How Many Are Too Many? Optimal Expansion of the Professional Sports League

by

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B.A., Simon Fraser University, 2006

PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

In the
Department
Of
Economics

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SIMON FRASER UNIVERSITY

Spring 2008

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Degree: **Master of Arts**

Title of Project: **How Many Are Too Many? Optimal Expansion of the Professional Sports League**

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ABSTRACT

How does a professional sports league decide on the number of teams to let compete? Even if allowing for each team to be a local monopoly, the increase in the number of teams in a league will reduce the profits of existing teams through reducing the playing talent per team. The league will choose to expand the number of teams if this talent pool increases (or if income increases or costs decrease). The last 50 years of expansion of the MLB, NBA, NHL, and NFL are inspected in light of these predictions. The findings are that the model is consistent with the pattern of expansion over the last 50 years for these leagues.

Keywords: League expansion; league size; sports economics

Subject Terms: Sports-Economic Aspects

DEDICATION

Dedicated in memory of Shoeless Joe Jackson,

May he someday make it into the Hall of Fame.

ACKNOWLEDGEMENTS

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1 INTRODUCTION

Since 1960, Major League Baseball (MLB) has expanded from 16 to 30 teams,

the National Hockey League (NHL) has expanded from 6 to 30 teams, the National

Basketball Association (NBA) has expanded from 8 to 30 teams, and the National

Football League (NFL) has expanded from 13 to 32 teams[1]. The total number of teams in

the four major professional sports leagues of North America[2] have thus increased from 43

in 1960 to 122 in 2007. While this near tripling of teams in just under 50 years reflects a

general increase in North American's interest in following professional sports, the

question remains as to why the leagues chose these exact numbers and the specific paths

with which the expansions occurred.

Economic theory suggests that the leagues operate to maximize the profits of the

member teams. Therefore, the choices made by the leagues along their exact expansion

paths must have been the profit maximizing choices at the time. In other words, there

must have been tangible changes in supply or demand conditions that induced a league to

increase the number of teams at a specific time, and by a specific number.

This paper addresses this issue and finds that much of the expansion history of the

last 50 years can be explained by two simple variables: consumers' income and the talent

per team. A model is built that treats each team as the firm, and the league as a cartel that

decides on the number of teams to maximize each team's profits. The league operates at a

size where the marginal benefit of expansion equals the marginal cost of expansion. At

this equilibrium point, an increase in consumers' incomes or an increase in the talent per

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[1] A graph depicting the rise in league size of each of these leagues since 1960 can be found in appendix C.
[2] Only North American sports leagues will be included in this research. This is mainly do to the fact that
most of the European soccer leagues have not seen much expansion over the same time frame.

team both lead to the situation where expanding the number of teams increases profits for existing teams.

The next section will provide a brief review of previous literature on this topic. The model will be presented next, followed by a detailed look at the expansion decisions of the 4 major North American professional sports leagues in light of the models predictions. Section 5 investigates the data on income in more depth than in the previous section and section 6 concludes.

2 LITERATURE REVIEW

Early research on the optimal league size was undertaken by Vrooman in 1997. He used Buchanan's economic theory of clubs as a starting point for the research. In the club theory, the main determinant of league size becomes the degree to which the teams share revenues with each other. According to Vrooman (1997), if no league revenues are shared, then the league will select a size where the marginal team makes zero profits. However, if the league shares all of its revenues, then the league will choose the number of teams that maximizes the average value of each incumbent team plus the expansion fee charged the expansion team, provided the expansion teams can pay such a fee. This differs from the pure club theory in which the league would choose a number of teams to maximize average team value. The equilibrium condition in Vrooman (1997) becomes that the league expands until the marginal benefit of expansion to the existing teams (the fee) is equal to the marginal cost (the loss of average team value by letting in a team from an inferior market).

The next researchers to look directly at this problem were Bae and Choi (2007). Bae and Choi base a model on Salop's circular city theory. In this model, direct competition for fans is what determines the optimal league size. Bae and Choi (2007) envision a circular area with a uniformly distributed population. The teams then choose where to locate on this circle and are able to attract as fans those people for whom the team is the closest one available. Thus, as more teams enter into the league, each team gets a smaller and smaller fan base, due to the geographic cluttering of teams, resulting in

competition amongst the teams for fans[3]. The league then chooses the number of teams to maximize total profits (Bae and Choi, 2007).

The newest research on the issue of the size of sports leagues is by Khan (2007). Khan's main concern is in showing that the number of teams a league chooses to operate will be closer to the socially optimal number of teams than a situation of free entry. In free entry, the league would expand until the marginal team made zero profits. But, according to Khan, the league that controls entry would want to limit league size so that scarce playing talent doesn't get spread too thin, reducing demand and profits for existing teams. Thus, since the free entry league will be full of sub-standard players, the fans will get lower utility and the league will get fewer profits than if the league controlled entry into the market, ensuring a high average quality of player (Khan, 2007).

This paper differs from all three previous studies in key ways. Unlike Bae and Choi (2007), this paper assumes that each team is a local monopoly and focuses on non-market competition as the driving force of expansion. This approach is similar to Khan, who looked at changes in the quality of games from introducing more teams into a league. However, where Khan (2007) was interested in looking at social welfare aspects of league size, this paper looks at league size in a positive manner. Finally, unlike Vrooman, this paper finds that expansion teams directly reduce existing teams profits through reduced quality of play. However, Vrooman (1997) comes to much the same conclusion as this paper: the league expands up until the point where the marginal benefit of expansion is equal to the marginal cost.

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[3] For example, the Buffalo Sabres and Toronto Maple Leafs compete for fans in Hamilton, if a team was placed in Hamilton, then neither team would get those fans anymore, and both teams would be less profitable.

3 THE MODEL

The model of the league is one of a cartel that has a complete monopoly on the sport; its responsibility is to select the number of franchises that maximizes total profits of the cartel. There are an infinite number of identical markets that could host teams. The individual teams are thus modelled as firms and are free to maximize profits. Each team is treated as a local monopoly[4] and thus chooses the quantity, q, that maximizes profits, which are given in equation 1.

$$\pi_n = q \cdot (p - c) \tag{1}$$

The quantity variable proves to be a bit difficult to define. The immediate choice would be simply attendance at games, but this only partially covers what a sports team provides. Many people consume sports through watching games on television, listening to games on the radio, wearing licensed merchandise, in addition to (or instead of) going to games. Thus, it is not possible to combine all these different types of consumption into one measure that is physical and easily countable. Thus, the quantity will be viewed as a composite good. Individuals can choose to consume the sport in any of the previously mentioned ways and they will all be included in the measure of quantity. The price then, p, is simply a measure of the price of one unit of this composite good.

The demand function, p, is given as $p=p(q,m,s,e)$ where q is quantity, m is consumers' income, s is success, and e is entertainment value. It is assumed that $p_q < 0$, $p_m > 0$, $p_s > 0$, and $p_e > 0$. Thus, as the team becomes more entertaining to watch

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[4] While some markets do have multiple teams, the majority of teams are the sole team in the market they occupy. The NHL has 30 teams in 27 markets, the NBA has 30 in 28, MLB has 30 in 25 and the NFL has 32 in 29.

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and as they enjoy more success, the demand will increase. It is also assumed that all cross-partial derivatives are zero.

The success variable is a function of the number of teams in the league, n. The more teams that there are in the league, the lower the probability that any given team will win the championship in any given year, thus $s_n < 0$. The entertainment variable is also a function of the number of teams in the league. Games with more skilled players tend to be more exciting than games with lower skilled players. This partly explains why the top professional leagues outdraw the lower-tier professional leagues. If all teams in the league are stocked with very talented players, then the excitement level is much higher than if lower-skilled players abound. Thus, for a given stock of talent, as the number of teams increases the talent per team will decrease and so will the entertainment value. Formally $e = f(t, n)$, where $e_n < 0$ and $e_t > 0$.

The first order condition for the individual teams maximization problem is $(p - c) + q \cdot p_q = 0$. The first term is assumed to be positive in order for the team to obtain positive profits and the second term is negative as the demand curve is downward sloping as usual. Thus this first-order condition will be solved by at least one value of q. In order to ensure that this is a maximum level of profits, it must be assumed that the second-order conditions for a maximum are satisfied. This is given in equation 2.

$$2p_q + q \cdot p_{qq} < 0 \tag{2}$$

Next, the league selects the number of teams, n, to maximize total profits of the league. With all teams being identical, the total profits are simply n multiplied by each teams' optimal profits, which is given in equation 3. By increasing the number of teams, there are more teams that earn profits, but the quality of the games and the lowered

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chance of success reduce the demand in each market, which reduces total profits. Thus, the firm must select an optimal n. Taking derivatives and then applying the envelope condition yields the first order condition for the leagues maximization problem, which is given in equation 4. The second order condition is given in equation 5. It is assumed that the second order condition at $n*$ is satisfied, thus ensuring that the first order condition yields a maximum.

$$\Pi = n \cdot q^* \cdot (p - c) \tag{3}$$

$$q^* \cdot (p - c) + n \cdot q^* \cdot (p_s \cdot s_n + p_e \cdot e_n) = 0 \tag{4}$$

$$2 \cdot (p_s \cdot s_n + p_e \cdot e_n) + n \cdot (p_s \cdot s_{nn} + p_e \cdot e_{nn}) < 0 \tag{5}$$

The first term in equation 4 is the increase in total profits that a prospective new team would bring to the league. It is positive since $(p - c) > 0$. The second term is the reduction in the existing profits of the existing teams through the reduced probability of success and the reduced quality of the games. This term is negative as price is an increasing function of both success and entertainment, which are both decreasing functions of the number of teams. Thus, the first order conditions implicitly define the optimal number of teams, $n*$, as a function of $q*$, c, m, s, and t.

It should be noted that, because of the spillover effect of adding a new team, the league doesn't operate where the marginal team receives zero profits. Adding new teams to the league reduces both the chance each team has of winning and the talent per team, and thus the quality of games. Both of which reduce the profits of existing teams. Thus the league operates at a position where the marginal team earns positive profits. In other words, in equilibrium profitable markets are left without teams. These vacant profitable markets bring about the possibility that a rival league may begin operations, something

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that happened to the NHL, NBA, and NFL in the 1960s and 1970s. This issue will be discussed later in the paper.

The next question to be asked is the ultimate question of interest for this paper, how does this optimal number of teams change as various parameters change. This will be done using the implicit function theorem, firstly for income, m. As can be seen in equation 6, $n^*_m > 0$. Thus an increase in a markets income will result in a league expansion.

$$n^*_m = \frac{-p_m}{2 \cdot (p_s \cdot s_n + p_e \cdot e_n) + n \cdot (p_s \cdot s_{nn} + p_e \cdot e_{nn})} > 0 \qquad (6)$$

Next the impact of a change in the cost parameter, c, will be inspected. As can be seen in equation 7, the derivative is negative. Thus, a decrease in costs will lead to an increase in the optimal league size.

$$n^*_c = \frac{1}{2 \cdot (p_s \cdot s_n + p_e \cdot e_n) + n \cdot (p_s \cdot s_{nn} + p_e \cdot e_{nn})} < 0 \qquad (7)$$

Finally the impact of a change in the talent pool on the optimal number of teams will be inspected. As can be seen from equation 8, the derivative is of an ambiguous sign. The first term in the numerator is positive if the second derivative of the demand with respect to the entertainment value is negative, i.e. there are diminishing returns to the price consumers are willing to pay for an increase in entertainment. This seems to be a very reasonable assumption and so the first term is positive.

$$n^*_t = \frac{(p_e + n \cdot p_{ee} \cdot e_n) \cdot e_t + n \cdot p_e \cdot e_{nt}}{-[2 \cdot (p_s \cdot s_n + p_e \cdot e_n) + n \cdot (p_s \cdot s_{nn} + p_e \cdot e_{nn})]} \qquad (8)$$

The second term depends on the cross-partial derivative of the entertainment function. This has an ambiguous sign. However, when looking at the data, one can see a

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number of cases where exogenous increases in talent lead to an increase in the league size[5], thus the derivative is positive.

The likely result is that an increase in the talent pool will lead a league to expand its size, although not as much as one might first believe. The reason for this is that for a league with many teams it takes a large increase in the talent pool to make a significant effect on the entertainment value of the games. For instance, if the league only has 6 teams, then a very modest addition of 6 superstar players to the league will allow each team to have one extra star player. If the league had 30 teams then the same increase of 6 superstar players would only add an extra star to one fifth of the teams, which would have a smaller impact on entertainment value than in the 6-team league. The conclusion reached is that an increase in talent will lead to an increasingly smaller change in the optimal number of teams as the number of teams in the league increases.

Thus the conclusions of the model are straightforward. If the consumers' income increases, then the league will increase the number of teams, if the costs decrease then the league will expand, and if the players available to the league increase in talent, then the league will decide to expand.

3.1 Issues

One potential issue arises when one asks why the existing teams would want to add new teams to the league if that would decrease their profits, even if increasing total league profits. The reason is simple: the existing teams charge the new teams an expansion fee to enter the league. Thus all of the increase in the league profits is shared by the existing teams and the new teams earn zero profits after the expansion fee has been

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[5] Section 4 shows numerous cases where this occurred.

paid. So, it is in the best interest of existing teams to expand when optimal to do so, as they are the sole beneficiaries of the increased profits.

A second concern is that the model treats all current and potential markets as identical, which is obviously not indicative of actual sports leagues, which have large variation in the profitability of franchises. However, this ends up being only a small problem.

If the model were to allow for heterogeneity of markets, then it would make sense for the league to select the most profitable markets first and then expand into the next most profitable markets when optimal to expand. However, as certain markets may increase or decrease in profitability, it is quite possible that a market without a team could be much more profitable than markets with teams (for example the Los Angeles area has no team in the NFL, even though it is the second largest market in America). One may think that the league decides to expand into this market even if this would increase the number of teams beyond optimal. However, the more likely result would be one of an existing team in a low profit market relocating to the high profit market, thus ensuring the total number of teams remains constant.

A related issue arises if there are no more profitable markets available and the league is wishing to expand. It seems as if the league must choose to have a sub-optimal number of teams, or expand to the optimal number of teams and let in an unprofitable market. However, the model clearly states that the optimal number of teams is set such that the increase in profits that the new team brings in is equal to the loss of profits this new team has on the existing teams. Thus, it is impossible to have a situation where the league is operating at a sub-optimal size.

A final issue arises with the notion of league contraction, which has been seen only once in the four major professional sports leagues since 1960[6]. It is quite clear that the model can predict that a league should contract if talent or incomes decrease. So why then, if it may be optimal for a league to contract, do they not? One reason lies in the increased role players unions have in modern professional sports. A contraction of a sports leagues results in numerous job losses for the players unions, and so any league that decides to contract can expect a lengthy and expensive legal fight with the union. Thus, it may not be optimal for the league to contract in light of credible threats by the players union to fight the contraction.

A second reason lies in the selection of the teams to be contracted. No owner would want their investment to disappear through a league decision to eliminate their team, and thus would need to be justly compensated for the lose of the team. Thus, the other owners must incur a great loss to purchase the team to be contracted in order to get to the optimal league size. Again, it seems perfectly reasonable that the optimal decision is to keep the league at a too large size and avoid having to pay out a large compensation in order to get to the optimal size. For theses reasons, we don't see contraction in the major sports leagues. However, long periods without expansion can possibly be interpreted as periods where contraction was optimal but did not occur.

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[6] The Cleveland Barons of the NHL merged with the Minnesota North Stars in 1978.

4 HISTORY

The logical next question is to ask how the model does in explaining the expansion of the four main North American professional sports leagues. Since the professional sports landscape in North America saw little expansion in the first half of the 20th century, the model best applies to the latter half of the century. Thus, the consistency of the models predictions will be tested by investigating the expansion decisions since 1960.

4.1 Rival Leagues

Before inspecting each league in depth, the issue of rival leagues needs to be discussed. All four leagues at one point either faced a strong threat of a rival league forming or had to compete directly with a second league. MLB was threatened by the proposed Continental league in 1960 (Leeds and von Allmen, 2008). The NHL competed with the Western Hockey Association (WHA) from 1972 to 1979, the NBA competed with the American Basketball Association (ABA) from 1967 to 1976, and the NFL competed with the American Football League (AFL) from 1960 to 1970.

The model predicts that the existence (or threat) of a rival league would lead to a contraction of teams in the existing league. The league now must compete for talent and so one would expect the talent level to decrease, which would lead to a reduction in the optimal league size. At the same time, the increased competition for talent would drive salaries up (Leeds and von Allmen, 2008), increasing the costs and thus also leading to contraction. At the very least, one would expect to see a period of non-expansion in light of the costs associated with contraction. However, this is not what was seen. All four

leagues responded by expanding, an action completely contrary to the models predictions.

MLB immediately expanded from 16 to 18 teams in 1960 and then to 20 teams in 1962 in response to the threat of the Continental League[7]. The NHL expanded to 16 teams in 1972 and 18 in 1974 in response to the WHA. The NBA expanded from 9 to 18 teams over the course of the decade that they were competing with the ABA. Finally, the NFL expanded from 13 to 16 teams and the AFL expanded from 8 to 10 teams in the decade that they were competing.

The reason for this discrepancy between the models predicted response and the leagues actual response lies in the fact that the assumptions of the model are violated when there is a competing league. The model assumes that each league, as well as each team, is a monopoly. This is clearly not the case when two leagues exist. Thus, the creation (or threatened creation) of a new league will reduce the existing leagues profits through a reduction in monopoly power. Expanding the league would tip the balance of market power in the existing league's favour, which would increase monopoly power, and thus increase the profits of existing teams. The cost is the lost profits due to expanding the league to a size larger than is optimal. Therefore, while the model fails to predict the response of the leagues to rivals, the response certainly makes sense in a profit maximizing framework.

Eventually, the loss of monopoly power becomes too much for both leagues and so a merger becomes inevitable in order for the monopoly to be restored. However, the league at this point is now too large. After a period of sub-optimal expansion, plus the

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[7] A chart of all expansions, including the cities that received the new franchises, can be found in appendix B.

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addition of a number of teams from the rival league, the talent level is too low and costs are too high (thus profits are too low). Thus, the model would predict contraction, or a period of non-expansion.

4.2 MLB

The year of 1960 saw MLB forced to deal with the threatened creation of the rival Continental League. The leagues response and analysis of the response were presented in the previous section. To review, the league expanded from 16 to 20 teams by 1962.

In 1969, MLB expanded again, increasing its size by 4 teams to 24. This expansion occurred near the end of a long period of sustained economic growth for the United States[8]. This economic growth increased the incomes available to spend on luxury goods, such as entertainment obtained by watching baseball. As a result, the model predicts expansion would occur, which is what was seen.

The next expansion occurred 8 years later in 1977, when the league increased to 26 teams. At first, this seems to contradict the model again, as this was a period of stagnant incomes and there was no apparent event that would indicate an increase in talent per team. However, what occurred in the late 1970's in North America is the baby-boom generation reached early adulthood. This increased the population of people who were of the age to play professional baseball. If one assumes that, regardless of era, the same fraction of the total people are skilled baseball players, then a large increase in the population can be viewed as a large increase in the playing talent. Thus, the expansion in 1977 can be thought of as occurring during a time when there was a large increase in the talent pool for the MLB. This is entirely consistent with the model.

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[8] More details concerning the impact of income on league size can be found in section 5.

After MLB expanded into Toronto and Seattle in 1977, no further expansion was seen until the league expanded to 28 teams in 1993, a span of 15 years. The main reason for the lack of expansion in the first part of this period would be the stagnation in incomes that many people in North America experienced as a result of the recession in the 1970s and 1980s. This decrease in income leads, as the model predicts, to a contraction in the number of teams. However, the league stayed at 26 teams for the full period. This is due, as mentioned in the previous section, to the costs of contraction that would make it no longer an optimal choice, even if it was in a first-best world. However, the lack of expansion for such an extended period can be seen to be a result of the contractionary pressures on the league through the decrease in consumer income.

By the late 1980's, incomes were starting to rise again, suggesting that expansion might be the optimal choice. However, expansion did not occur until 1993, when the league increased to 28 teams. This would seem to be a slightly delayed reaction of the MLB to the increase in incomes seen in this period. As incomes increased even more throughout the decade, the league decided to expand again in 1998, when it reached its present size of 30 teams. Both of the last two expansions can be explained by the rise in incomes of the 1990s.

More recently, MLB has seen another long stretch (10 years) without expansion. As before, this is indicative of pressures making contraction the optimal choice in theory, but not in practice due to the extra costs. In fact, MLB has openly talked about contracting 2 teams in this period (Stark, 2002). The model explains this contractionary pressure by the decrease in the talent pool resulting from the decreased numbers of African-Americans becoming baseball players. According to ABC News, in 1974 27% of

players were African-American, while in 2006 only 9% were (Lee, 2007). This decrease is likely a result of fewer African-Americans going into baseball than before and not because they are being displaced by other players. From 1992 to 1995 the percentage of African-Americans in the NBA increased from 75% to 82% (Lelinwalla, 2004). This suggests that African-Americans are entering the NBA (and perhaps the NFL) in greater numbers now at the expense of MLB. The model predicts that this decrease in talent should lead to a decrease in the number of teams in the league. In recent years, the increase movement of Asian players from the Japanese and Korean baseball leagues to MLB has begun to offset this (Kurkjian, 2007), and if it continues to do so, one might see MLB expand again.

Except for when the league was threatened with competition by the Continental League, the model does very well in predicting the expansion path of MLB over the last 50 years. The only other possible inconsistency with the data is that the 1993 expansion brought about by rising incomes may have occurred a bit later than would seem likely given the rising incomes in the late 1980s. Other than these minor concerns, the model was very consistent with the expansion pattern of MLB.

4.3 NHL

In 1960 the NHL was comprised of only six teams, and had been since 1942. The league would maintain this number of teams until 1967, when the first wave of expansion doubled the number of teams to 12. Then, a mere 3 years later, the NHL expanded by a further 2 teams, bring the total to 14. According to the model, the reason for this expansion was likely two-fold; an increase in incomes and an increase in the talent pool. The post-war era was one of unprecedented growth in GDP for the Western countries,

including Canada and the United States. This growth brought extra spending money to many current and prospective hockey fans, which would shift demand for hockey out (just as it did with baseball), increasing existing teams profits and increase the optimal number of teams in the league.

Furthermore, the 26 year period of playing with only 6 teams almost certainly allowed the pool of skilled-enough hockey players to increase. Continuing to envision that the number of skilled hockey players is a constant fraction of the total population, then a 26 year increase in the population would increase the number of talented players. Therefore, the 1967 and 1970 expansions are consistent with the model. However, the question as to why the NHL waited 26 years to expand remains unanswered.

The 1970s in the NHL were the period where they were competing with the WHA, as was discussed in the previous section. During this period the NHL expanded from 14 to 18 teams in order to increase its monopoly power in light of the WHA competition. However, the NHL is unique in that, unlike the other leagues, it succumbed to the pressures of over expanding in an attempt to compete with the WHA. The NHL contracted by one team in 1978 when the Cleveland Barons merged with the Minnesota North Stars. The reduced talent pool did lead to a reduced league size in this year as the model predicts. In 1979 the two leagues merged and 4 WHA teams joined the NHL, resulting in a single 21 team league.

The previous 7 years of over-expansion led to a league that was much larger than optimal. The talent level per team was very low, resulting in games that wouldn't be as exciting as they would have in the event of an optimally sized league. Also having an effect in the early part of this period was the recession of the early 1980's which reduced

the disposable income that consumers had to spend on hockey. Both of these events

should lead to a decrease in the league size, but as contraction tends to be costly, a 12-

year period of no expansion was seen instead.

The most recent phase of expansion in the NHL has coincided with an influx of

talent from Europe, which was brought about by the fall of the Berlin wall, allowing

Slovak, Czech, and Russian players to migrate to North America (Leeds and von

Alllmen, 2008). As well, the 1990's were a period of growth for the North American

economies, which increased the income that consumers had to spend on attending hockey

games. As the model predicts, this influx of talent and increased income led to a period of

expansion. From 1991 to 1993, the NHL expanded from 21 to 26 teams. The continued

influx of European talent and growth of the economy led to a second expansion from 26

to the current 30 teams between 1998 and 2000.

As with MLB, the model is very consistent with the expansion decisions made by

the NHL. Aside from the period when the NHL was forced to compete with the WHA,

the only possible inconsistency arises in the NHL's decision to wait until 1967 before

expanding beyond 6 teams. Rising incomes and increased playing talent suggests that this

expansion may have occurred earlier. Other than these inconsistencies, the model

performs very well in explaining the NHL expansion.

4.4 NBA

At the beginning of the 1960's, the NBA was the second smallest of the four

leagues, comprising only 8 teams, but in 1961 it expanded to 9 teams. This expansion can

be seen as the result of increased incomes resulting from the post war economic boom in

America.

In the mid to late 1960s and early 1970s the NBA had to compete with the ABA. The response of the NBA was summarized and analysed earlier. However, a brief summary of the response may be useful. In 1966, the NBA pre-empted the ABA by expanding to 10 teams. Further expansion occurred in 1967 (12 teams), 1968 (14 teams), 1970 (17 teams), and 1974 (18 teams). The period of competition ended when the ABA merged with the NBA in 1976. 4 ABA teams gained admission into the NBA, leading to a 22 team league. The NBA was the sole monopoly league again, albeit one that had too many teams.

The inflated league of the time, along with the economic recession would suggest that it would be a while before the NBA expanded again, but just a short 4 years later, the Dallas Mavericks increased the number of teams to 23. The first thought for this expansion might be that the aging of the baby-boomers has led to an increase in the talent pool of the league, however by 1980, the baby-boomers were already past the age where they were entering the league. The effect of the baby-boomers would have likely been seen earlier than 1980. Furthermore, it is unlikely that the talent pool had sufficiently recovered from the over-expansion of the ABA era to now be at the point where the league was ready to expand again for talent reasons. This is the one unexplained expansion in the 4 leagues since 1960. Not only had the NBA expanded too quickly in an effort to eliminate the ABA from the picture, but this was a period of stagnation in the American economy, which reduced consumer incomes. Thus, the expansion of the NBA to Dallas in 1980 remains the one expansion that is inconsistent with the model and occurred in an era when the assumptions of the model were valid.

It would be another 8 years before the NBA expanded to 25 teams in 1988 and 27

teams in 1989. The reason for this lies in the fact that, led by Magic Johnson, Larry Bird,

and Michael Jordan, the 1980's proved to be the pinnacle of playing talent in the NBA.

During the season immediately preceding this expansion a total of 20 future basketball

Hall of Fame members played in the league, a sure sign of an incredible increase in the

talent pool available. This increased talent pool increased the quality of games and

directly led to the increased league size.

The next expansion in the NBA occurred in 1995, when the NBA entered into

Canadian markets for this first time, expanding to 29 teams. This was an era of high

income growth in both Canada and the United States, which allowed consumers to spend

more money on consuming basketball entertainment. The model predicts that this would

lead to expansion, which is what occurred.

The last expansion of the NBA occurred in 2004 when the Charlotte Bobcats

entered the league. It is likely that this occurred as a response to the recent influx of

foreign talent into the league. According to Boeck, a record 18% of NBA players were

non-American in 2006. While historically the NBA has had a predominantly American

talent pool, the spread of basketball worldwide has seen a number of high profile players

enter the league from Asia, Africa, Europe, Canada, Australia and Latin America. The

last three MVP awards went to non-Americans: a Canadian twice and a German. Thus, it

is likely that the founding of new talent pools has caused the recent expansion and could

very well lead to future expansion in the near future.

The NBA is the league with which the model performs the worst. Aside from the

ABA era, the model is also inconsistent with the expansion of the Dallas Mavericks in

1980. The Dallas Mavericks expansion is the only expansion that is inconsistent with the model and occurred when the model's assumptions were met. However, the model still performed admirably as it predicts all other expansions.

4.5 NFL

The story of football over the last 50 years differs somewhat from that of the other 3 sports, since the period began with two competing football leagues, the NFL and the American Football League (AFL). The analysis of this period was already present, but a brief review of the expansion over this period is in order. The NFL had 13 teams in 1960, but expanded to 14 in 1961, 15 in 1966, and 16 in 1967. The AFL had 8 teams in 1960, but expanded to 9 in 1966 and 10 in 1968, for a total of 26 professional football teams. Eventually, as with basketball and hockey, the leagues realized the gains to be had from operating only one league and so merged into a single league for the 1970 season.

As was seen with the NHL, the NFL saw a relatively long period of no expansion immediately following the merger with the AFL. The NFL remained at 26 teams for 6 years. The same story as the NHL applies here as well. The competition with the AFL led to a league with too many teams, which greatly reduced the talent per team, making contraction the optimal choice. However, as the costs of contraction are too high, the league decided to not expand.

The next expansion occurred in 1976 when the Tampa Bay Buccaneers and Seattle Seahawks were admitted into the league, increasing the number of teams to 28. This occurred during a period of recession in the United States, which suggest that increasing incomes was not the reason. Thus, one can look at increased talent, coming about as a result of the baby-boomers coming of age, as a possible cause. Keeping the

assumption that a constant fraction of the population is a skilled football player, than a large increase in the population would correspond with a large increase in the talent pool. Thus, one would see an increase in the talent pool when the baby-boomer bulge reached early adulthood, which would have occurred during this era, when the NFL expanded by 2 teams.

Following the 1976 expansion, the NFL saw 19 year period where the size of the league remained constant. The beginning of this era was a period of recession, which would imply that incomes are decreasing, and so contraction should occur (but doesn't because of the extra cost). However, by the middle 1980's the recession was over, but the league still did not expand with rising incomes. Eventually however, the increase in incomes that was seen in the latter part of the 1980's and into the 1990's and early 21st century did lead to an increase in the number of teams in the NFL, the response seemed to have simply been delayed. The NFL expanded to 30 teams in 1995, 31 in 1999, and 32 in 2002, all during the era of rising incomes. Thus, the model is consistent with the expansion pattern of the NFL as well.

Aside from the period when the NFL was competing with the AFL, all expansions are consistent with the predictions of the model. The one possible area of concern lies in the delay of expansion in the 1990s, after incomes had been increasing for some time. The model may have predicted these expansions should have occurred at an earlier date.

5 INCOME

While the ability to undergo a full empirical study is limited due to the lack of

data, some observations can be made on the relationship between consumer income and

the number of teams in a league. The model predicts that a rise in consumer incomes

should lead to an increase in the number of teams in the league. By inspecting the

expansion histories of the four major leagues we have found that the model's predictions

are consistent with the expansion. The question remains as to how strong this effect is.

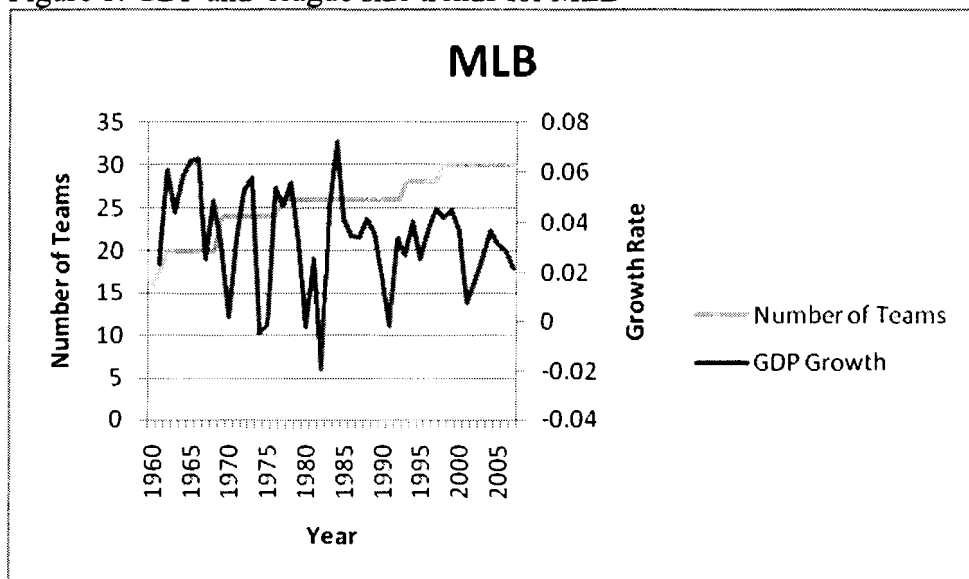Figure 1: GDP and league size trends for MLB

Figure 1 graphs the number of teams in MLB and the annual growth rate of US

real GDP[9] since 1960. The thing to notice is that all of the expansions in this period

followed a jump in the growth rate of US GDP. This is as the model predicts. Further,

the long period of no expansion from the late 1970's to the early 1990's coincided with

the lowest growth rates. Again, this is as the model predicts, given that the costs of

contraction make it an unlikely choice. This pattern is also found in figure 2 (the same

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[9] This is not the best measure, both because there are teams in Canada and because the total income of
markets in the league would be more applicable to the effect of income on league size. However, it should
be sufficient given the inexactness of the task at hand.

graph but for the NFL). All of the expansions followed spikes in the growth rate of GDP, and the long period in the 1980's of no expansion coincided with the lowest growth rates in the 50 year period[10].

Figure 2: GDP and league size trends for the NFL
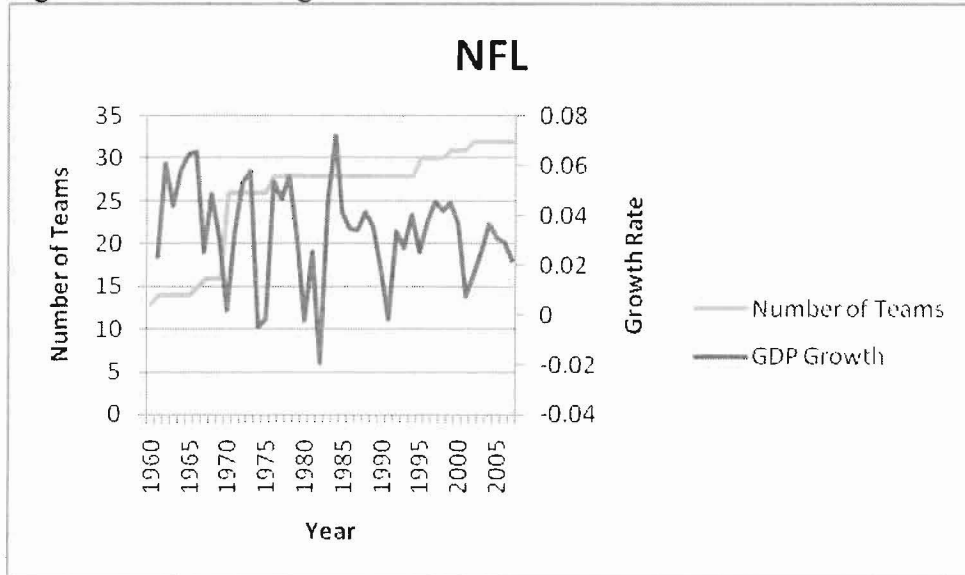
Unfortunately, in both MLB and the NFL, there were a number of increase in the growth rate of GDP without an expansion following. In terms of the model, these years could have also coincide with either decreases (or stagnation of playing talent) or increases in costs through increases in playing salary. However, another possible reason for could result from the fact that not all markets are the same. Logically, the leagues will expand into the best markets when they do choose to expand. However, if there is no market available that will earn profits large enough to compensate the existing teams for their lost profits, then expansion will not occur. So, perhaps the increases in GDP growth rate that were not followed by expansion could be caused by the lack of a suitable market with which to expand into.

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[10] Similar patterns can be seen for the NHL and NBA in appendix A.

Either way, this brief foray into more formal empirics highlights the need for a formal empirical study of the problem. Unfortunately, with only 50 years of data and a handful of expansions for each league, any formal empirical investigation would have very weak results. However, as time passes and more years and expansions are included in possible datasets, the ability to undertake formal empirics will arise.

It would make sense in light of this to try and investigate how this research would be undertaken. One main issue is how to measure talent. There is no readily available variable that can be used. Possible proxies would include average height or weight of players, which has risen over time as talent has. Another possible choice could be the average result on a benchmark test, such as a 40 yard dash for football players. These measures would measure absolute athleticism which is certainly correlated with talent. The other data needed, such as consumer income, number of teams and degree of revenue sharing would be much easier to find than talent.

6 CONCLUSION

The professional sports landscape of North America has changed drastically over the last century. It is now a major business that attracts the attention of millions of people from all walks of life. Since it is a business, the profit maximizing theory of economics can be applied, and the optimal number of teams in a league can be determined. In this paper, it is shown that simple increases in income and the talent pool should lead to an increase in the optimal number of teams in a league. This theory is inconsistent with only one of the expansions in the four major sports leagues since 1960 in which the assumption of a monopoly league were met.

Aside from the fact that changes in only two variables can explain theoretically much of the expansion of the MLB, NHL, NBA, and NFL, the main point of interest in this paper is that the model had assumed that each team is always a local monopoly. In most areas of business, if firms are always local monopolies, then theoretically, there would be no externalities created by the addition of new firms which would limit the profit maximizing number of firms. However, due to the unique nature of the sports business, externalities from new teams arise even without market competition between teams reducing monopoly power. An increase in the number of teams will always reduce profits of existing teams by reducing demand through decreased quality of games.

Future research in this area of sports economics should be focusing on two items: improving the theory and undertaking more formal empirical analysis to test the theory. The main point of concern for the theory is the assumption that all markets are identical. This assumption is not realistic and if relaxed may lead to theoretical issues regarding the

problem of the profitability of potential markets. Relaxing this assumption of identical markets may also allow for the issue of team relocation to be included in the model.

By simply looking at the expansion histories of the four major sports leagues in light of the predictions of the model, the best that can be obtained is that the model is consistent with the real world data. What is missing is causation and size of the effects. Thus, more formal empirical research should be done which can determine both causation and the importance of income and talent changes on expansion relative to competing theories, such as degree of revenue-sharing (from Vrooman) and loss of monopoly power (from Bae and Choi). Unfortunately, due to the very small sample sizes seen in potential datasets (50 years and a handful of expansions in each league) this empirical research will have to wait. When this does occur, we will be able to shine more light, as this paper does, on the question of the optimal number of teams in a sports league: How many are too many?
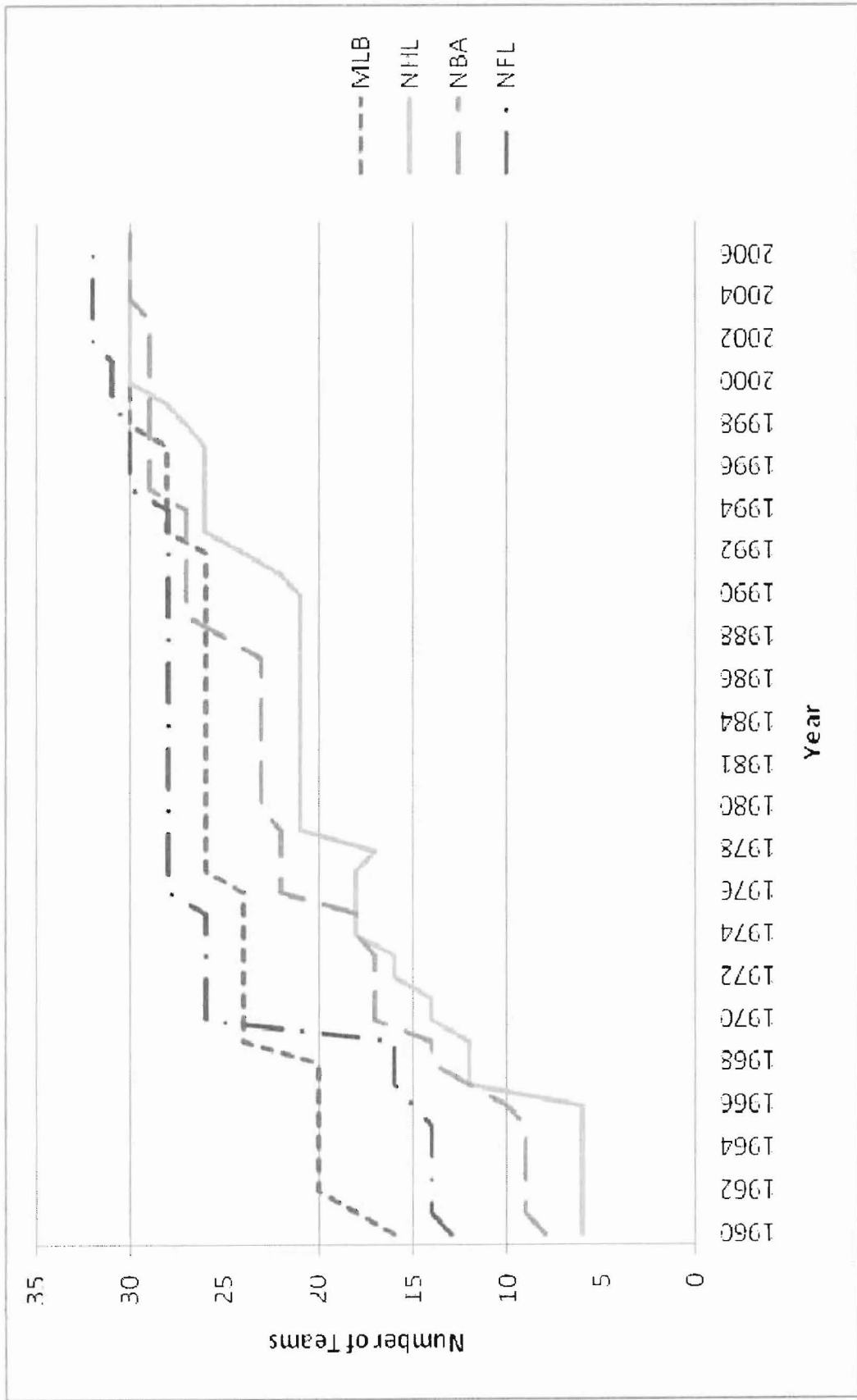
APPENDICES

Appendix A: GDP-League Size Graphs

NHL

NBA
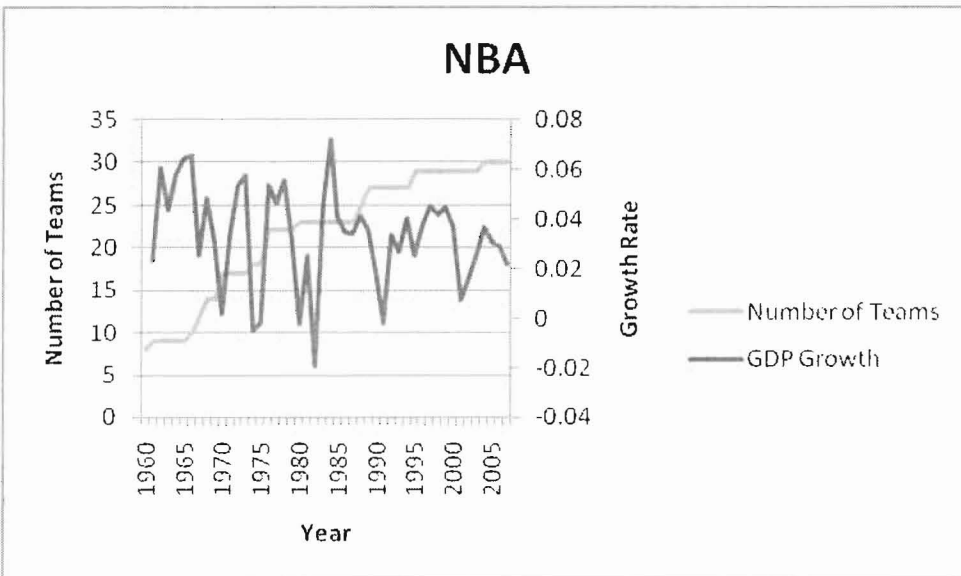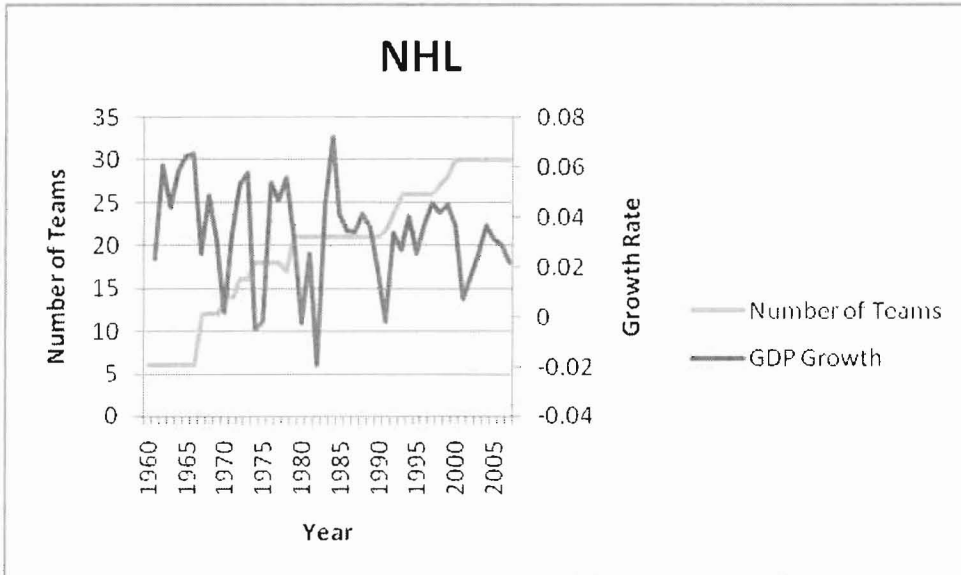
Appendix B: Timeline of Expansion Events

Year	MLB	NHL	NBA	NFL
1960	16 teams Threat of Continental League	6 teams	8 teams	13 teams plus 8 in the AFL
1961	Washington, Anaheim (18)		Chicago (9)	Minneapolis to NFL (14)
1962	Houston and New York (20)			
1966			Chicago (10)	Atlanta, NFL (15) Miami, AFL (9)
1967		Los Angeles, Philadelphia, Pittsburgh, St. Louis, Minnesota, Oakland (12)	Seattle, San Diego (12) ABA forms	New Orleans, NFL (16)
1968			Milwaukee, Phoenix (14)	Cincinnati, AFL (10)
1969	Kansas City, San Diego, Seattle, Montreal (24)			
1970		Vancouver, Buffalo (14)	Portland, Cleveland, Buffalo (17)	AFL-NFL merger (26)
1972		New York, Atlanta (16) WHA forms		
1974		Washington, Kansas City (18)	New Orleans (18)	
1976			ABA merges (22)	Seattle, Tampa Bay (28)
1977	Toronto, Seattle (26)			
1978		Cleveland folds (17)		
1979		WHA merges (21)		
1980			Dallas (23)	
1988			Miami, Charlotte (25)	
1989			Orlando, Minnesota (27)	
1991		San Jose (22)		
1992		Ottawa, Tampa Bay (24)		
1993	Colorado, Florida (28)	Florida, Anaheim (26)		
1995			Toronto, Vancouver (29)	Carolina, Jacksonville (30)
1998	Arizona, Tampa Bay (30)	Nashville (27)		
1999		Atlanta (28)		Cleveland (31)
2000		Columbus, Minnesota (30)		
2002				Houston (32)
2004			Charlotte (30)	

Appendix C: League Sizes

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