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# Uncertainty, Efficiency, and the Brokerage Industry

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## I. The Problem

The purpose of this article is to examine the socially efficient class of brokerage-fee rules. It is a commonly observed phenomenon that real estate brokers charge a fee of about 6 percent of the sale price on private homes.[1] The tendency for the brokerage fee to increase with the price of the item sold has been observed in other markets as well.[2] There is, however, no reason to expect that a 6 percent rule, or any other class of rules where the brokerage fee is not fixed independently of the price of the property, is efficient; for it costs no more to sell a relatively expensive piece of property than to sell a relatively inexpensive one.[3] There has also been considerable speculation that the traditional brokerage-fee arrangement is anticompetitive. The argument, which is that brokers are engaging in price discrimination by charging the owners of expensive houses more

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[1] See, for example, Bruce Owen, Kickbacks, Specialization, Price Fixing, and Efficiency in Residential Real Estate Markets, 29 Stan. L. Rev. 931, 947 (1977).

[2] For example, the usual brokerage fee for a lease on a rent-stabilized apartment in Manhattan is one and one-half months' rent. For commercial real estate, the standard brokerage fee on a lease is 3 percent of the rental value of the lease.

[3] It may cost somewhat more to show a twenty-three-room house than to show an eight-room house, but it probably does not cost three times as much. There are other costs involved that are unrelated to the sale price: making trips out to the house, listing the house in the appropriate ways, contacting prospective purchasers, and arranging for financing. Furthermore, depending on the locations of the two houses, an eight-room house in a desirable location may sell for more than a twenty-three-room house in an undesirable one, or the twenty-three-room house might cost ten times as much as the eight-room house.

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for the same service, is largely based on the observation that the brokerage fee is an increasing function of the price of the property sold.[4] It does not follow, however, that the brokerage industry is anticompetitive just because the brokerage fee is an increasing function of the price of the property, because a brokerage fee that increases with the sale price is consistent with a competitive market.

In addition, the contingent brokerage-fee contract plays an important role in ensuring that brokers provide the agreed-upon effort. The broker is the owner's agent and has the agent's usual incentive to shirk. The contingent contract provides the broker with an interest in making the sale and, therefore, reduces shirking. Furthermore, the owner, by using a multiple listing service to sell the house, may be able to eliminate shirking entirely.

## II. The Intuitive Solution

A partial answer to the question, Why do brokerage fees generally increase with the price of the property sold? comes from recognizing that ownership is costly and that the total cost of ownership is directly related to the duration of ownership. Consider a builder who has borrowed $100,000, at an interest rate of 12 percent a year, to build and subsequently to sell a house for $125,000, which is going to take one year to build. If the builder sells the house at the end of the year, he will make a profit of $13,000.[5] If, however, it takes an additional three months for him to sell the house, his profit will be $10,000.[6]

The cost to the builder of owning the house is not only a function of the interest rate and the length of time it takes to sell the house; it is a function of the price of the house as well. The lost interest income, assuming that the borrowing and lending rates are the same, is proportional to the price of the house, where the constant of proportionality is the interest rate. Therefore, the cost to the builder of owning the house is an increasing function of its selling price, of how long it takes to complete the sale, and of the rate of interest.

The builder, by selling the house one month earlier, would save the monthly interest cost. Thus the builder would be willing to pay up to the monthly interest cost, which is directly related to the price of the house,

[4] See Owen, *supra* note 1, at 947 n.109, 948 n.111.

[5] This is not an economic profit, but a return to the builder on his investment.

[6] With a discount rate of 12 percent, the present value of $10,000 three months from now is $9,704. Thus, the present value of the builder's profit is $296 more if he sells the house today instead of three months later.

to sell the house one month earlier.[7] There is, however, no market where the rapidity with which a house is sold can be purchased directly. The demand for brokerage services is indirectly the demand for such a service.

The more time and effort a broker dedicates to selling any one particular house, by contracting and showing the house to potential purchasers,[8] the higher is its probability of sale. A broker's time, like anyone else's, is limited and valuable. Thus the broker must allocate his time and effort among the houses he is trying to sell. Because the interest income gain from an earlier sale is directly related to price received, the demand for brokerage services is greater, the greater is the selling price. Therefore, an owner would purchase more brokerage services, the more expensive is the property to be sold.[9] This implies that the contingent brokerage fee would be an increasing function of the price of the house. This result is based only on the demand for brokerage services. It is not based on the assumption that it costs more to sell more expensive houses, nor is it based on the assumption that brokers have monopoly power.

## III. The Formal Solution[10]

In order to model the provision of brokerage services, the following assumptions are made. Time is assumed to be in discrete units, and in

[7] In the example, the builder would be willing to pay an additional $1,250 to sell the house one month earlier. Compare a second house, which is being sold for $250,000, to the original. The monthly interest cost on this house would be $2,500, and the builder would be willing to pay up to $2,500 to sell this house one month earlier. If there were a market where the builders could directly purchase the time it takes to sell their houses, the first builder would choose the level of services for which a sale one month earlier cost $1,250, whereas the second builder would choose the level of services for which a sale one month earlier cost $2,500. Assuming that the marginal cost of selling the house one month earlier increased as the selling time decreased, then the second builder would contract for more services than the first builder.

[8] The broker expends both time and money to sell the house. In order to make a sale, the broker has to contact potential purchasers and take them to see the house. If the potential purchasers are still interested, then the broker might get involved in negotiations between the potential buyer and the owner.

[9] According to this view, the broker is assumed to be a middleman bringing the willing buyer and seller together. The broker is not, in the colloquial sense of the phrase, a good salesman: someone who can talk a client into buying what he does not want. Instead, any increased effort by the broker takes the form of showing the house to more prospective buyers, who decide for themselves whether or not to purchase the house. Conceptually, the broker can be viewed as reducing information costs by providing both buyers and sellers with information about the housing market.

[10] This section is based in large part on William M. Landes & Richard A. Posner, Salvors, Finders, Good Samaritans, and Other Rescuers: An Economic Study of Law and Altruism. 7 J. Legal Stud. 83 (1978). In their paper, Landes and Posner develop a one-period model to

each period the house is either sold or it is not sold. The probability that the house is sold in any period, $p$, is a function only of the services provided in that period. In the language of statistics, the trials are independent. The builder is assumed to contract with a single broker for a certain level of services to be provided until the house is sold.[11] These assumptions imply that the sale of the house can be modeled by a Bernoulli process.[12] The builder is interested in the waiting time for the first success, which can be modeled by a geometric distribution. Denoting the geometric probability function by Pge, the probability of the first success occurring in period $n$ is given by

$$\text{Pge}(\tilde{n} = n|p) = q^{n-1}p, \tag{1}$$

where $q = 1 - p$. Denoting the mean waiting time by $E(\tilde{n})$, it can be shown that the mean waiting time is the inverse of the probability of a success at any trial:

$$E(\tilde{n}) = 1/p.$$

Furthermore, assume that the real estate industry can be modeled by an urn with a large number of balls representing prospective buyers, labeled success and failure.[13] The number of balls that can be drawn from the urn

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explain court-determined fees for rescues. In this article, a model with an infinite number of periods is constructed. The notation of Landes and Posner is used to facilitate comparisons. There is another, much larger literature to which this essay is also related. This is the literature on innovation. The multiperiod model of an owner trying to sell a house is similar to some multiperiod models of inventors trying to develop new technologies. For a good survey of the literature on innovation, see Morton Kamien & Nancy Schwartz, Market Structure and Innovation (1982).

[11] This model presents the problem facing the owner each period. The optimal strategy for the builder is the same each period. This follows from the assumption of independence, which led to the modeling of the waiting time for the first success by a geometric distribution. The geometric distribution has the property that the probability that a random variable is greater than or equal to $i + j$, given that it is greater than $i$, is the unconditional probability that it is greater than or equal to $j$. What this means is that just because a builder has already observed $i$ successive failures does not change the distribution of the number of trials required to obtain the first success. Therefore, regardless of how long the house has been on the market, the optimal strategy is the same each period until the house is sold. This assumption is relaxed in Section IV, where the price of the house is treated as a variable. The model developed in this section also assumes that the contract between the builder and the broker to provide a level of brokerage services can be easily enforced by the builder. This assumption is relaxed in Section IV, where the effect of the form of the brokerage contract on broker performance is discussed.

[12] A good survey of the statistical techniques used in this article is contained in Alexander Mood, Franklin Graybill, & Duane Boes, Introduction to the Theory of Statistics (3d ed. 1974).

[13] The assumption that the trials are independent is given meaning by letting the sampling be done with replacement or by assuming that the urn is so large that the distortion from sampling without replacement is small.

each period is an increasing function of the expenditure on brokerage services. Thus the probability of a success in any given period is an increasing function of the number of balls drawn from the urn.[14]

The builder is assumed to operate by initially borrowing enough money from a bank to cover all of the construction and related expenses of building the house. The house is built without a commission; instead, the builder intends to sell the house on the market. Once the house is sold, the builder will pay off the loan, pay the broker the fee, and deposit any remaining money from the sale in the bank. In order to make the problem tractable, all builders and brokers are assumed to be risk neutral.[15]

The following notation will be used throughout this article. Let $y$ be the level of brokerage services, which can be measured either in broker-hours dedicated to selling the house or in prospective buyers who view the house in a single period. Let $v$ be the average price for a unit of brokerage service, which is to be provided continuously until the house is sold. Thus, $vy$ is the builder's payment to the broker for services contingent upon the sale being made. Finally, $c$ is the broker's cost of providing one unit of brokerage service for one period.[16]

The probability that the broker will make the sale and earn his fee in the next period, assuming that he has not yet sold the house, is $p$. Thus, because the contingent fee is paid only once the sale has been made, the expected present value of the contingent brokerage fee, $F$, is given by the geometric series

$$F = pvy + (1 - p)(pvy)/(1 + r) + \dots + (1 - p)^i(pvy)/(1 + r)^i pvy + \dots, \tag{2}$$

where $(1 - p)^i p$ is the probability today that the house will be sold in period $i + 1$, and $(1 + r)^i$ is the discount factor that equates flows in period $i$ to flows in the current period. The expected present value of the contingent brokerage fee, $F$, is the sum of the above geometric series, which is given by equation (3):

$$F = pvy(1 + r)/(p + r). \tag{3}$$

The broker will expend $y$ units trying to sell the house each period at a cost of $c$ a unit. Therefore, the broker's expected outlay is given by the

14 Let $m$ be the proportion of balls labeled failure and $k$ the number of balls drawn from the urn each period. The probability that all of the balls drawn from the urn in a single period will be failures is $m^k$. Thus, the probability of at least one success is $1 - m^k$.

15 This assumption is relaxed in Section IV, where the form of the contract between the builder and the broker is discussed.

16 In order to simplify the calculations, brokerage services are assumed to be provided at constant marginal cost.

infinite series

$$cy + (1 - p)cy/(1 + r) + \ldots + (1 - p)^i cy/(1 + r)^i + \ldots . \quad (4)$$

The expected present value of the broker's expenses, $C$, is the sum of this series:

$$C = cy(1 + r)/(p + r). \quad (5)$$

The expected present value of the broker's profit, $B$, is the difference between the expected present value of the contingent brokerage fee, $F$, and the expected present value of the broker's expenses, $C$:

$$B = pvy(1 + r)/(p + r) - cy(1 + r)/(p + r). \quad (6)$$

A profit-maximizing broker will offer a contract specifying a contingent fee and a level of service such that equation (7) holds:

$$dB/dy = [(p + r) - yp_y][pv - c]/(p + r) + p_y y[v + p(dv/dp)] = 0, \quad (7)$$

where $p_y$ denotes the derivative of $p$ with respect to $y$. Competition among brokers and free entry, which imply zero expected profits, force each broker to internalize the effect of an increase in the level of services on the probability of success by reducing the unit price of the service. Thus, to maintain expected price equal to marginal cost, which is necessary to obtain a contract, the broker must offer in response to an increase in $p$ a compensating decrease in $v$. Formally, setting equation (6) equal to zero implies that $pv - c = 0$.[17] Thus, equations (6) and (7) together imply that

$$dv/dp = -v/p. \quad (8)$$

Therefore, as the probability of sale increases, builders will pay a lower price for each unit of brokerage services purchased.

The loss to the builder from a later sale is the sum of the additional interest paid on the original loan and the interest income forgone on the builder's profit. Assuming an infinitely durable house with no costs of maintenance,[18] this loss is just the rental value of the house over the period prior to its sale.[19] If the probability of selling the house in any

[17] This can be seen by dividing both sides of equation (6) by $y(1 + r)/(p + r)$.

[18] This assumption is made for simplicity. Assuming the house is not infinitely durable would complicate the mathematics but would not change the main result: the optimal brokerage fee would still be an increasing function of the price of the house.

[19] For a discussion of the relation between price and rental value when the property is not infinitely durable, see Peter Swann, Durability of Consumption Goods, 60 Am. Econ. Rev. 884 (1970).

period is $p$ and the one-period rental value is $l$, then the expected interest loss, $L$, is given by the following infinite series:

$$L = (1 - p)l + (1 - p)^2 \, l/(1 + r) + \ldots + (1 - p)^i \, l/(1 + r)^{i-1} + \ldots . \tag{9}$$

The one-period rental rate is assumed to be constant over time. The term $(1 - p)^i$ is the probability that the house has not been sold after $i$ periods. Thus, the expected present value of the rental loss is given by equation (10):

$$L = l(1 + r)(1 - p)/(p + r). \tag{10}$$

From Coase's theorem and competition, it follows that the builder and broker will together minimize the discounted sum of the expected interest loss and the cost of the brokerage services provided. Denoting this total cost by $TL$, the social problem can formally be written as

$$\min_y TL = \min_y \, [(1 - p)l + cy][(1 + r)/(p + r)]. \tag{11}$$

Differentiating equation (11) with respect to $y$, and setting the resulting expression equal to zero, yields the first-order necessary condition for a maximum:

$$-p_y l(1 + r) + c(p + r) - p_y cy = 0. \tag{12}$$

The first term in equation (12) is the expected gain from an earlier expected sale when the level of brokerage services is increased. This gain is directly related to the rental value of the house. The last two terms are the expected increase in the cost of providing the higher level of brokerage services; this cost is independent of the rental value. Equation (12) implies that expected total costs are at a minimum when an additional unit of brokerage services will reduce the expected interest loss just as much as it will increase the expected brokerage cost. The optimal level of brokerage services for the builder to contract for, call it $y^*$, must be a solution to equation (12).

The second-order sufficiency condition is derived by differentiating the first-order necessary condition, equation (12), with respect to $y$. In order for the value of $y$ that solves equation (12) to be a minimum, the second-order sufficiency has to be positive when evaluated at $y^*$. Thus, for $y = y^*$, equation (13) must hold:

$$-p_{yy} l(1 + r) - p_{yy} cy > 0. \tag{13}$$

The effect of an exogenous change in the rental value on the equilibrium level of brokerage services is determined by an application of the implicitfunction theorem. Totally differentiating the first-order necessary condition, equation (12), and rearranging terms yields:

$$-p_y(1 + r) + \{[-p_{yy}l(1 + r)] - p_{yy}cy\}dy^*/dl = 0. \qquad (14)$$

The term in braces in equation (14) is the second-order sufficiency condition, equation (13). The second-order sufficiency condition is positive when evaluated at $y^*$, and the first term in equation (14) is negative. Thus,

$$dy^*/dl > 0,$$

which is to say that the equilibrium level of brokerage services is an increasing function of the rental value of the house. This is because the marginal value of an additional level of brokerage services is an increasing function of the rental loss. Therefore, the owner of a more expensive house will contract for a higher level of brokerage services.

The equilibrium probability of making the sale in a single period is also an increasing function of the rental value. Formally,

$$dp/dl = (dp/dy^*)(dy^*/dl) > 0. \qquad (15)$$

Thus, because the mean waiting time is the inverse of the probability of a success in any trial, the equilibrium expected waiting time is lower, the larger the rental value. Therefore, the model predicts that, on average, more expensive houses will spend less time on the market.[20]

The contingent fee received by the broker is $vy$. It can be shown that if

[20] This result, that on average more expensive houses will spend less time on the market, depends heavily on the assumption that the probability of sale depends only on the level of services. There are several reasons to believe that the probability of sale is also a decreasing function of the price of the house. First, because there is more variability in expensive houses than in inexpensive houses, it is probably more difficult to match buyers and sellers of expensive houses. Second, over some range the market becomes thinner as prices rise. As a result, expenditures, such as for newspaper advertisements, will reach fewer potential purchasers when they are for more expensive houses. Thus, advertising expenditures may be less effective for expensive houses. Third, because the price and the value of a house are not the same, there may be a tendency for low-priced houses to be underpriced and thus easy to sell, and for high-priced houses to be overpriced and thus difficult to sell. For these reasons, the probability of sale may not depend on the level of brokerage services alone but also on the price of the house. If the probability of sale were a decreasing function of the price of the house, as well as an increasing function of the level of services, the model would be more complicated. In general, assuming the function $p_y$ were not changed in the relevant range, then expensive houses would have relatively larger contingent brokerage fees, but they could have longer waiting times than inexpensive houses. The point of the article is not that expensive houses are sold faster than are inexpensive houses, but that owners of expensive houses have an incentive to pay higher contingent fees in order to induce brokers to provide more services. As a result, the average waiting time for expensive houses is shorter than it would otherwise be. Assuming that brokerage services are relatively less effective for expensive houses only makes the main result, that equilibrium expected waiting times vary directly with the price of the house, easier to prove.

the contingent fee is less than half of the sale price of the house, then the brokerage fee will be an increasing function of the brokerage services employed.[21] Differentiating the contingent brokerage fee with respect to the level of services yields

$$d(vy)/dy = (dv/dp)p_y y + v = -(v/p)p_y y + v = v(1 - e), \quad (16)$$

where $e = p_y y/p$ is the elasticity of the probability of sale in the current period with respect to the brokerage services provided. The result that the contingent fee is increasing in the level of services in equilibrium implies that in equilibrium $e$ is less than one. This result is used to derive a number of other results.

An exogenous increase in the rental value will increase the contingent brokerage fee. Formally,

$$d(vy)^*/dl = [d(vy)^*/dy^*](dy^*/dl) = v^*(1 - e^*)dy^*/dl > 0. \quad (17)$$

The expected present value of the contingent fee is increasing in the rental value. At $y^*$ the expected present value of the contingent fee must be increasing in the level of brokerage services, for if this were not true, the present value of the total loss could be reduced by increasing the brokerage services. Therefore, the expected present value of the contingent fee is increasing in the rental value. Formally,

$$d[vy(1 + r)/(p + r^*)]/dl = \{d[vy(1 + r)/(p + r)^*]/dy^*\}\, dy^*/dl > 0. \quad (18)$$

Thus, both the contingent brokerage fee and its expected present value are increasing functions of the price of the house. The expected total level of services devoted to selling the house is an increasing function of the rental value. Formally,

$$d(y/p)^*/dl = (1/p)(1 - e)dy^*/dl > 0. \quad (19)$$

Thus, in equilibrium, increasing the level of services by, say, 10 percent will reduce the expected waiting time by less than 10 percent. Therefore, if there are two builders who differ in that the rental value of the house built by the first exceeds the rental value of the house built by the second,

[21] The argument is as follows: in order for the builder's profits to be at a maximum, the discounted expected value of the contingent brokerage fee must be increasing in the level of services provided. Now assume that an incremental increase in the level of brokerage service raises the present value of the brokerage fee, but because it reduces the expected waiting time, the amount of the contingent fee actually declines. From the assumption that the owner's share of the sale exceeds the broker's share, increasing the level of brokerage services must increase the present value of the difference between the sale price and the brokerage fee. Therefore, at a maximum, the contingent brokerage fee must be an increasing function of the level of services provided.

then in equilibrium the first will hire more units of brokerage service, have a higher probability of sale, have a shorter expected waiting time, pay a larger fee with a larger expected present value, and when the houses are sold pay a lower price for each unit of service.

Denoting the broker's share of the sale price of the house by $S$, the broker's equilibrium share of the sale price is given by equation (20):

$$S = rcy/pl. \tag{20}$$

The effect of an exogenous increase in the rental value on the broker's share of the sale is ambiguous. Formally,

$$dS/dl = (rc/pl)[(1 - e)dy^*/dl - y/l], \tag{21}$$

which cannot be unambiguously signed. Thus, as the price of the house increases, the broker's contingent fee increases. Without further specifying the relation between the service provided and the probability of sale, it cannot be determined whether the broker's share of the sale price is increasing or decreasing with the sale price of the house.

## IV. Discussion

In the preceding section, I showed that the optimal contract between a broker and a seller has the seller paying a larger fee the more expensive is the property. In this section, I examine the factors that tend to cause houses to come onto the market at the optimal price with the optimal level of services devoted to their sale. In addition, the advantages of a contingent contract over a fee-for-service arrangement are examined. In order to discuss these issues, it is first necessary to draw a distinction between the price and the value of a house, a distinction which has so far been ignored. Clearly, the value of a house is determined by its physical characteristics, including the neighborhood where it is located, as well as the tastes, incomes, and situations of potential purchasers. On the other hand, the price of the house is simply the amount of money the eventual purchaser pays for the house. Given a house, and an initial level of brokerage services, the higher the asking price for the house, the fewer people will be willing to pay the price.[22] Thus, given the house and the level of brokerage services, the higher the asking price, the longer is the expected waiting time for the sale.[23]

[22] Conceptually the urn can be viewed as containing many balls with different numbers on them. These numbers are the reservation prices of different buyers for the same house. The higher the asking price, the fewer buyers will have a reservation price above the asking price and, thus, the lower will be the proportion of successes.

[23] See Saul Levmore, Efficient Markets and Puzzling Intermediaries, 70 Va. L. Rev. 645, 663–68 (1984).

Given a price-fee schedule for the market, the broker will try to sell the house below the price that maximizes the builder's expected profits subject to zero profits in the brokerage industry. In this way, the broker will be able to earn a positive expected profit. If the broker then expends the usual amount of services for houses being sold at the lower asking price, the builder's house will have an unusually large probability of sale.

Even if each builder hires only one broker, if each builder first receives bids from a number of competing brokers stipulating the contingent fee and the selling price of the house, then the house will go on the market at the price that maximizes the expected present value of the builder's profit. Thus, if the first broker suggests a selling price below the optimal level with the standard fee for that selling price, a second broker can suggest a higher price with the standard fee for that price. The second broker, as long as he bids a price below the optimal level, can both earn positive expected profits and offer the builder a higher expected profit than if the builder accepts the first offer. This, however, as is usually the case in these stories, is not the end. Brokers will have expected profits as long as the selling price is below the optimal level. Thus, the competitively offered package will converge to the optimal package.

The analysis when the suggested selling price exceeds the optimal price is similar. No broker would be willing to sell the house above the optimal price for the standard fee, because his expected profits would be negative. If a broker tried to sell the house at a price above the optimal level in a package in which his expected profits were positive, then a second broker could offer to sell the house at a lower price and at a fee that would yield him positive expected profits as well as increasing the builder's expected profits. This process will also converge to the optimal combination of the price and the contingent fee. Thus, the system in which brokers bid for the right of being the sole broker for a house by offering combinations of price and fee will lead to houses coming on the market at the efficient price. The importance of the above result is that a builder, even if he does not know what is the optimal price for his product, will find his house coming onto the market at the optimal price.[24]

The second issue is whether brokers will apply the optimal level of services or shirk. To discuss this issue, the assumption that the builder

[24] The builder, however, will have to know something about the brokerage industry, specifically, how long it will take on average to sell the house. This is because the builder and the broker are not simply interested in their price and fee but in their present values. If time were not a factor, then the builder would choose the broker who made the bid with the greatest difference between the selling price and the contingent brokerage fee. If sellers ignore this effect, they will tend to charge too high a price for their houses and take too long to sell them.

can perfectly and costlessly monitor the broker's activity must be relaxed. Thus, the builder can no longer enforce a contract that sets the level of services. Instead, the builder can only set the contingent fee. One broker alone dealing with a builder with an already agreed-upon price-contingent fee combination will have an incentive to shirk, that is, to employ less than the agreed-upon level of services in selling the house. This is because the broker does not get the entire sale price when he sells the house, but only his fee.[25]

It is, thus, through competition among brokers, or enforcement by the builder, that the agreed-upon services will be provided.[26] The multiple listing system ("MLS"), where a substantial part of the fee is earned by the broker who sells the house, is one mechanism that reduces shirking.[27] With an MLS, once a house has been listed by a broker, all of the brokers who subscribe to the list can compete to sell the house. If the prearranged split is efficient—neither the listing nor the selling broker receives too much or too little—the brokers will have the appropriate incentives to bring the house on the market at the optimal price and to expend the optimal level of services trying to sell it.[28]

The contingent fee is not the only form the contract between the broker and the owner could take. An alternative is to have the owner pay the broker directly for the services.[29] There are several reasons why a contingent contract would be preferable to a fee-for-service arrangement. The first reason is risk aversion.[30] There is a random element that affects when

[25] The broker with an exclusive contract would like to maximize his profits. Formally, the broker's problem can be written as $\max_{y} (pvy - cy)/(p + r)$, where $vy$ is constant.

[26] There are a number of factors that could reduce shirking by brokers with exclusive contracts. First, there is direct monitoring by the seller. Second, a broker who gets a reputation for shirking will have difficulty getting exclusive contracts in the future.

[27] According to Owen, a typical arrangement among members of an MLS is to allocate 75 percent of the fee to the selling broker, 20 percent to the listing broker, and 5 percent to the MLS itself. Owen, *supra* note 1, at 946 n.104.

[28] With a multiple listing service, a member broker will expend resources on selling a listed house up to the point where the expected brokerage fee just equals the cost of providing the service. Denote by $y^*$ the optimal level of services and by $v^*$ the corresponding unit price. A member broker would be willing to spend up to $y$ units on selling the house, where $y$ is given by $(y/y^*)pv^*y^* - cy = 0$. Simplifying, the above equation implies $pv^* - c = 0$, which holds at a social optimum.

[29] An analogy can be drawn to the contract between a lawyer and his client. The contract between a personal injury lawyer and his allegedly injured client can have the client pay the lawyer directly for his services, or the lawyer can be given a share of the final award. In the latter case, if there is no award, the lawyer receives nothing. The lawyer's contingent-fee contract is similar to the standard brokerage contract.

[30] Risk aversion was ignored in the model presented in the third section. In that model, in order to facilitate the calculations, both brokers and owners were assumed to be risk-neutral.

the house is sold.[31] The broker is in a better position than the owner to diversify this risk because the broker can pool the risk of a long wait with many houses. With a contingent contract, the owner does not transfer the entire risk to the broker but only a portion of the total risk. The owner still has the risk from the rent forgone.[32]

A second reason to believe that a contingent contract is efficient is based on agency costs. With a fee-for-service arrangement, the broker has little incentive to make the sale. The broker would prefer that a potential buyer not purchase the house so he can continue to provide services, rather than that a sale be made so he can earn his fee. Once a buyer and seller have been found and a sale seems likely, a broker working for a contingent fee has an incentive to try to facilitate the sale. If the sale falls through the broker has to continue working to earn his fee, which will not be any larger. With a fee-for-service arrangement, the broker will stop earning money from the client when the sale is made. Thus, the fee-for-service arrangement leaves the seller and broker with divergent interests in completing the sale.

Third, a fee-for-service arrangement does not lend itself to a multiple listing system, which is one market mechanism to discourage shirking. If the owner could efficiently monitor the level and quality of services provided by the broker, there would be no shirking regardless of the form of the contract. Because monitoring is expensive, shirking is a potential problem. A contingent fee reduces the incentive for the broker to provide little service or low-quality service.

The model presented in this article has an interesting implication for the

[31] The formula for the variance in the length of time for a sale to occur for a given value of $p$ is $q/p^2$.

[32] A perceptive, anonymous referee observed that sellers with an optimal contract face a diversifiable risk because of the variance in the waiting time for the first success. The referee was thus led to ask why brokers do not insure owners against a long wait by purchasing the houses that are offered for sale and selling them themselves. Although brokers could diversify the risk from late sales by concentrating their wealth in the local housing stock, they would subject themselves to the risk of a decrease in the value of the housing stock. In addition, there are tax reasons that would make it more costly for brokers to own the houses they sell. First, under the old tax law, short-term capital gains were taxed at a higher rate than long-term capital gains. Brokers, who would frequently sell their houses within six months, would have been subject to the higher short-term capital gains rates. Second, in many instances, a sale with a leaseback to the original owner will create taxable income. With owner-occupied housing, the value of the housing is not included in taxable income. When the occupant is a renter, however, the rental payments are included in the owner's income. Although the owner gets a depreciation deduction when the house is rented, that deduction is often less than the rent. See Marvin A. Chirelstein, Federal Income Taxation para. 1.03 (3d ed. 1982). Therefore, it is not so clear that there is a profitable, albeit unexploited, opportunity for brokers to insure sellers against the risk of a late sale by directly buying and selling houses.

asking prices set by owners of occupied and unoccupied houses. In the case of owner-occupied housing, the loss is not as easily specified as it is with occupied housing. When the house is occupied, there is a subjective component that must be included: the value of the house to the occupant. This value will not be constant across owners, even if tastes are constant, as long as circumstances differ. The relevant loss is now equal to the old loss less the value of the house to the resident owner.[33]

It can be shown that the prices charged by owners of occupied houses will exceed the prices charged by owners of unoccupied houses. An owner of a house can be assumed to set a price and select a level of brokerage services. The probability of a sale is an increasing function of the level of services and a decreasing function of the price. For owners of occupied houses, because their loss is not the rent forgone but the difference between the rent forgone and the value of the house to the owner, raising the price of the house costs the owner less the more he values the house. Thus, the more the owner values the house, the higher the price he will charge.

In today's highly mobile society, most of the houses sold each year are not new, unoccupied houses but houses occupied by their owners. This does not mean that the paradigm of the unoccupied house is necessarily inappropriate for the market in general. As a rule, 25 percent of income is spent on housing. Thus, an individual who is offered a job in another region that starts at his convenience with a 25 percent increase in pay (this percentage increase expected to continue) will find himself in the same situation as the builder. Alternatively, an individual who is offered a job starting immediately that increases the present value of his income stream by enough to cover the cost of relocating, which includes the cost of selling the old house, will be in the same position as the builder. If these two examples represent the majority of sales, the model will still be appropriate.

## V. Conclusion

The model using the unoccupied builder's house as a paradigm is based on the realization that the ownership of property entails costs, regardless of whether the services of the property are being enjoyed. These costs vary directly with the price of the property. Thus, the gains from selling the property sooner vary directly with the price of the property. By increasing the level of services, the probability of selling the house sooner can be increased. Therefore, the investment in selling the house, the

[33] If the house is rented to a third party, its value to its owner is just the rent.

contingent brokerage fee, varies directly with the selling price of the house. Consequently, it does not follow that brokers are engaging in monopolistic price discrimination just because the brokerage fee is an increasing function of the selling price.

This article has not established the efficiency of the 6 percent rule or any other straight percentage rule; it has argued only for the efficiency of a rule that is an increasing function of the rental value. This result was derived assuming that both the cost and the effectiveness of brokerage services were the same for all houses on the market.

In addition, competition among brokers to list and to sell houses will result in houses coming on the market at optimal prices and with the optimal amount of brokerage services dedicated to their sale. Finally, the formal model presented here is not specific to the American, private residence housing market. It is applicable to any market in which both buyers and goods are unique and sales occur at uncertain dates so that there are gains from search. Thus, the formal model can be applied to a variety of markets where brokers are used.

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