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This article analyzes the characteristics and incentive effects of standard contractual practices in professional boxing. A boxer's purse is linked to past rather than current performance, thereby creating an incentives problem. Although preference for stable lifetime consumption alleviates this problem, savings act as further insurance and the contract's distorted incentives do not go away. Observation of a boxer being poorly prepared for a fight after earning a very large purse is consistent with this prediction. These disappointing outcomes are likely driven by the absence of a well-defined contract-maker in the boxing market, and by the prevalence of "casual" boxing fans.

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On October 25, 1990, James "Buster" Douglas was scheduled to defend his heavyweight boxing title against Evander "Real Deal" Holyfield. Douglas, who was guaranteed over $20 million for the match, showed up visibly out of shape, and delivered a lackluster performance while being knocked-out in three rounds. [1] He did not fight again for six years. Many boxing fans felt ripped-off by Douglas' performance. From the fans' perspective, the contract Douglas was given did not elicit appropriate work incentives.

Unlike other individual sports, where explicit incentive payments and tournament rewards are prevalent, professional boxing displays a simple yet unique compensation scheme: a boxer's payment or "purse" for a given fight is entirely guaranteed. Once a fight's expected proceeds are assessed, and after deducting administrative costs, the boxer knows exactly how much he will get for his performance, win, lose, or draw, thereby enjoying full insurance at any given fight. [2] Economic theory predicts that, once fully insured, an agent (the boxer in this case) will not exert the proper effort level. Thus, from a static point of view, this contract does not give the boxer an incentive to train properly, increasing the likelihood of a poor showing.

How do incentives work in professional boxing? The answer lies in the dynamic nature of boxing's contractual arrangements. The market value of a fight, which is the source of the boxers' payments, is largely determined by the boxers' reputation and past performances. Thus, although in

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[1] In fact, to the casual observer, it appeared that Douglas did not try to get up when he was knocked down.

[2] There are cases where a boxer shares revenues with a promoter above a guaranteed amount. The amount to be shared, called the "overage", is uncertain and depends on possible extra pay-per-view or closed-circuit proceeds. Although this kind of agreemchere4ireemlties ialt skister"pur(e, tht rewa a wile)]TJ-20.

a static setting one would expect a sub-par performance, such performance would have a detrimental effect on a boxer's future rewards. As a result, the boxer faces a trade-off between the disutility of effort expended in training for a fight and the positive effect that this effort has on his future income, assets, and consumption. Therefore, professional boxing contractual incentives work through intertemporal incentives.

Intertemporal contracting has been extensively studied. Fama (1980) asserts that market forces will tend to remove incentive problems because workers will be concerned about their labor market reputations. Klein and Leffler (1981) and Shapiro (1982) apply a similar logic to product markets, and show that firms will have the incentive to supply good quality products when future sales depend on their current reputations. Thus, theory suggests that explicit contracts may not be necessary, since markets are capable of providing efficient implicit contracts. However, Holmström (1982) shows that only under very specific assumptions will this claim be valid. In situations where agents value the present more than the future and are averse to risk, the market's ability to effectively police incentives may be limited.

Radner (1981, 1985) and Rubinstein and Yaari (1983) both show that multi-period contracting can approach efficient outcomes only if the horizon is sufficiently long and discounting is low. Lambert (1983) relaxes these two assumptions and shows that although incentive problems cannot be eliminated, they can be alleviated if the agent’s rewards are based on all information available at each period. Finally, Rogerson (1985) shows that because saving provides additional insurance to a risk-averse agent, he will prefer to save part of his current wage if she could. Since these savings provide insurance for the future, access to savings reduces effort levels.

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professional boxing.

Although some of the features of the existing models apply to professional boxing, there is an element that makes contracting in this market unique: a true “principal” or contract-maker in the traditional sense does not exist. The boxer's manager and the fight promoter play mainly intermediation roles, and as such their interests are not necessarily opposed to the boxer’s interests. This absence offers an initial explanation for the potential suboptimality of standard boxing contracts: by not tying the fighter’s current compensation to his current performance, valuable information is excluded from the contract. In other words, whether the boxer is properly prepared or not, or whether he wins or loses is irrelevant to the purse the boxer will receive, thus creating a potentially glaring incentives problem.

The contract-maker's role in the boxing market is played by a large and decentralized group of "fight buyers" or “fans” who do not necessarily coordinate their actions. As the theory shows, since each fan's decision about buying the fight has a negligible effect on the boxer's payment, the resulting choice may be suboptimal. An indication of this may be the observed "short-term memory" of fans: a good performance can easily erase a stream of poor performances and vice versa. The old Hollywood adage "you are only as good as your last performance" seems to fit perfectly to boxing. [3]

This article will analyze the existing contractual arrangements in professional boxing with emphasis on two questions. First, what are the effects that standard boxing contracts have on a boxer's choice of effort? Second, what sort of fan behavior is consistent with the existing structure

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[3] The November 12, 1992 edition of The New York Times, quotes pay-per-view boxing businessman Seth Abraham as saying "The one beautiful thing about this business is that the viewer has a short memory,..., looking at it event by event. If an event warrants the time and the money, they'll order".

of boxing contracts?

My analysis is based on a formal model of professional boxing contracting I published elsewhere (Tenorio 2000). In that model, a boxer's future reward is a function of his current performance, and this performance is positively related to the effort he expends training for a fight. Since effort is costly and the boxer cares both about present and future consumption, the contract payment scheme presents him with a tradeoff: higher effort causes current disutility but has a positive impact on expected income and consumption. In principle, if the boxer cares about reputation, market forces should provide him with the incentives to train well. However, the boxer's access to saving distorts the incentives provided by reputation. If accumulated savings are high enough (which is very likely in this day and age of sizable purses), a boxer may find it optimal to exert arbitrarily low effort at some point in time and either retire permanently, or "retire" temporarily and stage a comeback later, exploiting the fans short-term memory.

The paper also presents some suggestive evidence lending support to a wealth-disincentive effect in professional boxing. Comparative analysis of an extensive sample of boxing champions across categories reveals that heavier-weight champions wait longer between title defenses and make fewer successful defenses per year than lower-weight champions. Since, on average, championship purses are higher for heavier weight classes, these observations are consistent with the theoretical prediction.

A second point I discuss is the type of fan behavior reconcilable with the observed contractual practices and the relationship between the fans' assessments and the purses offered to boxers. I argue that the observation of large purses followed by disappointing pugilistic performances is compatible with the predominance of "casual" fans. A casual fan is defined as one who fails to

account for the disincentive effect of large purses on the boxer's effort when deciding on his willingness to pay for a fight. If a promoter believed that most fans were “avid” or knowledgeable -able to anticipate large purse disincentives- excessively large purses would not exist because they would bias the promoter's payoff downwards.

The rest of the article is as follows. Section II describes boxing's standard contractual practices. Section III discusses behavior reconcilable with observed outcomes in this market. Section IV describes a boxer's intertemporal decisions. Section V discusses the relationship between fans' assessments and boxers' purses. Some empirical implications are discussed in section VI. Section VII concludes.

(a) The market value of a fight

Boxers A and B will engage in a match at time t. Both fighters get guaranteed purses and, in exchange, will train and deliver their performances. Purses are determined on the basis of the fight's expected revenue *m*. This expected revenue or "market value" is an estimate of the total willingness to pay from the "fight buyers", i.e., the viewers, advertisers, and other interested parties. The bulk of these revenues is generated by viewing fees. [4]

An individual's willingness to pay to view the fight is determined by his expected utility or satisfaction from viewing the match. This utility is a function of the boxers' expected performances, and each person forms his expectations based on all available information (i.e., like the boxers'

[4] Revenue sources include television, closed circuit and on-site proceeds, sponsoring fees, sale of memorabilia, and others.

reputations, purses, etc.) and also on idiosyncratic or "opinion" factors. The opinion factor may reflect a person's ability to process available information, as well as other subjective considerations (e.g., like or dislike for a boxer).

Any individual will pay for viewing the fight if his expected utility from viewing exceeds the viewing fee. Suppose there are *n* individuals for whom this inequality holds. Then, the fight's market value m is an estimate of this number *n* multiplied by the viewing fee. In practice, a large fraction of *m* –and *n*- can be assessed in advance. This is because viewing fees may be pre-contracted in blocks and on-site proceeds are largely determined by capacity. Other revenue components like pay-per-view or closed-circuit fees can also be estimated, but their totals will not be known until after the fight. Thus, the market value *m* has both a predictable and a random component. It is the job of the fight promoter to estimate value of *m*, and then, based on that estimate, decide on the purses he will guarantee to each boxer. [5] Observe, however, that this guarantee has to be made based on a non-iron clad estimate, as the fight's actual proceeds will only be known after the fight has transpired.

(b) <u>The boxer's performance and utility</u>

[5] The promoter's role is twofold. First, he contracts with the interested parties, organizes events, advertises the fight, and coordinates with managers and athletic commissions. For these services, he charges a promotional fee proportional to the fight's expected proceeds net of promotional costs. With competing promoters, it is reasonable to assume that the promotional fee results from market conditions. In fact, it is customary for promoters to bid for the right to promote a fight. Second, he assesses the fight's market value and guarantees payments to the boxers based on this assessment. Thus, he plays an insurance role, and assumes the risk arising from uncertain ex-post fight revenues. Despite this insurance role, the promoter is not a "principal" as defined in the agency literature. He is basically an intermediary between boxers and fight buyers. This intermediation role is consistent with the fact that some boxers have chosen to promote their own fights.

A boxer's performance is primarily a function of his training effort and ability to execute a fight plan. However, no matter how hard a fighter trains, there are factors beyond his control (like the weather, his opponent's strategy, and the fight officials) that will also affect his observed performance. Thus performance is affected by both deterministic and random factors.

To wrap up the description of the model, I assume that a boxer's current period utility is a function of two variables: the effort he expends preparing for the fight, and his consumption during that period.

At each period the boxing market "game" unfolds as follows:

(i) The promoter: (a) determines the viewing fee and assesses the fight's expected market value *m*, and (b) offers the boxers their guaranteed purses.

(ii) Each fight buyer, given his information, chooses whether or not to pay the fee for viewing the fight.

(iii) Each boxer, given his current purse and previously accumulated savings chooses his effort and consumption levels.

The fans' purchasing decisions determine the fight's actual market value and the promoter's payoff. After the boxers make their effort and consumption decisions, the fight takes place and each fan receives his payoff as the difference between his utility from viewing the fight (i.e., the actual boxers' performances) and the viewing fee. Note that since the promoter simply offers the market schedule, the game is between the fight buyers and the boxers (the fans and the boxers).

This problem is similar in structure to that of a seller whose reputation -and sales- depends on

his past choice of product quality (Klein and Leffler 1981, Shapiro 1982). Here, a cooperative outcome in which the seller always offers good quality and the buyers always buy the product, is attainable through a reputation mechanism. Buyers buy in the current period as long as past quality was good, and boycott as soon as quality deteriorates. The seller finds it optimal to offer good quality because the one-period windfall he would get from offering bad quality would be offset by the future losses triggered by the consumers' boycott. In this reputation outcome buyers correctly expect good quality because it is in the seller's best interest to supply this quality.

This reputation equilibrium is in principle attainable in boxing. A boxer would have the incentive to train hard because this will positively impact his future purses. Fans know that training hard is in the boxer's best interest and thus they would buy the fight based on this expectation. If it was obvious that the boxer shirked, fans would punish him by not buying his next fight(s), and would not resume their purchases until the boxer rebuilds his reputation with one or more good performances. If the punishment is set correctly, shirking will not occur in equilibrium and expectations will be fulfilled.

However, as stressed before, outcomes with non-self-fulfilling expectations are common in professional boxing. Why are these outcomes admissible? I subsequently discuss some possible explanations.

A first reason may be that boxing fans are too forgiving and do not punish defections harshly enough. As shown in reputation models, if a player finds it optimal to build a reputation and then milk it, cooperation is not a sustainable outcome. If fans display short-term memory and only punish defections for one (or a few) period(s), a boxer may find it optimal to shirk. As demonstrated in the technical version of this article, shirking may be more likely once the boxer's savings are high

enough to afford him to rebuild his reputation while consuming mainly out of his savings.

A second explanation is a one-sided version of the "end-game" problem. Although from the fans' perspective, the probability that a boxer will retire increases as he gets older, only the boxer knows when this will happen. Thus, even if a reputation-based game is being played, it is possible that the boxer will end the game unilaterally and defect in his last fight. Since no punishment is possible afterwards, this behavior is optimal. Like before, defection is more likely if the boxer's savings are high enough. [6]

Third, cooperation may be hindered by the lack of observability and monitoring of actual training effort. Since performance is not a deterministic function of effort, and effort is unobservable, fans may give the boxer the benefit of the doubt after a bad performance. As a result, either no punishment will take place or it may be triggered only after two or more defections. If the boxer knows this, opportunism is optimal. Radner (1981, 1985) and Rubinstein and Yaari (1983) discuss contract design under these conditions.

A fourth possible explanation is incomplete information about the boxer's "type" or private attributes. Suppose that boxers can be one of two types, honest or opportunistic. Honest boxers always cooperate while opportunistic boxers are strategic. As shown by Kreps *et. al.* (1982), if fans face uncertainty about the true type of the boxer, opportunistic boxers may pool with honest boxers for a number of periods and then defect and supply low effort(s) as the end of the game nears.

Finally, it is possible that fight buyers do not use available information strategically, or lack

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[6] Lazear (1979) argues that with increasing age-earnings profiles, termination of employment should be mandatory, because marginal products will most likely fall below pay at the later stages in the career. Gibbons and Murphy (1992) show that in the presence of career concerns, an optimal contract deals with the end-game problem by introducing stronger explicit incentives as retirement nears.

the necessary information to devise fully rational strategies. For instance, if fans are not aware of purses or are unable to anticipate the disincentive effects of large purses or large savings accounts, disappointment may occur. Also, boxers have private information about their savings and effort-consumption tradeoffs, which are crucial in determining optimal choices. I will later discuss the incentive effects of the fans' potential inability to correctly process information. [7]

Building all of the elements outlined in the previous section into a formal model of an optimizing boxer, yields the following results:

i A boxer's current period effort depends negatively on his accumulated assets (which equal the addition of his previous savings and current purse). This result summarizes the basic incentive problem created by the contractual structure in professional boxing. Because the boxer's current assets are entirely determined by past considerations, his current effort is negatively related to the level of these assets. Therefore, the larger the value of his assets, the less money he will need to finance future consumption, which diminishes the incentive to expend effort. One could call this "the fat cat" effect.

ii. The boxer's optimal choice of effort is positively related to the degree to which a good

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[7] The proliferation of sports media through cable and satellite television as well as the Internet, has made information more readily accessible to sports fans. The main results we present in the next section will rely on the fans' ability to process the information rather than the amount of information itself.

performance affects future purses (also known as the "marginal incentive"). Several modern day contracts include contingency clauses for future purses that depend on whether the fighter wins or loses. In fact, some of the big cable networks reserve their right to terminate a contract a long term contract if a boxer loses.

iii. The larger the potential role of random factors in affecting a boxer's performance, the herder he will train. We often times hear a boxer say "I won't leave it into the hands of the judges, because you never know…" When a boxer expects to face highly uncertain circumstances his best response is to hedge by stepping up his preparation for the fight.

iv. A higher discount factor (lower discount rate) increases the relative importance of tomorrow's consumption on the boxer's utility so that more current period effort is induced. In simpler terms, the more important the future is, the more effort the boxer will exert today, which suggests that fighters are more likely to shirk as they get older.

A final important result relates to the possibility of a boxer choosing an arbitrarily low effort level at some point. As pointed out before, the payment scheme built into a boxing contract has counteracting effects on the boxer's choice of effort in the current period: a negative effect of effort disutility (i.e., training is hard), and a positive effect of future expected consumption utility (i.e., more effort translates into higher future purses). However, because of access to savings, the boxer needs not rely on his effort alone to enjoy higher future consumption, i.e., savings act as insurance for the future. As a result, it is possible that at some point in time -especially as the boxer ages-

effort disutility may be so high as to outweigh the additional consumption utility induced by higher future purses. In such case, the boxer may optimally exert arbitrarily low effort, and just be content with financing his future consumption out of his savings account. This scenario is more likely when effort aversion is high (i.e., “lazy” boxers) and savings are also high. Thus, poor training discipline coupled with large accumulated assets increase the probability of a poor preparation and performance. [8]

Empirically, we observe the above phenomenon when a boxer builds up to the point where he gets his "big payday" and then decides to shirk and not train properly for a subsequent fight. As suggested before, two scenarios are possible. First, the boxer may decide to retire after his big payday so that the impact of current effort on the future becomes meaningless. Second, a boxer may decide to take a big payday with little effort, temporarily lay-off and enjoy his savings, and then come back. Short-term fan memory makes this scenario admissible, because the consequences of a poor performance may be erased by a good performance in the future. Panamanian boxer Roberto "Manos de Piedra" Durán, with his many pugilistic reincarnations, exemplifies this kind of behavior.

It would be unfair to conclude this section by exclusively mentioning anecdotal evidence on poor contractual incentives in professional boxing. Intertemporal incentives, even if sub-optimal, are capable of eliciting strong effort under some conditions. Clearly, if a boxer has good training discipline and/or his big payday still lies ahead of him, incentives for hard work are significant.

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[8] A sign of poor training habits is a wide fluctuation of the fighter's weight between and across fights. Boxers like Douglas, Durán, and James Toney have been known to follow this pattern. Unfortunately, information about the boxers' weights between fights is seldom available, and weight profiles across fights is only observable in heavyweights.

The previous section analyzed a boxer's optimal decisions given contractual payment scheme offered by the fans through the promoter. I this section, I characterize the type of fan behavior that is compatible with the standard contracts.

Casual observation will tell us that there are two basic types of boxing fans. "Avid" fans are those who are more informed and knowledgeable, and process all of the information available in a strategic way. This is, they anticipate possible disincentive effects associated with large guaranteed purses, and determine their willingness to pay accordingly. On the other hand, "casual" fans may not gather and/or carefully process all of the information available prior to the fight. As such, they may fail to account for the purse information, and the potential disincentives associated with large guaranteed purses.

In this context, the mix of avid and casual fans would be crucial in determining the likelihood that a promoter will offer a given purse. If the bulk of the fans interpreted a very large purse as being negatively correlated with the boxer's expected performance, this purse will not be offered because it would lower the market value of the fight and increase the promoter's risk. Hence, with mostly avid fans, promoters would be less likely to offer very large purses. Conversely, if casual fans were a significant fraction of the total fan population, promoters would be more likely offer large purses, as they will not hurt the market value of the fight or increase promoter's risk. These predictions are summarized in the following result:

v. The boxers' purses (a) reflect the fans' assessments of the information content of these purses, and (b) are inversely related to the fraction of avid fans relative to the total fan population.

The idea of a market outcome resulting from the interaction of different categories of agents is associated with the notion of "strategic complementarities" (Haltiwanger and Waldman 1985). A strategic complementarity arises when the higher the total number of agents choosing a particular behavior, the higher the return to a single agent that chooses that behavior.

The strategic complementarity in the boxing market is asymmetric and unexploited. The casual fan would be better-off acting as an avid one but not *vice versa*. If all fans acted in a more avid-like fashion, the boxer's pay schedule would carry more incentives, and more efficient outcomes could be attained. In a sense, one could say that the casual fans exert a negative externality on the avid fans, as they are more willing to pay for relatively low quality shows, and thus further dilute the quality of the product offered to the public. The recent proliferation of low quality PPV shows that actually turned a good number of buys exemplifies this situation.

Unfortunately, a direct test of the large purse disincentive hypothesis is not possible with the available data. This is because of a lack of systematic purse data across a variety of boxers and fights. Purse information is generally available only for "big time" fights, which would result in a sample selection bias if used to test the purse-effort incentive link. The reason is that young fighters or fighters in less prestigious weight categories, for whom reputation building incentive effects are strong, would be excluded from the sample.

However, beyond the purely anecdotal, one can exploit a well-known fact regarding championship boxing purses to indirectly analyze the predictions of the theory. It is known that

there is wide variation in championship purses across weight categories, with the higher-weight boxers often taking substantially larger purses than the lower-weight ones. As a result, one expects a newly crowned heavyweight champion to be wealthier than a newly crowned lighter-weight champion, and that the former's wealth will increase faster than the latter's as they successfully defend their titles. Hence, the theoretical prediction that high wealth deters effort would suggest that, holding everything else constant, lighter-weight champions will likely exert more effort and hence tend to successfully defend their titles more than heavier weight champions.

Table I presents summary statistics of the performances of professional boxing champions in the eight traditional weight categories. [9,10] The performance indices selected are successful title defenses and total months of championship tenure. Since there is variation in frequency of title defenses, this table also presents the average interval between defenses as well as the number of successful defenses per year. Mean difference tests across pairs of weight categories indicate that there are not any significant differences in the performance indicators of heavyweights (H) and light heavyweights (LH). Thus, these two categories (the "big" fighters) are grouped together for purposes of comparison with other weight classes.[11,12] The rest of the weight classes can either be

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[9] The use of data of championship bouts only potentially biases the results I present. This is because purses in championship bouts are most of the time larger that in non-championship fights. As such, the purse disincentive effect may be larger when it comes to championships (relative to non-championships). However, since the main thrust of the claims will be based on comparing purses across weight categories, the purse-disincentive effect should still appear as it relates to weight rather than fight status.

[10] The champions included are all the ones recognized by at least one major sanctioning association under Queensberry --post-bare-knuckle-- rules up to May 30, 1994. Excluded are champions that gave up their titles without retiring, because this action is likely not prompted by a wealth-disincentive effect. This excluded group consists primarily of champions who move up to challenge heavier-weight titleholders.

pooled together or split between "medium" size fighters (middleweights [M] and welterweights [W]) and "small" fighters (lightweights [L], featherweights [F], bantamweights [B], and flyweights [Fl]). Neither of these groupings has a meaningful impact in their comparison with H and LH.

(Tables I and II about here)

The z-statistics for mean comparison of performances across weight groups are also presented in Table I. Although we observe that H and LH tend to keep their titles longer, they do not make significantly more successful defenses than other boxers. The fact that H and LH enjoy a longer average championship tenure than the rest appears to contradict the wealth-disincentive prediction. However, this inference is refuted in column 3: H and LH keep their titles longer because they wait significantly longer between defenses than boxers in the other categories. This is the first indication of a wealth-disincentive effect in professional boxing. Since H and LH likely have higher and steeper earning profiles, they do not have the incentive to exert a lot of effort to accumulate extra wealth at shorter intervals. A competing explanation for this longer lag between title fights is that heavier boxers suffer more severe punishment and thus take longer to heal. This explanation is not convincing, because opponents are evenly matched in terms of weight. As such, there should be little or no reason for the relative damage inflicted to significantly vary across categories. In fact,

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[11] An important reason for this grouping is that the sample size for heavyweights alone is too small to yield a statistical test with power.

[12] This grouping is also somewhat historically justified, since, traditionally, the great light heavyweight champions move up and challenge for the heavyweight championship. ob Fitzimmons, Tommy Loughran, Joey Maxim, Archie Moore, Billy Conn, Bob Foster, Michael Spinks, and Roy Jones, Jr are examples of this.

one could argue that lighter fighters are more likely to take longer to heal between fights because of their physically draining efforts to adhere to weight limits. [13] Anecdotal evidence shows that most of the fatalities associated with boxing have occurred in non-heavyweight fights. [14]

Finally, the observed longer tenure of H and LH is misleading because (a) the length of tenure indicator has a very large variance due to the presence of a few outliers (see Table II), and (b) the quality of opposition for champions in the heavier-weight classes has traditionally been lower than the one for champions in other divisions. [15]

The previous discussion points towards the use of a more standard measure to compare performance across weight categories. Column 4 shows the number of successful defenses per year for each grouping of weight divisions. It is clear that H and LH tend to make significantly fewer successful defenses per year than the rest. However, since this test penalizes weight classes in which boxers tend to keep their titles longer, I re-evaluated these comparisons by omitting the outliers in

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[13] In fact, since fighter weigh-ins take place the day before the fight, many fighters dehydrate themselves in order to make the weight, and then proceed to regain a substantial amount in a short-period of time. Boxers like Arturo Gatti and James Toney are known for gaining as much as 15 to 20 pounds between the weigh-in and the actual fight time. Needless to say, this may pose significant risks both for the fighter gaining the weight as well as his opponent.

[14] High profile cases of permanent impairment/death as a result of injuries suffered in a match include Benny "Kid" Paret (middleweight), Deuk-Koo Kim (lightweight), Michael Watson (middleweight), "Kid" Akeem (bantamweight), Gerald McClellan (super middleweight), and Jimmy García (super feartherweight).

[15] *The Ring* magazine, in a number of issues between August 1987 and February 1989, published some carefully constructed "quality of opposition" indexes for champions in four of the traditional weight categories. Out of a maximum of 10 points, the averages were 6.926 (heavyweights), 8.071 (light heavyweights), 8.25 (middleweights), and 8.274 (lightweights). Simple observation shows that the opposition gets better as the weight gets lower. In fact, the index for heavyweights is lower than each --as well as the pool-- of all the other categories at a 1% level of significance. Also, the pool of the two heaviest weight groups has an index significantly lower than the other two weight groups at a 1% level.

each of the weight classes. As seen in Table II, omitting the two highest and the two lowest performance indicators in each class diminishes the significance of the tests in columns 1 and 2 (absolute measures), but leaves the significance of the standard tests in columns 4 and 5 basically unchanged. Thus, the tests shown in the last two columns appear more robust and reliable than the ones in the first two columns. Similar results hold if omitting only the highest and lowest indicators in each group.

In sum, the main indications of the wealth-disincentive effect in professional boxing are the longer interval between defenses and the fewer successful defenses per year observed in the heavier -and wealthier- weight categories. Lower-weight boxers, facing lower and flatter earnings profiles, have the incentive to exert more effort and successfully defend their titles more often to build-up their savings towards retirement. Heavier boxers can afford to be less active -and less successful- and still be able to retire or voluntarily lay-off after a few large paydays.

An important result in the contracting literature is that optimal solutions are attainable under reward systems involving some insurance (i.e., guaranteed payment) and a constrained level of incentives. Unlike most other individual sports, the reward system in professional boxing specifies a boxer's payment as a function of past performance alone. This article has argued that this system, while emphasizing the role of insurance, provides work incentives that may be sub-optimal. By detaching the boxer's current reward from his current performance, these contracts do not make use of a valuable signal of the boxer's unobservable effort in preparing for a fight.

Boxing is a rough and risky sport and as such providing insurance is very important. Any

fighter's life could be lost in a single fight. However, even in the presence of such risks, existing incentives leave a lot to be desired. This fact, compounded with the growth of purses for boxing "superstars", makes "Buster" Douglas-like episodes ever more likely to occur. Preventing such episodes does not seem easy. Since a fan association or union does not exist, it is not feasible to expect that provision of incentives will come from this front.

Can fans rely on the boxing organizations or athletic commissions to provide appropriate incentives? Not really. Unlike other sports, boxing has a multiplicity of sanctioning organizations, and the athletic commissions are virtually powerless relative to promotional and business ventures. These many organizations and promoters create a propitious environment for poor incentive provision. If a promoter offered a boxer a contract with heavy incentives, risk-aversion would imply that the boxer would prefer a contract offered by a different promoter specifying more insurance and fewer incentives. From the contracting literature, we know that in these environments the agents are bound to enjoy more favorable contracting terms.

The contrast between the organizational structures and reward systems in boxing and other individual sports like tennis, golf, or bowling, suggests what could be an appealing improvement of the current incentive system in boxing. The common denominators across these other sports are that they all (a) have fairly centralized governing bodies, and (b) display tournament-based compensation schemes. If applied to boxing, the tournament idea would mean that given a total purse amount, the winner would be awarded a larger fraction than the loser. While providing insurance through minimum guarantees, this system would certainly have more desirable incentive properties than the current one. Unfortunately, without a major institutional overhaul, a change in this direction will never make it beyond the avid fan's wish list.

Weight Category		Successful Defenses	Months of Tenure	Months between Defenses	Successful Defenses per Year
Heavies and Light Heavies (n=104)	Mean	2.49	23.43	9.17	0.96
	S. Dev.	3.99	22.73	10.51	1.07
Middles and Welters (n=148)	Mean	2.04	17.51	7.39	1.27
	S. Dev.	2.89	16.81	7.69	1.51
Lights, Feathers, Bantams, and Flies (n=294)	Mean	2.11	18.19	6.44	1.25
	S. Dev.	2.7	17.95	5.66	1.64
H & LH v. M & W	z-val	0.98	2.26**	1.52	-1.93*
H & LH v. L, F, B, & Fl	z-val	0.9	2.13**	2.58***	-2.1**
H & LH v. Field	z-val	0.97	2.3**	2.29**	-2.33**

Notes: z-vals are for two-tailed tests of mean differences between groups
* indicates significance at 10% level
** indicates significance at 5% level
*** indicates significance at 1% level

Source: The Boxing Record Book 1994. Vol. 11

Weight Category		Successful Defenses	Months of Tenure	Months between Defenses	Successful Defenses per Year
Heavies and Light Heavies (n=96)	Mean	2.06	19.96	7.6	0.97
	S. Dev.	2.85	18.02	5.35	1.06
Middles and Welters (n=140)	Mean	1.76	15.78	6.71	1.24
	S. Dev.	2.11	14.97	5.67	1.44
Lights, Feathers, Bantams, and Flies (n=278)	Mean	1.93	16.66	5.87	1.27
	S. Dev.	2.19	15.59	3.6	1.65
H & LH v. M & W	z-val	0.90	1.88*	1.26	-1.7*
H & LH v. L, F, B, & Fl	z-val	0.42	1.61	3.03***	-2.1**
H & LH v. Field	z-val	0.62	1.823*	2.53**	-2.23**

Notes: z-vals are for two-tailed tests of mean differences between groups
* indicates significance at 10% level
** indicates significance at 5% level
*** indicates significance at 1% level

Source: The Boxing Record Book 1994. Vol. 11

The Boxing Record Book (1994), Vol. 11, New Jersey, Fight Fax, Inc.

Fama, E. (1980), "Agency Problems and the Theory of the Firm," *Journal of Political Economy* 88, 288-307.

Gibbons, Robert, and Kevin Murphy (1992), "Optimal Incentive Contracts in the Presence of Career Concerns," *Journal of Political Economy* 100, 468-505.

Haltiwanger, J., and M. Waldman (1985), "Rational Expectations and the Limits of Rationality: An Analysis of Heterogeneity," *American Economic Review* LXXV, 326-340.

Holmström, B. (1982), "Managerial Incentive Problems-A Dynamic Perspective," in *Essays in Economics and Management in Honor of Lars Wahlbeck*, Helsinki, Swedish School of Economics.

Klein, B., and K. Leffler (1981), "The Role of Market Forces in Assuring Contractual Performance," *Journal of Political Economy* 81, 615-641.

Kreps, D., P. Milgrom, J. Roberts, and R. Wilson (1981), "Rational Cooperation in the Finitely Repeated Prisoner's Dilemma," *Journal of Economic Theory* 27, 45-252.

Lambert, R. (1983), "Long-Term Contracting and Moral Hazard," *Bell Journal of Economics* 14, 441-452.

Lazear, E. (1979), "Why is There Mandatory Retirement?," *Journal of Political Economy* 87, 1261-1284.

Radner, R. (1981), "Monitoring Cooperative Agreements in a Repeated Principal-Agent Relationship," *Econometrica* 49, 1127-1148.

Radner, R. (1985), "Repeated Principal-Agent Games with Discounting," *Econometrica* 53, 1173-1198.

Reed, G. (1981), *This Business of Boxing and "Its Secrets"*, Washington, D.C., and Detroit, New National Publishing Company.

The Ring (various issues 1987-1989), New York, The Ring Publishing Corp.

Rogerson, W. (1985), "Repeated Moral-Hazard," *Econometrica* 53, 69-76.

Rubinstein, A. and M. Yaari (1983), "Repeated Insurance Contracts and Moral Hazard," *Journal of Economic Theory* 30, 74-97.

Sargent, T. (1987), *Dynamic Macroeconomic Theory*, Cambridge, MA, Harvard University Press.

Shapiro, C. (1982), "Consumer Information, Product Quality and Seller Reputation, *Bell Journal of Economics* 13, 20-35.

Tenorio, R. (2000), “The Economics of Professional Boxing Contracts," J*ournal of Sports Economics* I, 2000, pp. 363-384.