The Control of Extemalities in Sports Leagues: An Analysis of Restrictions in the National Hockey League

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This paper provides one of the few successful demonstrations of the efficiency of certain types of restrictions in the context of a joint venture. The joint venture we examine is the National Hockey League (NHL) in the 1980s, which was then composed of 21 separately owned teams. (It now has 30 teams.) The restriction we analyze is the NHL rule on franchise relocation. Before one can fully understand the effect of the restriction, one must understand the theory of how sports leagues operate and whether sports leagues have any market power that can be enhanced by such a restriction. After providing such a theory, we empirically test the effect of the NHL restriction on franchise relocation. Aside from data availability, the advantage of our time period is that television was then an unimportant source of rev-

We thank William Daley, Bingham Leverich, William Landes, Gregory Pelnar, Sherwin Rosen, and Andrew Rosenfield for helpful discussions and comments. This study originated as a Lexecon consulting project for the National Hockey League with regard to the litigation over the potential move of the St. Louis Blues to Saskatoon. We thank the NHL for permission to use the data. The results of the study reflect the opinions of the authors only. This paper is dedicated to the memory of our dear friend, Sherwin Rosen. We thank the referee and Steven Levitt for helpful comments.

[*Journal of Political Economy*, 2004, vol. 112, no. 1, pt. 2]
 0022-3808/2004/112S1-0010$10.00

enue for the NHL. Thus we are able to isolate a particular externality arising from how the NHL finances teams.

I. Introduction

Lester Telser's 1960 paper on fair trade spawned a theoretical literature on the potential procompetitive effects of certain types of contractual agreements that, at first glance, appear to restrict competition but in fact can sometimes promote it. There has been a smaller but related literature on the efficiency of joint ventures in which competing firms cooperate (see, e.g., Carlton and Klamer 1983; Carlton and Salop 1996). Here too, what initially may look like a suppression of competition can actually benefit consumers. While the theoretical literature has been growing, the empirical literature has been sparse. Part of the problem is undoubtedly the difficulty of obtaining the necessary data. But another part is the difficulty of finding statistically significant effects from the restriction or joint venture. By their very nature, the efficiency effects of these restrictions among independent firms may be hard to find. If the efficiency effects were very large (and hence easy to detect), the efficiencies from integration into a single firm in many cases would likely outweigh the cost of enforcing restrictions among independent firms.[1] It follows, therefore, that the most likely restrictions one observes among otherwise independent firms are those that will tend to have small effects that are inherently hard to detect.

This paper provides a rare successful demonstration of the efficiency of an apparent competitive restriction in the context of a joint venture. The joint venture we examine is the National Hockey League (NHL) in the 1980s, which was then composed of 21 separately owned teams. (It now has 30 teams.) The restriction we analyze is the NHL rule governing franchise relocation. Before one can fully understand the effect of the restriction, one must understand the theory of how sports leagues operate and whether sports leagues have any market power that can be enhanced by such a restriction. After providing such a theory, we empirically test the effect of the NHL restriction on franchise relocation. Aside from data availability, the advantage of our time period is that television was then a relatively unimportant source of revenue for the NHL. Thus we are able to isolate an externality arising from how the NHL finances teams.

Although interesting as examples of joint ventures, sports leagues are

[1] One cost of enforcing restrictions among independent firms is the possible litigation resulting from antitrust suits. Bittlingmayer (1985) argues that the antitrust laws raised the cost of agreements between independent firms and were responsible in part for the wave of horizontal mergers around 1900.

also of interest because they raise current public policy issues. An early Supreme Court decision has exempted baseball from the antitrust laws.[2] Legislation designed to exempt sports leagues from various aspects of the antitrust laws has been proposed from time to time.[3] The logic of the proponents of such exemptions is that a sports league, by its very nature, is a cooperative venture and that certain activities—which may be necessary for its survival—should not be subject to challenge under the antitrust laws.

The courts also have recognized that sports leagues are joint ventures and that the "rule of reason" rather than a "per se" rule should generally be applied in judging the legality of league activities.[4] However, the legal decisions—especially regarding team relocations—have been inconsistent.[5] For example, one court found that the NHL did not violate the antitrust laws when it prevented the Oakland, California, team from moving to Vancouver.[6] Another court, however, ruled that the National Football League's (NFL's) refusal to allow the Oakland team to move to Los Angeles was a violation.[7] In light of these uncertainties, professional sports leagues often petition Congress for legislative resolution of their legal liabilities under the antitrust laws

The proper resolution of these issues affecting sports leagues is not to be taken lightly. Aside from the importance of properly treating joint ventures under the antitrust laws, the specific resolution of the relocation decision will affect cities that often vie for the right to have a sports franchise on the belief that the presence of such a franchise bolsters the city's image and provides significant economic benefit.[8]

This paper is organized as follows. Section II discusses the theory of a sports league and investigates whether a sports league in general, and the NHL in particular, should be considered to have market power, and, if so, in what markets. It uses this analysis to interpret the rationale for various mobility restrictions on NHL teams. Section III presents the

[2] Federal Baseball Club v. National League 259 US 200 (1922). This exemption was modified by congressional action in 1998 to lift the exemption on labor relations.

[3] See, e.g., the Sports Broadcasting Act of 1961 (15 U.S.C. 1291–95) and 105.H.R. 3817 (1998).

[4] The "rule of reason" permits a court to balance the procompetitive and anticompetitive effects of an activity. The "per se" rule refuses to look at any procompetitive effects if the activity belongs to a particular class of activities deemed undesirable (e.g., price fixing).

[5] For a survey of the antitrust issues facing sports leagues, see the special sports issue of *Antitrust* (Spring 2000) and Fisher, Maxwell, and Schouten (1999). See Fisher et al. (2000), Goldfein (2000), and Ross (2000) for issues related to team relocation. For an economic analysis of restrictions related to labor, see Rosen and Sanderson (2001).

[6] See, e.g., San Francisco Seals Ltd. v. National Hockey League, 379F. Supp., 966 (C.D. Cal 1974); see also St. Louis Convention and Visitors Commission v. NFL, 154F 3d 851 (1998).

[7] Los Angeles Memorial Coliseum Commission v. National Football League, 726 F 2d 1381 (1984).

[8] See Quirk and Fort (1997) for a discussion of these issues.

empirical tests that identify the externality that a moving team imposes on the other teams and shows how the mobility restrictions control this externality.

II. Theory of a Sports League and Its Market Power

A. *Theory*

Before we address whether a sports league has market power, we first explain how a sports league operates and the many different markets in which it is involved. A sports league is a joint venture of independent firms whose cooperation is essential if the league is to produce a desirable "product"—games (and, more generally, a championship race).[9] Members of a league must agree on obvious matters such as rules and schedules but also might want to agree on exclusive territories, procedures to transfer franchises, hiring practices, division of revenues (gate plus broadcast), and admission of new members.

A distinguishing characteristic of sports leagues is that the value of one franchise can depend positively on the value-enhancing actions of other franchises. This means that, to a point, an improvement in the quality of one franchise can increase the value of all the other franchises. The presence of Michael Jordan on a team, for example, has famously drawn larger crowds for all National Basketball Association (NBA) teams. Competitive balance may also be important. Past a certain point, further improvements in the quality of a single team relative to other teams may diminish the value of the league as a whole. It is these potentially complex externalities that may account for many of the restrictions that sports leagues place on their members. The size of the externalities and the conflicts they create will depend, in part, on how the league divides its revenues. For example, during the time period of our study, in the NBA and the NHL, the home team kept 100 percent of the gate receipts, whereas in baseball and football, the gate was shared between the home and visiting teams.[10] The particular gate-splitting formula will affect the incentives for home teams to develop their team and promote it locally, the incentives for the away team to generate

[9] Perhaps partly in response to antitrust rules and uncertainty facing sports leagues, some recent leagues, e.g., major-league soccer, have been formed with all teams owned by a single corporation, thus reducing conflicts among owners and potential future antitrust exposure should the new league later acquire market power (see, e.g., *Pittsburgh Bus. Times* 1997). Some argue, however, that joint ownership itself reduces the value of the resulting product to consumers (see, e.g., Ackman 2001).

[10] In the NFL, the split was 60–40, with the home team getting the larger share. In baseball, the split was 80–20 in the American League and 90–10 in the National League, again with the home team getting the larger share.

high away attendance, and the ability of the sports league to achieve competitive balance.

Because sports leagues differ slightly from one another and because this paper analyzes data for the NHL, we carry out our discussion in terms of the NHL. Two important traits of the NHL during the time period of our study are that teams gathered their gate revenues during the season exclusively from home attendance (100 percent of the gate going to the home team) and that there was relatively little broadcast revenue, especially when compared with football and baseball. During the period of our study, the NHL had 21 teams, each of which was the only NHL team in its metropolitan area with one exception (the densely populated New York–New Jersey area had and still has three teams). Teams have territorial exclusivity at least in part for the same economic reasons that distributors in other industries often have exclusive territories.[11] Granting a property right to a team in its area gives the team an incentive to develop and promote hockey in its area and then to reap the benefit of its efforts either through increased gate receipts (which in the NHL during the time period of our analysis were all kept by the home team) or through increased local broadcast revenue (which was typically not very large for U.S. teams in the NHL during the time period of our analysis).

Without territorial exclusivity, one team might "free-ride" off the promotional efforts of another. Because of the territorial exclusivity, each NHL team may have some short-run market power in the setting of ticket prices for hockey games. Of course, any such market power will be constrained in part by alternative entertainment opportunities, such as other sporting events and movies, and by the possibility of entry by another professional hockey league. Again, any consciously created market power provides an incentive for the local NHL team to promote hockey in competition with these alternative entertainment expenditures. Courts sometimes mistakenly assume that such short-run market power necessarily implies harm to consumers. In the short run, entry might erode the market power and lower prices. If removal of territorial exclusivity also eliminates important incentives for teams to maintain investments that justify the initially higher price, however, then removal of exclusivity could permit free riding and may not benefit consumers in the long run.

The NHL can also be regarded as a producer of NHL franchises. The NHL decides how many franchises to have and where to put them. The league grants a franchise in a particular area and allows locational trans-

[11] The efficiency effects of placing a second team in a metropolitan area can be complicated to analyze. Aggregate interest in a sport among fans in a city might also be negatively affected by sharing the territory between two teams, with aggregate promotional efforts held constant.

fers only after a vote of all the member teams. The league may require a payment for the franchise at the new location. These restrictions on the creation of new franchises or transfer of old franchises to new locations have led to legal uncertainty, which has sometimes prompted Congress to seek legislative solutions. The courts appear to agree that a sports league can decide who should be admitted to a league and on what terms[12] but, as discussed earlier, are unclear as to what restrictions a league can place on the transfer of existing franchises.

As long as there is only one team in each exclusive territory and the value to the league of a new NHL team equals the change in the discounted present value of profits of all NHL teams resulting from the addition of the new team, the NHL has the correct incentives to expand the number of franchises from the team owners' viewpoint.[13] Expansion will continue as long as the incremental profit *to the league* (not just to the entrant) of an additional franchise is positive. In addition to the new team's own likely profitability, the league's incremental profit calculation must also consider the effect of diminishing player quality on league attendance, the cost of traveling to and from the new location, and the level of *away* attendance for new teams. Notice that, all else equal, *away* attendance of the new franchise matters more to existing NHL teams than the new team's expected home attendance because of the NHL gate-sharing arrangement (home team takes all). For the same reason, the new team's away attendance matters more to the existing teams than it does to the new team.

Similar reasoning applies to the transfer of teams to new locations. The league's owners want to adopt transfer procedures that maximize the overall value of the NHL. Moreover, as long as transfer payments among teams can occur (and, in fact, have occurred), the Coase theorem guarantees that a move will be rejected only if it is expected to be unprofitable to the league as a whole. Of course, this does not mean that disputes will not arise ex post after agreement to the transfer rules.

[12] See, e.g., the Mid-South Grizzlies v. the National Football League, 720 F 2d 712 (1983).

[13] The NHL's incentives are also aligned with those of team owners even when there can be multiple franchises in a city. If there is short-run local market power in the setting of ticket prices (a topic discussed in the next section), then the NHL could create competition by creation of a second franchise in a local area. Of course, this competition would reduce the local profits of the incumbent and from the incumbent's viewpoint could represent ex post opportunism on the part of the NHL. The situation is similar to McDonald's opening a franchise in the territory of an existing franchisee who paid for the franchise in expectation of exclusivity. This issue here is ex post who has the right to the profits from exclusivity and not whether the right to such profits exists under the antitrust laws. (Sports leagues can lawfully restrict the number of franchises, and side payments among team owners are allowed.) With side payments among team owners and clearly defined rights to exclusivity, the NHL has the correct incentives to choose franchise relocations from the viewpoint of the team owners (though, if there is local market power, not necessarily from the viewpoint of the fans).

Aside from differences of opinion among owners about the likely effects of a proposed move, each team owner would prefer to move his team to a higher-profit location without paying a transfer fee. The key point is that the presence of externalities may account for why the NHL evaluation of the desirability of a franchise move is different from that of the owner of the moving franchise.

The most important external effect of a franchise transfer is the reduced away attendance for the moving franchise, which we shall call the "rivalry" effect.[14] An example illustrates this effect. The St. Louis Blues had been playing the Chicago Blackhawks for over 30 years. Fans show up to the games at Chicago, in part, because of this built-up rivalry. If the St. Louis Blues were to move to, say, Saskatoon, Saskatchewan, the possibility exists that, at least initially, attendance at games between the Blues and the Blackhawks played in Chicago will drop (though perhaps attendance at, say, other Canadian cities could increase). Because the costs of a sporting event are largely fixed, even a small drop in attendance can significantly reduce profits. The potential for large declines in profits from even a small overall decline in attendance helps explain why sports leagues seem to believe that stability of team location is desirable.[15]

Sports leagues operate in several markets other than the franchise market. For example, sports leagues hire players in the labor market, often sell broadcast rights to games, and are involved in various concession activities as well as stadium rental. In this paper we examine only the transfer restrictions on franchise movements and so limit our discussion of economic issues to only those that are relevant to NHL franchise relocation.[16]

B. Market Power Related to Franchise Movements

Does a sports league have market power in any of the many markets in which it operates? This is one of the fundamental questions that many of the antitrust cases involving sports leagues have wrestled with. Although leagues rival to the established ones have arisen from time to time, the history of rival leagues suggests that they often either fail or eventually merge with the established league (e.g., the American Bas-

[14] Another externality that could be associated with reduced away attendance is an increase in the risk of bankruptcy to the existing teams. The likelihood of bankruptcy matters because a team's demise in midseason will impose large rescheduling costs on existing teams. (In fact, the NHL on several occasions has lent money to bankrupt clubs to get them through the season.)

[15] Stability is also good for fan loyalty. If teams move frequently, it may be harder to generate fan interest since fans may feel that the team will soon leave.

[16] Noll (1974) and Quirk and Fort (1997) plus the papers cited therein examine in considerable detail the various markets in which sports leagues operate.

ketball Association merged with the NBA, the American Football League merged with the NFL, and four teams in the World Hockey Association [WHA] joined the NHL). Given the difficulty of establishing a rival league, it is unlikely that the mere potential to establish a rival league by itself can preclude the exercise of market power, if indeed a sports league has any.

If there is only one league per sport, then, as discussed earlier, in an exclusive territory, a team such as an NHL team may have market power (in the short run) in the setting of ticket prices since, by assumption, there are no competing hockey teams in the area. But there may indeed be many entertainment substitutes for the fan, and the exclusive territory may well serve to provide incentives to promote hockey so that fans will spend their money on hockey rather than on other forms of entertainment.[17]

One could possibly argue that if the NHL and its teams have market power (e.g., in setting local ticket prices), they will act like all other firms with market power and restrict output (e.g., number of games, number of franchises) in order to maximize profit. What is especially peculiar about the litigation involving sports leagues is that the ability of a sports league to restrict either the number of games or the number of new franchises has not successfully been challenged.[18] The muddled state of the law arises from cases involving location transfers of franchises. Even if the NHL had market power in the sale of franchises, once it had decided to issue a fixed number of franchises, it is clearly in the NHL's interest to let a franchise move if that move would be profitable for the league as a whole. Ex ante, the restriction on franchise relocations must be value-enhancing to the franchise owners; otherwise all franchise owners, as a group, could immediately increase the value of their franchises by rescinding the rule. Ex post, as with all contracts, violation of one of the terms may benefit one party at the expense of the other. In short, given that the NHL restricts the number of franchises, there cannot be an antitrust injury to existing franchise owners from restrictions on franchise transfer, and therefore, the franchise owners should not have "antitrust standing to sue."[19]

Stated differently, restrictions on franchise transfers do not reduce

[17] In the market for broadcasts, e.g., advertisers pay on the basis of the number of viewers. If the price paid per viewer is the same in sports programming as in other programming and sports programming accounts for a small share of available advertising minutes, then other alternatives may preclude the exercise of market power in that market.

[18] The Mid-South Grizzly case (n. 12) established the rule that sports leagues have the right to restrict entry to their league, but as described earlier, the court's other rulings have created significant uncertainty as to what are allowable restrictions on relocation.

[19] Only individuals directly harmed by the exercise of market power have "standing" to bring an antitrust suit (Brunswick Corp. v. Pueblo Bowl-O-Mat Inc., 429 U.S. 477, 97 S.Ct. 690, 50 L.E.D.2d, 701).

"output" (e.g., number of games or franchises) in the franchise market, and the league has the correct incentives to place the franchises in their most profitable locations. The teams could, of course, have different opinions on where the most profitable locations are. Resolution of these conflicts is not the purpose of the antitrust laws but the purpose of ex ante contracting. Therefore, the antitrust cases arising out of franchise relocations represent an attempt to misuse the antitrust laws by parties unhappy about a contract stipulation regarding dispute resolution—a stipulation that accounts in part for the value of the franchise.

It is difficult to see how the NHL has any market power over *buyers* of NHL franchises. As long as the purpose of owning a franchise is to make money, a hockey franchise is like any other asset. Even if the asset's price reflects the local market power just discussed, the buyers of NHL franchises are not harmed in any way when they purchase an NHL team. Just as the buyer of a stock issued by a firm that is a monopolist can expect to earn the normal economic rate of return on his investment, so too can the purchaser of an NHL franchise. As long as there are many alternative investments, no sports league, including the NHL, can exercise market power over franchise buyers when it sells franchises.

III. Measuring the Externalities of Moves

The previous sections showed that league restrictions can be a means by which the league deals with externalities. This section investigates whether there are any empirically demonstrable externalities that these restrictions on franchise relocation control.

We examine whether a team that moves imposes a cost on other teams. In the NHL in the mid-1980s, the home team kept all its gate revenues. A team would therefore want to move if it expected net revenues from home attendance to be greater at the new location, all else equal. But if attendance falls when the moved team plays away, other franchises would oppose the move because their home attendance would decline.[20]

Four teams moved between 1967 and 1984.[21] In table 1, we show the away attendance as a percentage of away capacity for the year before and after each move. The table shows that a decline in away attendance as a percentage of capacity seemed to follow almost every move. Figure

[20] Municipalities and states, e.g., are sometimes willing to spend considerable amounts to induce a team to relocate. The league's other teams have a natural interest in the effects of such a move on their overall profitability, whereas the local team might be tempted to accept the financial inducements to move even if the move significantly harmed the other teams.

[21] Atlanta moved to Calgary, Kansas City moved to Colorado, Colorado moved to New Jersey, and California moved to Cleveland, which later merged with the Minnesota franchise and played its home games in Minnesota.

TABLE 1
DROP IN AWAY ATTENDANCE FOLLOWING MOVES

Move	Away Capacity Sold in Final Year at Old Location (%)	Away Capacity Sold in First Year at New Location (%)	Change
California (1975/76) to Cleveland (1976/77)	77.97	72.78	−5.19
Kansas City (1975/76) to Colorado (1976/77)	78.04	72.01	−6.03
Atlanta (1979/80) to Calgary (1980/81)	81.67	75.98	−5.69
Colorado (1981/82) to New Jersey (1982/83)	77.99	76.05	−1.94

1 shows how away attendance as a percentage of capacity changed in the four years following a move. It indicates that the decline in away attendance as a percentage of away capacity wears off by the fourth year.[22] Although table 1 and figure 1 are suggestive, they represent crude analyses because they fail to control for such variables as team quality, the team's opponents, rink capacities, and the changing popularity of hockey over time.[23]

We estimate a reduced-form model explaining away attendance for the period 1967/68–1983/84. We postulate that attendance at a particular game depends on the attributes of the home team, the attributes of the visiting team, the season (year), and the day of the week. The attributes of the home team we consider are standing (in both the league and its division), population of the home city, and seating capacity. The attributes of the visiting team we consider are standing, population of the visiting team's city, and whether the team is new or has moved recently. The rationale for including standing, season, and day of week is obvious. Fans like to see good teams play on weekends in years in which hockey interest is high. Population of the visiting team may have

[22] Figure 1 uses data only for Colorado and Calgary since our data contained fewer than three years of experience following the moves of the other two teams.

[23] Although we focus on away attendance in order to illustrate the source of the externality, our logic suggests that, in the absence of transfer payments, home attendance of the moving team (or, more accurately, profits from home attendance) should rise after the move, if the move is successful. Data from an independent source (http://www.hockey.research.com, updated September 19, 2002) confirm this. Home attendance for the Colorado to New Jersey move increased from 8,180 to 12,489, for the Kansas City to Colorado move increased from 7,356 to 8,550 (the 7,356 figure pertains to two years prior to the move; data are not available for the year prior to the move), and for the Atlanta to Calgary move increased from 10,024 to 16,674 (after the new stadium was completed three years after the move). For the California to Cleveland move, home attendance fell from the prior year (though not from the average of the three prior years), but the franchise soon moved again (i.e., the move to Cleveland was not successful) and merged with Minnesota.

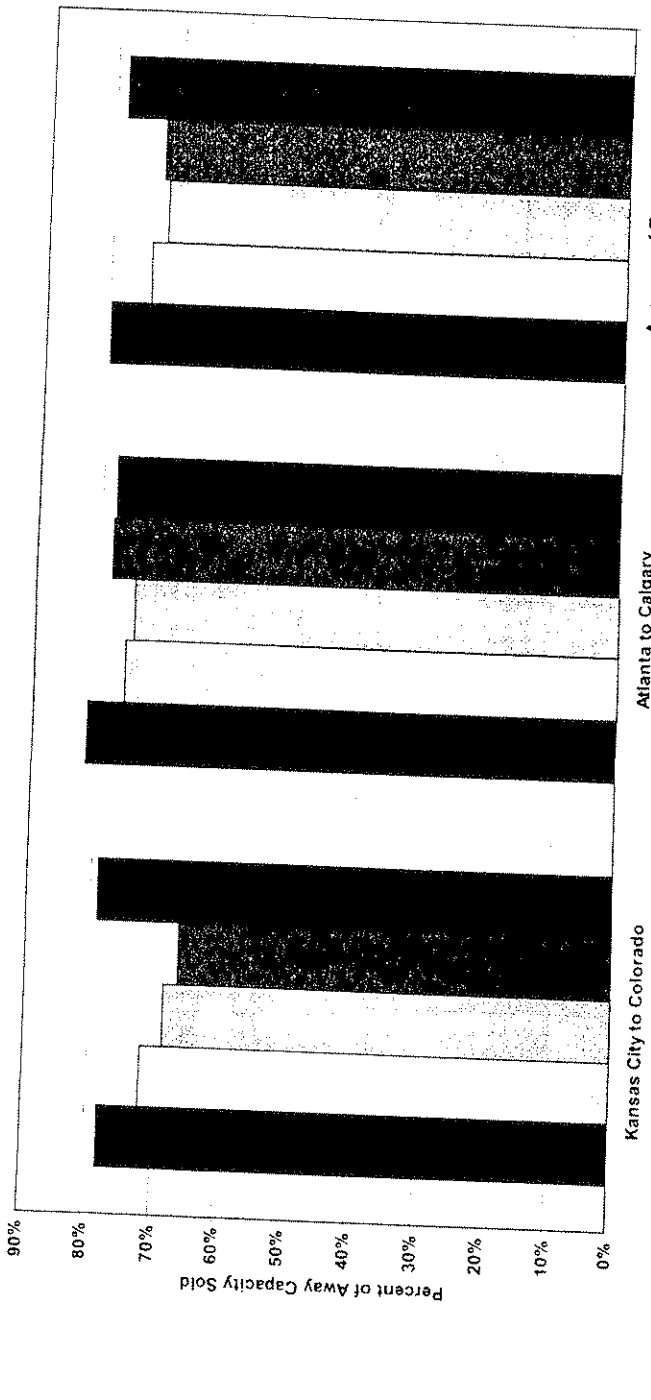

FIG. 1.—Away attendance following two NHL moves

something to do with rivalry. For example, fans might be more interested in seeing teams from big cities. We include dummy variables indicating whether the visiting team is a new franchise or a moved franchise to see whether attendance is lower for visits by these teams. We allow for different effects over time for a new and a moved team. Seating capacity is also included as an exogenous variable, but it may be justifiable to regard it as endogenous since it can eventually respond to demand changes. We therefore estimate all equations with and without this capacity variable.

The basic equation explaining attendance is then

$$A_{ij}(t) = b_0 + b_1\mathbf{V}_i(t) + b_2\mathbf{V}_j(t) + b_3\mathbf{DOW}_{ij} + b_4\text{season} + b_5C_i + E_{ij}(t), \quad (1)$$

where $A_{ij} \leq C_i$; $A_{ij}(t)$ equals (log) attendance when home team i plays away team j on a particular date in year t; $\mathbf{V}_i(t)$ is a vector of attributes about team i in year t, such as its standing, the (log) population of its city, or its division; **DOW** is day of the week effects; season is a season dummy; C_i is the (log) capacity of the home team; and $E_{ij}(t)$ is an error term.

Equation (1) represents attendance at individual games. By summing over all the away games of team j, one can derive the equation explaining away attendance of team j in year t, $A_j(t)$. If w_{ij} is the frequency with which team j plays team i, then

$$A_j(t) = \sum_i w_{ij}A_{ij}(t) = B_0 + B_1\sum_{i\neq j} w_{ij}\mathbf{V}_i(t) + B_2\mathbf{V}_j(t) + B_3\sum_{i\neq j} w_{ij}\mathbf{DOW}_{ij} + B_4\text{season} + B_5\sum_{i\neq j} w_{ij}C_i(t) + \sum_{i\neq j} w_{ij}E_{ij}(t). \quad (2)$$

The NHL teams in the same division played each other the same number of times and played all teams outside their division the same number of times during the period we studied. Therefore, terms in (2) consisting of sums over i will be virtually the same for teams within the same division within any year.[24] Moreover, with the possible exception of capacity (which has been growing over time), these variables should be roughly constant during a period in which the division's (and league's) composition has been constant.[25] The NHL altered the structure of its divisions three times between the 1967/68 season and 1983/84 season, so we include three types of division dummy variables to

[24] Since teams do not play themselves, these terms will not be identical for teams within the same division.

[25] Later, we discuss the results when these variables are not assumed to be constant.

correspond to these changes. Let $DIV_i(t)$ be the division of team i in year t. Then (2) can be rewritten as

$$A_j(t) = \alpha_0 + \alpha_1 DIV_j(t) + \alpha_2 season + \alpha_3 V_j(t) + \alpha_4 CAP_j(t) + \epsilon_j(t), \quad (3)$$

where the α's are the coefficients to be estimated, and $\epsilon_j(t)$ is an error term.

Recalling that $V_j(t)$ is a vector of characteristics of team j, we define $V_j(t)$ to include the following variables: $POP_j(t)$ is the (log) population in year t of the city of team j; $CAP_j(t) = \Sigma_{i \neq j} w_{ij} C_i(t)$; $STL_j(t)$ is the standing in the league (top four teams or not) of team j; $STD_j(t)$ is the standing in the division (first or not) of team j; move k is a dummy variable indicating that team j moved k years ago; and new k is a dummy variable indicating that team j was a new franchise k years ago.

We estimate equation (3) using 16 years of data from 1967/68 to 1983/84 for each NHL team. The results of the ordinary least squares estimation of (3) (with and without capacity) are presented in table 2. The results indicate that a team that moves does indeed impose a small but statistically significant cost on its fellow league members by reducing away attendance by approximately 3–4 percent below the away attendance of a comparable established team.[26] (The "move" and "new" variables, as a group, are both statistically significant at the 5 percent level.) The move effect seems to vanish after three years. This move effect on away attendance is initially less than that of a new team that reduces away attendance initially by about 6 percent (though the difference between the two effects is not statistically significant). This makes sense since a moving team probably can preserve some rivalry from the fact that its players are unchanged by the move, whereas a new team has no past history. The basic results are not affected when the capacity variable is omitted from the equation.

The precise timing and pattern of how the move effect and new effect decline are a bit unclear. The equation seems to indicate that the move effect in the third year is greater than that in the first year and that the new effect tapers off faster than the move effect. Neither of these results makes much intuitive sense, and, in fact, the decay pattern is hard to pin down statistically. For example, one cannot reject the hypothesis that the move effect in year 3 is the same as in year 1. The best summary of the evidence is that both the new and move effects die out within

[26] The total move effect includes, of course, any change in population multiplied by the population coefficient. The discussion here assumes similar-sized cities. Moving to smaller cities creates a larger (negative) externality.

TABLE 2
REGRESSION RESULTS: INDIVIDUAL MOVE EFFECTS

Variable	Regression 1		Regression 2	
Intercept	−7.19672	(2.88819)*	12.89299	(.18611)**
Log(capacity)	1.52429	(.21914)**	...	...
Log(population)	.01784	(.0047540)**	.0089795	(.0049862)
Season dummies:				
1968/69	−.009569	(.02639)	.11289	(.02140)**
1969/70	.04750	(.02737)	.17974	(.02144)**
1970/71	.06252	(.02894)*	.22218	(.01919)**
1971/72	.07032	(.03329)*	.26392	(.01989)**
1972/73	.05346	(.03428)	.25950	(.01878)**
1973/74	.04873	(.03511)	.25904	(.01942)**
1974/75	−.0080773	(.04312)	.26179	(.02048)**
1975/76	−.07345	(.04459)	.20577	(.02114)**
1976/77	−.17236	(.04945)**	.14375	(.02122)**
1977/78	−.17822	(.04946)**	.13758	(.02136)**
1978/79	−.13302	(.04776)**	.16922	(.02158)**
1979/80	−.05503	(.04268)	.21256	(.02012)**
1980/81	−.03832	(.04255)	.22507	(.02112)**
1981/82	−.02799	(.04137)	.21806	(.02336)**
1982/83	−.01829	(.04287)	.23992	(.02334)**
1983/84	−.03175	(.04861)	.27147	(.02341)**
Division dummies:				
Adams I	.02126	(.01640)	.03510	(.01772)*
Adams II	.03069	(.01093)**	.02921	(.01190)*
Patrick I	−.02381	(.01791)	.02424	(.01799)
Patrick II	.02567	(.01146)*	.03583	(.01237)**
Norris I	−.03975	(.01783)*	.008252	(.01789)
Norris II	−.004443	(.01074)	−.001443	(.01169)
East	.04635	(.0094497)**	.05586	(.01018)**
Quality dummies:				
Top 4 teams	.05175	(.0087459)**	.04733	(.0094959)**
First in division	.02413	(.008866)**	.02119	(.0096411)*
New team dummies:				
Year 1	−.06476	(.01387)**	−.08517	(.01475)**
Year 2	−.03723	(.01345)**	−.04411	(.01460)**
Year 3	−.01467	(.01404)	−.02401	(.01522)
Moving team dummies:				
Year 1	−.03582	(.02273)	−.02989	(.02472)
Year 2	−.03856	(.02280)	−.02870	(.02478)
Year 3	−.06767	(.03225)*	−.04340	(.03490)
Year 4	−.01178	(.02315)	−.02291	(.02514)
R^2	.8114		.7756	
Adjusted R^2	.7862		.7467	
Degrees of freedom	255		256	

NOTE.—Standard errors are in parentheses.
* Significant at the 5 percent confidence level.
** Significant at the 1 percent confidence level.

four years and that both effects are statistically significant,[27] with the new effect perhaps being the slightly larger one.

If the move effect is constrained to be equal for the first three years and zero thereafter, the best estimate of the effect is around 4 percent (see table 3). That is, all else equal, when a team moves, away attendance is lower for each of the first three years by about 4 percent. Although, as expected (see the discussion in the Introduction), this effect is small, it is statistically significant. Moreover, many of the costs of a stadium are fixed, so that a 4 percent revenue decrease can represent a substantial decrease in profits.

One puzzling feature of the specification with the capacity variable is that the coefficient on capacity is greater than one. The reason for this appears to be that the average ratio of attendance to capacity is much higher in Canada than in the United States. When the equation is run separately for away games played in Canada and away games played in the United States, the coefficient on capacity drops slightly below one in each equation. Some other coefficients change also, and we discuss them in the next section.

A. *Robustness Tests*

There are several different variable definitions for team quality and several different econometric methods that can be used in the estimation of the move effect of equation (3). We report in table 4 the results of the more important alternative estimations of the move effect. We experimented with measuring team quality by total points scored (rather than standing) or by the previous year's standing, with little change in either the magnitude or statistical significance of the results. We investigated whether the error structure in (3) may be heteroskedastic. We ran Glejser-type tests, which showed that heteroskedasticity was not a problem. Nevertheless, we used the method due to White (1980) to calculate consistent standard errors, and the move effects remained statistically significant. We also corrected (3) for serial correlation and reestimated, with little change in the results. We reestimated (3) allowing for separate division dummies for each year. This estimation relaxes the restriction used in the derivation of (3) that during periods of unchanging composition of divisions the "weighted" variable ($\sum w_{ij}V_j$) remained roughly constant over time for teams in the same division. This method raises the number of independent variables from 33 to 63 and places very little structure on the relationship. Still,

[27] For example, the *F*-tests on the joint significance of the first three move coefficients and the first three new coefficients are both significant at the 5 percent level for regression 1 of table 2.

TABLE 3
REGRESSION RESULTS: ONE THREE-YEAR MOVE EFFECT

Variable	Regression 3	
Intercept	−7.12777	(2.86255)*
Log(capacity)	1.51900	(.21720)**
Log(population)	.01819	(.0047056)**
Season dummies:		
1968/69	−.009083	(.02623)
1969/70	.04814	(.02720)
1970/71	.06338	(.02875)*
1971/72	.07132	(.03306)*
1972/73	.05447	(.03403)
1973/74	.04981	(.03486)
1974/75	−.007631	(.04277)
1975/76	−.07292	(.04424)
1976/77	−.17092	(.04894)**
1977/78	−.17707	(.04899)**
1978/79	−.13389	(.04743)**
1979/80	−.05510	(.04225)
1980/81	−.03802	(.04209)
1981/82	−.02917	(.04082)
1982/83	−.01992	(.04249)
1983/84	−.03272	(.04802)
Division dummies:		
Adams I	.02426	(.01592)
Adams II	.03223	(.01075)**
Patrick I	−.02046	(.01747)
Patrick II	.02690	(.01131)*
Norris I	−.03697	(.01745)*
Norris II	−.0034950	(.01063)
East	.04655	(.009410)**
Quality dummies:		
Top 4 teams	.05157	(.008708)**
First in division	.02449	(.008816)**
New team dummies:		
Year 1	−.06413	(.01376)**
Year 2	−.03667	(.01335)**
Year 3	−.01435	(.01396)
Moving team: years 1–3	−.04250	(.01471)**
R^2	.8107	
Adjusted R^2	.7879	
Degrees of freedom	258	

NOTE.—Standard errors are in parentheses.
* Significant at the 5 percent confidence level.
** Significant at the 1 percent confidence level.

the estimation yielded a statistically significant move effect in roughly the 3 percent range.

Capacity may be an endogenous variable that responds to demand conditions and, therefore, should be omitted from the reduced form, as in regression 2 of table 2. On the other hand, large capacity changes probably are not possible in the short run, and this justifies treating capacity as exogenous. A separate potential problem with the estimation

TABLE 4
ESTIMATES OF MOVE EFFECT UNDER VARIOUS ROBUSTNESS EXPERIMENTS

Experiment	Coefficient	t-Statistic
Regression 3, from table 3	−.0425	−2.89
Regression 3, with points scored per game used as the measure of visiting team quality*	−.0347	−2.18
Regression 3, standard errors adjusted using White's method*	−.0425	−3.27
Regression 3, adjusted for serial correlation*	−.0461	−2.79
Regression 3, interacting all season and division dummies*	−.0308	−2.30
Regression 3, for U.S. cities only	−.0558	−2.90
Regression 3, for Canadian cities only	−.0057	−.65
Regression 3, all cities, with separate U.S. and Canadian capacity variables	−.0450	−3.04
Regression 3, for nonsellout cities only*	−.0483	−2.19
Omits capacity variable from regression 3*	−.0308	−1.94

* These tests were also repeated for away games in U.S. cities alone, with no change in the general results.

is that no direct account is taken of the capacity constraint on attendance. If a team at home is always at capacity at home, then there will be no effect on (home) attendance for such a team when it plays a visiting team that has recently moved. This suggests that a moving team's effect on attendance will be concentrated among those teams that do not sell out their home games—which tended to be the U.S. teams in the NHL during this period. Table 4 shows the results of analyzing separately away games played in Canada and away games played in the United States. When away games in Canada are analyzed separately, there is much weaker evidence of an effect of moving. The effect is still negative, but it is no longer statistically significant. The effect of moving on attendance at away games in the United States is stronger and more statistically significant than that in table 3.[28]

The capacity constraint causes the attendance variable to be truncated at the upper tail. This truncation tends to make it more difficult to estimate a move effect since sometimes move affects desired attendance but not actual.[29] One approach (in addition to separately analyzing U.S.

[28] The decision to move will depend on whether total profits rise from the move (to both the moving team and the rest of the league). All else constant, the NHL is more likely to approve a move if the move effect is expected to be small. Since the data contain only moves approved by the NHL, the move effect will tend to be an underestimate of the true move effect (i.e., the error term and move are positively correlated). Therefore, our estimate of the move externality is likely to be an underestimate of the effect on attendance of requiring a randomly chosen team to move.

[29] We want to estimate the effect of move on desired attendance. The effect on actual attendance will depend on whether attendance is constrained by capacity. Not accounting for the capacity constraint will tend to lower the estimated effect of move on attendance.

TABLE 5
GAME-BY-GAME REGRESSION ANALYSIS
Dependant Variable: Log(Paid Admissions)

Variable	Regression	
Intercept	−.76936	(.43121)
Log(mean home team attendance)	1.07129	(.01186)**
Log(capacity)[a]	.01586	(.04310)
Season dummies:		
1978/79	−.0049639	(.01390)
1979/80	.0025533	(.01329)
1980/81	.0002385	(.01324)
1981/82	−.01758	(.01733)
1982/83	−.02298	(.01694)
1983/84	−.02374	(.01679)
Division dummies:		
Adams I	.03062	(.01404)*
Adams II	.02691	(.01255)*
Patrick I	.04870	(.01328)**
Patrick II	.02078	(.01313)
Norris I	.01353	(.01363)
Norris II	.006284	(.01238)
Team rank:		
Overall	.09615	(.01295)**
In division	.02521	(.01257)*
New team:		
Year 1	−.05419	(.02093)**
Year 2	−.06693	(.02064)**
Year 3	.0011288	(.02154)
Moving team: years 1–3	−.05289	(.01411)**
Day of the week:		
Sunday	−.09464	(.01036)**
Monday	−.11796	(.01952)**
Tuesday	−.18548	(.01117)**
Wednesday	−.16034	(.0096743)**
Thursday	−.13668	(.01122)**
Friday	−.05645	(.01274)**
R^2	.7998	
Adjusted R^2	.7976	
Degrees of freedom	2,344	

NOTE.—Standard errors are in parentheses.
[a] Omitting the capacity variable has little effect on the results.
* Significant at the 5 percent level.
** Significant at the 1 percent level.

assumptions. The results are robust to different specifications and estimation techniques.

B. *Predictions of the Move Effect*

The NHL votes on whether to allow a team to move. All else equal, the NHL is more likely to approve a move if the move effect will be small.[32]

[32] It is possible that a move could affect the quality of a team. An examination of the four moves indicated little change in team quality before and after the move.

TABLE 6
PREDICTED CHANGES IN AWAY ATTENDANCE FOR MOVING TEAMS

MOVE	PREDICTED ANNUAL EFFECT* EACH OF FIRST 3 YEARS	ACTUAL EFFECT (%)*		
		Year 1	Year 2	Year 3
California to Cleveland	−4.11% (−12.65%, +4.43%)	−.22	−.90	
Kansas City to Colorado	−3.44% (−11.88%, +5.00%)	+2.63	−1.59	−8.79
Atlanta to Calgary	−6.58% (−15.05%, +4.92%)	−9.22	−9.70	−5.61
Colorado to New Jersey	−.88% (−9.51%, +7.75%)	−5.59	−1.04	
St. Louis to Saskatoon†	−9.21% (−17.93%, −.49%)			

NOTE.—95 percent confidence intervals are in parentheses.
* Predicted change in away attendance is the difference between the predicted attendance when there is no move and when there is a move from regression 3 of table 3. The actual attendance change is the difference between away attendance in the new city and that predicted by the regression model had the team not moved.
† Proposed move, denied by the NHL Board of Governors.

As of 1985, the NHL had approved four moves. In the mid-1980s, it disapproved a proposed move from St. Louis, Missouri, to Saskatoon, Saskatchewan, despite predictions that such a move might be profitable for the franchise.[33] Therefore, one might expect that the move from St. Louis to Saskatoon would have represented a much greater decline in away attendance than any of the other moves. In fact, as table 6 shows, this is precisely what the model predicts. The table shows that the model predicts a much greater negative effect on away attendance for the move that the NHL disapproved compared to the predictions for moves that the NHL approved.

IV. Conclusions

Some vertical restrictions and restrictions among members of a joint venture that outwardly appear to reduce competition may, in fact, enhance it. This paper has documented a small though financially important and statistically significant externality that arises in a joint venture, the NHL. A team that has moved draws fewer fans to its away games and thereby imposes a cost on all the other league members. The move effect disappears after the first few years and seems to be most concentrated on U.S. teams. This externality provides a clear reason for a sports league to restrict franchise moves.

[33] Geddert (1984) suggests that Saskatoon could have generated enough *home* attendance to support a successful franchise. On the other hand, Saskatoon did not have a team in the WHA. (The WHA was a rival league to the NHL. It operated in several cities, most of which were smaller than those in the NHL.) The proposed move led to litigation. The case eventually settled with the team remaining in St. Louis.

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