that prior to the 2002 regulation, the manufacturers were using ET to induce the dealer services that they were compelled to specify directly in contracts after ET was banned.

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[46] The cross elasticities of demand between retailers are statistically insignificant in Villas-Boas's estimates. Thus, her finding of zero wholesale margin does not provide support for the predictions of the models with contracting externalities, as those models require retail competition.

3.4 Implications of Literature for the Antitrust Treatment of Vertical Restraints

3.4.1 A. Which Theories Provide a Basis for Antitrust Intervention?

Table 1 lists the theoretical literature on vertical integration/restraints reviewed in the preceding section. The scientific approach to the analysis of vertical integration/restraints can be viewed as determining which explanation (or set of explanations) is most consistent with the evidence in a particular case and choosing a course of action using the Bayesian decision approach.

At the outset, note that most of the theories in Table 1 explain how firms use vertical integration or restraints to increase and/or capture profits generated by their products. This is true of theories 1, 2, 3, 4a-c, 5, 7, 8, 9, and 10b. Most of these theories suggest that vertical integration/restraints are associated with potential efficiencies, such as the elimination of double marginalization, cost savings, or enhanced incentives for upstream or downstream services. However, the two theories involving contracting externalities (7 and 10b) suggest that vertical integration/restraints can raise price without any associated efficiency benefits. Do these theories provide a basis for antitrust intervention?

The contracting externality theories expose some key assumptions behind the "one-monopoly-rent" arguments of the Circa 1984 Synthesis, most importantly, the assumptions of observable, take-it or leave-it offers. The effects of vertical integration and restraints in these theories have also been called "foreclosure" by leading scholars,[47] and there is experimental evidence suggesting that contracting externalities in this class of models have relevance.[48]

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[47] See Rey and Tirole (2007).

[48] See Martin, Normann, and Snyder (2001).

However, these theories do not provide a good basis for antitrust intervention in my opinion.

The motivation for restraints in these theories is to allow the upstream firm to make the commitments necessary to maximize and capture the profits generated by its product. With the exception of actions deemed predatory or collusive, the antitrust laws have never been used in the U.S. to prevent firms from doing their best to maximize profits. Indeed, the patent and trademark system explicitly recognizes the need to protect this right in order to promote investments leading to new and better products. Firms adopt myriad pricing practices designed to maximize profits, including volume discounts, rebate programs, warranties, periodic sales, etc., many of which are known to have theoretically ambiguous effects on ex post welfare. However, these practices are not condemned by the anti-trust laws because the freedom to engage in these practices encourages investment and innovation. Similarly, the antitrust laws should not be used, in my opinion, to condemn upstream strategies designed to create or extract value, but rather should focus on practices that harm competition.[49]

3.4.2 Empirical Evidence and Prior Beliefs

Under Bayesian decision approach, prior beliefs should be guided by the empirical evidence. Based on the survey in the previous section, the empirical literature on RPM, ET, vertical integration, and non-linear contracting suggests that these practices have been used to mitigate double marginalization and induce demand increasing activities by retailers. With few exceptions, the literature does not support the view that these practices are used for anticompetitive reasons. This literature supports a fairly strong prior belief that these practices are unlikely to be anti-competitive in most cases.

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[49] See Carlton and Heyer (2008) for a similar view.

3.4.3 Case-Specific Evidence and the Reasonableness Criterion

The second step in the Bayesian decision approach to the analysis of vertical practices is to update prior beliefs based on evidence in a case. I note at the outset that all of the anticompetitive theories of vertical restraints require the presence of market power in either the upstream or downstream market. For the purposes of the discussion here, I will assume that market power exists and focus on using the evidence to determine which theory seems most consistent with the evidence conditional on the presence of market power.

In the best case scenario, the evidence would offer a natural experiment that could be used to infer the effects of the practice in question on important variables like price, industry output, and measures of demand-enhancing effort (although the latter may be extremely hard to measure). For example, if the RPM under challenge was adopted in response to an event such as a change in a state law, it may be possible to use states in which the law did not change as a control group for measuring the impact of RPM in the states where it did change. Such natural experiments, however, are rarely possible in antitrust investigations.

Cases typically present evidence about whether firms believe they benefit or are harmed by vertical restraints, but this evidence typically is not very helpful. Manufacturers who impose minimum RPM benefit whether they do so to induce non-price retailer decisions (theories 4a-4c), soften competition (theory 6b), mitigate contracting externalities (theory 7), mitigate double moral hazard (theory 8), mitigate retailer price discrimination (theory 9), or support a manufacturer cartel (theory 11a). Similarly, retailers may be worse off with restraints under theories involving non-price retailer effort, so retailer complaints are not informative.

The reality is that the primary tools the policy authority has for determining which explanations in Table 1 are consistent with the evidence is the *reasonableness* of the model's assumptions in light of the evidence. In attempting to use the reasonableness criterion for

model selection in an investigation of a vertical practice, a practitioner confronts several difficulties.

First, it is often not clear which assumptions are the most reasonable. To understand the scope of this problem, consider the class of models that assume upstream monopoly, downstream oligopoly, no important non-price decisions by retailers and manufacturers, and no uncertainty or asymmetric information. Suppose we also abstract from the potential for retail collusion. The relevant model classes are then 3 (One Monopoly Rent – Modern), 7 (Contract externalities I), and 10b (Bargaining). These models are a subset of the class "agency" models, in which a principle (the upstream monopolist) sells through multiple agents (the retailers). This is small subset of the class of all agency models, however, as the models abstract from moral hazard, uncertainty, and exogenous (non-contractual) asymmetric information.

Even within this very narrow set of agency models, however, the predictions of the theoretical literature vary wildly depending on the assumptions made about the nature of contracting. This becomes clear from considering the predictions of the models in the benchmark case without integration or restraints. If manufacturers offer observable, linear payment schedules on a take-it or leave-it basis (model 3), then the resulting retail prices are typically above the prices a fully integrated firm would charge and fall to the fully integrated prices as the downstream market becomes perfectly competitive. On the other hand, if retailers bargain over linear payment schedules (model 10b), then retail prices may be below the fully integrated prices, possibly well below. Finally, if the manufacturer makes offers that are unobservable to rivals, then theory predicts that virtually anything can happen, depending on the assumptions made about out-of-equilibrium beliefs (model 7). No compelling basis has been offered for choosing appropriate out-of-equilibrium beliefs.

The point is that even in the simplified world of an upstream monopolist distributing its products through downstream oligopolists, the theoretical literature makes wildly different predictions

based on assumptions made about the nature of input contracting. The predicted price absent restraints ranges from downstream oligopoly outcome conditional on *competitive* wholesale prices to an outcome with double marginalization and a price *above* the fully-integrated monopoly price. All the models in Table 1 below model 3 add additional complexities to the mix and thus retain the property that the predictions depend crucially on the assumptions about the nature of input contracting.

One might hope that it would be obvious which contracting assumption is most reasonable. Unfortunately, this is not the case. Consider the question of whether contracts are observable to rivals, an assumption that is crucial in many of these models. Note that this question cannot be answered simply by asking the firms in the industry. The models that rely on this assumption are abstractions that collapse complicated dynamic processes into simple two-stage games. Even if contracts are signed in private, are they effectively inferred quickly enough to reasonably be treated as observable? If treating them as observable leads to equilibria in which firms would have incentives to secretly renegotiate, should we treat them as unobservable? The question is not whether contracts are observable, but rather which observability assumption works best in the particular abstraction (model) that is used. Ultimately, this is an empirical question, but the relevant empirical work has not been carried out.

Two related issues bear on the difficulties of using the reasonableness criterion. First, the theoretical literature has tended to evaluate the incentives for and effects of integration/restraints relative to bench-marks that do not involve any integration or restraints. However, one would expect a firm constrained from using its most preferred restraint to adopt an alternative in an attempt to mimic the prohibited restraint. For example, Zanarone (2009) finds that firms responded to a ban on ET by adopting retail service standards. Similarly, vertical integration is often a substitute for vertical restraints; exclusive territories are sometimes a substitute for RPM; revenue sharing contracts mitigate double marginalization

(Mortimer, 2008) and may be a substitute for maximum RPM or vertical integration. The potential for firms to respond to antitrust challenges by adopting alternative restraints complicates the use of the reasonableness criterion. What benchmark should be used?

Second, the theoretical literature also tends to focus on models that abstract from one set of issues to focus specifically on another set. For example, the literature on non-price retailer decisions typically assumes upstream monopoly, abstracting from the effects of upstream rivalry. An implication of this path in the development of the theory is that there are many gaps in the literature. For example, I am not aware of any published papers that that explore the effects of RPM and ET in a model with both upstream and downstream oligopoly in an environment in which firms write observable, buyer-specific, nonlinear contracts (row 12 in Table 1).[50] To my knowledge, there are also no papers that explore the motivation and effects of vertical restraints when both non-price retailer decisions and upstream competition are important (row 13 in Table 1). We do not know the conditions under which vertical restraints arise in equilibrium in such environments, nor do we know whether they enhance or suppress competition.

One could go on and on about the difficulties of using the reasonableness criterion for model selection in the antitrust treatment of vertical restraints and integration given the current state of the literature. The bottom line is that we simply must accept that the literature has not progressed to the point where the

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[50] Rey and Vergé (2008) have begun to explore this issue theoretically in a model with duopoly at both stages. They show that there exists an equilibrium in observable two-part tariffs with RPM that sustains the monopoly outcome. It is hard to evaluate the welfare effects of RPM in their model, however, because 1) there are multiple equilibria, and the upstream and downstream firms have different preferences over them; and 2) they have not characterized the full set equilibria in the absence of RPM. Without RPM, a pure strategy equilibrium in which both retailers stock all products often fails to exist.

reasonableness criterion advances the ball very far in these investigations.

3.5   Conclusion

The theoretical literature on RPM, ET, and forward integration from Cournot through the Circa 1984 Synthesis implies a largely benign view of the effects of vertical restraints/integration, consistent with what I have called the fundamental theorem of antitrust ("combining substitutes is bad and combining complements is good, unless demonstrated otherwise"). The empirical literature over the last 25 years largely supports this theorem, at least with respect to the statement about complements. The theoretical literature on vertical practices over the past 25 years has generated numerous possibility theorems regarding the possible effects of vertical practices. However, possibility theorems without more do not provide a good basis for policy. Neither the empirical literature conducted to date, nor an evaluation of this literature based on the reasonableness of model assumptions, offers a compelling rejection of the implications of the Circa 1984 Synthesis.

The models that support the Circa 1984 Synthesis incorporate the horizontal and vertical pricing externalities first studied by Cournot, as well as non-price externalities of a similar nature. These models are relatively simple and make straightforward predictions. Developments following the Circa 1984 Synthesis include the recognition of contracting externalities and strategic effects designed to soften competition. These factors complicate the models significantly, and the predictions of these models do not seem to be robust across the set of reasonable assumptions about the nature of input contracts. Given what we know now, a preference for parsimony and robustness would not support putting a lot of weight on the predictions of models of vertical control that incorporate contracting externalities and strategic effects of the type discussed in this paper. This does not mean that these factors are not important.

The point is that we do not know enough to give these factors significant weight.

Given the state of the literature, a scientific approach to policy regarding vertical restraints/integration would challenge these practices under two circumstances: (1) direct evidence of likely harm in a specific case, e.g., a natural experiment that suggests that the practice will be harmful; or (2) a belief that the loss associated with committing type II error (failing to condemn an anticompetitive practice) would be very large relative to the cost of committing type I error (wrongly condemning a pro-competitive practice). There is no empirical basis for such a belief. Thus, my own view, based largely on a Hippocratic philosophy of non-intervention absent good evidence that intervention will have benefits, is that direct evidence of likely harm should be required before condemning a vertical practice. If there were a Hippocratic Oath among antitrust practitioners, this is where a scientific approach would lead.

Table 1: Theoretical Literature on RPM, ET, and Vertical Integration under Fixed Proportions.

Label/ Market Structure	Benchmark Contracts	Non-price Decisions	Information Structure	Representative Literature	Key Results
1. Successive Monopoly Upstream Monopoly Downstream Monopoly	Linear payment schedules Observable offers Take-it or leave-it offers	Retailer: None Mfgr: None	No uncertainty Symmetric information	Cournot (1838) Zeuthen (1930) Spengler (1950)	**No Restraints:** Double marginalization; retail price above the fully integrated price. **Restraints:** Vertical integration, nonlinear contracts, or max RPM eliminates double marginalization, lowers price. **Welfare Effects of Restraints:** Positive
2. "One Monopoly Rent"- Original Upstream Monopoly Downstream Competition	Linear payment schedules Observable offers Take-it or leave-it offers	Retailer: None Mfgr: None	No uncertainty Symmetric information	Director ('40s-'50s) Comment (1952) Bork (1954)	**No Restraints:** Linear contracts achieve the fully integrated out-come. **Restraints:** The only motivation for integration or restraints is to reduce production or transaction costs.
3. "One Monopoly Rent" - Modern Upstream Monopoly Downstream Oligopoly	Linear payment schedules Observable offers Take-it or leave-it offers	Retailer: None Mfgr: None	No uncertainty Symmetric information	Dixit (1983) Mathewson & Winter (1984) Perry & Groff (1985)	**No Restraints:** Double marginalization; retail prices typically above fully integrated prices. **Restraints:** Nonlinear contracts or max RPM with linear contracts achieve the fully integrated outcome. **Welfare Effects of Restraints:** Ambiguous; often positive.

Label/ Market Structure	Benchmark Contracts	Non-price Decisions	Information Structure	Representative Literature	Key Results
4.a. Retailer Non-Price Decisions – services/ effort, with free riding Upstream Monopoly Downstream Competition/ Oligopoly	Linear*/ Two-part tariff payment schedules Observable offers Take-it or leave-it offers *Telser / Marvel & MaCafferty	Retailer: Demand-enhancing services, with free-riding, or spillovers Mfgr: None	No uncertainty Symmetric information	Telser (1960) Mathewson & Winter (1983a), (1984) Mavel & McCafferty (1984) Perry & Porter (1990)	**No Restraints:** Margins too low to induce fully integrated service level. **Restraints:** Min RPM or ET with franchise fees gives retailers incentives to invest in services, restores fully integrated outcome. **Welfare Effects of Restraints:** Ambiguous; often positive.
4.b. Retailer non-price decisions – services/ effort, no free-riding	Two-part tariff payment schedules Observable offers Take-it or leave-it offers	Retailer: Demand-enhanc-ing services, no free-riding or spillovers Mfgr: None	No uncertainty Symmetric information	Mathewson & Winter (1984) Winter (1993)	**No Restraints:** Retail competition yields margins too low to induce the fully integrated service level. **Restraints:** Min RPM or ET gives retailers incentives to invest in services, and restores the fully integrated outcome. **Welfare Effects of Restraints:** Ambiguous; often positive.
4.c. Retailer non-price decisions – product variety/ entry/ inventory Upstream Monopoly Downstream Oligopoly	Linear/Two-part tariff* payment schedules Observable offers Take-it or leave-it offers *Perry & Porter considered both	Retailer: Entry decision Inventory decision Mfgr: None	No uncertainty Symmetric information	Gould & Preston (1965) Dixit (1983) Perry and Groff (1983) Perry and Porter (1990) Deneckere et al. (1996)	**No Restraints:** Equilibrium may involve double marginalization and too much or too little product variety. **Restraints:** Two-part tariffs and/or RPM (sometimes max, sometimes min) leads to fully integrated outcome. **Welfare Effects of Restraints:** Ambiguous; often positive.

Label/ Market Structure	Benchmark Contracts	Non-price Decisions	Information Structure	Representative Literature	Key Results
5. Cost or Demand Uncertainty/ Retailer Risk Aversion Upstream Monopoly Downstream Oligopoly	Two-part tariff contracts Observable offers Take-it or leave-it offers	Retailer: None Mfgr: None	Cost and demand uncertainty at time of contracting Retailer risk-aversion Retailers observe cost and demand when pricing	Rey and Tirole (1986)	**No Restraints:** Retail competition with no restraints transfers risk to the manufacturer and yields efficient responses to cost uncertainty, but does not respond optimally to demand uncertainty. **Restraints:** When retailer risk aversion is low, ET is used to induce optimal responses to retail cost and demand shocks. **Welfare Effects of Restraints:** ET reduces welfare because consumer surplus is increasing in the variance of consumption.
6.a. Strategic Motives – Vertical Integration Upstream Oligopoly Downstream Oligopoly	Linear payment schedules Observable offers Take-it or Leave-it Offers	Retailer: None Mfgr: None	No uncertainty Symmetric information	Salinger (1988) Ordover et al. (1990) Reiffen and Vita (1994) Choi & Yi (2000) Chen (2001)	**Integration:** In general, vertical integration can have two opposing effects. It can eliminate double marginalization between integrating firms, and it may reduce effective competition for sales to nonintegrated downstream firms. **Welfare Effects of Integration:** Ambiguous.

Label/ Market Structure	Benchmark Contracts	Non-price Decisions	Information Structure	Representative Literature	Key Results
6.b. Strategic Motives – Vertical Restraints Upstream Competition /Oligopoly Down-stream Oligopoly	Linear/ Two-part tariff payment schedules* Obser-vable/ Unobservable offers** Take-it or leave-it Offers *Found-ational literature assumes two-part tariffs; Shaffer and Rey & Stiglitz consider both. **Results depend on what is observable.	Retailer: None Mfgr: None	No uncertainty Symmetric information	*Foundations:* - Ferhstman & Judd (1987) - Sklivas (1987) - Bonanno & Vickers (1988) *Applications:* - Shaffer (1991) - Rey & Stiglitz (1995)	**No Restraints:** Up-stream competition leads to competitive wholesale prices. Retail prices equal those of integrated, differentiated Bertrand retailers. **Restraints:** *Slotting Allowances and RPM (Shaffer):* - Slotting allowances with observable wholesale prices lead to wholesale prices above marginal cost, softening competition. - Min RPM may be used to soften competition when i) slotting allowances are infeasible, or ii) RPM is observable, wholesale prices are not. *Exclusive Territories (Rey & Stiglitz):* - Under linear contracts, ET softens competition but exacerbates double mark-ups. Profitability depends on the size of these effects. When ET is used, it raises prices. - Under observable nonlinear contracts, ET softens competition and leads to higher prices. **Welfare Effects of Restraints:** Slotting allowances, RPM, or both together raises prices reduces welfare relative to the linear price benchmark. ET raises prices and reduces welfare relative to the linear and non-linear benchmarks.

Label/ Market Structure	Benchmark Contracts	Non-price Decisions	Information Structure	Representative Literature	Key Results
7. Contracting Externalities I Upstream Monopoly/ Oligopoly Down-stream Oligopoly	Nonlinear payment schedules Unobservable offers Take-it or leave-it offers/ bargaining	Retailer: None Mfgr: None	No uncertainty Symmetric cost and demand information Private contract information	Hart & Tirole (1990) O'Brien & Shaffer (1992) McAfee & Schwartz (1994) Rey & Vergé (2004) Alexander & Reiffen (2005) Rey & Tirole (2007)	**No Restraints:** Outcome depends on details of the game (solution concept, game form). *1. Contract Equilibrium (O'Brien & Shaffer), or Take-it or Leave-it Offers with Passive Beliefs (Hart & Tirole, McAfee & Schwartz).* Marginal transfer prices equal upstream marginal cost. Retail prices are less than fully-integrated prices. *2. Take-it or Leave-it Offers with Wary Beliefs (McAfee & Schwartz, Rey & Vergé).* Marginal transfer prices exceed upstream marginal cost, but are too low to induce the fully integrated outcome. *3. Take-it or Leave-it Offers with Symmetry Beliefs (Rey and Tirole).* If retailers are sym-metric, two-part tariff contracts achieve the fully integrated outcome. *4. Take-it or Leave-it Offers with Suspicious Beliefs (Unpublished).* Retailers may refuse to agree to anything but linear prices out of fear that rivals will receive low offers and be very aggressive. The outcome may be analogous to double marginalization. **Integration/Restraints:** *1. Contract Equilibrium/-Passive Beliefs Bench-mark.* A vertical merger between the upstream

Label/ Market Structure	Benchmark Contracts	Non-price Decisions	Information Structure	Representative Literature	Key Results
7. Contracting Externalities I…continued. Upstream Monopoly/ Oligopoly Down-stream Oligopoly	Nonlinear payment schedules Unobservable offers Take-it or leave-it offers/ bargaining	Retailer: None Mfgr: None	No uncertainty Symmetric cost and demand information Private contract information	Hart & Tirole (1990) O'Brien & Shaffer (1992) McAfee & Schwartz (1994) Rey & Vergé (2004) Alexander & Reiffen (2005) Rey & Tirole (2007)	firm and one downstream firm raises the wholesale prices charged unintegrated down-stream firms. Final prices rise (Hart & Tirole). Industry-wide min RPM, max RPM, and ET can recover the fully integrated outcome, (O'Brien & Shaffer). Enforceability of min RPM and ET are questionable (Alexander & Reiffen). *2. Other Beliefs.* Vertical integration eliminates the wholesale margin, mitigating double-marginalization. The integrated firm may also raise prices to unintegrated down-stream firms. The net effect is ambiguous. Sufficient vertical restraints may raise or lower retail prices, depending on out-of-equilibrium beliefs. **Welfare Effects of Integration/Restraints:** *1. Passive beliefs.* Integration/restraints lowers ex post welfare by allowing the upstream firm to make commitments required to exercise its market power. *2. Other beliefs.* Effects of integration/ restraints are ambiguous; depends on out-of-equilibrium beliefs.

Label/ Market Structure	Benchmark Contracts	Non-price Decisions	Information Structure	Representative Literature	Key Results
8. Double Moral Hazard Upstream Monopoly Down-stream Monopoly	Linear payment schedules Observable offers Take-it or leave-it offers	Retailer: Demand-enhanc-ing service Mfgr: Demand-enhanc-ing service	No uncertainty Symmetric information	Romano (1994)	**No Restraints:** Equilibrium wholesale price balances externalities associated with double marginalization, upstream effort, and downstream effort. **Restraints:** Max or min RPM, depending on the size of the double marginalization and upstream and down-stream service exter-nalities, increases the manufacturer's profit. RPM induces greater service provision up-stream and/or down-stream while minimi-zing the effect of other output-reducing externalities. **Welfare Effects of Restraints:** Generally ambiguous. Often positive.
9. Mitigate Distortions from Price Discrimi-nation by Competing Retailers	Two-part tariff payment schedules Observable offers Take-it or leave-it offers	Retailer: None Mfgr: None	No uncertainty Retailer has private information about sales by customer class.	Chen (2002)	**No Restraints:** Two-part tariffs are insufficient to control the full set of discriminatory prices charged by downstream firms. **Restraints:** Max or min RPM move closer to integrated outcome. **Welfare Effects of Restraints:** Ambiguous, for reasons related to the ambiguous effects of price discrimination.

Label/ Market Structure	Benchmark Contracts	Non-price Decisions	Information Structure	Representative Literature	Key Results
10.a. Contracting Externalities II – RPM Under Linear Price Bargaining Upstream Oligopoly Down-stream Oligopoly	Linear payment schedules Observable offers Negotiated linear wholesale prices	Retailer: None Mfgr: None	No Uncertainty Symmetric information	Dobson and Waterson (2007)	**No Restraints:** Under differentiated Bertrand competition upstream and downstream, the negotiated transfer price is decreasing in the degree of down-stream competition (closeness of substitution). As down-stream firms become perfect substitutes, the wholesale price falls to marginal cost, leading to the competitive outcome, even when upstream firms have market power. **Restraints:** When interbrand competition is weak, or when retailers have sufficient bargaining power, RPM may raise prices, especially if intrabrand competition is intense. If retailers have little bargaining power and intrabrand rivalry is weak, then RPM lowers prices. It is unclear whether RPM is min, max, or fixed. **Welfare Effects of Restraints:** Difficult to evaluate because the authors do not model manufacturers' decisions whether to adopt restraints. It appears that RPM would be profitable in at least some cases in which it raises prices. It is unclear how much is due to the commitment effect and how much is from a strategic effect.

Label/ Market Structure	Benchmark Contracts	Non-price Decisions	Information Structure	Representative Literature	Key Results
10.b. Contracting Externalities II – Vertical Integration Under Linear Price Bargaining Upstream Oligopoly Down-stream Oligopoly	Linear payment schedules Observable offers Negotiated linear wholesale prices	Retailer: None Mfgr: None	No Uncertainty Symmetric information	Thesis: O'Brien (1989) Working Paper: O'Brien (2002)	**No Integration** 1. Under Cournot oligopoly, if the number of downstream firms is high enough, the equilibrium price is below the fully integrated price. (O'Brien, 1989). 2. As conduct in the downstream market becomes more competitive, the equilibrium wholesale price falls to marginal cost. (O'Brien, 2002). **Vertical Integration:** If the number of downstream firms is high enough (greater than 2 for linear demand and symmetric bargaining weights), or if downstream conduct is sufficiently competitive, vertical integration raises the equilibrium price. **Welfare:** Vertical integration reduces ex post welfare by allowing the upstream firm to make commitments necessary to exercise its market power.

Label/ Market Structure	Benchmark Contracts	Non-price Decisions	Information Structure	Representative Literature	Key Results
11.a. Collusion – Mfgr Cartel Upstream Oligopoly Down-stream: Each mfgr sells through sequence of different exclusive retailers	Two-part tariff payment schedules Unobservable offers Take-it or leave-it offers	Retailer: None Mfgr: None	Final demand is uncertain at time of contracting Retailers observe demand shocks before pricing	Jullien and Rey (2007)	**No Restraints:** Repeated interaction in two-part tariffs generally leads to some degree of tacit coordination. **Restraints:** RPM makes it easier to detect defections from a collusive agreement, but the short run gains from defection are higher and the long run cost from defection is lower under RPM than without it. RPM may or may not enhance the scope for collusion. **Welfare Effect of Restraints:** Generally ambiguous, although RPM reduces welfare if it is adopted when the scope for collusion is high in the absence of RPM.
11.b. Collusion – Dealer Cartel Upstream Oligopoly Down-stream Oligopoly	No formal literature	No formal literature	No formal literature	No formal literature	No formal literature

Label/ Market Structure	Benchmark Contracts	Non-price Decisions	Information Structure	Representative Literature	Key Results
12. Mfgr Oligopoly/ Retail Oligopoly	Non-linear payment schedules Bargaining or take-it or leave-it offers Observable offers	Retailer: None Mfrg: None	No uncertainty Symmetric information	Working paper: *Rey and Vergé (2008) *They explore the case of take-it or leave-it offers by manu-facturers	**No Restraints:** Pure strategy equilibria often fail to exist when retailers are imperfectly competitive and decide independently whether to carry their products. **Restraints:** Multiple equilibria exist, one of which sustains the fully integrated outcome. **Welfare Effects of Restraints:** ??
13. Non-price Retailer Effort and Manu-facturer Oligopoly Upstream Oligopoly Downstream Oligopoly	Linear/ Non-linear payment schedules Observable offers Take-it or leave-it offers	Retailer: Demand-enhanc-ing services Mfgr: None	No uncertainty Symmetric information	No formal literature	**No Restraints:** ?? **Restraints:** ?? **Welfare Effects of Restraints:** ??

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