Reserve Price Formation in Online Auctions

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Abstract

We use a unique hand collected data set of 6 258 auctions from the online football manager game *Hattrick* to study micro-patterns of reserve price formation. We find that chosen reserve prices exhibit both, very sophisticated and "irrational" behavior by the sellers. Reserve prices pick up the "birthday effect" in sales prices, documented in Englmaier and Schmöller (2008) and are adjusted remarkably nuanced to the resulting sales price pattern. Moreover, reserve prices are too clustered (around multiples of €50 000) as to be consistent with fully rational behavior. Furthermore, we find evidence for entitlement effects and the sunk cost fallacy as there is a huge positive effect on the reserve price when the player has been acquired previously.

JEL Code: D12, D44.

Keywords: auctions, reserve price, bounded rationality, heuristics, entitlement effect.

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1 Introduction

Auctions have been an important allocation mechanism for a long time. Though not all applications of auctions have been as extraordinary as the legendary auction that occurred in the year 193 A.D. when the entire Roman Empire was auctioned off by the Praetorian Guard to the highest bidder Didius Julianus, they are used in a wide array of fields like art sale, real estate, or spectrum rights. With the ascent of the internet, auctions have exceedingly gained popularity on platforms such as eBay.com, amazon.com, or eBid.com. It is therefore hardly surprising that the field has been studied extensively by many economists. One example is Lucking-Reiley (2000) who presents data from a comprehensive study of 142 different internet auction sites. His results describe the transaction volumes, the types of auction mechanisms used, the types of goods auctioned, and the business models employed at the various sites. From his results it is obvious that an important strategic design element in most auction environments is the reserve or minimum price that can be set by the seller. From the classic contributions in auction theory, Myerson (1981), Riley and Samuelson (1981), or Bulow and Roberts (1989), we have a fairly clear picture about how optimal reserve prices should look - they do not depend on the number of bidders and they are a continuous function of the hazard rate of the distribution of valuations of buyers.[1] Rosenkranz and Schmitz (2007) extend the analysis to non-standard reference point dependent preferences and show whether and how reserve prices perceived as reference points affect bidding behavior.

However, while there is considerable (although conflicting) empirical evidence on the effect of reserve prices on bidding behavior, there is little empirical evidence on how sellers actually set reserve prices. Using a hand collected data set of 6 258 auctions of virtual football players traded in English auctions on *hattrick.org* we are able to approach this question and provide micro evidence on individual sellers' reserve price choices.[2] The online game *Hattrick* (HT) is the world's largest online football manager game with almost one million participants and every day about forty thousand virtual players are traded on the *HT* transfer market. By design, these trades take place in a highly controlled environment including a standardized duration for each auction, a fixed mode of how players on sale are presented, and no risk of default. Sellers are however free to choose a non-negative reserve price (public minimum bid). Moreover, unlike many other online auction platforms, in *HT* there is no relation between the minimum bid and the transaction fees a seller is charged, which could bias individuals in their optimal choice of a reserve price. We find both evidence for very sophisticated behavior and boundedly rational behavior in the reserve price patterns in our data.

[1] Note however that these predictions are derived in independent private value environments. In interdependent value environments affiliated or common values there are few general results to be found.

[2] Data on auctions of virtual football players traded on *hattrick.org* have been used previously in studies by Trautmann and Traxler (2008) and by Englmaier and Schmöller (2008).

On the one hand, we find strong evidence that sellers take into account the "birthday effect" as documented in Englmaier and Schmöller (2008). A player's value in the game decreases, ceteris paribus, continuously with his age measured in days as it becomes harder and harder to improve his skills by training. In Englmaier and Schmöller (2008) we show a very strong drop in sales prices just on a player's birthday, indicating that buyers in *HT* overweigh the age of a player measured in years as opposed to his age measured in days, though the latter is also plainly visible to all buyers free of cost as can be seen in Figure 5 in the appendix. Our analysis of sellers' reserve price formation patterns clearly shows that the birthday effect is also present with respect to reserve prices. Further examination of the data indicates that this is the case not (only) because sellers fall prey to the same information under-usage fallacy as the buyers but because (at least a substantial fraction of) sellers tries to strategically exploit this irrational behavior of the demand side. We find a clustering of sale offers just before players' birthdays, indicating that sellers rationally want to sell players before they drop in value on their birthday. Furthermore, for the same time a spike in the number of unsold players indicates comparably aggressive reserve prices for these players. Finally, a sharp drop of median reserve prices immediately before the birthday indicates that sellers anticipate the immanent drop in market value, trying to make sure the player is sold in time and that a sale is not inhibited by a too aggressive reserve price.

On the other hand, we find that reserve prices are too clustered as to be compatible with fully rational behavior. In particular, the distribution of reserve prices spikes substantially at multiples of €50 000, and also suggests a lower scale clustering at multiples of €5 000. This is in marked contrast to standard auction theoretical results which would predict reserve prices to be a continuous function of the hazard rate of the distribution of buyers' valuations (see eg. Krishna, 2002). We interpret this as evidence for sellers using a round number heuristic in setting reserve prices as the one documented in Benartzi and Thaler (2008) for determining savings choices. The phenomenon of "price clustering" is also well documented for stock markets, where limit sell orders and also prices tend to be rounded to whole numbers rather than displaying fractions.[3] Also, round integer clustering at multiples of 5 has been suggested earlier (eg. Harris, 1991), resembling the frequent appearance of reserve prices at multiples of €5 000 in our data.

Our regressions provide strong evidence that sellers fall prey to an aggravated entitlement effect, closely related to another prominent bias, the sunk cost fallacy.[4] In our data we have a very good proxy whether a player on the transfer market had been acquired by the seller previously or whether he was promoted (basically for free) from the seller's own youth team. We find that, ceteris paribus, sellers set substantially and significantly higher

[3]Sonnemans (2006) provides an overview on previous studies on price clustering on stock markets and discusses several possible explanations.

[4]Cf. eg. Arkes and Blumer (1985).

reserve prices for players they have bought as compared to players they promoted internally. They are also much more likely (by 9%) to set a positive reserve price for those players. Hence it seems that the active purchasing of a player creates an entitlement effect, maybe because sellers do not regard the price they paid as sunk.[5] There is ample evidence for the entitlement or endowment effect and the resulting Willingness-to-Pay/Willingness-to-Accept gap in controlled experiments[6], though recent work by Plott and Zeiler (2005, 2007) is critical with respect to the validity of the endowment and entitlement effects outside the lab. Our study provides evidence for a strong and persistent entitlement effect in a very competitive natural setting. All our results are robust if we control for the experience of the sellers in our sample. If anything, the entitlement effect seems to be stronger for more experienced sellers. This could be interpreted in line with Huck, Kirchsteiger, and Oechssler (2005) who show theoretically that evolution favors individuals whose preferences embody an endowment effect. The reason is that the endowment effect improves the bargaining position in bilateral trades. Translating this intuition into our setting, experienced sellers are more prone to aggressive rent appropriation for acquired players, securing themselves a larger share of the pie when trade is successful, and allowing them to be more successful in the overall game.

Genesove and Mayer (2001) empirically analyze seller behavior in the Boston residential real estate market using panel data obtained from proprietary records. In their data, sellers whose condominium's expected selling price falls below the original purchase price due to an aggregate market downturn tend to set asking prices well above the expected price level. They argue that this unwillingness to accept market prices for property in the down part of the market cycle could stem from loss aversion on behalf of the sellers. However, in our sample there are no losses caused by business cycle swings, since all data was collected within the period of only a fortnight. The setting studied in Genesove and Mayer (2001) involves bargaining, where the final price can fall below the initial asking price of the seller, which in addition not necessarily reflects his reserve price. It is also reasonable to assume that the evaluation of a condominium may involve substantial search costs, whereas all relevant information on *HT's* virtual players is readily available, highly standardized, and thus comparable. Hence, while we observe similar behavior of sellers, the motivations behind it may differ considerably.

As alluded to above, though there is to our knowledge very few other evidence on reserve price formation, there are several studies on the effects of reserve prices on selling prices. However, the evidence from those is mixed. While Ariely and Simonson (2003) and Kamins

[5]Though this may seem a bit far fetched there is a striking resemblance to the often heard proverb in real world soccer that a "prophet has no honor in his own country," meaning that a player that grew up in a club is oftentimes not as much valued there as other players that have been acquired on the transfer market.

[6]For references see eg. Thaler (1980), Knetsch (1989), Hanemann (1991), Shogren, Shin, Hayes, and Kliebenstein (1994), Casey (1995) or Carmon and Ariely (2000).

et al. (2004) find positive effects of reserve prices on selling prices in field data and in field experiments, Bajari and Hortacsu (2003) and Hoppe and Sadrieh (2007) find no evidence for reference dependence in their field study and field experiment respectively. Of particular interest to us is the study by Trautmann and Traxler (2008), which also uses data from auctions of virtual football players traded in *HT*. The focus of their study is separating two potential channels how reserve prices might affect selling prices: A reference point or anchoring effect as suggested in Rosenkranz and Schmitz (2007) and a standard rent appropriation effect that stems from reserve prices forcing bidders to pay more than the second highest bidders valuation. Trautmann and Traxler (2008) find a positive effect of reserve prices but they find no evidence that any of these higher prices stem from a reference point effect but rather most of this can be accounted for by rent appropriation, as sellers try to set prices competitively between the highest and second highest bidders' valuations.

The remainder of the paper is structured as follows. Section 2 describes the structure of the data and the relevant details of *HT*. Section 3 presents our empirical analysis and its results and Section 4 concludes. All Tables and Figures are collected at the end of the paper.

2 Data Description

HT is a browser-based free online football manager game with almost one million registered users, henceforth referred to as "managers".[7] The basic concept of the game is to manage your own virtual football club, which consists of virtual players that are represented by a multi-dimensional vector of attributes. The tasks for the human managers are manifold, combining the elements of economic management, tactical options, and community interaction. Alongside the sportive component of challenging the teams of other human managers, the game requires the manager to develop a sound financial scheme for his club. The most important source of (virtual in-game) revenue for a manager is successfully trading players on the *HT* transfer market. Most managers follow a "train and trade" strategy which first ensures the improvement of quality of their own virtual players by choosing a sound training scheme and then profitably trading them with other managers. Since the proceeds from player sales are the major source of income in *HT*, the transfer market provides strong incentives for the participants in this open-ended manager game.

Each player has eight abilities, his "skills", that determine his suitability to play a certain position in the line-up.[8] From the set of player attributes, only these skills can be actively

[7] We refer to human users as "managers", while using the term "player" to address virtual football players.

[8] The eight skills are labeled *goalkeeping, stamina, set-pieces, playmaking, winger, scoring, passing,* and *defense*, and the current level is displayed as integer on range 0 to 20. To all other attributes, we will refer to

improved by the managers via training. However, it takes several weeks for an individual player to increase by a full skill level and only a single skill can be trained at a time. Hence, managers have to specialize in training only one specific skill, say goalkeeping. As soon as such a keeper-trainee surpasses the threshold for a skill-up in this skill, the manager can profitably sell him to another manager and assign the free training slot to a new (and younger) trainee, which he can either acquire on the transfer market or promote directly from his own youth team.[9] The proceeds from the sales are in turn used to finance the club.

The selling mechanism implemented on the transfer market is an English ascending open bid auction. When selling a player, managers can specify a non-negative reserve price and select a line-up category for the player (e.g. goalkeeper). An auction ends exactly 72 hours from submission, but the deadline is automatically extended by 3 minutes if a bid is placed within 3 minutes to the deadline. This continues until all bidders but one retire.[10] All players on sale are displayed in the same standardized way and the sellers have no possibility to affect the way how an individual player is presented to potential buyers. A prospective buyer has to submit a bid at least equal to the reserve price or above the current highest bid, respectively. After the auction ends, the player is automatically transferred to the winning manager's team and the seller receives the winning bid net of some small fee.[11] If a player received no bid, the auction fails and he stays with the seller. Importantly, and in clear contrast to other internet auction platforms, when *HT* players are on the market, all relevant information concerning their quality - that is the full attribute vector - becomes publicly available. Hence, at the time of sale there is no information asymmetry between buyers and sellers and, for that matter, the econometrician.

The market value of a player to a large extent depends on his current skill levels. In combination with his form and health status, they determine the strength a player adds to a team if he is currently lined-up in a certain position for a match, which we define for the purpose of this paper as his "consumption value" (CV). For instance, a keepers' CV in *HT* is almost exclusively driven by the goalkeeping-skill. However, the market value is in addition affected through a second channel, which we will call in this paper the "Advancement Potential" (AP) of a player. While the consumption component is independent of a player's age, the AP value strongly depends on the fact that age is a key determinant for training

as "traits" or "characteristics" throughout the paper. A typical player profile with the full set of attributes and the corresponding auction details can be seen in Figure 5 in the Appendix.

[9]Each manager can promote one player from the youth team each week, whose attributes are determined randomly with a high probability of low skills. Age is also randomly assigned on the interval 17 to 19 years.

[10]Given the reserve price is set below the second highest bidder's valuation, the transfer price will equal the second-highest bid plus one discrete increment, i.e. the format is equivalent to a second-price auction. For reference on the effects of the employed ending rule on bidding behavior see eg. Roth and Ockenfels (2002) and Ariely et. al (2005).

[11]The fee is proportional to the transfer price and declines with the time a player is member of the team with a minimum of 2% after 112 real-time days (an *HT* year). These transaction costs are small and do not affect any of our results.

effectiveness. In *HT*, the marginal skill-improvement from training declines with the age of a player.[12] The younger a player, the more he benefits ceteris paribus from training and the faster he advances to a higher skill level, with which in turn his CV increases. As a consequence, a viable training strategy necessarily requires rather young players, since they have the highest innate potential for further skill development. However, a player who is just a few days younger than another - being otherwise identical - should not be worth much more, since the difference in their AP is minimal. This remains true, even if the one player already turned a year older while the other's birthday lies just ahead. All else equal, a player's AP value decreases continuously with his age measured in days.

Our main interest in this paper is to explain how sellers choose their reserve prices. For this purpose, we focus on a specific subgroup of players: We collected all publicly available information on 6 258 virtual players aged between seventeen - the youngest age possible in the game - and nineteen years, all listed as goalkeepers on *HT*'s transfer market. Moreover, all players display the same skill level in goalkeeping (score 6 out of 20), which is the only important skill for a goalie.[13] By exclusively restricting our sample to this subgroup of players, we create partial homogeneity. As with the goalkeeping-skill the most influential determinant of the CV is kept constant, we can regard the whole CV as virtually constant in our data. We are thus able to identify variations of players' APs in the sample, which crucially depend on their age, or more precisely, their total age measured in units of days. The game design is such that all relevant information on the players age attribute is readily available and explicitly stated to every potential bidder.

Next to all relevant player and auction characteristics, we also collected information on buyers and sellers. For a subsample of 2 411 auctions we are able to construct a proxy for seller nd buyer experience as we use the information on how a manager ranks relative to all other managers within a given country. We argue that a higher ranking within a country is a good indicator for being more experienced as a higher ranking can only be achieved by playing the game for a long period of time and/or being very successful quickly, which should to a large degree be correlated with having routine playing the game.

Furthermore we use the information whether a player plays abroad or not, indicated by a 20% bonus on his wage,[14] as a proxy whether he had been previously traded or whether he is a "fresh" player from the seller's own youth team. Fresh players never receive this 20%

[12]Importantly, the marginal effect of training is otherwise homogenous for all virtual players, i.e. there exists nothing like a talent-attribute capturing the potential for skill-improvements. It does, however, to some extent depend on the current skill level (which we hold constant in our sample), the ability of the club's trainer, and the training intensity chosen by the manager, where the latter two give rise to variation in private valuations.

[13]In contrast to goalkeepers, the values of other types of players crucially depend on more than one skill and in addition also on the individual line-up tactics of a manager, making an analysis of the driving forces behind the market value substantially more difficult.

[14]Note that a player's wage is exogenously fixed by *HT* and cannot be influenced by the managers.

playing-abroad bonus on their wages, as e.g. German teams always produce fresh German players. As in roughly 85% of all trades buyer and seller are not from the same country, our potential mistake from missing trades within a country is small and this 20% bonus is a very good proxy to discriminate between fresh and previously traded players.

3 Analysis and Results

Our dataset consists of 6 258 players with identical goalkeeper-skill that were posted on *HT*'s transfer market between November 18, 2007 and December 02, 2007.[15] Table 1 shows the summary statistics of the most important variables in our sample. The mean reserve price (*"askprice"*) in our sample was €77 537, but levels as high as €579 000 were reached. Note that the final prices fall in a comparable range, indicating that by and large the reserve prices were not set beside the point. A year in *HT* is normalized to 112 real-time days and the age of a player is displayed in the form "X years and Y days" on his profile-page. Hence, *years* defines the age-group of a player, while *days* discloses information on the distance to the next higher age-level, or equivalently, how far his next birthday is away. For our empirical estimation, we construct the measure *totalage* $\in$ [0,335], which combines all information contained in both of these two variables and displays the total age of player in day units.[16]

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Table 1 - Summary Statistics

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Panel B of Table 1 shows some statistics on the frequency of data. Note that all age-groups are roughly equally represented, with a slight majority of players aged nineteen. According to our wage-bonus proxy (indicated by the dummy *dbonus*), in about 32% of all auctions the sellers offered players they previously bought themselves on the market. In 68% of the times a player promoted from the own youth squad of the seller, i.e. a "fresh" player, was auctioned off. For 5 108 players in our sample the sellers fixed a strictly positive reserve price. 4 743 of all players were sold, where in 756 cases the trade took place at a price equal to the minimum bid (single bidder case). The fact that a substantial fraction of players remained unsold is evidence that reserve prices were set competitively.

[15] We started out with a total sample of 6 460 auctions comprising all the auctions of players in the relevant age and skill group in that period. From this we dropped 4 players that play for their respective home country's national team, 66 players with reserve prices identified as outliers by Grubbs' test (Grubbs, 1969) and 132 players that were injured at the time of the auction. This leaves us with 6 258 players or 96.9% of the initial sample.

[16] The variable is calculated as *totalage* = 112·(*years*-17)+ *days*. Hence, the minimum value of *totalage* at 0 reflects age "17 years and 0 days" and the maximum value at 335 stands for "19 years and 111 days".

The "Birthday-Effect". In our earlier work on the demand side of *HT*'s transfer market, we find strong evidence for a discontinuous relation between the selling price and age. Hence, it seems a natural point to start our analysis of the driving forces in the formation of reserve prices by similarly examining the relation of reserve price and total age. Intuitively, the variable *totalage* captures all available information on the players' age attribute, and, as we have argued above, ceteris paribus the value of a player should decline gradually as *totalage* increases. However, Figure 1 reveals that the relation between reserve price and total age is not smooth but exhibits striking discontinuities where the players enter the next higher age-group. This finding exactly resembles the "birthday effect" we document in Englmaier and Schmöller (2008) for the final selling prices in *HT*. There, we argue that buyers overweigh the informational content of the age-group indicator *years*, while they under-use the finer information on a players age attribute given in form of the variable *days*, leading to suboptimal bidding behavior.

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Figure 1 - Relation of Reserve Price and Total Age in Days

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Appropriation of Buyer Surplus. Since most managers in *HT* alternate between both roles, it seems not too surprising to find similar behavioral patterns for buyers and sellers. At a first glance, it stands to reason that the sellers fall prey to the same suboptimal use of information as the buyers do. However, it is also possible that it is the bias on the demand side that actually triggers the observed choice of reserve prices. That would be the case if at least some sellers follow strategic considerations and try to exploit the biased buyers. To understand whether this is indeed the case, first note that in 15.9% of the successful trades there was a single bidder only and the winning bid equaled the reserve price (Panel B of Table 1). Building upon the interpretation in Trautmann and Traxler (2008), we take it that in these 756 auctions the sellers successfully managed to appropriate some of the highest bidder's surplus. By setting the reserve price between the latter's and the second highest bidder's valuation, the selling price is mechanically higher than if there was no minimum bid. Furthermore, at least some of the 24% failed auctions are likely to result from some sellers following this strategy of "rent appropriation" too aggressively and set their reserve price above even the highest bidder's valuation. In line with this argument, a non-parametric Wilcoxon-Mann-Whitney test confirms that the askprices for unsold players are significantly higher than those for successful trades (p-value=0.000). Though merely inferred by inspection, we take these observations as a first indication that at least some sellers behave strategically and try to reap some of the buyers' surplus.

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Figure 2 - Age Distribution of Sold and Unsold Players

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An analysis of the age distribution of offered players further strengthens this intuition. Figure 2 depicts the age distribution (measured in day units) for the full sample, sold and unsold players separately. The dashed lines at 112 and 224 mark the points where the players turn eighteen and nineteen, respectively. We find a clustering of sale offers about three weeks before players turn one year older, indicating that sellers rationally want to sell players before they drop in value due to the "birthday effect". Most intriguingly, at about 90 days of total age both the total number of offers and the number of failed auctions increase substantially, while the number of sales (and also the selling price pattern) remains largely constant.[17] At the same time, in Figure 1 the median askprice exhibits a local peak at exactly the same age level, though this latter finding is not statistically significant. Apparently the sellers are most aggressive in their "rent appropriation" strategy for players that are about to turn one year older and therefore they often exceed the maximum willingness to pay of any potential bidder and fail in their attempt to reap the surplus.

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Figure 3 - Reserve Prices in Close Proximity to Discontinuity Point

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However, in even closer proximity to the day of birthday, a different picture arises, as Figure 3 shows. It depicts all reserve prices two weeks before and after the eighteenth birthday of players ($totalage \in [98;125]$). Observe that the median reserve price begins to decline at 110 days of total age and drops to zero at 112, while it moves upwards again immediately after the birthday. Evidentially, many sellers seem to be aware of the value loss that arises through the "birthday effect" and hence try to avoid to bear it themselves. Consequently, they charge low minimum bids for players whose birthday is imminent, thereby minimizing the risk that they remain unsold.

Round number heuristic. Though the above findings point towards rather sophisticated seller behavior, we also find contrasting evidence. For a start, reserve prices are too clustered as to be compatible with fully rational behavior. In particular, Figure 4 clearly shows that the distribution of reserve prices spikes at multiples of €50 000 (Figure 4a), but also at multiples of €5 000 (Figure 4b). This finding stands in marked contrast to standard auction

[17] We find similar, but less pronounced effects at around 200 and 315 days of age, i.e. the 19th and 20th birthday.

theory which would predict reserve prices to be a continuous function of the hazard rate of the distribution of buyers' valuations (see eg. Krishna, 2002). We interpret this as evidence that sellers follow a rule of thumb to considerably simplify their decision making. Our intuition is that they are using a round number heuristic in setting reserve prices as the one documented in Benartzi and Thaler (2008) for determining savings choices. According to Sonnemans (2006), this sort of large scale round number-clustering could be caused by boundedly rational sellers, who form mental target prices, which then serve as a "good enough"-solution in their view instead of demanding the true market value. Note that especially in the light of a rent appropriation strategy as proposed by Trautmann and Traxler (2008) this makes very little sense as this strategy depends on very fine tuned estimates of the distribution of valuations.

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Figure 4 - Patterns and Distribution of Reserve Prices

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Evidence on entitlement effects. Moreover, we find striking evidence that reserve prices strongly differ whether or not a player has been purchased or was instead drafted from a seller's own youth squad. First, among the players that were bought (*dbonus=1*) the share of failed auctions (32.6%) is substantially higher than that for fresh players (20.3%). Pearson's chi-square test confirms that there is a statistically significant relationship between *dbonus* and the frequency of players remaining unsold (p-value: 0.000). While in principle this could result from a preference for fresh players on behalf of the buyers,[18] we find strong evidence that sellers chose significantly higher minimum bids for players they acquired on the market. For instance, the mean reserve price for fresh players at €66 320 is substantially below the mean we observe for acquired players at €101 331. This difference is statistically significant on the highest level (non-parametric Mann-Whitney two-sample ranksum, p-value = 0.0000). Apparently, sellers become attached to acquired players and hence demand a premium to give them away again. Stated differently, our findings indicate that sellers in *HT* exhibit some form of entitlement effect with respect to players they bought on the market, but not for those players they promoted from their own youth squad.

To provide statistical backup for our findings, we employ multi-variate regression analyses with *askprice* as the dependent variable. Because some of the players with a positive reserve price were not sold, we have a censored sample. We address this by using a Tobit model with left censored reserve price records at value zero in addition to standard OLS with robust

[18] In Englmaier and Schmöller (2008) we find such a tendency of the buyers, but the effect is of small magnitude and there is a rational interpretation for a discount on purchased players: A fresh player may be close to the next skill level whereas a previously traded and trained player is more likely to be sold directly after a skill-up. Conversely, for sellers there is no such plausible rationale.

standard errors for all specifications. All results from the OLS regression remain robust without any attenuation. The results from both approaches are shown in Table 2.

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Table 2 - Multivariate Regression - Determinants of Reserve Price

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The first and the fourth column of Table 2 contain the coefficients from the simplest specifications we analyzed (OLS I and TOBIT I), using only a subset of the explanatory variables at hand. Remember that the measure *totalage* by construction represents all available information on the age attribute of a player. Conversely, the age-group dummies *agegroup18* and *agegroup19* only reflect the noisier information contained in the variable *years*.[19] Therefore, the latter should all be redundant once we include *totalage* as explanatory variable. However, the coefficients of *agegroup18* and *agegroup19* both are of stunning magnitude and highly significant. By the day players turn eighteen, in model OLS I the expected reserve price slumps down by an average of €88 529 (€92 706 in TOBIT I) with 99% statistically significant t-statistics. At their nineteenth birthday, players experience another value loss of roughly €11 000, the difference between the coefficients of the age-group dummies, or about 18% relative to the mean askprice for age-group eighteen (€56 399). A chi-square test approves that both coefficients are jointly significant and also statistically different from each other (p-value=0.000 in OLS I and p-value= 0.012 in TOBIT I). Hence, both regression models confirm that the "birthday effect" is also present in reserve prices.

We also find indications for sophistication in the seller behavior. In any specification, at least one out of two (correlated) quality indicators has a significant positive relation with *askprice*. The variables *wage* and *total skill index* both are noisy signals of where between the current and the next higher skill-level the player is located, and are correlated at rate ρ=0.597.[20] For instance, in model OLS I (TOBIT I) the expected reserve price changes by €20.43 (€20.11) for each unit increase in *total skill index*. While the current *form* is rather volatile and directly affects the player's performance in matches, it is also correlated with the *total skill index* (ρ=0.495). As we would expect, all three variables are positively related

[19]Instead of directly including the variable *years* we use dummies to indicate the age-group, because our analysis in Englmaier and Schmöller (2008) shows that the effect of a birthday is non-constant across age-groups. Additionally, we include the square of *totalage* in the estimation model rather than the absolute values to allow for a stronger than linear relationship between the total age (in day units) and the reserve price. All results remain robust if we use a linear specification and/or include *years* directly.

[20]Since the characteristic wage of the players in our sample is small relative to the observed (reserve) prices, the cost aspect of wage becomes negligible. At the same time, in *HT* a higher wage ceteris paribus signals that a player is closer to experience a level-up in one of his skills. Hence, the positive sign of the coefficient for *wage* is plausible.

to the level of the reserve price, even though the influence is sometimes not significant across specifications.[21]

Most intriguingly, the fact whether a player was acquired or promoted internally from the youth squad has a tremendous impact on the choice of the reserve price. As indicated by a large and highly significant coefficient of *dbonus*, the expected reserve price on average increases by €25 815 in OLS I (€31 449 in TOBIT I) if a player was previously purchased by the seller. We have similar results in models OLS II and TOBIT II, in which we add the full player attribute vector into the regression, including all skills except *goalkeeping*, which is identical for all players. We also control for potential auction end day and end time effects adding a dummy for each weekday, and dummies for evening and night hours.[22] All important influential coefficients from the previous specification remain at the same order of magnitude and are still highly significant. From the skills, only the positive influence of *stamina* on the reserve price is highly significant. Again, this finding points towards sophisticated seller behavior since stamina is to some extent influential for a goalkeeper's performance.

In the models OLS III and TOBIT III we maintain the full control specification, but only consider experienced sellers ($sellerxp < 0.2$) to control for possible learning effects.[23] We observe that the "birthday effect" is clearly present also among expert sellers as indicated by the large and significant coefficients of the age-group dummies, though the coefficient for *agegroup19* is no longer statistically different from that for *agegroup18*. Furthermore, also the entitlement effect remains robust with experienced sellers. If anything, it seems that the impact of *dbonus* gets even more pronounced.

Moreover, if a player was previously traded, we find that only in 9.88% of the cases the reserve price was set to zero. Among fresh players with 20.27% this share is more than twice as large. As a robustness check, we use logit models to estimate the likelihood for a positive reserve price.[24] In this specification the dependent variable is *dask*, a dummy of value 0 or 1 on whether or not there was a positive minimum bid. The results from these regressions are shown in Table 3.

[21] To account for the problem of multicollinearity, we ran diagnostics on the variance inflation factor. The co-movement between the variables turns out to be unproblematic and we keep all three variables in the estimation model. All results remain robust if we drop one or more of them.

[22] We find that for players with a nicer character and more experience a higher *askprice* is demanded. Moreover, the sellers seem to react to demand fluctuations on the transfer market. For instance, at night hours, where less potential bidders are online simultaneously, we document a significant positive impact on the minimum bid. Since these effects are of secondary order and do not conflict with our main results, the respective coefficients are not displayed in Table 2 to ease the exposition. The full regression tables can be requested from the authors.

[23] The proxy *sellerxp* takes values on the interval [0,1] and is calculated by dividing the seller's position in the national ranking through the total number of active managers in same country. Using $sellerxp < 0.2$ leaves us with a bit less than the 30% most experienced sellers in the subsample where we can construct the experience dummy.

[24] Using a probit model yields virtually identical results.

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Table 3 - Logit Regression - Likelihood of Non-Zero Reserve Price

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The first two columns (Logit I) show the odds ratios (exponentiated coefficients) and the corresponding marginal effects (instantaneous change) in the probability when only the main variables are used as regressors. The regression establishes evidence that a previous acquisition increases the expected likelihood of a non-zero askprice. The dummy *agegroup18* and the previous-trade-proxy *dbonus* are statistically significant on the highest level. In other words, the likelihood for a strictly positive reserve price decreases if a player turns eighteen. Conversely, the effect of *dbonus* on the likelihood for a non-zero reserve price is large and positive: For a purchased player (*dbonus = 1*) the odds of a strictly positive reserve price (versus a zero reserve price) increases by a factor of 2.3 as compared to a player that was promoted from a manager's own youth team. In terms of the marginal effect, a non-zero reserve price is 11 percent more likely for previously acquired players.[25] If we again employ the full vector of player and auction attributes as controls (Logit II), all results remain qualitatively robust. In line with our previous results, a separate regression for expert sellers (Logit III) reveals that, if anything, the effect is more pronounced for experts.

Hence, if a player was bought rather than promoted, on average not only the absolute level of the reserve price is higher, but also the likelihood that it is set different from zero at all. Both findings suggest that the sellers are prone to an aggravated entitlement effect for players that they purchased on the market beforehand, but not if a player was promoted from their own youth team. Since the managers in *HT* engage in a highly competitive environment this result is even more startling, since it is an common argument that such entitlement effects vanish if competition gets more intense (see e.g. Plott and Zeiler, 2007) or of goods are purchased for resale (see e.g. Kahnemann, 2003).

4 Conclusion

We examine empirically how managers playing the online game *HT* set reserve prices in auctions for virtual players. Using detailed field data on 6 258 auctions from *HT*'s transfer market, we find that chosen reserve prices exhibit both, very sophisticated and "irrational" behavior by the sellers. Reserve Prices pick up the "birthday effect" in sales prices, documented in Englmaier and Schmöller (2008) and are adjusted remarkably nuanced to the resulting sales price pattern.

[25] The marginal change is the partial derivative of the predicted probability w.r.t. an independent variable.

Evidentially, while many sellers act strategically and try to reap some of the buyers' surplus, some fail in this endeavor as they set reserve prices too aggressively. In addition, we have established that reserve prices are too clustered (around €50 000 steps) as to be consistent with fully rational behavior. Most intriguingly, even though *HT*'s transfer market is highly competitive, we find strong evidence for an entitlement effect in form of a huge positive effect on the reserve price when a player has been acquired previously. All our results are robust when we control for the experience of sellers, and the auction-end-day and time-of-day effects. Hence we conclude that *HT* managers simplify their decision making by adopting heuristic pricing rules that are suboptimal from a fully rational point of view. In particular, the strong entitlement effect we document most plausibly is a ramification of psychological motivations like the sunk cost fallacy or loss aversion. Abstracting from skill-improvements for the moment, for any purchased player a seller may always use the paid price as a direct benchmark. Though this cost is sunk by then, sellers might be tempted to charge at least the same amount, or even an additional mark-up, as reserve price. Since however their valuation was the highest in the previous auction, this might be too high a threshold. For promoted players, in contrast, there is no such benchmark to anchor upon. If, as in our data, this entitlement effect is persistent and quantitatively relevant, the option of choosing a reserve price might be an impediment to market efficiency as sellers set too high reserve prices resulting in too little trade. In such situations the social planner might want to avoid using a reserve price in the design of an auction format to avoid this potential distortion. On the upside, our paper suggests that simple microeconomic theory gives us a lot of mileage in explaining market behavior in complex environments. We document that (the majority of) sellers very finely adjust their behavior to demand patterns and try to strategically exploit potential arbitrage possibilities.

Games like *HT*, where people strategically interact, not only attract increasing numbers of customers, but also create new markets and business ideas. We are convinced that the vast amount of data generated by social gaming involving thousands of motivated online gamers provides a fruitful source for valuable insights and can contribute to the analysis of human decision making.

5 References

1. Ariely, D., A. Ockenfels, and A.E. Roth (2005) "An experimental analysis of ending rules in Internet auctions," *RAND Journal of Economics*, Vol. 36(4), pp. 891-908

2. Ariely, D. and I. Simonson (2003) "Buying, Bidding, Playing, or Competing? Value Assessment and Decision Dynamics in Online Auctions," *Journal of Consumer Psychology*, Vol. 13(1&2), pp. 113-123

3. Arkes, H. and C. Blumer (1985) "The Psychology of Sunk Cost," *Organizational Behavior and Human Decision Process*, Vol. 35, pp. 124-140

4. Bajari, P. and A. Hortacsu (2003) "Winner's Curse, Reserve Prices and Endogenous Entry: Empirical Insights from eBay," *RAND Journal of Economics*, Vol. 34, pp. 329-355

5. Benartzi, S. and R.H. Thaler (2008) "Heuristics and Biases in Retirement Savings Behavior," *Journal of Economic Perspectives*, forthcoming

6. Bulow, J. and J. Roberts (1989) "The Simple Economics of Optimal Auctions," *The Journal of Political Economy*, Vol. 97(5), pp. 1060-1090

7. Carmon, Z. and D. Ariely (2000) "Focusing on the Forgone: How Value Can Appear so Different to Buyers and Sellers," *The Journal of Consumer Research*, Vol. 27(3), pp. 360-370

8. Casey, J.T. (1995) "Predicting Buyer-Seller Pricing Disparities," *Management Science*, Vol. 41(6), pp. 979-999

9. Englmaier, F. and A. Schmöller (2008) "Bidding Behavior in Online Auctions - Micro Evidence from the Online Game Hattrick," mimeo

10. Genesove, D. and C. Mayer (2001) "Loss Aversion And Seller Behavior: Evidence From The Housing Market," *The Quarterly Journal of Economics*, Vol. 116(4), pp. 1233-1260

11. Grubbs, F. (1969) "Procedures for Detecting Outlying Observations in Samples", *Technometrics*, 11(1), pp. 1-21.

12. Hanemann, W.M. (1991) "Willingness to Pay and Willingness to Accept: How Much Can They Differ?," *The American Economic Review*, Vol. 81(3), pp. 635-647

13. Harris, L. (1991) "Stock price clustering and discreteness", *Review of Financial Studies*, Vol. 4, pp. 389-415

14. Hoppe, T. and A. Sadrieh (2007) "An Experimental Assessment of Confederate Reserve Price Bids in Online Auctions," mimeo

15. Huck, S., G. Kirchsteiger, and J. Oechssler (2005) "Learning to like what you have - explaining the endowment effect," *Economic Journal*, Vol. 115(505), pp. 689-702

16. Kahneman, D. (2003) "Maps of bounded rationality: Psychology for behavioral economics," *The American Economic Review*, Vol. 93, 1449-1475

17. Kamins, M.A., X. Dreze, and V.S. Folkes (2004) "Effects of Seller-Supplied Prices on Buyers' Product Evaluations: Reference Prices in an Internet Auction Context," *Journal of Consumer Research*, Vol. 30, pp. 622-628

18. Knetsch, J.L. (1989) "The Endowment Effect and Evidence of Nonreversible Indifference Curves," *The American Economic Review*, Vol. 79(5), pp. 1277-1284

19. Krishna, V. (2002) "Auction Theory," Academic Press

20. Lucking-Reiley, D. (2000) "Auctions on the Internet: What's Being Auctioned, and How?," *The Journal of Industrial Economics*, Vol. 48(3), pp. 227-252

21. Myerson, R.B. (1981) "Optimal auction design," *Mathematics of Operations Research*, Vol. 6, pp. 58-73

22. Ockenfels, A. and A.E. Roth (2002) "Last-Minute Bidding and the Rules for Ending Second-Price Auctions: Evidence from eBay and Amazon Auctions on the Internet," *The American Economic Review*, Vol. 92(4), pp. 1093-1103

23. Plott, C.R. and K. Zeiler (2005) "The Willingness to Pay/Willingness to Accept Gap, the Endowment Effect, Subject Misconceptions and Experimental Procedures for Eliciting Valuations," *The American Economic Review*, Vol. 95(3), pp. 530-545

24. Plott, C.R. and K. Zeiler (2007) "Exchange Asymmetries Incorrectly Interpreted as Evidence of Endowment Effect Theory and Prospect Theory?," *The American Economic Review*, Vol. 97, p. 1449

25. Riley, J.G. and W.F. Samuelson (1981) "Optimal Auctions," *The American Economic Review*, Vol. 71(3), pp. 381-392

26. Rosenkranz, S. and P.W. Schmitz (2007) "Reserve prices in auctions as reference points," *Economic Journal* 117, 637-653

27. Shogren, J.F., S.Y. Shin, D.J. Hayes, and J.B. Kliebenstein (1994) "Resolving Differences in Willingness to Pay and Willingness to Accept," *The American Economic Review*, Vol. 84(1), pp. 255-270

28. Sonnemans, J. (2006) "Price clustering and natural resistance points in the Dutch stock market: a natural experiment," *European Economic Review*, Vol. 50, pp. 1937-1950

29. Thaler, R. (1980) "Towards a positive theory of consumer choice," *Journal of Economic Behavior and Organization*, Vol. 1, pp. 39-60

30. Trautmann, S.T. and C. Traxler (2008) "Reserve prices as reference points - Evidence from auctions for football players at hattrick.org," mimeo

6 Tables and Figures

Table 1: Summary Statistics

Panel A.				Panel B.			
Variable	Mean	Min	Max		Variable Value	Frequency	Percent
askprice	77537	0	579000	age distribution	(years = 17)	1886	30.14
price[a]	81459	0	634000		(years = 18)	1935	30.92
years	18	17	19		(years = 19)	2437	38.94
days	59	0	111				
totalage[b]	181	3	335	fresh players	(dbonus = 0)	4253	67.96
total skill index	1994	650	3240	purchased players	(dbonus = 1)	2005	32.04
wage	1884	770	2676				
form	6	1	8	reserve price	(askprice > 0)	5108	81.62
stamina	3	1	9	no reserve price	(askprice = 0)	1150	18.38
passing	1	1	4				
playmaking	1	1	3	successful trades	(price > 0)	4743	75.79
scoring	1	1	3	players unsold	(price = 0)	1515	24.21
winger	1	1	4				
setpieces	2	1	7	sold at reserve price	(price=askprice)	756	15.94
defense	1	1	4				(of all sold)

a. A Price of zero indicates a failed auction. The minimum price among all successful trades was €19 000.
b. The measure for total age is calculated as *totalage* = 112·(*years*-17)+ *days*. It displays a players age in day units and is normalized such that the minimum value of *totalage* at 0 reflects age "17 years and 0 days" and the maximum value at 335 stands for "19 years and 111 days".

Table 2: Multivariate Regression - Determinants of Reserve Price

	OLS I no controls	OLS II	OLS III expert sellers	Tobit I no controls	Tobit II	Tobit III expert sellers
agegroup18	-88529.73***	-88663.06***	-87625.39***	-92706.27***	-92923.12***	-95038.57***
	(2720.41)	(2730.02)	(7835.08)	(3099.74)	(3095.09)	(9367.06)
agegroup19	-99150.27***	-97663.81***	-89941.40***	-103822.60***	-101995.20***	-97106.86***
	(3992.42)	(4032.39)	(12021.47)	(6100.97)	(6072.99)	(19234.19)
totalage^2	-0.13***	-0.14***	-0.27**	-0.16**	-0.18**	-0.34
	(0.04)	(0.04)	(0.13)	(0.07)	(0.07)	(0.24)
total skill index	20.43***	20.17***	18.71	20.11***	19.57***	28.06*
	(4.92)	(4.82)	(17.21)	(4.45)	(4.42)	(16.26)
wage	17.45**	18.49**	22.94	19.65***	21.72***	21.47
	(7.88)	(7.74)	(30.74)	(7.01)	(7.02)	(28.97)
form	-2767.89**	-1276.34	-1564.55	-3165.42***	-1175.64	-1060.93
	(1203.09)	(1247.10)	(3643.78)	(1218.45)	(1253.45)	(3848.84)
acquired	25815.38***	21127.71***	39040.31***	31448.75***	25114.21***	50265.09***
(dbonus=1)	(2964.97)	(3076.64)	(11143.74)	(2834.87)	(2958.61)	(12155.47)
skills	no	yes	yes	no	yes	yes
daytime	no	yes	yes	no	yes	yes
weekday	no	yes	yes	no	yes	yes
character	no	yes	yes	no	yes	yes
R^2	0.38	0.39	0.46			
N	6258	6258	748	6258	6258	748
				(1150 left-cens.)	(1150 left-cens.)	(181 left-cens.)

Notes: Standard errors are stated in parentheses (robust for OLS). Asterisks denote statistical significance at the 1%(***), 5%(**) or 10%(*) level. Sellers are classified as experts if *sellerxp*<0.2. "Skills" captures the playing abilities except of "goalkeeping" (= constant at score 6). "Character" contains all other player attributes. "Daytime" and "weekday" indicate whether dummies for daytime and day of the week were included.

Table 3: Logit Regression - Likelihood of Non-Zero Reserve Price

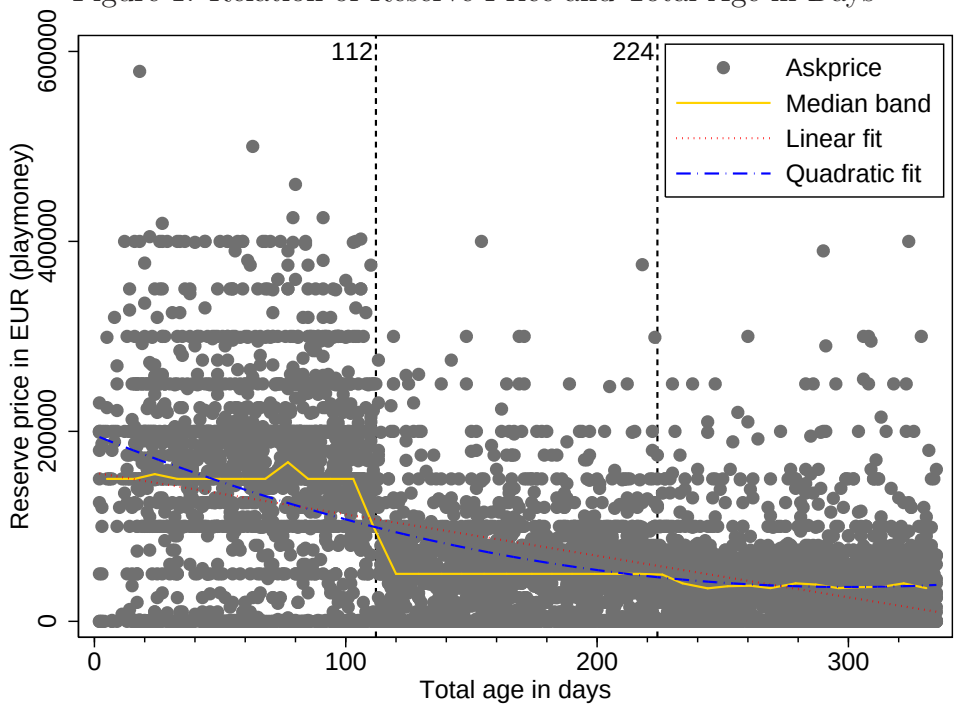
	Logit I no controls		Logit II		Logit III expert sellers	
	Odds Rt.	Marg.Efct.	Odds Rt.	Marg.Efct.	Odds Rt.	Marg.Efct.
agegroup18	0.675***	-0.0559	0.681***	-0.053	0.539**	-0.1001
	(0.074)		(0.076)		(0.160)	
agegroup19	0.708*	-0.049	0.760	-0.038	0.632	-0.0743
	(0.143)		(0.156)		(0.358)	
totalage2	1.000	0	1.000	0.000	1.000	0
	(0.000)		(0.000)		(0.000)	
total skill index	1.000	0	1.000	0.000	1.001	0.0001
	(0.000)		(0.000)		(0.001)	
wage	1.000	0	1.000	0.000	1.000	0
	(0.000)		(0.000)		(0.001)	
form	0.966	-0.0049	1.037	0.005	1.131	0.0199
	(0.043)		(0.049)		(0.144)	
acquired	2.322***	0.1197	1.882***	0.088	5.057***	0.2622
(dbonus=1)	(0.266)		(0.230)		(2.422)	
skills	no		yes		yes	
daytime	no		yes		yes	
weekday	no		yes		yes	
character	no		yes		yes	
N	6258		6258		748	

Notes: For each specification the respective odds ratio and marginal effect for the regressors used to predict *dask* are shown. Standard errors are stated in parentheses (robust for OLS). Asterisks denote statistical significance at the 1%(***), 5%(**) or 10%(*) level. Sellers are classified as experts if *sellerxp*<0.2. Groups of controls identical to those in Table 2.

Table 4: List of Variables

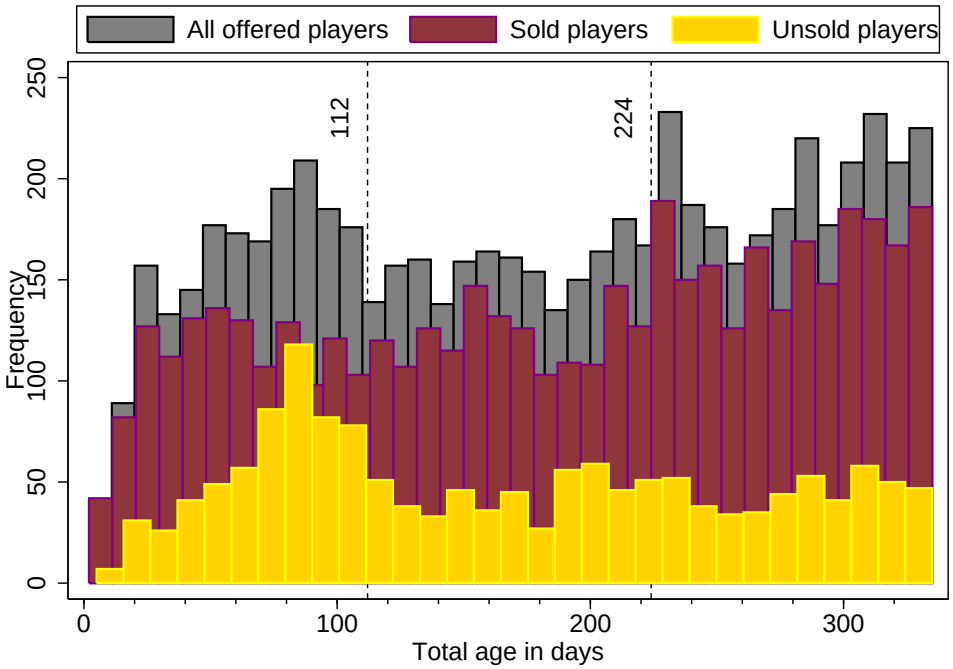
	Variable	Description	Range
Player attributes	years	Age-group of player	17 - 19
	days	Days of age / distance to next higher age-level	0 - 112
	totalage	Total age in day units (normalized)	0 - 335
	form	Current form of player	0 - 8
	total skill index	Noisy indicator for overall quality of player	$\mathbb{N}$
	wage	Salary (exogenous; in virtual Euro)	$\mathbb{N}$
	cohort	Age in week intervals	1 - 48
	stamina	Playing skill for all player types	0 - 20
	setpieces	Playing skill for all player types	0 - 20
	keeper	Playing skill, position specific	0 - 20
	playmaking	Playing skill, position specific	0 - 20
	winger	Playing skill, position specific	0 - 20
	scoring	Playing skill, position specific	0 - 20
	passing	Playing skill, position specific	0 - 20
	defense	Playing skill, position specific	0 - 20
	agreeability	High value if agreeable person (ascending order)	0 - 5
	aggression	Low value if player aggressive (descending order)	0 - 4
	honesty	High value if honest person (ascending order)	0 - 5
	plrexp	Experience of player	0 - 20
	ldrshp	Leadership qualities of player	0 - 7
	gtotal	Number of goals scored by player	$\mathbb{N}$
Auction Data	askprice	Reserve price chosen by seller	$\mathbb{N}$
	price	Price paid by buyer if sold	$\mathbb{N}$
	dtime	Time of deadline	hh.mm.ss
	dday	Day of deadline	dd.mm.yy
	buyerexp	Buyer's rank relative to all other managers in same country	0 - 1
	sellerxp	Seller's rank relative to all other managers in same country	0 - 1
Dummy variables (1=yes, 0=no)	deve	Was player sold between 4 p.m. - 0 a.m.?	{0,1}
	dnight	Was player was sold between 0 a.m. - 8 a.m.?	{0,1}
	dmon - dsun	On which day does the auction end?	{0,1}
	dask	Was the reserve price different from zero?	{0,1}
	dbonus	Is away-bonus on wage present? (proxy for previous sale)	{0,1}
	intracountry	Were buyer and seller from same country?	{0,1}

Figure 1: Relation of Reserve Price and Total Age in Days



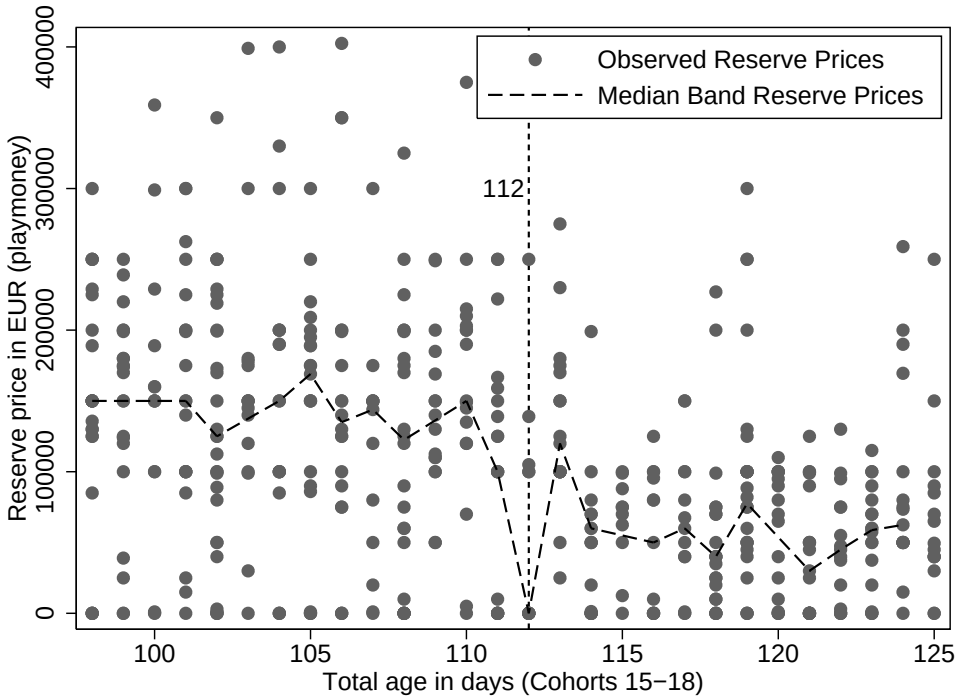
Notes: The measure for total age in days is calculated as *totalage* = 112·(*years*-17)+ *days*. It is normalized such that the minimum value of *totalage* at 0 reflects age "17 years and 0 days" and the maximum value at 335 stands for "19 years and 111 days".

Figure 2: Age Distribution of Sold and Unsold Players



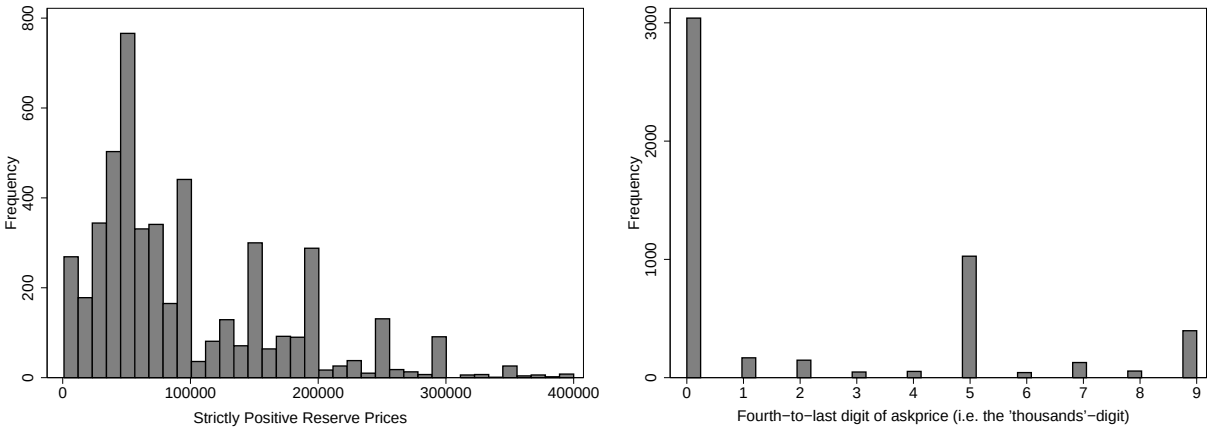
Notes: The measure for total age in days is calculated as *totalage* = 112·(*years*-17)+ *days*. It is normalized such that the minimum value of *totalage* at 0 reflects age "17 years and 0 days" and the maximum value at 335 stands for "19 years and 111 days".

Figure 3: Reserve Prices in Close Proximity to Discontinuity Point



Notes: The figure depicts all reserve prices for players two weeks before and after their eighteens birthday at *totalage*=112, i.e. *totalage* $\in$ [98;125] overall including 498 observations.

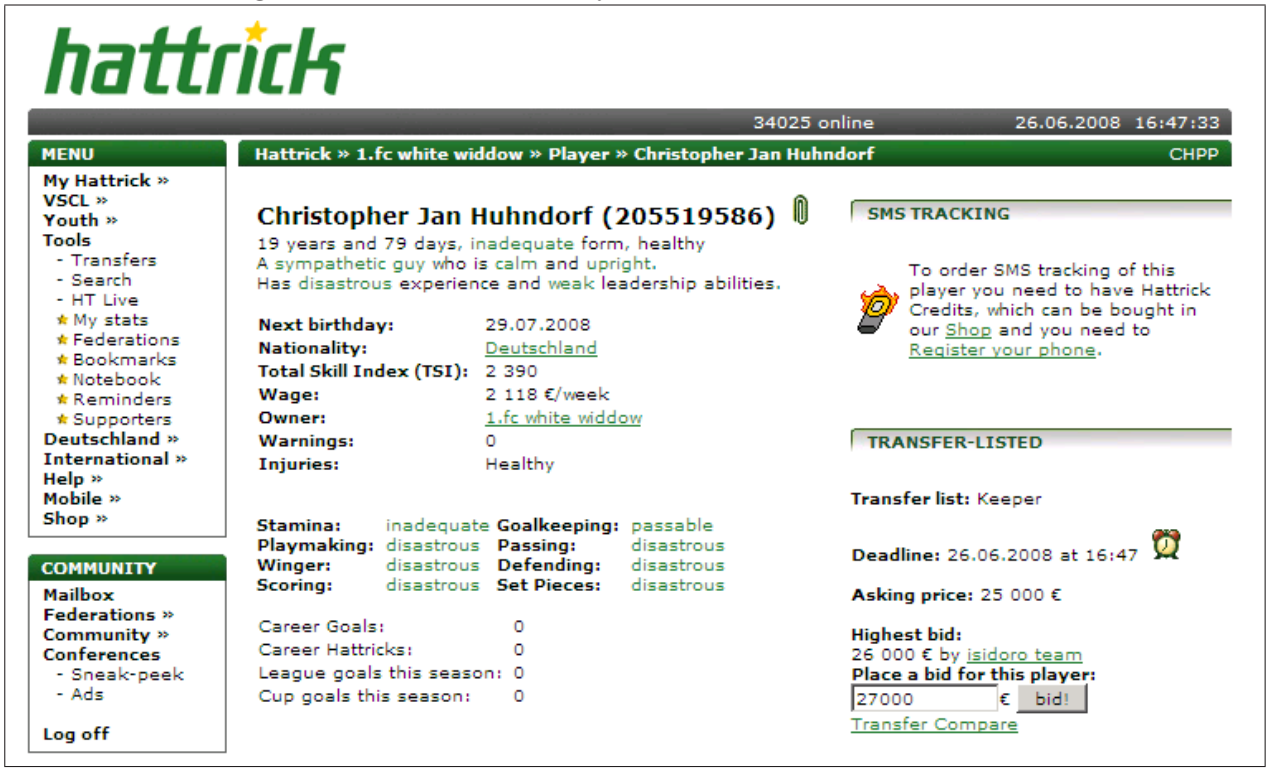
Figure 4: Patterns and Distribution of Reserve Prices



(a) Distribution non-zero reserve prices[a] (b) Frequency of forth-to-last digit of Reserve Prices[b]

a. The figure depicts the frequency of strictly positive reserve prices. The pattern clearly clusters around multiples of €50 000.
b. This histogram shows the frequency distribution of the fourth-to-last digit (the "thousands"-digit) of the (non-zero) reserve prices in the sample. For example, if *askprice* is €6**7** 000 the digit takes value "7". The spikes at the values of 0, 5 and 9 indicate that a majority of reserve prices were set at multiples of €5 000, or just below the next full ten-thousand.

Figure 5: Screenshot of Player Profile with Auction Details



Notes: The figure shows the typical profile for a player on sale. Next to his full attribute vector, on the lower right all information regarding the auction details are displayed. The seller of this goalkeeper set him on the transfer market during the afternoon on June 23, 2008 (i.e. exactly 72 hours before the deadline displayed) at a reserve price of €25 000. Unless no other manager submitted a higher amount before the deadline ended, the then-current highest bid of €26 000 will have won the auction. (*Source: www.hattrick.org*)

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