

Is the Price Right? An Analysis of the National Football League Ticket Market relative to the Great Recession¹

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Abstract

The Great Recession in the United States (concentrated in 2008 and 2009) not only incurred widespread economic turmoil, but also was one of the few times when National Football League (NFL) attendance figures fell below almost complete attendance during the last decade. However, despite this fact, NFL ticket prices never decreased on average during this time. This paper takes advantage of this natural experiment to analyze the macroeconomic, team performance, and other factors that influence the market for NFL tickets before, during, and after the Great Recession. Data for 30 teams from the years 2004-2014 are used in a regression model that accounts both for team-based fixed effects and autocorrelation in the errors. The results show that the unemployment rate in a team's metropolitan area is a strong predictor of that team's attendance; that the mean annual wage in a team's metropolitan area and the opening of a new stadium are strongly predictive of the price of non-premium tickets; and that the relative ticket price increase associated with a new stadium is greater for non-premium tickets than for premium tickets. Additionally, there is no evidence that team performance affects either of these components of ticket demand, after controlling for team fixed effects. These findings provide a window into how demand for NFL tickets was impacted by the Great Recession and contribute to knowledge of which factors can be used to predict the market for NFL tickets in the future. Furthermore, this paper lays the foundation for future work that investigates to what degree NFL teams' ticket pricing strategies were economically rational during this time period.

1. Introduction

In this paper, I examine the relationship between economic conditions and National Football League (NFL) team ticket prices and game attendance. During the Great Recession in the United States (US), which occurred primarily during the years 2008 and 2009, economic conditions deteriorated dramatically over a relatively short period of time, with lingering negative aftereffects [1]. As a consumption good with very transparent quality and price data, NFL tickets provide a glimpse into how the Great Recession affected one aspect of the US economy across a variety of different regions. Available data (see section 2.1 for more details) on NFL ticket prices and game attendance show that while mean attendance declined during 2008-2010 (the depths of the Great Recession), mean NFL ticket prices (measured in US dollars, or USD) never declined. Figure 1 shows these patterns for NFL attendance, non-premium ticket prices, as well as mean local unemployment rates and annual wages for metropolitan areas with NFL teams.

Given the patterns in Figure 1, the Great Recession provides the opportunity to examine the following two questions:

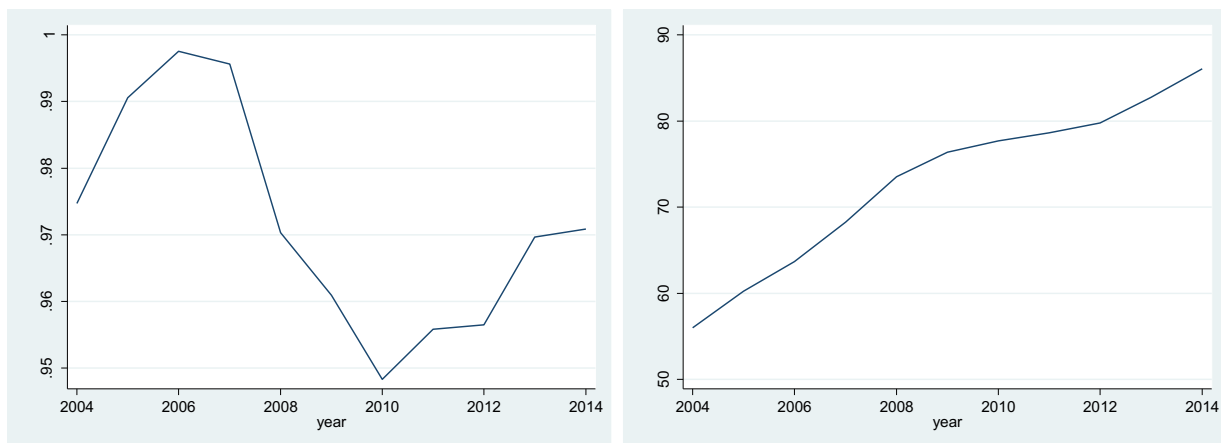
¹ Business of Sports, ID: 1569

1. How do local economic factors impact the demand for NFL tickets (ticket price and attendance) relative to team performance variables?
2. To what degree do these various economic and team-related factors have different effects on different elements of ticket demand (e.g., non-premium tickets vs. premium tickets)?

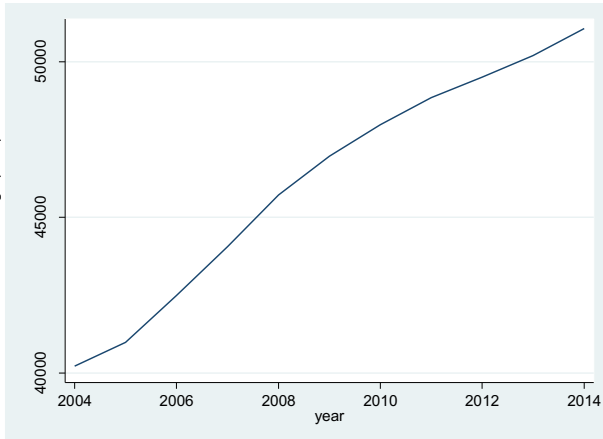
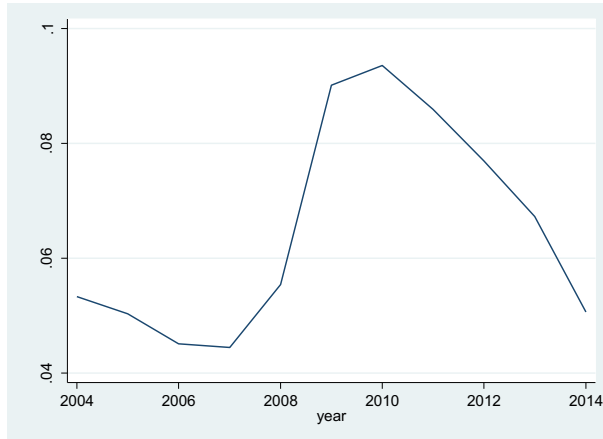
Prior research has shown that opening new stadia, prior year team performance, and macroeconomic variables such as market size and average income levels may be positively linked with ticket prices [2, 3] and attendance [4]. However, these variables typically have not been examined in the same study, making it difficult to assess their relative importance. Furthermore, only two prior studies have directly examined the impact of the Great Recession on ticket demand [5, 6]. These studies have various limitations, including a lack of control for autocorrelation, and not including team performance covariates alongside macroeconomic covariates in the same model.

This paper focuses on these two questions using panel data with team-year observations for 30 NFL teams² during the years 2004-2014 (11 years). All ticket prices are taken from the primary market because this is where teams set ticket prices and this paper is concerned with the strategic ticket pricing behavior of teams. The use of fixed effects and the Prais-Winsten regression model enables the paper to isolate the individual effects within teams and account for potential autocorrelation problems, and the inclusion of team performance and macroeconomic covariates allows assessment of the relative importance of each of these factors in determining the components of ticket demand. Additionally, the results of this paper also create a foundation for further research into the more ambitious question: Were teams operating in an economically rational way in setting ticket prices during the Great Recession?

Figure 1: Annual values from 2004-2014 for: Top left – NFL mean attendance (percent of seated stadium capacity); Top right – NFL mean ticket price (USD); Bottom left – Mean unemployment rate across NFL team metropolitan areas; Bottom right – Mean annual wage across NFL team metropolitan areas (USD)



² Data excluded for the Buffalo Bills and Jacksonville Jaguars. Buffalo is excluded because a large proportion of its fan base is located in Canada, which would not be cleanly mapped to the US economic data. Jacksonville is excluded because Jacksonville, FL does not consistently contain the same level of economic data as the other 30 NFL teams' respective US Large Metropolitan Areas.



2. Methods

For all of the economic models analyzed in this paper, I use linear regression with team-based fixed effects and a Prais-Winsten specification for panel-corrected errors. The fixed effects specification assigns a separate y-intercept for each of the 30 teams, which means it accounts for the possibility of large disparities in baseline values of dependent variables (i.e., attendance, non-premium and premium ticket prices) for different teams. The Prais-Winsten estimation controls for serial correlation between the errors in autoregressive models. Additionally, I include independent dummy variables for each year (except 2014, which is used as the baseline year) to account for annual NFL-wide fluctuations in variables.

Furthermore, in accounting for the autocorrelation between the errors, the Prais-Winsten model incorporates a direct time series component into the model. This is important because I am interested in how the economic conditions and other independent variables correlate with the dependent variables in general, as well as how the relationships between these variables changed over time during the Great Recession and the subsequent economic recovery.

2.1. Data Sources

The data span 30 NFL teams (Jacksonville and Buffalo excluded) from 2001 - 2014 (11 years). The notable variables include average primary market premium and non-premium ticket price (source: Team Marketing Report), average home game attendance (source: ESPN.com), average unemployment rate and median wage (source: Bureau of Labor Statistics), regular season wins, Super Bowl wins, and winning percentage of local MLB, NBA, and NHL teams for each team and its corresponding metropolitan area. Table A1 (Appendix) shows the Large Metropolitan Area (as defined by the Bureau of Labor Statistics) I used for each team.

2.2. Economic Models

The economic models for these regression analyses can be expressed theoretically as:

$$\begin{aligned}
 Y1 = \text{attendance} = & \beta_0 + \beta_1(\text{unemployment}) + \beta_2(\text{wage}) + \\
 & \beta_3(\text{wins}_{py}) + \beta_4(\text{championship}_{py}) + \beta_5(\text{new stadium}) + \\
 & \beta_6(\text{MLB win rate}) + \beta_7(\text{NBA win rate}) + \beta_8(\text{NHL win rate}) + \varepsilon
 \end{aligned}
 \tag{1}$$



$$Y2 = \text{nonpremium ticket price} = \beta_0 + \beta_1(\text{unemployment_py}) + \beta_2(\text{wage_py}) + \beta_3(\text{wins_py}) + \beta_4(\text{championship_py}) + \beta_5(\text{new stadium}) + \beta_6(\text{MLB win rate_py}) + \beta_7(\text{NBA win rate_py}) + \beta_8(\text{NHL win rate_py}) + \varepsilon \quad (2)$$

$$Y3 = \text{premium ticket price} = \beta_0 + \beta_1(\text{unemployment_py}) + \beta_2(\text{wage_py}) + \beta_3(\text{wins_py}) + \beta_4(\text{championship_py}) + \beta_5(\text{new stadium}) + \beta_6(\text{MLB win rate_py}) + \beta_7(\text{NBA win rate_py}) + \beta_8(\text{NHL win rate_py}) + \varepsilon \quad (3)$$

In these models, Y is the dependent variable (either attendance, non-premium ticket price, or premium ticket price), β_0 is the y-intercept, $\beta_1 - \beta_5$ are the coefficients with respect to the variables listed in parentheses (the suffix “_py” indicates that it is a lagged variable that records the value of the variable for the prior year), and ε is the error term. The decision to use prior year versions of independent variables in some models rather than others is based on how the dependent variable in the model would interact with the independent variable of interest. Because ticket prices are set before current year team performance and macroeconomic variables are known, I use prior year independent variables except for new stadium (because teams know when the stadium will open when they set prices). However, because attendance occurs later on during the course of the season when values of most of these independent variables are known (except for the true team performance for that full year), I use current year versions of these independent variables in the attendance model. The hypotheses for models 1-3 are as follows:

- Unemployment will be negatively associated with attendance and non-premium ticket price because higher unemployment means that fewer consumers will have the financial means to purchase tickets to attend games;
- Wage will be positively associated with attendance and non-premium ticket price because higher mean wages suggest that consumers have more disposable income to spend on luxury items such as NFL game tickets, and higher wages may reflect demographic changes in local area populations that are hypothesized to impact ticket prices [3];
- Neither unemployment nor wage will have any association with premium ticket price because the average consumer of premium tickets is someone with enough financial security/wealth that he/she is insulated from marginal fluctuations in area mean wages and unemployment rates;
- Wins and championship will be positively associated with all three dependent variables because better team performance will increase demand to see the team live during games, both increasing the price and the audience/fan base;
- New stadium will be positively associated with all three dependent variables because teams will increase ticket prices upon opening a new stadium in response to providing consumers with newer facilities, and consumer interest in experiencing the new stadium will lead more individuals to buy tickets (at least in the short-term).
- MLB win rate, NBA win rate, and NHL win rate will be negatively correlated with all three dependent variables because better competing teams will be more attractive to consumers, who use those teams as potential substitutes for NFL teams, thus exerting downward pressure on NFL ticket prices and/or attendance.

3. Results

I employ a common set of eight independent variables for each economic model. All models have 300 observations because the inclusion of lagged independent variables excludes observations from 2004 from the sample.

3.1. Results for attendance³

Table 1 displays the output for the fixed effects Prais-Winsten regression for attendance. The main result from this model is that unemployment has a very statistically significant negative correlation (at the one percent level) with attendance. The unemployment coefficient suggests that every one percent increase in a metropolitan area's unemployment rates yields a 1.34 percent decrease in attendance for that area's NFL team. Because unemployment rates have a tight range in reality, with a difference of less than four percent separating normal conditions and widespread economic malaise, a coefficient of this magnitude seems intuitively reasonable.

The other interesting information from Table 1 is that there is no suggestion that team performance has any impact on attendance. The estimates for prior year wins and championship are not statistically significant, which is surprising because I had hypothesized that there would be a strong positive relationship between these variables and attendance. The initial evidence suggests that attendance is not impacted by the success of the product on the field after one controls for team fixed effects and macroeconomic conditions.

Variables that show weakly statistically significant associations with attendance (percentage of seated stadium capacity filled) are new stadium and NHL win rate (both at the marginal 10 percent level). Opening a new stadium is estimated to increase attendance by roughly 4.40 percent, which seems reasonable from the perspective that more fans will want to attend games to see the new stadium. In turn, the new stadium also acts as a signal to fans from the team that the team cares about the in-game fan experience. In contrast, each percent increase in an area's NHL win rate is estimated to decrease NFL attendance by -0.07 percent. That would suggest that an NHL team improving from a non-contender (0.35 NHL win rate) to a high playoff seed (0.65 NHL win rate) would result in a decrease in attendance of slightly over two percent. While this result is consistent with the hypothesis that better sports alternatives put downward pressure on NFL ticket demand, my concerns with win rate variables along with the marginal significance make me hesitant to read too much into this result.

³ Note that all regressions use a two-tailed significance test. Statistical significance at the 10 percent, five percent, and one percent levels are designated by *, **, and ***, respectively.



Table 1. Prais-Winsten fixed effects regression results for attendance

	Coefficient	Stat. Sig.
Macroeconomic Conditions		
Unemployment rate (%)	-1.34%	***
Mean wage (\$1,000's)	0.15%	
Team Performance		
Prior year regular season wins	0.15%	
Prior year championship (Super Bowl win)	-0.63%	
Other Factors		
New stadium	4.40%	*
MLB team win rate (%)	0.04%	
NBA team win rate (%)	0.00%	
NHL team win rate (%)	-0.07%	*
Observations	300	
R-squared	0.76	
Rho	0.31	

3.2. Results for non-premium ticket price

While it appears that the primary predictor of attendance (that is accounted for in this paper) is unemployment, Table 2 shows that non-premium ticket price does not share this association. There is no relationship between prior year unemployment and non-premium ticket price. New stadium has a stronger impact on non-premium ticket price (statistically significant at the one percent level) than in the attendance model, which makes sense given that teams are providing an improved stadium experience and thus can charge a higher price. The other reason this makes sense is because teams want to recoup a profit on the massive fixed cost investment of building a new stadium, and the most sensible way to achieve that is through increasing ticket prices. The result estimates new stadium increase non-premium ticket price by twenty dollars.

Aside from new stadium, prior year wage has a statistically significant positive correlation with non-premium ticket price (at the five percent level). The positive relationship between prior year wage and non-premium ticket price is in line with my hypothesis. These two variables may be correlated due to inflation increasing both non-premium ticket price and prior year wage proportionally, and/or due to increased discretionary income for consumers spurring them to purchase tickets at higher prices. The magnitude of this effect suggests that every 1,000 dollar increase in wages is associated with an increase in non-premium ticket price of slightly over one dollar. In considering the impact of this effect, it is important to keep in mind that mean wage increased by over 10,000 dollars from 2004 to 2014 (Figure 1) and that the greatest wage growth for any one metropolitan area was 17,780 dollars for San Francisco. It is also possible that wage growth may influence a team's decision to build a new stadium, although this claim is difficult to establish using only the data that I have.

The other noteworthy departure from the attendance model is that both team performance variables have statistically significant (at the 10 percent level) positive relationships with non-premium ticket price. The fact that teams that win the Super Bowl increase their ticket prices by

2.35 dollars on average is not shocking, given that a prior year championship would seem to confer premium status on a product that is already a luxury/entertainment good. Additionally, the estimate that each additional prior year win has a marginal value of 0.17 dollars seems reasonable; if anything, it is surprising that going from a 4-12 cellar-dweller to a 12-4 conference champion would be estimated to only boost prices by 1.35 dollars per ticket. Perhaps this is a reflection of the possibility that many teams have relatively stable year-to-year percentage of prior year wins, such that there are not many instances in the sample where a team experiences a dramatic turnaround from one year to the next.

Table 2. Prais-Winsten fixed effects regression results for non-premium ticket price (dollars)

	Coefficient	Stat. Sig.
Macroeconomic Conditions		
Prior year unemployment rate (%)	\$0.10	
Prior year mean wage (\$1,000's)	\$1.05	**
Team Performance		
Prior year regular season wins	\$0.17	*
Prior year championship (Super Bowl win)	\$2.35	*
Other Factors		
New stadium	\$20.30	***
Prior year MLB team win rate (%)	-\$0.11	*
Prior year NBA team win rate (%)	\$0.07	*
Prior year NHL team win rate (%)	-\$0.07	
Observations	300	
R-squared	0.74	
Rho	0.47	

3.3. Results for premium ticket price

One of the issues for the premium ticket price model is that I was unable to access premium ticket price data for 2004 and 2006 that Team Marketing Report published. Hence, I imputed the missing values for premium ticket price under the premise that they are missing at random (MAR) for those two years (as well as five other observations, four of which are for the San Francisco Forty-Niners) using chained imputation via predictive mean matching in Stata. To predict premium ticket price in my imputations I used prior year versions of: unemployment, wage, wins, championship, new stadium, MLB win rate, NBA win rate, and NHL win rate. Figure A1 (Appendix) shows the distribution plots of imputed, observed, and completed (combined observed and imputed) values for premium ticket price.

Table 3 shows the results for premium ticket price (R-squared and Rho values omitted due to use of multiple imputation). Unlike with non-premium ticket prices, prior year wage has no statistically significant relationship with premium ticket price. Similarly, the significance of new stadium as a predictor of premium ticket price is marginal at best (10 percent significance level). Even though its

coefficient is double the value seen in the non-premium ticket price model, the link between new stadium and premium ticket prices is more tenuous.

Overall, these results support the notions that a) premium ticket consumers are not as vulnerable to macroeconomic fluctuations as non-premium ticket consumers (because of the lack of association between premium ticket price and either prior year unemployment or prior year wage), and b) the burden of ticket price increases as a result of new stadium falls on consumers of non-premium tickets disproportionately relative to consumers of premium tickets.

Specifically, mean non-premium ticket price and premium ticket price are 73 dollars and 232 dollars, respectively. Hence, on average, non-premium ticket price is less than one third of premium ticket price. However, a proportionate increase for each price would have premium ticket prices increasing by three times the increase in non-premium ticket price, not just by a little over two.

Table 3. Prais-Winsten fixed effects regression results for *premium ticket price* (in dollars)

	Coefficient	Stat. Sig.
Macroeconomic Conditions		
Prior year unemployment rate (%)	-\$1.11	
Prior year mean wage (\$1,000's)	\$6.48	
Team Performance		
Prior year regular season wins	\$0.91	
Prior year championship (Super Bowl win)	\$15.19	
Other Factors		
New stadium	\$43.08	*
Prior year MLB team win rate (%)	\$0.41	
Prior year NBA team win rate (%)	\$0.58	*
Prior year NHL team win rate (%)	-\$0.20	
Observations	300	

4. Discussion and Conclusion

In this paper, I have estimated the relative contributions of macroeconomic, team performance, and other factors to NFL attendance, non-premium ticket price, and premium ticket price during the Great Recession and the years before and after (2004-2014). The results show that attendance and non-premium ticket price are predicted by separate macroeconomic factors; the former is strongly correlated with unemployment rate while the latter is strongly correlated with prior year mean annual wage. Moreover, premium ticket price does not have a statistically significant correlation with either macroeconomic variable, supporting the notion that consumers of premium tickets are more insulated from economic shocks than consumers of non-premium tickets.

Furthermore, it appears that the increase in ticket prices associated with new stadiums falls on non-premium ticket consumers to a greater extent than premium ticket consumers (an estimated



increase of 20 dollars for non-premium ticket prices vs. an estimated increase of 43 dollars for premium ticket prices, even though non-premium ticket prices cost 73 dollars on average versus 232 dollars for premium ticket prices). Even if turns out that these new stadia have a greater ratio of premium seats to non-premium seats than the stadia they are replacing (meaning that teams could increase premium ticket revenue by increasing the volume of premium seats rather than the price per premium seat), these findings still support the notion that non-premium tickets are becoming increasingly expensive as teams modernize their stadia.

Finally, it is noteworthy that team performance was not a statistically significant predictor (at the five percent level or greater) of any dependent variable measured in the five economic models, a very surprising result given my initial hypotheses. This could arise because I examine annual changes in team performance while controlling for larger franchise history, but it is still surprising.

Beyond that, I hope this paper serves as a foundation for future work on the more ambitious question of whether NFL teams set ticket prices in an economically rational manner in response to the Great Recession. This could dovetail with prior research that has suggested that NFL teams set prices consistent with the notion of maximizing current ticket revenue and profit [7]. A logical next step would be to build a model that estimates the elasticity of ticket demand for premium and non-premium tickets during the period of time used here.

These analyses are important not just because they provide insight into the effects of the Great Recession or the broader market for NFL tickets, but because this information can help provide a view into how ticket prices could be set moving forward. This is a particularly exciting issue in light of how teams such as the San Francisco Forty-Niners are now using dynamic ticket pricing models to better adjust their ticket prices to meet fan demand while trying to maximize attendance and team revenue. As implementation of dynamic ticket pricing models is increasingly adopted throughout the NFL in the coming years, I expect the questions posed within this paper to become even more relevant to teams as well as NFL consumers.

References

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Appendix

Table A1: NFL teams and their corresponding US Large Metropolitan Areas

NFL Team(s)	Corresponding Large Metropolitan Area (as defined by the Bureau of Labor Statistics)
Arizona Cardinals	Phoenix-Mesa-Glendale, AZ Metropolitan Statistical Area (SA)
Atlanta Falcons	Atlanta-Sandy Springs-Marietta, GA Metropolitan SA
Baltimore Ravens	Baltimore-Towson, MD Metropolitan SA
Carolina Panthers	Charlotte-Gastonia-Rock Hill, NC-SC Metropolitan SA
Chicago Bears	Chicago-Joliet-Naperville, IL-IN-WI Metropolitan SA
Cincinnati Bengals	Cincinnati-Middletown, OH-KY-IN Metropolitan SA
Cleveland Browns	Cleveland-Elyria-Mentor, OH Metropolitan SA
Dallas Cowboys	Dallas-Fort Worth-Arlington, TX Metropolitan SA
Denver Broncos	Denver-Aurora-Broomfield, CO Metropolitan SA
Detroit Lions	Detroit-Warren-Livonia, MI Metropolitan SA
Green Bay Packers	Milwaukee-Waukesha-West Allis, WI Metropolitan SA
Houston Texans	Houston-Sugar Land-Baytown, TX Metropolitan SA
Indianapolis Colts	Indianapolis-Carmel, IN Metropolitan SA
Kansas City Chiefs	Kansas City, MO-KS Metropolitan SA
Miami Dolphins	Miami-Fort Lauderdale-Pompano Beach, FL Metropolitan SA
Minnesota Vikings	Minneapolis-St. Paul-Bloomington, MN-WI Metropolitan SA
New England Patriots	Boston-Cambridge-Quincy, MA-NH Metropolitan NECTA
New Orleans Saints	New Orleans-Metairie-Kenner, LA Metropolitan SA
New York Giants, New York Jets	New York-Northern New Jersey-Long Island, NY-NJ-PA Metropolitan SA
Oakland Raiders, San Francisco Forty-Niners	San Francisco-Oakland-Fremont, CA Metropolitan SA
Philadelphia Eagles	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD Metropolitan SA
Pittsburgh Steelers	Pittsburgh, PA Metropolitan SA
San Diego Chargers	San Diego-Carlsbad-San Marcos, CA Metropolitan SA
Seattle Seahawks	Seattle-Tacoma-Bellevue, WA Metropolitan SA
St. Louis Rams	St. Louis, MO-IL Metropolitan SA
Tampa Bay Buccaneers	Tampa-St. Petersburg-Clearwater, FL Metropolitan SA
Tennessee Titans	Nashville-Davidson--Murfreesboro--Franklin, TN Metropolitan SA
Washington Redskins	Washington-Arlington-Alexandria, DC-VA-MD-WV Metropolitan SA



Figure A1: Distributions of observed (blue), imputed (red), and completed (green) values for premium ticket price – x-axis represents the range of values of premium ticket price (dollars)

