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UFC pay-per-view buys and the value of the celebrity fighter

Abstract

In 2016, the Ultimate Fighting Championship was sold for a reported price of $4 billion, the highest price ever paid for a sports franchise. This was a remarkable turn-around for a promotion that 15 years earlier was saved from bankruptcy by a $2 million buyout. This turnaround was driven by the UFC's ability to mainstream the promotion and the sport while establishing reliable revenue streams through television contracts and massive pay-per-view events. In this paper, the authors review the pay-per-view record of the UFC and analyze the extent to which it is driven by high profile celebrity fighters with broad crossover appeal. Using statistical analysis, the authors identify the top crossover celebrities and assess the economic value they generate for the UFC. They compare this to the impact generated from the promotion's highest ranked pound-for-pound fighter and find that celebrity has far more economic value than fighting skill.

Keywords: pay-per-view buys, pound-for-pound fighter, sports franchise, crossover celebrities.
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Introduction

On September 10, 2016 at UFC 203, professional wrestler CM Punk stepped into the world famous Octagon to make his UFC and mixed martial arts (MMA) debut. The UFC is generally considered the most elite MMA organization, and competition is usually limited to the highest level mixed martial artists in the world. Most fighters train and compete in smaller organizations for years before earning a UFC contract. Many experienced professionals are forced to compete in a challenging multi-round tournament on *The Ultimate Fighter* reality show to earn a UFC contract. Yet Mr. Punk was given a fight on the main card of a UFC pay-per-view event despite having never competed in MMA as a professional or as an amateur. In fact, he had never competed in an actual combat sport event at any level. The results from a competitive perspective were not good for Mr. Punk. He was dominated in the contest and quickly defeated, taping out at 2:13 of the first round, having never landed a single strike on his relatively inexperienced opponent. But what was a competitive disaster may have been a tremendous financial victory for Mr. Punk and for the UFC. Punk received a disclosed appearance fee of $500,000 in addition to undisclosed incentive bonuses. His opponent, Mickey Gaul, on the other hand, was paid $30,000 including a $15,000-win bonus. The UFC reportedly generated 425,000 to 475,000 pay-per-view buys for the event, with industry observers estimating that this fight card without Punk would have generated 250,000 to 300,000 buys. In other words Punk's appearance generated incremental revenue estimated somewhere between $3.75 million and $6.75 million (Meltzer, 2016).

The CM Punk appearance is just the latest, and perhaps most blatant example of the UFC's desire to create high profile celebrity fighters. In this paper, we examine the history of UFC and analyze pay-per-view buys over the past 12 years. We build a causal model to explain the rate of PPV buys and estimate the incremental value of several high-profile cross-over stars: Brock Lesner, Ronda Rousey and Conor McGregor. We also analyze the impact generated by Demetrius "Mighty Mouse" Johnson, the promotion's long reigning flyweight champion. Long considered the best pound for pound fighter in the UFC, we find that Mr. Johnson's ability to generate pay-per-view is substantially less than that of celebrity fighters concluding that fighting ability is a necessary but not sufficient requirement to drive PPV revenue for the promotion and income for the fighter.

1. Related literature

1.1. The history of mixed martial arts. The history of mixed martial arts in general and the UFC in particular is chronicled in multiple sources. A detailed account of the first UFC is provided in the memoir of Art Davie, a key founder (Davie, 2014). A biography of Pat Militech, one of the promotion's early fighters and coaches (Wertheim, 2010), provides a fighter's level perspective on the birth of the UFC. Two scholarly papers from the anthropology literature also are chronicles of the evolution of UFC from its roots in Brazil (Downey, 2006, 2007). These papers highlight the historical

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evolution of the sport, focusing on the effect the sport had on the culture of martial arts and the mass culture in general. Rather than a barbaric spectacle, Downey argues that MMA rapidly developed into a technically sophisticated event. The sport's evolution along with the evolution of the media which delivered it, from pay-per-view and video cassette to cable and broadcast television, provided a distance learning environment that radically shifted perceptions in the traditional martial arts community. He argues that "*mixed martial arts fighting is a science of suffering: an experimental, cumulative, communal undertaking to produce knowledge – in this case, about how to inflict and resist pain in the human body*" (Downey, 2007, p. 220).

Several case studies are also chronicles of the early development of the UFC. Serafeim and Welch (2011) review the early development of the sport leading up to the 2001 purchase of the UFC by Zuffa, LLC. Their review includes a description of the evolving MMA rule set along with attendance and PPV buys from UFC 1 to UFC 27. Thomson and Baker (2010) review the expansion of the promotion under Zuffa's ownership throughout the early 2000s including the development of *The Ultimate Fighter* reality show and the acquisition of the Pride and World Extreme Cagefighting (WEC) promotions. Serafeim and Welch (2011) focus on Zuffa's attempts to internationalize the sport, contrasting it with the internationalization of other sports. They also review the growth of PPV buys and compare PPV volume to other sports. They present a list of the top 10 PPV purchases for the year 2009, showing that 6 of the top 10 PPV sales were UFC events.

1.2. Analytics in MMA. While analytics has become quite popular in sports applications, the amount of academic literature devoted to combat sports in general and mixed martial arts in particular is quite limited. Papers such as Tenorio (2000) and Amegashie and Kutsoati (2005) examine economic incentives in boxing, while Duggan and Levitt (2002) investigate match fixing in sumo wrestling. The literature specifically devoted to analytics in MMA is mixed and somewhat limited. Fightnomics (Kuhn & Crigger, 2013) is a book that bills itself as mix of Moneyball (Lewis, 2004) and Freakonomics (Levitt & Dubner, 2009), applied to MMA. The book includes a series of analytics applied to detail fight data available from Fightmetrics (Spekman & Davis, 2004), a service that captured very detailed data about individual MMA contests. Despite the analytics, the text is oriented to the general public and lacks academic rigor. Other authors have applied more rigorous scholarly analysis of this data, though the literature is sparse and highly varied. Johnson (2009) uses detailed fighter statistics to develop a logistic regression model that seeks to predict fight winners. Collier, Johnson, and Ruggiero (2012) also develop a predictive model from this data. Gift (2014) uses the same database, along with judges' score cards, to investigate biases in judging. Kraus and Chen (2013) use the same Fightmetric data along with pre-fight "stare down" photos to investigate the impact a fighter's smile has on fight performance. Their research indicates that fighters who exhibited a more intense smile in the pre-fight stare down tended to win less and perform worse than their opponents. A similar analysis is provided in Třebický, Havlíček, Roberts, Little, and Kleisner (2013).

Models for forecasting television ratings include J Danaher, Dagger and Smith (2011) and Danaher and Dagger (2012). Several have examined the drivers of viewership in sports. Shetty, Ohlmann, and Gaeth (2016) and Paul and Weinbach (2007) present viewership models for Monday Night Football.

Multiple papers have specifically examined viewership for UFC events. Tainsky, Salaga, and Santos (2012) analyze PPV Buys for UFC 33 through UFC 132. Their model includes predictor variables related to trend, title defenses, title defenses by weight class, and competition from other major league sports. The also include an independent variable "stars" that includes the number of fighters on the card who held a UFC title anytime during the analysis period. They also control for events that took place before the premier of the TUF reality show. McGowan and Mahon (2015) analyze PPV buys from UFC 57 to 170. Their model also uses indicator variables for title fights by weight class but, in addition uses macro level economic data such as GDP per capita and US population. Their paper also includes an augmented model that adds an indicator variable for all main and co-main event fighters. They find five fighters with large draw effects, Brock Lesnar, George St-Piere, Anderson Silva, BJ Penn and Ronda Rousey. Their analysis is based only on data through 2014, a down year for the UFC, before the breakout stardom of Connor McGregor and Ronda Rousey. Seven of the 10 largest UFC pay-per-view events have occurred in 2015 or 2016. Their analysis does not attempt to explain why these fighters have large draw effects. Watanabe (2015) examines both PPV buys and live attendance for PPV events between 2001 and 2012. Their PPV buy model includes macro-economic variables and indicator variables for title fights by weight class. They find title fights in the featherweight, welterweight, light heavyweight, and heavyweight divisions have significant effects. They do not include variables

for individual fighters. Reams and Shapiro (2016) present a model with an intent similar to ours, they focus on the star power of the main fighters. However, they do not model individual fighters, instead they use proxies for star-power such as fighter ranking, finishing rate, media mentions, and Twitter followers. In this model, popularity proxies were not statistically significant, but fight performance variables, such as finishing rates, were analyzed. Their analysis focuses on a relatively small sample of events from UFC 72 to UFC 183.

1.3. Star power. The importance of star power in driving viewership in entertainment has been examined in a number of areas. DeSchriver (2007) examines the ability of a single player to influence game specific attendance in Major League Soccer. Hausman and Leonard (1997) examine NBA television ratings and estimate the economic value of star players such as Michael Jordon. Several papers examine the impact of stars on motion picture success (Elberse, 2007; Ravid, 1999). Rosen (1981) is a theoretical paper that examines the economics of superstars. Agrawal and Kamakura (1995) present an empirical assessment of the impact of celebrity endorsements. Oprah Winfrey's 2015 collaboration with Weight Watchers has increased year over year sales by $342 million with forecasted double digit increase to revenue in 2017 (Thomas, 2017).

2. A brief history of MMA and the UFC

2.1. Mixed martial arts. Mixed martial arts (MMA) is a combat sport that has evolved over roughly the past 25 years. In a modern Mixed Martial Arts competition, two fighters compete in a ring/cage surround by a chain link fence. Fighters wear gloves on their hands that are typically 4oz, much smaller and less protective than the 12-14oz gloves used in boxing. The fighting style is generally a mix of different fighting techniques including boxing, kick-boxing, wrestling, Brazilian Jiujitsu and other martial arts styles. As such the fights have a stand-up striking component, as well as a grappling component. Standard fights typically consist of three rounds, each five minutes in duration. Championship and other headline fights are usually five rounds of five minutes each.

Fighters can win a fight by several methods. A knockout or technical knockout occurs when a fighter loses consciousness or is incapacitated to the degree where they can no longer intelligently defend themselves. A submission occurs when a fighter taps out, or concedes victory to his or her opponent. Submissions are most often the result of a joint locking or choking technique where the fighter must either concede, or face the risk of injury from a joint lock, or unconsciousness from a chokehold. In cases where a fighter fails to concede before losing consciousness, the fight is stopped and declared a technical submission.

Mixed martial arts fights are generally sanctioned and regulated by various state athletic commissions and in most cases governed by the Unified Rules of Mixed Martial Arts (Tovey, 2002; UFC.com). Fighters compete in various divisions, defined by gender and weight class. The Unified Rules define a total of 10 weight classes for each gender, though not all classes are active in each gender.

MMA contests are conducted under the banner of various local, regional, national and international promotions. While there are hundreds of organizations globally, the top-tier of the sport is dominated by a few global organizations including Bellator, the World Series of Fighting (WSOF), Resurrection Fighting Alliance (RFA) and Dream. By virtually all accounts The Ultimate Fighting Championship (UFC) is the highest level organization, having the best fighters, the highest exposure and the highest value (MMAMania.com).

2.2. The Ultimate Fighting Championship. *2.2.1. History.* The UFC was founded in 1992 and held its first event, UFC 1, on November 1, 1993. The UFC was initially conceived as a contest between different fighting styles and sought to determine which discipline of martial arts gave the defender the most advantage in a real fight. The contest was promoted as a no rules event conducted in an 8 sided cage known as the Octagon. UFC 1 was distributed exclusively via cable pay-per-view. Based on the relative popularity of the first event the original owners, Semaphore Entertainment Group (SEG), held additional events.

The early UFC events were considered inhumane spectacles by many and were banned in many locations. Senator John McCain famously referred to the UFC as human-cockfighting (Downey, 2007). By 2000 the UFC was on the verge of bankruptcy. The company was bought out by Frank and Lorenzo Fertitta who formed the company Zuffa LLC under the leadership of President Dana White. Zuffa originally paid $2 million for the UFC (Ceranic, 2011). Over the next several years Zuffa successfully sought to legitimize the sport and the promotion (Ceranic, 2011). They eventually converted the sport into a recognized and legally sanctioned sporting event in all 50 states[1]. Political opposition was eliminated, and distribution shifted from 100% PPV to a mix of PPV and broadcast television. A successful reality show, *The Ultimate Fighter* (TUF),

[1] New York became the last state to sanction MMA in 2016.

was launched in 2009 and thorough 2016 has produced 24 seasons. TUF includes a behind the scenes reality show view into a group of fighters, but also includes a tournament that results in the winner being awarded a multi-fight contract in the UFC. TUF's first season brought the promotion to cable television and ushered in the modern era of the UFC.

Along the way Zuffa acquired and absorbed multiple rival promotions; including Pride Fighting Championship, Strikeforce, and World Extreme Cagefighting (WEC). Many of the fighters were added to the UFC roster and in some cases additional weight-classes were created. The acquisition of Strikeforce brought female fighters into the promotion and in 2013 the UFC created the female bantamweight division naming Strikeforce champion Ronda Rousey as its inaugural champion. Rousey fought for the first time under the UFC banner at UFC 157 in February 2013. The UFC has also expanded globally regularly holding events in North and South America, Europe, Australia, and Asia. As of September 2016, the UFC has held 372 events across 22 countries. In 2016, after months of rumors Zuffa announced the sale of the UFC promotion to WME-IMG for a reported $4 billion, 200 times their initial investment. This transaction was the highest valued sports franchise sale in history (Boren, 2016).

2.2.2. Economic model. The UFC is a mixed martial arts promotion. It earns its profit by facilitating, and distributing mixed martial arts contests. While it has over 640 fighters under contract, those fighters are not paid a salary. Instead they are paid on a per fight basis. Fighters are typically paid an appearance fee to fight. Fight winners typically receive a win bonus, often equal to their initial appearance fee[2] . The fees paid to fighters varies widely, a fact that creates considerable conflict among fighters (Bell, 2016). According to UFC President Dana White, pay is based on the fighters ability to draw fans – "the guys that bring in the majority of the revenue, make the majority of the revenue" (BJPenn.com, 2016). A perception among some fighters is that pay is based not on fighting ability, but rather on the ability to promote fights via trash talking.

"*Well I should get paid. I have defeated Jacare (Souza), I have defeated Mark Hunt, I have defeated Dan Henderson, I have defeated Vitor Belfort, I have defeated Weidman. …You think I cannot beat Bisping? I cannot talk like him …"* – Gegard Mousasi (Taylor, 2017a)

In addition to show and win money, bonus payments of $50,000 are also typically awarded to 4 fighters at each event; the two fighters who participated in the fight of the night, and two fighters selected for a performance of the night. Fighters are also given a sponsorship payment from the UFC's contract with Reebok, that varies depending on the experience level of the fighter (Okamoto, 2015); fighters earn between $2,500 for fighters with five or fewer UFC appearances, to $40,000 for a division champion. Additional compensation is available to premier fighters who may individually negotiate a pay-per-view percentage, a compensation mechanism that is not publically disclosed and generally available only to the promotion's top stars.

To generate revenue, the UFC sells tickets to live events and distributes fights via 3 major platforms. UFC Fightpass (Garey & Johnson, 1979) is the UFC's digital streaming service, sold on a subscription basis for approximately $10 per month, which allows fans to watch special programming. Select international events are shown exclusively in the US on Fightpass, and most events have a few early preliminary fights shown on Fightpass. The UFC also has a television contract with Fox that is worth a reported $115 million per year (Smith & Ourand, 2016). Smaller events, known as a *Fight Night*, feature lesser known fighters and are shown on either cable (Fox Sports 1) or sometimes on broadcast television (Fox).

The UFC's premier events are the pay-per-view events, which are generally numbered, for example UFC 200 which was held in July 2016. A major UFC even will begin with early preliminary fight distributed via Fightpass, a preliminary card on cable television (usually FS1), and the main card available on pay-per-view. PPV fees are $49.99 for standard definition and $59.99 for high definition. In 2015 the UFC held 13 pay-per-view events, generating an estimated 7.55 million pay-per-view buys, earning somewhere in the range of $375 million to 450 million in revenue. The 10 events held in the US had an average gate revenue of $4.2 million, putting total gate revenue from the PPV events on the order of $55 million, or about 12-14% of the PPV revenue. PPV is therefore the most significant, and variable, component of the UFC's revenue stream.

2.3. Event marketing. Events are generally marketed based on the last two fights on the card: the main event and the co-main event. The event is typically sub-titled for two fighters in the main event; for example, UFC 196: McGregor vs. Diaz. The promotional poster for the event generally features the images and names of the four fighters in the main and co-main events, see for example Fig. 1. It is widely accepted that PPV buys are highly dependent on the fighters in these featured fights.

[2] These payments are reported to Athletic commissions.

Fig. 1. Promotional Poster UFC 196

Source: https://en.wikipedia.org/wiki/UFC_196

2.4. Pay-per-view buys. The number of PPV buys varies considerably from event to event.

Figure 2 shows the level of PPV Buys as estimated by Dave Meltzer's Wrestling Observer Newsletter (MMAPayout.com) dating back to UFC 33 in September 2001 up to and including UFC 207 in December 2016.

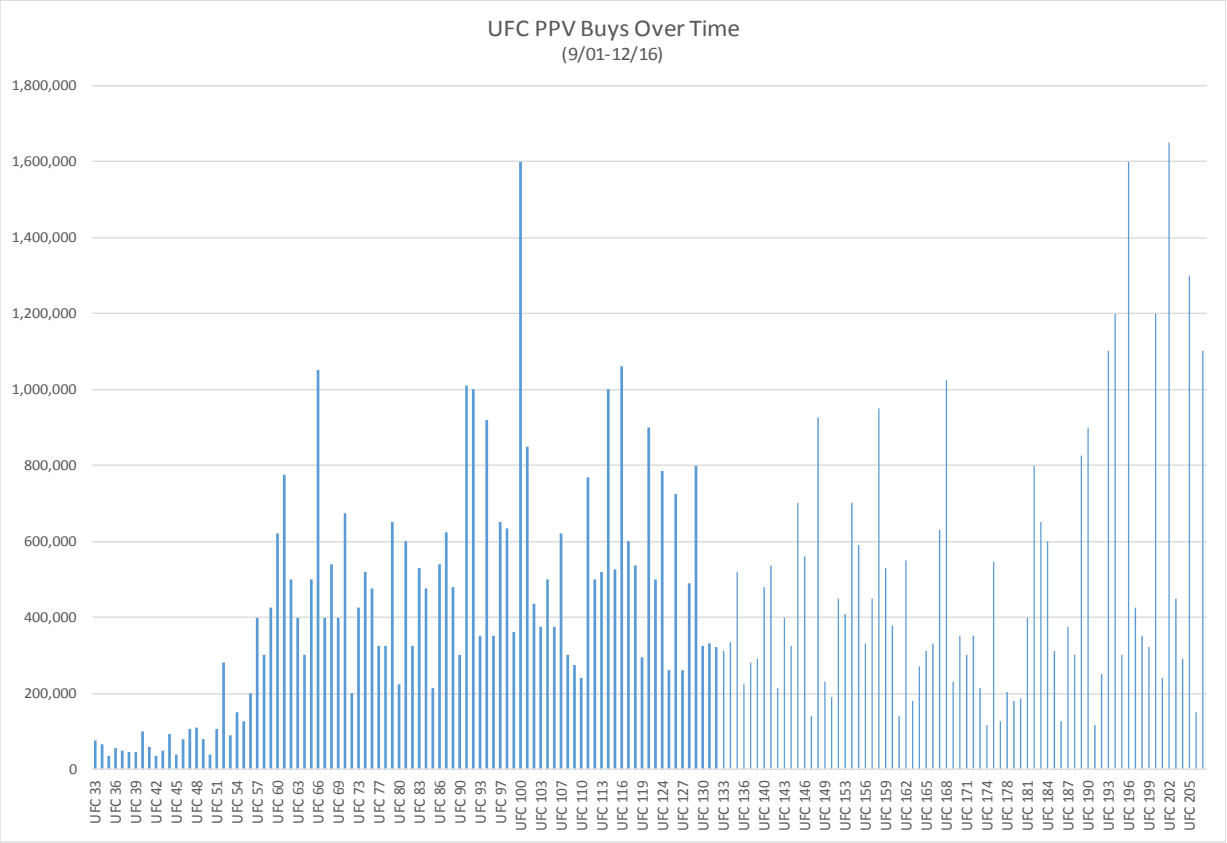

Fig. 2. PPV buys (2001–2016)

PPV buys were relatively low during the early years of the promotion. In 2005 *The Ultimate Fighter* reality show, broadcast on cable TV, helped bring the UFC in to the sports mainstream. The next PPV event, UFC 52: Couture vs. Liddell sold a then record 280,000 PPV buys and ushered in what can be considered the modern era of UFC PPV events. Between UFC 52 in April 2005, and UFC 207 in December of 2016 PPV events averaged 498,000 buys. But the buy rate has been quite variable with a standard deviation of 309,000. Fig. 3 shows PPV Buys in the modern era, after the debut of The Ultimate Fighter and the initial mainstreaming of the sport. Included in this graph are a linear trend line and a 10-period moving average. The trend line illustrates a slight upward movement in the buy rate over the 12-year period, while the 10-period moving average demonstrates the variability. The trend line slope is 29.2, the R^2 value 1.2% and the p-value for a simple trend line regression is .24 so any positive trend is small and of low statistical significance. The 10-period moving average shows considerable variation in the average PPV rate. Table 1 shows the total number of events and aggregate PPV buys during the modern era while Fig. 4 shows a histogram of PPV buys over the same period.

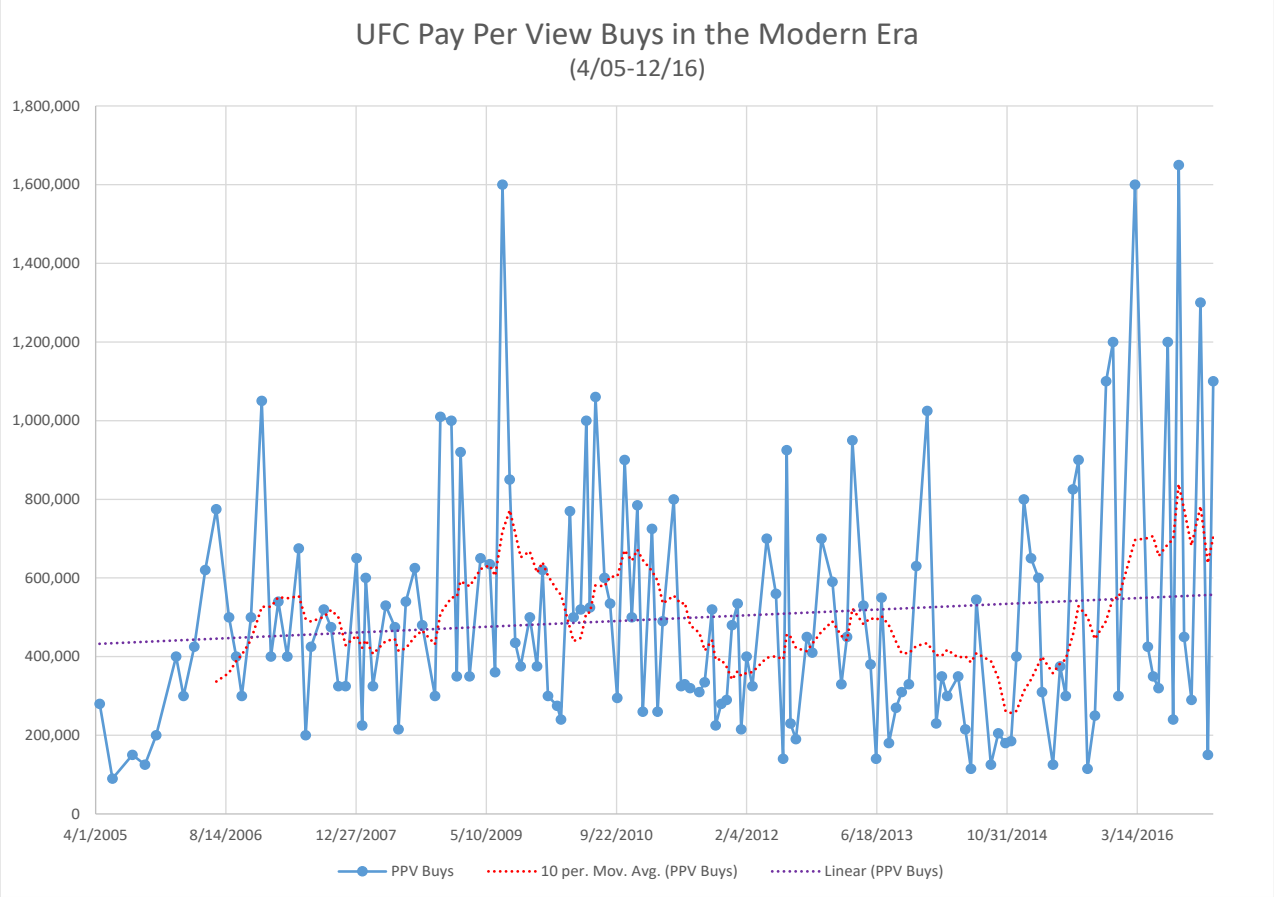

Fig. 3. PPV buys in the modern era

Table 1. PPV buys by year in the modern era

Year	Total buys	PPV events
2005	845,000	5
2006	5,270,000	10
2007	4,935,000	11
2008	6,325,000	12
2009	8,020,000	13
2010	8,805,000	15
2011	6,485,000	16
2012	5,835,000	13
2013	6,075,000	13
2014	3,200,000	12
2015	7,550,000	13
2016	9,375,000	13

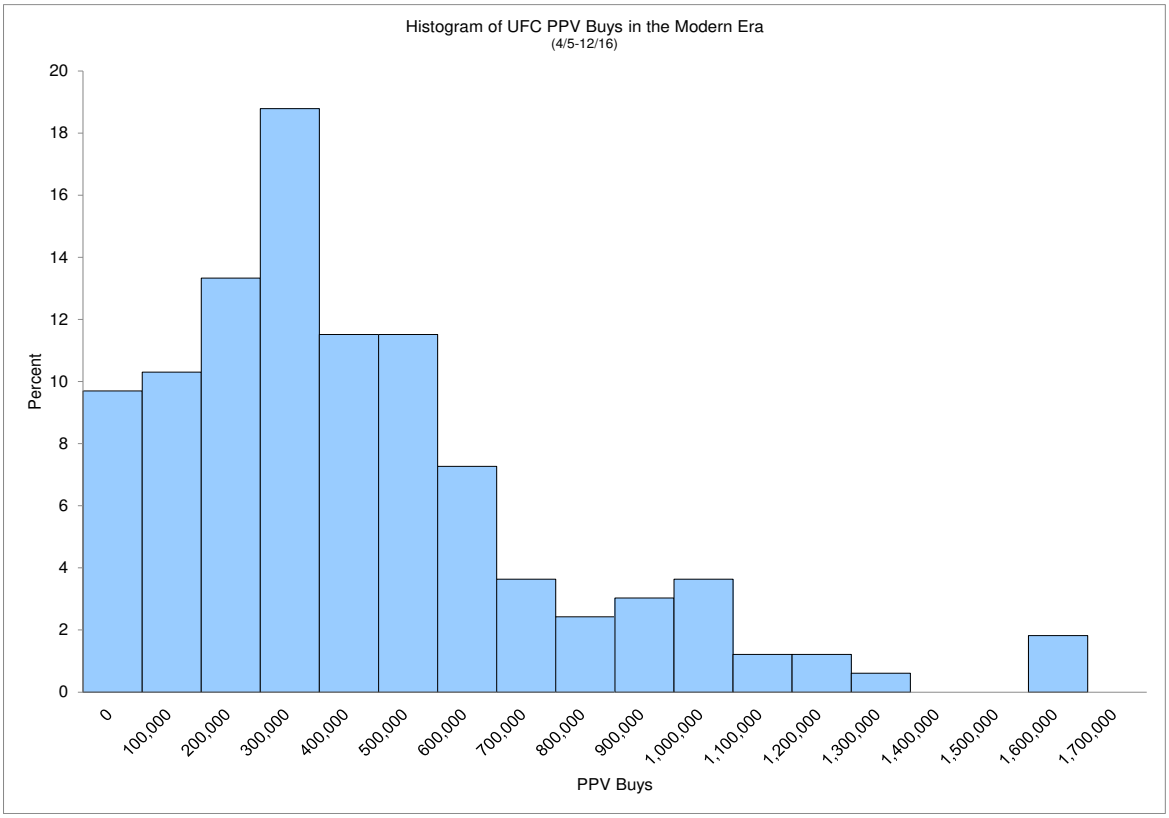

Fig. 4. Histogram of PPV buys

These figures demonstrate the high level of variability in PPV buys and therefore PPV revenue. Since PPV revenue is the single largest source of revenue for the UFC, this creates a highly variable revenue stream.

In an attempt to better explain the variability of PPV buys, we evaluated several regression based forecasting models. The data does not appear to present any meaningful seasonality. A simple trend line is not statistically significant (p=.24). Models that use the presence or number of title fights as predictors have very low predictive power, with R^2 less than 10%.

In order to develop a better model, we next consider the fighters on the card, specifically the fighters on the main and co-main events. We identified all the fighters who fought a main event or co-main event fight for the events from UFC 52 to UFC 207, for a total of 204 fighters. We limited our list by excluding fighters who have appeared in fewer than 4 headline events resulting in a list of 57 fighters.

We created binary dummy variables for each of these fighters based on their participation in a main or co-main event and added them to our regression model pool. Other potential inputs included an indicator for a title fight on the card, and an indicator for multiple title fights. Using PPV buys as the output variable we ran a forward selection algorithm. The algorithm searches sequentially for the individual variable that adds the most predictive capability to the model. The result of our analysis was a model with 8 input variables, all of them fighter variables. The binary variables selected for our model, along with their coefficients and p-values are shown in Table 2. The model has an R^2 value of 61.3%.

Table 2. Regression model coefficients

	Predictor	Appearances	Coefficient	*p*-value
0	Intercept		341,831	1.31E-31
1	Conor McGregor	5	973,169	1.07E-19
2	Brock Lesnar	8	518,021	7.50E-11
3	Ronda Rousey	8	401,462	1.93E-07
4	Georges St-Pierre	14	325,595	9.01E-08
5	Forrest Griffin	11	247,292	0.000175
6	Jon Jones	10	197,359	0.004073
7	Anderson Silva	19	123,663	0.015982
8	Demetrious Johnson	6	(168,450)	0.049917

Of the 57 fighters appearing in at least 4 main or co-main events our selected model includes only these 8. While all these fighters were champions at one time, the generic variables Title Fight and Multiple Title Fights were not included in the model, implying that who was fighting for the title was far more important than the fact that a title fight was on the card. Furthermore, title fights are quite common on pay-per-view events, fully 80% of the PPV events considered included at least one title fight.

Within the 8 big-draw fighters select there is a significant variation in incremental PPV Buys generated. Conor McGregor stands out as the clear leader, generating nearly twice as many buys as the next fighter. Three fighters; McGregor, Brock Lesnar, and Ronda Rousey, have incremental PPV Buys above 400,000. We identify these individuals as "celebrity fighters" as they have broad market appeal beyond the core UFC fan. According to our analysis Conor McGregor is by far the biggest draw in the history of the UFC. He is an outspoken, brash, trash talking Irishman. His ability to create pre-fight publicity by his public appearances and his outlandish comments have drawn comparisons to legendary boxer Muhamad Ali (Mazique, 2016). His identification as a proud and patriotic Irishman, literally draped in the Irish flag, have earned him an intensely loyal following among Irish nationals and the Irish diaspora (O'Toole, 2016). McGregor is widely considered the most popular figure in all of Mixed Martial Arts, with wide appeal outside the core UFC fan base (Connolly, 2016). McGregor is also an extremely accomplished competitor winning the championship in two different weight classes.

While Brock Lesnar may lack broad-based mass-market appeal, he does have a major appeal to a key demographic outside the core UFC fan base. Before entering the UFC, he was a major star in professional wrestling's World Wrestling Entertainment (WWE) promotion. Lesnar's appeal to professional wrestling fans helped drive PPV buys, as did his success in winning the UFC Heavyweight title. Ronda Rousey played a key role in the creation of a women's division within the UFC. Her spectacular success in the octagon made her a mass media sensation. After being awarded the inaugural women's bantamweight title she defended her title six times. Six of those fights were stopped in the first round, with the longest of those fights lasting one minute and six seconds. Rousey received so much attention she became the most popular female athlete in the world based on social media statistics (Keegan, 2015).

Fighters 4 through 8 on the list represent a group of highly accomplished UFC champions. Fighters such as George St-Pierre, Jon Jones, and Anderson Silva are considered the best fighters of all time in their respective weight classes. St-Pierre and Silva also have strong national followings, St-Pierre in Canada and Silva in Brazil. Forrest Griffen was a winner of the first season of The Ultimate Fighter, winning an epic fight that many consider the fight that saved the UFC, a fight enshrined in the UFC Hall of Fame (Fowlkes, 2015). Griffen went on to win the championship belt at light-heavyweight. They are clearly some of the most popular and most accomplished fighters in the history of the UFC, but the incremental PPV buys associated with their appearances is substantially less than the top tier celebrity fighters. We believe these fighters appeal primarily to the existing UFC fan, and lack the crossover appeal to bring in new fans. They are able to attract the less committed fans, but do not bring in massive numbers of new fans.

The last fighter on the list is Demetrious Johnson. Johnson is the only fighter with a negative incremental buy-rate, in other words his appearance on average lowers PPV numbers below their average value. This is somewhat surprising as Johnson is the only champion there has ever been in the UFC flyweight division. He won his title in September 2012. As of the end of 2016, he has defended his title a record nine straight times. He is also currently ranked as the number one pound for pound fighter in the world, in other words the best fighter regardless of weight class. In spite of his accolades as a fighter Johnson remains a poor draw both for PPV buys and ticket sales (Alexander, 2015; Taylor, 2017). Johnson has a relatively low-key personality and is not known as trash-talker or someone who can hype a fight.

2.5. The impact of celebrity fighters. Our analysis reveals that while PPV rate for UFC have shown significant variability over the past 11 years, a significant portion of that variability can be explained by the presence of only 8 fighters in the headline fights of each event. Furthermore, the most significant impact on PPVs has been made by only 3 fighters, fighters we identify as celebrity fighters for their mass market appeal.

Table 3 lists the 12 highest buy rate PPVs in UFC history. One of the 3 celebrity fighters appeared in the top 11 of these 12 events, each earning more than one million PPV buys; Lesnar fought in the co-main event of UFC 200. Fig. 5 shows the histogram of PPV buys with separating out events with celebrity fighters. This histogram further illustrates the influence this small number of fighters have on the overall economics of the promotion.

Table 3. Top 12 UFC pay-per-view events

Rank	Date	Event #	Event name	PPV buys	Celebrity
1	8/20/2016	UFC 202	McGregor v. Diaz 2	1,650,000	McGregor
2	3/5/2016	UFC 196	McGregor vs. Diaz	1,600,000	McGregor
3	7/11/2009	UFC 100	Lesnar v. Mir	1,600,000	Lesnar
4	11/12/2016	UFC 205	McGregor vs. Alvarez	1,300000	McGregor
5	12/12/2015	UFC 194	Aldo vs McGregor	1,200,000	McGregor
6	7/9/2016	UFC 200	Tate v Nunes	1,200,000	Lesnar
7	11/15/2015	UFC 193	Rousey vs Holm	1,100,000	Rousey
8	12/31/2016	UFC 207	Nunes vs Rousey	1,100,000	Rousey
9	7/3/2010	UFC 116	Lesnar vs. Carwin	1,060,000	Lesnar
10	12/30/2006	UFC 66	Liddell v. Ortiz II	1,050,000	
11	12/28/2013	UFC 168	Wiedman vs Silva II	1,025,000	Rousey
12	11/15/2008	UFC 91	Lesnar v. Couture	1,010,000	Lesnar

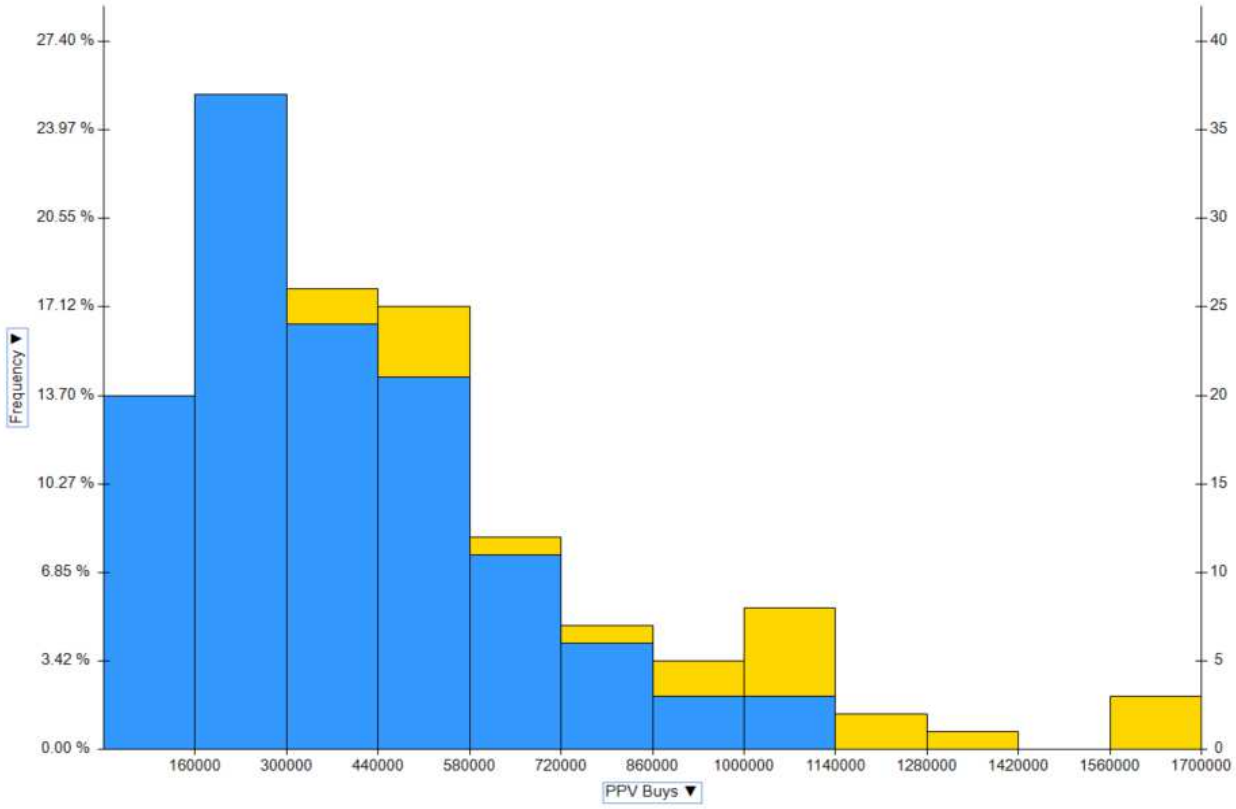

Fig. 5. Histogram coded for top celebrity fighters

Summary and conclusion

Our paper has examined the variability of PPV buys over the UFCs modern era (2005 to present). In contrast to most other papers that have examined this issue, our analysis is focused on the contribution of individual fighters. Our analysis also includes the resurgence of PPV buy rates that have occurred during 2015-16.

Our analysis shows that buy rates for Pay-per-view events is highly variable and driven to a significant level by the appearance of popular fighters. The appearance of 8 fighters explains more than 60% of the variation in buy rates. Our analysis further shows that the most significant contribution to buy rates have been made by high profile celebrity fighters; fighters with cross-over appeal who can reach beyond the core UFC fan base. These fighters are responsible for generating significant revenue for the promotion, and as such earn significantly higher pay than other fighters. While fighting ability is a necessary condition for generating a PPV bump, all the significant fighters were champions, it is not a sufficient condition. In fact, the number one pound for pound fighter, considered by some to be the best fighter of all time, Demetrius "Mighty Mouse" Johnson, is a negative draw. His appearance on a PPV event reduces the buy rate by 168,000 buys. Johnson's highly technical fighting skills, his dominance over his division, and his relatively soft-spoken manner fails to excite even the casual UFC fan.

The fighters who do drive significant buy rates, Lesnar, Rousey, and McGregor; are generally accomplished fighters, but are also strong personalities with specific demographic appeal. Lesnar created cross-over appeal to WWE fans; fans accustomed to the PPV model. Rousey and McGregor were also dominant fighters. Ronda Rousey went on a streak where she consistently submitted her opponents in the first round, often in seconds. At the height of her streak Rousey finished 4 opponents in a row, each fight lasting 1:06 or less. Two of these fights lasted 16 seconds or less.

Connor McGregor is the biggest star the UFC has produced to date. He also put together an impressive winning streak with multiple knockout wins including a 16 second victory over long time featherweight champion Jose Aldo. McGregor became the first fighter to simultaneously hold championships in two weight divisions. But in addition to his fighting skills, McGregor is a master showman. His outlandish antics, bold predictions, and trash talking abilities made him a major mass media celebrity. McGregor also used his Irish heritage to create significant interest among Irish fans worldwide. Similarly, Rousey opened up mixed martial arts to a new demographic. While she was not the first female fighter, she was the first to become a mass market star, apparently bringing in a new cohort of female fans.

While the UFC has profited significantly from these three fighters, the future is uncertain. Brock Lesnar has retired from MMA and returned to the WWE. Because of an anti-doping suspension, he is unlikely to return. Ronda Rousey's winning streak ended when shew was knocked out at UFC 193. After a long layoff she made a return at UFC 207 only to be knocked out again. While her official status is unclear, her return to MMA seems unlikely and is reportedly considering a switch to WWE (Golightly, 2017). The future of the UFC's biggest star, Connor McGregor, also remains uncertain. Although his winning streak ended at UFC 196 when he lost to Nate Diaz, he won a rematch at UFC 202. These two fights were the highest PPV purchased events in UFC history.

Since winning his last fight, and the lightweight title at UFC 205, McGregor has received significant media attention for a fight outside the UFC. On August 28, 2017 McGregor faced undefeated boxer Floyd Mayweather in a boxing match, widely believed to be one of the biggest fights in combat sports history. Estimates are that each fighter will have total earnings in excess of $100 million dollars for the fight (Polacek, 2017), far more than can be earned in a UFC contest. While McGregor lost the fight, he significantly increased his name recognition and arguably his brand appeal. The fight is estimated to have set the all-time record for PPV buys with estimates in excess of 5 million buys (Pugmire, 2017). While the fight was outside the UFC, the UFC enthusiastically promoted the fight across its platforms. The UFC's strategy appears to be based on the premise that a McGregor fight in the UFC will bring in the new fans he has won through the boxing arena is likely to set a new record for UFC PPV buys. On the other hand, having earned a record payout, McGregor's willingness to return to the UFC is uncertain. While some fighters feel the exposure created by the media attention for the fight will benefit the UFC, others are skeptical believing the fight challenges the legitimacy the UFC has sought for many years (Ess, 2017).

Without these high-profile fighters to drive massive pay-per-view events the short-term future of the UFC seems unclear. New celebrities will need to emerge if the UFC is going to produce million-buy events in the foreseeable future. The UFC is working hard to market fighters such as Stipe Miocic, the current heavyweight champion, and Jonna Jedrzejczyx, the women's strawweight champion, but so far big PPV numbers have not materialized (Markazi, 2017).

Another open inquiry is the long-term impact these celebrity fighters have on the UFC. While they clearly bring new fans to their fights, it is unclear if these fans are committed. In other words, do these new viewers continue to watch the events after the fighter is no longer competing? With the apparent retirement of Lesnar and Rousey and the uncertainty surrounding McGregor, we may be able to analyze this question empirically after more post-celebrity events have been held. While official numbers are not fully available for 2017, PPV buys appear to be down considerably (Harkness, 2017). It appears that the UFC's new owners will need to develop new celebrities and/or convince recently retired fighters such as CM Punk to come back in order to return the PPV buy rate back to its more lucrative levels (Golightly, 2017).

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