



Maximizing Firmamento profits in Auctions

X-10-2024

What do we find?

1. Firmamento sells at a discounted price conditional on quality.
Firmamento auctioned horses' performance is by far the best in Argentina, but other studs sell for the same price or even higher
2. Last May's 2024 auction prices were competitive, even above the historical average for Firmamento and comparable to other top studs. Selling at half ownership helped
3. Firmamento is potentially missing value by **1/ Organizing main auctions later in the year and 2/ Selling high quality horses in secondary auctions**
4. The market values different factors and deviates from maximizing Stake winners. Taking advantage of these public biases can lead to maximize auction prices for Firmamento, while remaining strong in the caballeriza
5. The market values Sires over Dams, partially explaining why Firmamento's prices are below average
6. The market does not internalize PR while pricing horses. PS is indeed considered, but there **are still a lot of** public biases after controlling for it.

What do we know?

We have information on horses sold at public auctions in Argentina from 2018 to 2024:

- 209 auctions
- 5959+ horses
- Final prices
- We match this information with their performance, their family, and their family's performance

Note: the analysis includes data from official auction prices published or recorded in real time. We have no ability to incorporate "Venta Particular" data for now.

Data sample



Horse	Auction year	Sire	Dam	PR	PS	Value (USDB)	Date of auction	Auction	Criador	Announced order	Color
GOING TO WIN	2023	GLOBAL HUNTER	GOING	50%	2%	7180	23-Jun-23	Gran Venta Haras La Pasion E Invitados	Las Retamas	39	Zaino
HIT IT A LODE	2023	HIT IT A BOMB (USA)	DISTINGUIDA LODE	75%	11%	9502	16-May-23	Venta Copa Bullrich Mayo	Firmamento	9	Zaino
BEAUTY BABY	2021	HURRICANE CAT (USA)	BABBY CRUSH	59%	9%	33929	29-Mar-21	Gran Venta Selecta Haras Abolengo Y Haras Vacacion	Vacacion	64	Zaino
HORSE KEY	2019	KEY DEPUTY (USA)	MISS TROVA	75%	8%	15029	5-Apr-19	Gran Venta Productos 2017 Key Deputy	Firmamento	24	Zaino
THE WAY	2022	EL MOISES	TRAIL AWAY	48%	2%	2116	7-Oct-22	Gran Venta Octubre De Productos 2020 Racehorse	Esece	10	Zaino

Descriptive analysis

Market does not pay enough for Firmamento's quality



Firmamento horses' are sold on average at the **same price** as Abolengo horses. But Firmamento horses are over **5 times more likely to become stake winners**.

	# Auctioned	Average price (USDB)	% Winners	% STK winners	% Group winners	Run share	Run share before 3yo	CEI	PR	PS
Abolengo	295	14,656	39.3	1.7	0.0	68.1	20.3	1.3	58.7	4.3
El Paraiso	280	10,149	66.1	8.9	0.0	87.1	49.3	3.1	69.9	5.9
Firmamento	190	14,284	59.5	9.5	0.0	86.8	38.9	2.6	72.5	9.3
La Pasion	107	10,399	45.8	3.7	0.0	80.4	26.2	1.3	68.0	4.8
Santa Maria De Araras	68	8,827	45.6	4.4	0.0	79.4	35.3	1.5	64.9	9.2
Vacacion	243	18,692	55.1	5.3	0.0	82.3	30.5	2.1	65.5	7.3

Includes horses sold at auctions from 2018 to 2021 who weren't exported.

	# Auctioned	Average price (USDB)	% Winners	% STK winners	% Group winners	Run share	Run share before 3yo	CEI	PR	PS
Firmamento	190	14,284	59.5	9.5	0.0	86.8	38.9	2.6	72.5	9.3
Top 5	993	13,515	51.9	5.0	0.0	79.1	32.6	2.0	64.9	5.9

Only includes horses sold at auctions from 2018 to 2021 who weren't exported. Top 5 includes Abolengo, El Paraiso, La Pasion, Santa Maria De Araras and Vacacion. We average across all top 5 criadores.

USDB: US Dolar Blue

CEI: Cumulative earnings index measures the earnings of horses across time. It represents the number of premios 3 años perdedores in Palermo that the horses won, to account for inflation and currency depreciation

Firmamento has consistently been selling over time below the average relative to the other top 5 studs



Mean auction values (USDB)

	Year						
	2018	2019	2020	2021	2022	2023	2024
Criador							
Abolengo	10553	15191	15495	14697	19140	18236	21749
El Paraiso	6050	10768	5345	12508	18295	24918	23749
Firmamento	9850	17879	10017	12772	13941	9175	15205
La Pasion		9519	6255	11902	13413	13452	16106
Santa Maria De Araras			6775	10651	18471	12816	8441
Vacacion	17013	16652	15980	22765	22634	23667	25387

Mean value in USDB

	2018	2019	2020	2021	2022	2023	2024
El Paraiso	0.44	0.79	0.47	0.84	0.99	1.29	1.18
Firmamento	0.71	1.31	0.88	0.86	0.75	0.48	0.76
La Pasion		0.70	0.55	0.80	0.73	0.70	0.80
Santa Maria De Araras			0.60	0.72	1.00	0.66	0.42
Vacacion	1.23	1.22	1.41	1.53	1.22	1.23	1.26

Value is relative to each year Top 5's average.

- Top table shows the mean value in USDB for auctions between 2018-2024
- Bottom table shows the same values, but **relative to the mean value by Top 5 studs in each year.**
- Except in 2019, **Firmamento has consistently been selling horses below average**, while other studs (as El Paraíso) have seen their mean values increase significantly over the years.

Mispricing Superstars: Firmamento also falls below other top studs in terms of maximum auction prices



Maximum auction values (USDB)

	Year						
	2018	2019	2020	2021	2022	2023	2024
Criador							
Abolengo	39088	44097	67768	72426	78962	103448	85616
El Paraiso	7731	17719	11131	96252	75319	83685	85481
Firmamento	22823	46276	14896	27520	30168	22895	53508
La Pasion		17429	14451	71168	87995	60567	59736
Santa Maria De Araras			15313	27253	46300	27573	28955
Vacacion	40737	36316	94122	69490	56141	78768	89948

Top Sells

2024 Season	
Horse	
Abolengo	SACHI
El Paraiso	EL MADRUGADOR
Firmamento	DRIVE JOY
La Pasion	MYTIKO
Santa Maria De Araras	FONTANERO
Vacacion	SPEEDMASTER

May 2024: Firmamento close to peak mean auction value from 2019.



The May 2024 auction performance was close to the Top 5 stud's average 2024 value (96%)

	Year						
	2018	2019	2020	2021	2022	2023	2024
Date							
26sep2018	9850						
05apr2019		16031					
06jun2019		15944					
28aug2019		9930					
24sep2019		20223					
24jun2020			10624				
23jul2020			7894				
20may2021				9897			
13oct2021				15252			
09dec2021				2398			
05may2022					18727		
10jun2022					10496		
05oct2022					10264		
07oct2022					7541		
10oct2022					10364		
16may2023						9434	
19may2023						7602	
29sep2023						9701	
23may2024							19235
25sep2024							10421

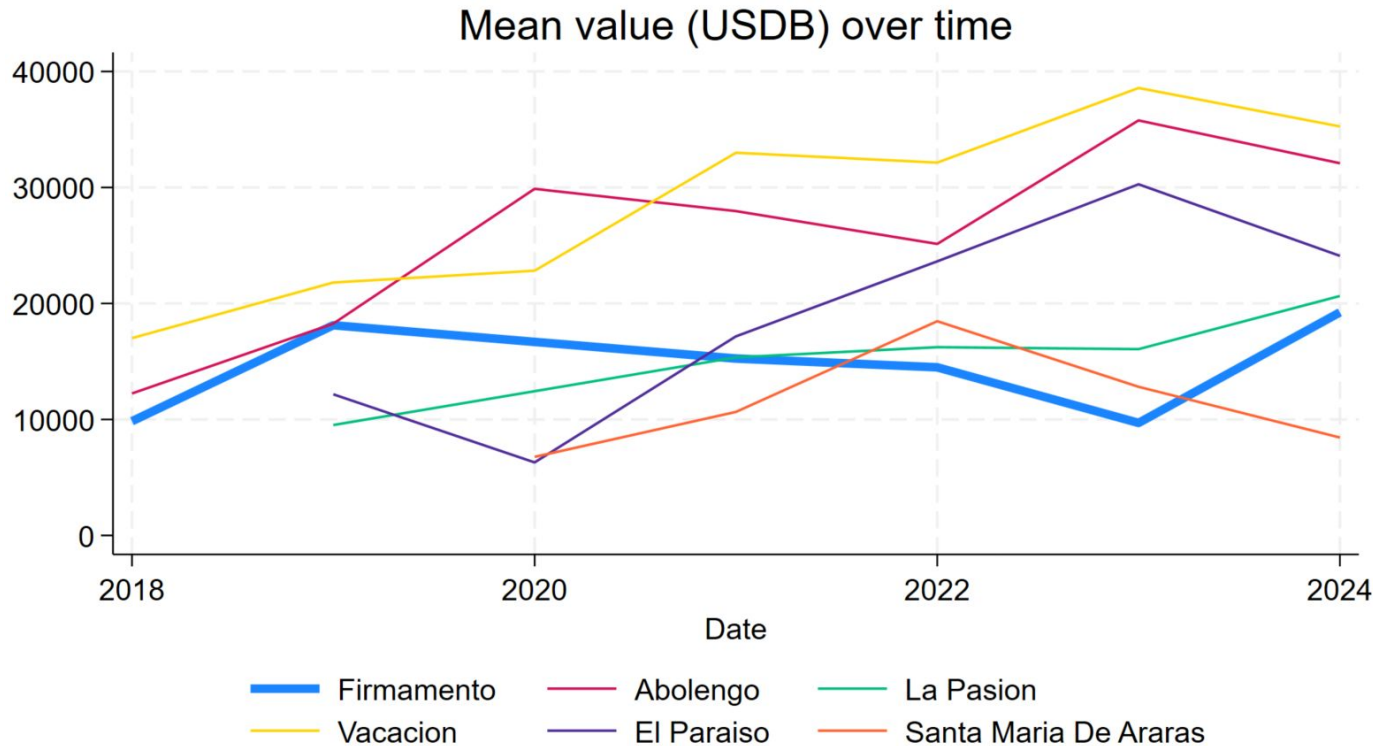
	Year						
	2018	2019	2020	2021	2022	2023	2024
Date							
26sep2018	0.71						
05apr2019		1.17					
06jun2019		1.17					
28aug2019		0.73					
24sep2019		1.48					
24jun2020			0.94				
23jul2020			0.70				
20may2021				0.67			
13oct2021				1.03			
09dec2021				0.16			
05may2022					1.01		
10jun2022					0.57		
05oct2022					0.55		
07oct2022					0.41		
10oct2022					0.56		
16may2023						0.49	
19may2023						0.39	
29sep2023						0.50	
23may2024							0.96
25sep2024							0.52

Right table shows the mean auction value relative to other Top 5 studs' mean value within that year. **Firmamento struggles to keep up over time.** Considering this table would be key to understand Firmamento's position relative to others, while controlling for the Macroeconomic scenario

Firmamento's May auction helped close the gap



The 2024 season saw a decrease in prices for most of the top criadores, but Firmamento had a significant increase.



Only includes main auctions

May 2024 Auction

- 1/ Half-ownership strategy helped achieve new auction maximum value in May 2024(*)
- 2/ Still only 60% of the maximum achieved by other top breeders.



	Year						
	2018	2019	2020	2021	2022	2023	2024
Date							
26sep2018	22823						
05apr2019		25434					
06jun2019		26696					
28aug2019		10402					
24sep2019		46276					
24jun2020			14896				
23jul2020			9099				
20may2021				26391			
13oct2021				27520			
09dec2021				2398			
05may2022					30168		
10jun2022					10496		
05oct2022					22025		
07oct2022					7541		
10oct2022					19200		
16may2023						19004	
19may2023						14403	
29sep2023						22895	
23may2024							53508
25sep2024							29695

	Year						
	2018	2019	2020	2021	2022	2023	2024
Date							
26sep2018	0.56						
05apr2019		0.58					
06jun2019		0.61					
28aug2019		0.24					
24sep2019		1.05					
24jun2020			0.16				
23jul2020			0.10				
20may2021				0.27			
13oct2021				0.29			
09dec2021				0.02			
05may2022					0.34		
10jun2022					0.12		
05oct2022					0.25		
07oct2022					0.09		
10oct2022					0.22		
16may2023						0.18	
19may2023						0.14	
29sep2023						0.22	
23may2024							0.59
25sep2024							0.33

(*) The record was broken by **DRIVE JOY** (FORTIFY (USA) - ZIP DRIVE (FR)), who comes from a “trendy” padrillo. The second highest was \$38.526 by **THE GREAT SUN** (THE GREAT DAY - STORMY LUNATICA), all three horses sold at half ownership did really well

May 2024 Auction (cont.)



List of Top 5 and Bottom 5 sold horses by Firmamento

2019			2023		2024	
Horse		USDB	Horse		USDB	USDB
Top 5	MASTER WONDERFUL	\$46,276	HAPPY ETICO	\$22,895	DRIVE JOY	\$53,508
	ROSADA CRAF	\$38,872	GUIDO RIM	\$19,004	THE GREAT SUN	\$38,526
	CURIOUS CRAF	\$32,856	SLAMIC RIMOUT	\$17,611	PECADOR RIM	\$37,812
	AIKIDO	\$32,394	MERCATO SEA	\$14,970	THE GREAT RACING	\$37,099
	REINA DE MOLLENDO	\$30,542	EXCELSUM HIT	\$14,403	THE GREAT WELLS	\$37,099
Bottom 5	WAN ZUN KEY	\$ 9,249	TORSIE'S HIT	\$ 5,281	AIRWAVES	\$ 6,335
	TAY RIMOUT	\$ 8,793	ELEGANT SEA	\$ 5,281	CHIC THE BOMB	\$ 6,064
	ASPAVENTO	\$ 7,404	FIRENZE HIT	\$ 4,403	BARBIE BOMB	\$ 5,701
	NOBLE CITY	\$ 7,404	CATCH THE HIT	\$ 4,403	MAGNIFIC HIT	\$ 5,147
	EMERALD RIMOUT	\$ 6,479	BELLEZA DIVERSA	\$ 4,403	SIXTIES ANGELIC	\$ 4,910
	GUIRGAL	\$ 6,479	SUNSET BOMB	\$ 3,963	SCALPEL	\$ 2,534

2023 Auction



List of Top 5 and Bottom 5 sold horses by Firmamento and Top 5 Studs

Horse	Criador	Value (USDB)	PR	PS	Padrillo	Yegua	Padrillo contribution with respect to year average	Yegua contribution with respect to year average
FORZA NATURAL	Abolengo	\$ 103,448	63%	7%	COSMIC TRIGGER	FANCY LEGS	0.40	1.13
EL OJO DEL HURACAN	El Paraíso	\$ 83,685	72%	11%	IL CAMPIONE (CHI)	INTERDRUIDA	1.29	0.81
THE GOAT	Vacacion	\$ 78,768	69%	12%	FORTIFY (USA)	QUE PIENSA CAT	1.19	0.82
EL PONIENTE	El Paraíso	\$ 78,762	74%	9%	IL CAMPIONE (CHI)	ALAMALHUA	1.20	0.51
SAFE WITH ME	Abolengo	\$ 76,142	66%	27%	FORTIFY (USA)	SA TALAIA	0.97	1.84
HAPPY ETICO	Firmamento	\$ 22,895	72%	10%	HI HAPPY	ZETICA (USA)	0.26	0.73
GUIDO RIM	Firmamento	\$ 19,004	78%	10%	REMOTE (GB)	DISTINGUIDA HALO	0.30	0.63
SLAMIC RIMOUT	Firmamento	\$ 17,611	71%	10%	REMOTE (GB)	SLAM REAL	0.57	0.85
MERCATO SEA	Firmamento	\$ 14,970	65%	6%	IL MERCATO	COQUETTE SEA	-0.14	0.55
EXCELSUM HIT	Firmamento	\$ 14,403	81%	13%	HIT IT A BOMB (USA)	EXCELSUM	0.46	0.49
ELEGANT SEA	Firmamento	\$ 5,281	69%	10%	SEAHENGE (USA)	ELEGANT NISTEL	-0.03	0.58
TORSIE'S HIT	Firmamento	\$ 5,281	80%	18%	HIT IT A BOMB (USA)	TORSIE'S SMILE (USA)	0.46	0.54
FIRENZE HIT	Firmamento	\$ 4,403	74%	11%	HIT IT A BOMB (USA)	FIRENZE SEATTLE	0.49	0.54
CATCH THE HIT	Firmamento	\$ 4,403	78%	6%	HIT IT A BOMB (USA)	CATCH THE CURSI	0.49	0.48
BELLEZA DIVERSA	Firmamento	\$ 4,403	78%	7%	HIT IT A BOMB (USA)	CAMBRIOLE GLORY	0.49	0.54
SUNSET BOMB	Firmamento	\$ 3,963	71%	10%	HIT IT A BOMB (USA)	JANE SUNSET	0.49	0.56
COPY SOUND	Abolengo	\$ 2,877	62%	8%	LONG ISLAND SOUND (USA)	COPYPASTE	0.13	0.56
DARK SOUND	Abolengo	\$ 2,877	65%	5%	LONG ISLAND SOUND (USA)	DARLING DIOR	0.13	0.55
FEDERAL FILLY	Santa Maria De Araras	\$ 2,651	65%	5%	DANIEL BOONE (BRZ)	FEEL THE BEST	0.63	0.55
ULTIMA ENTREGA	Abolengo	\$ 2,466	57%	5%	LONG ISLAND SOUND (USA)	ULTIMA OPCION	0.28	0.52
ARGENTA FOR YOU	El Paraíso	\$ 1,969	60%	4%	ANGIOLO	TATOO YOU (USA)	0.15	0.46
LA COMBATIENTE	El Paraíso	\$ 1,312	72%	6%	LE BLUES	SOY CIPAYA	0.12	0.58

Market undervalues secondary auctions: avoid them or reduce quality accordingly

	# Auctioned	Average price (USDB)	Run share	% STK winners	% Winners	Run share before 3yo	% G1 runners	% G1 winners	CEI	Total CEI	PR	PS
Firmamento	151	15,339	88.7	8.6	62.9	35.1	9.3	0.7	2.4	365.8	71.9	9.0
Top 5	530	17,466	83.2	7.5	59.2	36.6	9.1	1.5	2.6	1,360.7	66.2	6.8

Only includes horses sold at main auctions from 2018 to 2021.

	# Auctioned	Average price (USDB)	Run share	% STK winners	% Winners	Run share before 3yo	% G1 runners	% G1 winners	CEI	Total CEI	PR	PS
Firmamento	39	10,199	79.5	12.8	46.2	53.8	10.3	2.6	3.1	119.5	74.2	10.4
Top 5	463	8,992	74.3	2.2	43.4	28.1	3.0	0.0	1.4	647.3	63.4	4.8

Only includes horses **not** sold at main auctions from 2018 to 2021.

The **market** clearly **values less horses sold at secondary auctions**: it probably recognizes that horses sold at those auctions tend to be significantly lower quality, but this is not the case for Firmamento!

To maximize the value of their horses, Firmamento should consider **reserving the lower quality horses for secondary auctions**

Timing of the auction matters!

Mean USDB per PRS by month-year for Top 5 studs

	Year						
	2018	2019	2020	2021	2022	2023	2024
Month							
3		3512	5940	7051	5940	7150	7675
4		6672		3397	4261	4350	3858
5		3005	1232	4425	6121	8660	
6			2262	4080	3671	4143	2769
7	4356	5867	5040	3045		3412	4944
8	4469			2325	4321	2421	2914
9	3332		3840	2190			
10			1272		2871		
12				2371			

Conditional on quality, **horses sold later in the year are valued less** than those sold in the early months

Mean horse age (in months) by month-year for Top 5 studs

	Year						
	2018	2019	2020	2021	2022	2023	2024
Month							
3		18.62	18.53	18.63	19.02	19.30	19.01
4		19.79		19.49	19.67	19.16	19.52
5		20.08	19.42	20.73	20.03	20.19	
6			21.38	21.72	21.38	21.24	21.60
7	22.63	21.80	22.54	21.51		22.22	21.99
8	23.28			23.28	22.63	23.66	23.73
9	24.22		23.78	24.23			
10			25.14		25.14		
12				16.28			

It's not that horses auctioned later are those born later in the year, which could explain the value differences: horse age increases with time as well

Firmamento sells later in the year relative to other top 5 studs



	Month of auction	Month of birth
Criador		
Abolengo	5.8	8.6
El Paraiso	4.5	8.9
Firmamento	7.3	8.6
La Pasion	5.1	8.5
Santa Maria De Araras	4.1	8.9
Vacacion	5.0	8.6

Firmamento auctions horses much later than other top criadores, on average. Once again, this is not because Firmamento’s horses are born later. **This strategy decreases auction prices!**

	Month of auction	Month of birth
Criador		
Abolengo	3.7	8.4
El Paraiso	4.5	8.8
Firmamento	7.5	8.7
La Pasion	4.1	8.5
Santa Maria De Araras	4.1	8.9
Vacacion	4.0	8.3

This is not explained by secondary auctions, the same is true is we look at **main auctions only**

Firmamento's number of offspring sold by Padrillo-Year

	Year						
	2018	2019	2020	2021	2022	2023	2024
Padrillo							
BODEMEISTER (USA)					7		
CAMPANOLOGIST (USA)	9						
CITYSCAPE (GB)	4	5		4			1
COSMIC TRIGGER							1
DANIEL BOONE (BRZ)							1
ENDORSEMENT (USA)		1					
FORTIFY (USA)					2		1
GOUVERNEUR MORRIS (USA)							1
GRAND REWARD (USA)		1					
HI HAPPY					3	4	2
HIT IT A BOMB (USA)			7	19	21	27	23
IL MERCATO						3	
KEY DEPUTY (USA)		45					
MASTERCRAFTSMAN (IRE)		22		1	18		
REMOTE (GB)	14	8	2	5	4	18	13
ROMAN RULER (USA)		1					
SEAHENGE (USA)					2	2	
SEATTLE FITZ	4						
SIXTIES SONG						1	3
SUPER SAVER (USA)				28			
THE GREAT DAY							24
VAN NISTELROOY (USA)	9						
WINNING PRIZE		1					

Firmamento auctions less horses (in Argentina) than other top criadores



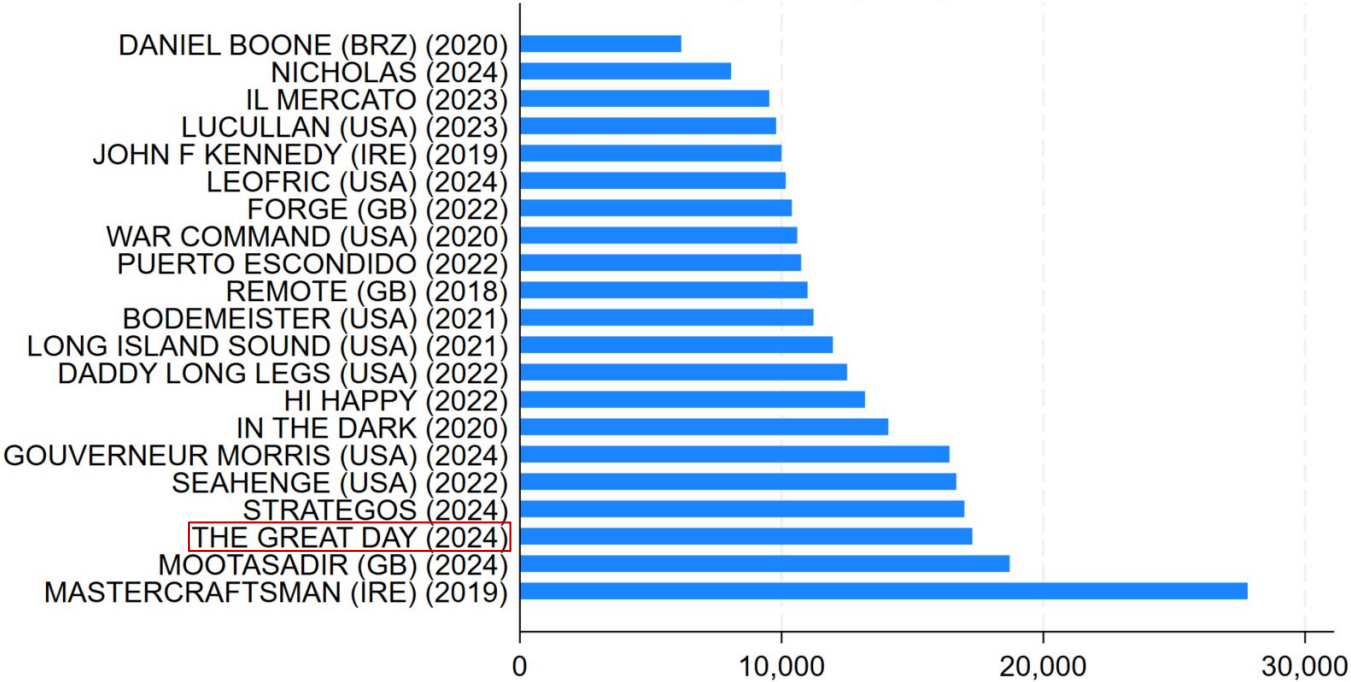
	Year						
	2018	2019	2020	2021	2022	2023	2024
Criador							
Abolengo	29	64	88	100	131	116	105
El Paraiso	3	69	70	128	101	88	78
Firmamento	40	83	9	55	56	55	68
La Pasion		13	23	64	77	68	65
Santa Maria De Araras			32	35	40	43	50
Vacacion	36	54	64	82	77	81	83

Might be relevant, might not. To me, it shows that Firmamento having the same mean value than, for example, Vacacion, is even worse

How did The Great Day's do as a first season padrillo?



Mean value (USDB) for padrillos in first season

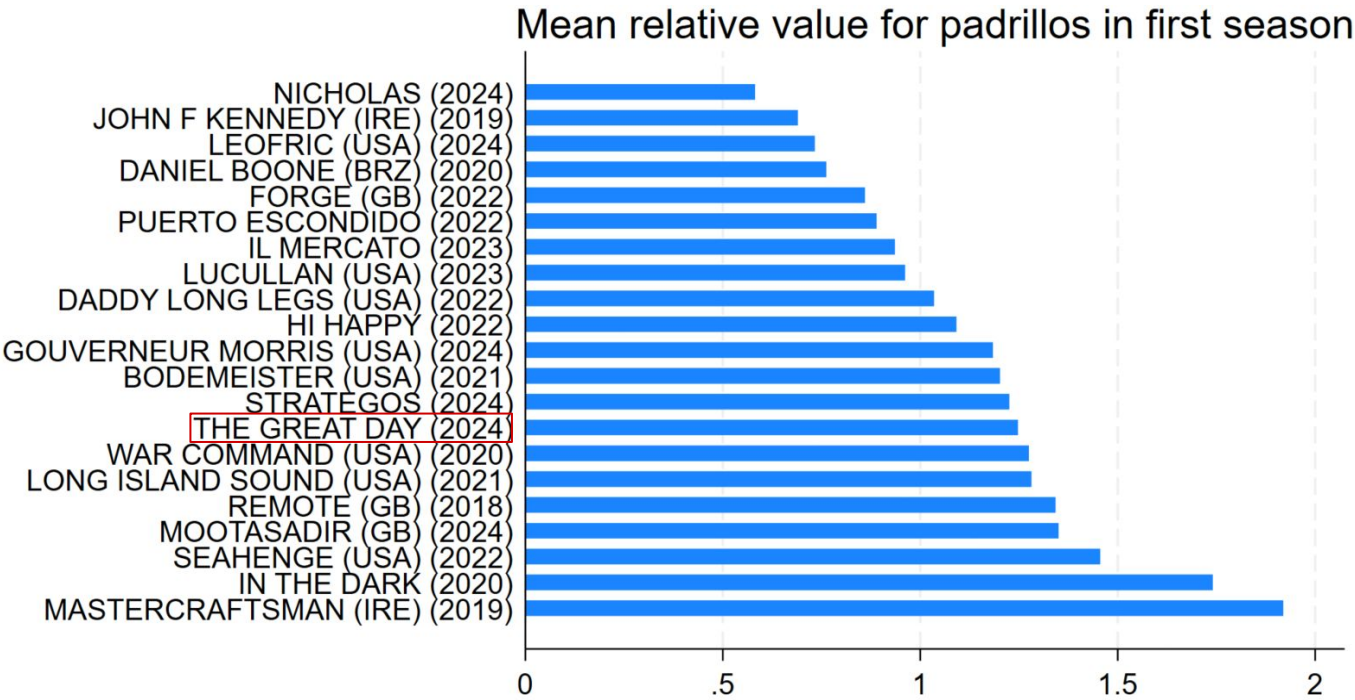


Only includes padrillos with at least 20 offspring sold in first season.

The Great Day's offspring sold for more than many other padrillo's first seasons have in the past, and even within 2024.

This, however, is partially due to three of his offspring being sold at half ownership. This sends a **positive signal regarding the horses' value**, leading the market to pay more

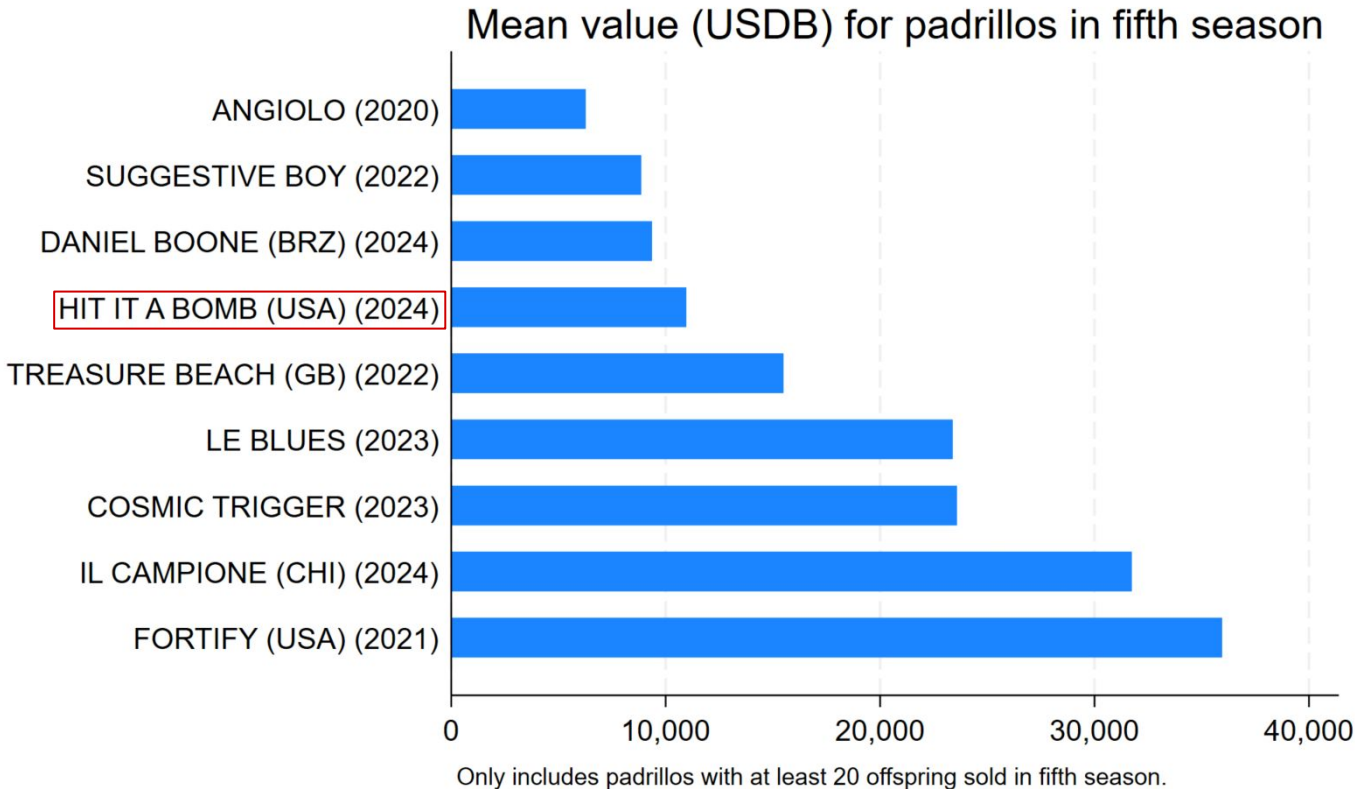
How did The Great Day's do as a first season padrillo?



- However, after controlling by year - and despite of the half ownership - TGD did not much better than other first season other padrillos

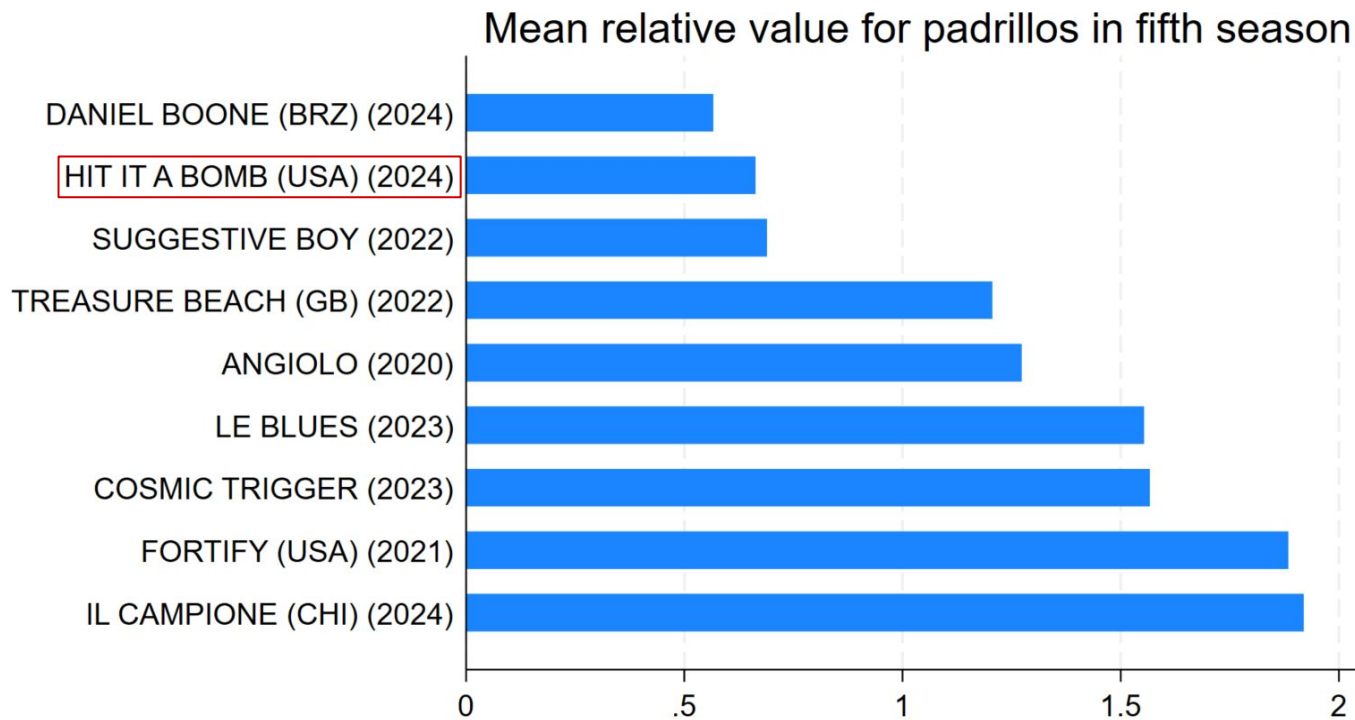
Only includes padrillos with at least 20 offspring sold in first season. Relative value is calculated by dividing the padrillo's average value with the average value for all padrillos in the first season from that same year.

How did Hit It A Bomb's do as a fifth season padrillo?



Hit It A Bomb's offspring sold for less than many other padrillo's fifth seasons have sold for.

How did Hit It A Bomb's do as a fifth season padrillo?



Hit It A Bomb's offspring sold for less than many other padrillo's fifth seasons have sold for.

Only includes padrillos with at least 20 offspring sold in fifth season. Relative value is calculated by dividing the padrillo's average value with the average value for all padrillos in the fifth season from that same year.

Firmamento's mean value by Sire vs other top studs



The table shows the mean auction value of horses sold by sire for Firmamento and other Top 5 criadores by year

	Mean Value (USDB)													
	2018		2019		2020		2021		2022		2023		2024	
	Firmamento	Top 5	Firmamento	Top 5	Firmamento	Top 5	Firmamento	Top 5	Firmamento	Top 5	Firmamento	Top 5	Firmamento	Top 5
Remote (GB)	\$ 10,624	\$ 12,138	\$ 11,569	\$ 13,782	\$ 10,000	\$ 8,574	\$ 7,998	\$ 13,234	\$ 16,026	\$ 13,034			\$ 14,453	\$ 10,048
Grand Reward (USA)			\$ 14,808	\$ 26,501										
Roman Ruler (USA)			\$ 26,696	\$ 23,063										
Bodemeister (USA)									\$ 14,552	\$ 14,693				
Fortify (USA)									\$ 23,310	\$ 46,849			\$ 53,507	\$ 38,904
Hi Happy									\$ 9,272	\$ 15,429	\$ 13,098	\$ 11,812	\$ 12,083	\$ 19,985
Hit it a Bomb (USA)									\$ 16,116	\$ 21,419			\$ 11,683	\$ 3,269
Mastercraftsman (IRE)									\$ 10,054	\$ 8,181				
Seahenge (USA)									\$ 17,404	\$ 17,978	\$ 5,761	\$ 15,138		
Il Mercato											\$ 9,447	\$ 10,376		
Sixties Song											\$ 11,887	\$ 10,242		
Cosmic Trigger													\$ 26,923	\$ 24,892
Daniel Boone (BRZ)													\$ 12,128	\$ 9,294
Gouverneur Morris													\$ 28,537	\$ 19,202

Conditional on the sire, Firmamento does not deviate from other top studs on average, meaning that **Firmamento dams are not being valued sufficiently!**

Predicting auction values

What does the market value?

Predicting auction values

Using information that buyer's have available at the auction (from auction catalogues), we can estimate how different types of information are valued.

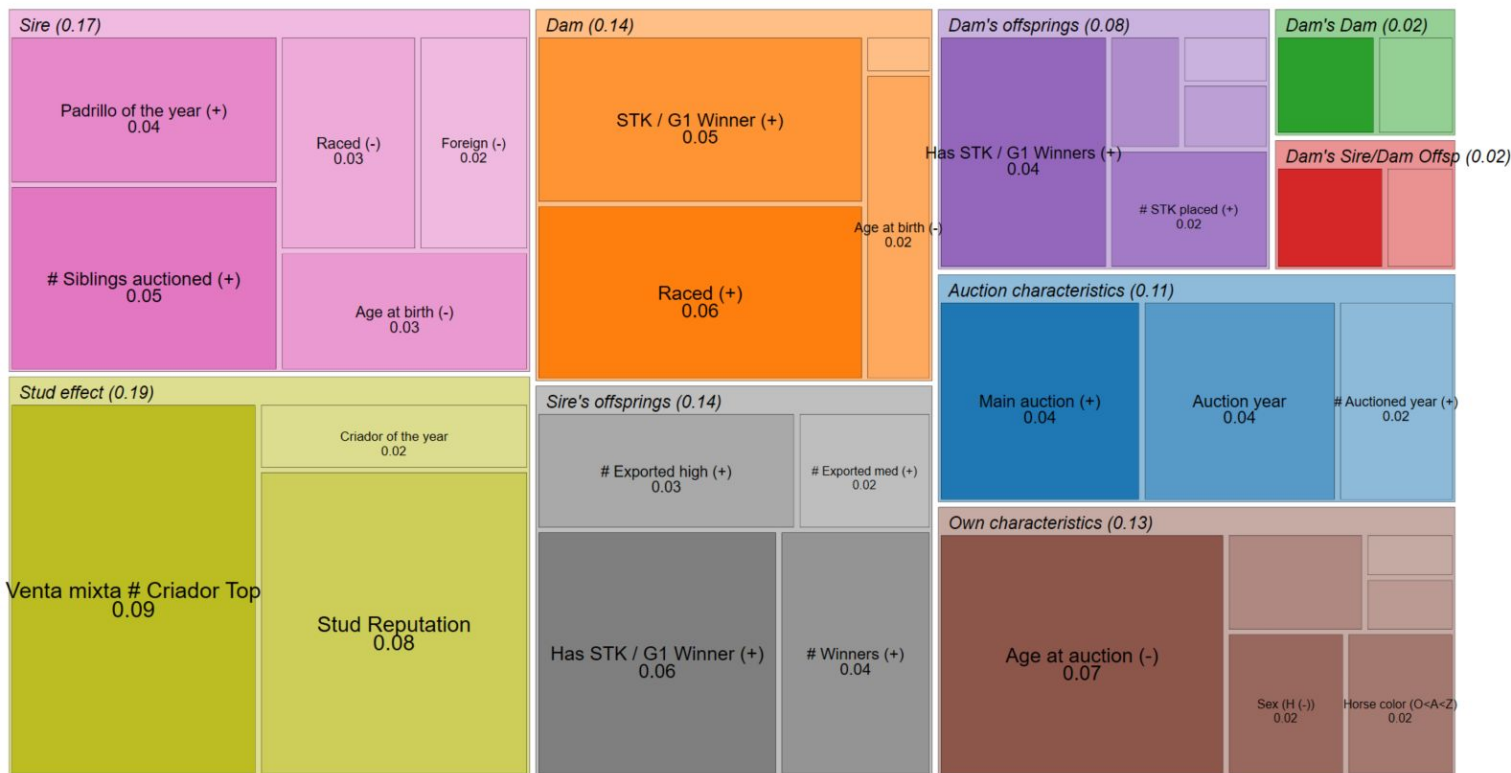
For example, we know:

- The performance of maternal side siblings and uncles
- Whether the padrillo was classified as padrillo of the year
- Whether the criador was classified as criador of the year
- The inbreeding coefficient for each offspring
- If the horse was sold at half ownership (value signal)
- Number of father's side siblings sold in that auction

and more...

Stud reputation -> 19%
 Sire -> 18%
 Dam -> 14%
 Sire Offsprings -> 15%
 Horse characteristics -> 12%
 Auction characteristics -> 10%
 Dam offsprings -> 8%

Determinants of auction value



1/ The market penalizes the Sire's and Dam's age, almost as relevant as the Sire being "Padrillo of the year"

2/ Number of Sire Offsprings auctioned operates as a signal of confidence the Stud has over the Sire, especially on early season sires

3/ Stud reputation is one of the most important factors. Being a Top Stud in a "Venta Mixta" auction also increase prices: market internalizes the Stud reputation among others and pushes on the price

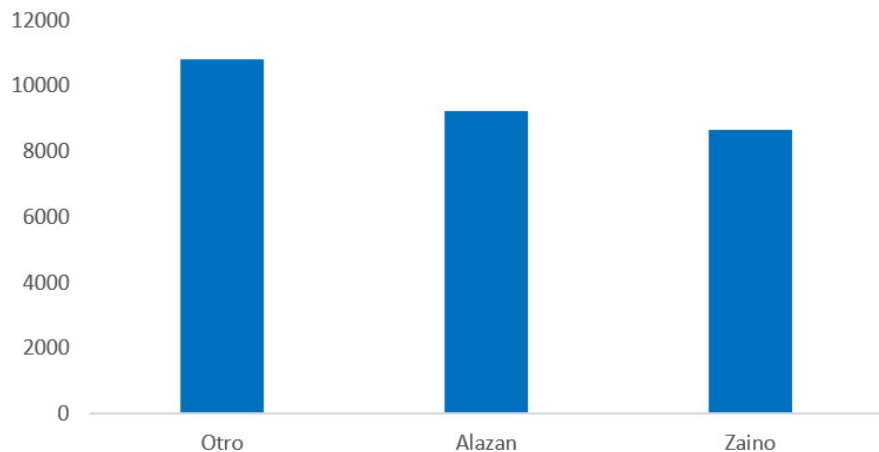
4/ Exported Sire offsprings are positively considered by the market

5/ Market does not value Dam's offsprings enough (8%), probably one of the main reasons of Firmamento's underprice

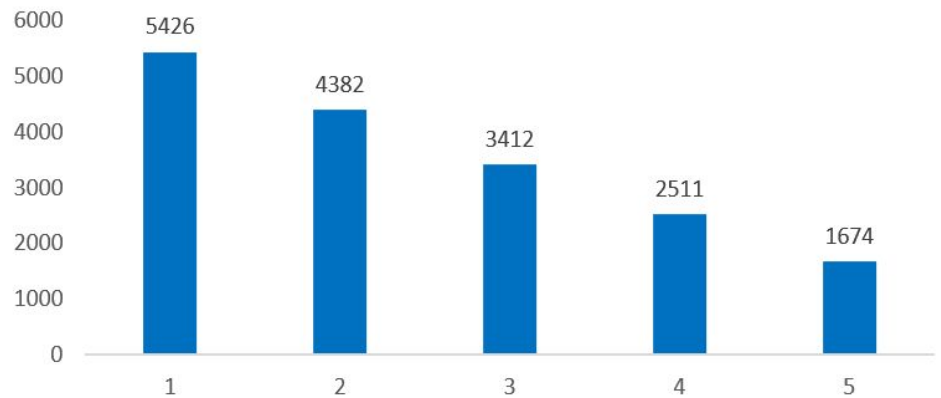
6/ Market has a preference for younger horses at auction: time matters!

The exercise allows us to predict how different characteristics will affect the values horses are sold at

Average predicted value (USDB) by horse color



Average predicted gain from having a Padrillo of the Year by years since award



These graphs assume that all other variables are at their average values. So we assume horses all exactly equal between them, except for each particular variable. A horse may be benefited less/more from these characteristics if they have an expected value above the mean.

Source	SS	df	MS	Number of obs	=	6,387
				F(88, 6298)	=	89.45
Model	2541.76213	88	28.8836606	Prob > F	=	0.0000
Residual	2033.74053	6,298	.322918472	R-squared	=	0.5555
				Adj R-squared	=	0.5493
Total	4575.50267	6,386	.716489613	Root MSE	=	.56826

	Invalueblue	Coefficient	Std. err.	t	P> t
year					
2019		.0059448	.0564471	0.11	0.916
2020		-.1704236	.054075	-3.15	0.002
2021		-.0896639	.0587714	-1.53	0.127
2022		.2353018	.0596989	3.94	0.000
2023		.1172356	.0616369	1.90	0.057
2024		.0865963	.0609034	1.42	0.155
1.Hembras		-.1122436	.0149586	-7.50	0.000
ageAtAuction		.2505819	.0752613	3.33	0.001
month#c.ageAtAuction					
4		-.0086705	.0310128	-0.28	0.780
5		-.0527079	.0348454	-1.51	0.130
6		-.1705479	.0372005	-4.58	0.000
7		-.2105227	.03748	-5.62	0.000
8		-.2998249	.0404081	-7.42	0.000
9		-.2126555	.0420133	-5.06	0.000
10		-.3129792	.0430429	-7.27	0.000
12		.4846851	.0898989	5.39	0.000
horseColor					
Otro		.1620476	.0377382	4.29	0.000
Zaino		-.0708857	.0177311	-4.00	0.000
1.halfOwnership		1.176642	.182242	6.46	0.000
1.enYunta		-.1470435	.1068142	-1.38	0.169
inbreedingCoefficient		2.130067	1.554096	1.37	0.171
inbreedingCoefficientSq		-31.78294	17.89317	-1.78	0.076
1.mRaced		.4049582	.0568619	7.12	0.000
dmi_M_age_at_birth#c.M_age_at_birth					
0		0 (omitted)			
1		-.017249	.0033537	-5.14	0.000

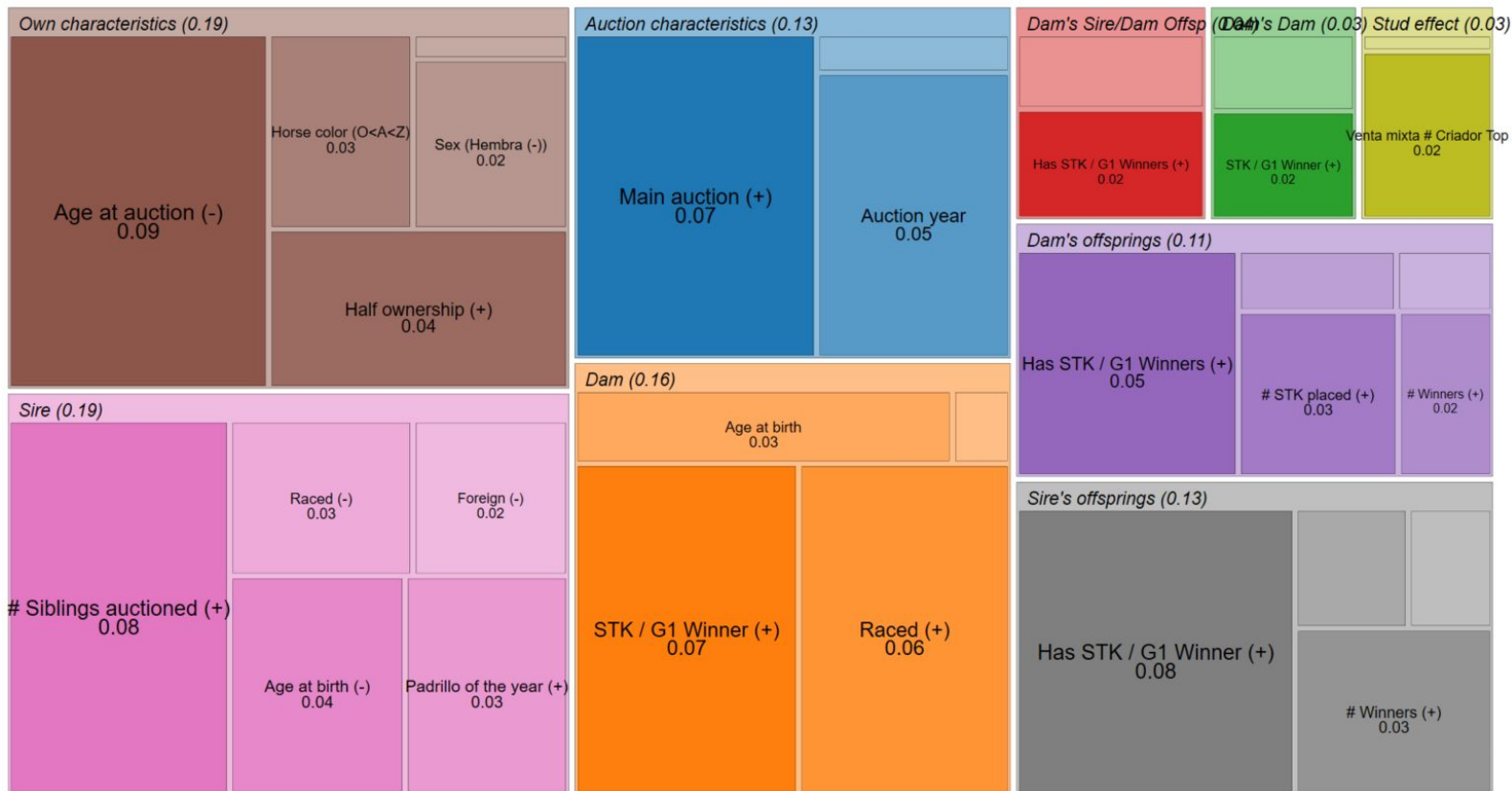
	1.mFirstSeason	.0285177	.0253433	1.13	0.261
dmi_mSTKWinner#mSTKWinner#mG1Winner					
0 0 1		0 (empty)			
0 1 0		0 (empty)			
0 1 1		0 (empty)			
1 0 0		-.3832868	.0555361	-6.90	0.000
1 0 1		0 (empty)			
1 1 0		-.1491779	.0607926	-2.45	0.014
1 1 1		0 (omitted)			
dmi_momSibWinners#atLeastThreeRacingAgeSib#c.momSibWinners					
0 0		0 (omitted)			
0 1		0 (omitted)			
1 0		.1151714	.0309568	3.72	0.000
1 1		.0075557	.006824	1.11	0.268
dmi_mSibSTKWinner#atLeastThreeRacingAgeSib#mSibSTKWinner#mSibG1Winner					
1 0 0 0		-.5638059	.0567135	-9.94	0.000
1 0 0 1		0 (empty)			
1 0 1 0		-.2306898	.1271192	-1.81	0.070
1 0 1 1		.6379639	.2243652	2.84	0.004
1 1 0 0		-.4726302	.0510652	-9.26	0.000
1 1 0 1		0 (empty)			
1 1 1 0		-.2950826	.046971	-6.28	0.000
1 1 1 1		0 (omitted)			
dmi_MomSib_Sibs_expmed_at2y#c.MomSib_Sibs_expmed_at2y					
0		0 (omitted)			
1		.0551468	.0171948	3.21	0.001
dmi_MomSib_Sibs_exphigh_at2y#c.MomSib_Sibs_exphigh_at2y					
0		0 (omitted)			
1		.0740525	.042904	1.73	0.084
dmi_Msib_STK_placed_at2y#c.MSib_STK_placed_at2y					
0		0 (omitted)			
1		.0177145	.0035097	5.05	0.000
1.mMRaced		.0583969	.0346549	1.69	0.092

dmi_mMSTKWinner#mMSTKWinner#mMG1Winner				
0 0 1	0 (empty)			
0 1 0	0 (empty)			
0 1 1	0 (empty)			
1 0 0	-.0834651 .0339104	-2.46	0.014	
1 0 1	0 (empty)			
1 1 0	-.0234681 .0388499	-0.60	0.546	
1 1 1	0 (omitted)			
dmi_momMUncWinners#c.momMUncWinners				
0	0 (omitted)			
1	-.0033856 .0037193	-0.91	0.363	
dmi_mMUncSTKWinner#mMUncSTKWinner#mMUncG1Winner				
0 0 1	0 (empty)			
0 1 0	0 (empty)			
0 1 1	0 (empty)			
1 0 0	-.0169961 .037778	-0.45	0.653	
1 0 1	0 (empty)			
1 1 0	.0517437 .0424713	1.22	0.223	
1 1 1	.1060182 .0446428	2.37	0.018	
1.fRaced	-.1626356 .0576557	-2.82	0.005	
dmi_F_age_at_birth#c.F_age_at_birth				
1	-.0257331 .0033418	-7.70	0.000	
dmi_lnpSiblingsAuctioned#c.lnpSiblingsAuctioned				
0	0 (omitted)			
1	.1521603 .0097041	15.68	0.000	
1.padre_extranjero	-.0867783 .0572161	-1.52	0.129	
F_season_4ormore#padrilloOfTheYear				
0#Was padrillo of the year	.5227218 .0829292	6.30	0.000	
1#Wasn't padrillo of the year	-.096068 .0451122	-2.13	0.033	
1#Was padrillo of the year	.3961417 .0636551	6.22	0.000	
padrilloOfTheYear#c.yearsSincePadrilloOfTheYear				
Wasn't padrillo of the year	0 (omitted)			
Was padrillo of the year	-.0693589 .009385	-7.39	0.000	

dmi_fathSibWinners#F_season_4ormore#c.fathSibWinners				
0 0	0 (omitted)			
0 1	0 (omitted)			
1 0	.0007032 .0002671	2.63	0.008	
1 1	.0005988 .0001228	4.87	0.000	
dmi_fSibSTKWinner#F_season_4ormore#fSibSTKWinner#fSibG1Winner				
1 0 0 0	-.3724053 .0452736	-8.23	0.000	
1 0 0 1	0 (empty)			
1 0 1 0	-.1559023 .048036	-3.25	0.001	
1 0 1 1	0 (omitted)			
1 1 0 0	-.2333148 .0271111	-8.61	0.000	
1 1 0 1	0 (empty)			
1 1 1 0	-.180668 .026046	-6.94	0.000	
1 1 1 1	0 (omitted)			
dmi_FathSib_Sibs_expmed_at2y#F_season_4ormore#c.FathSib_Sibs_expmed_at2y				
0 0	0 (omitted)			
0 1	0 (omitted)			
1 0	.0003984 .0024201	0.16	0.869	
1 1	.0037639 .0012096	3.11	0.002	
dmi_FathSib_Sibs_exphigh_at2y#c.FathSib_Sibs_exphigh_at2y				
0	0 (omitted)			
1	.0200896 .0036689	5.48	0.000	
ventaMixta#topAndBottomCriadorInAuction#criadorTop				
0 0 1	.5562795 .104927	5.30	0.000	
0 1 0	0 (empty)			
0 1 1	0 (empty)			
1 0 0	-.0791639 .0299806	-2.64	0.008	
1 0 1	.6349557 .1093042	5.81	0.000	
1 1 0	-.0899033 .0308178	-2.92	0.004	
1 1 1	.6700301 .1070177	6.26	0.000	
criadorOfTheYear				
Was criador of the year	-.0261767 .0418191	-0.63	0.531	
criadorOfTheYear#c.yearsSinceCriadorOfTheYear				
Wasn't criador of the year	0 (omitted)			
Was criador of the year	-.0051191 .0057757	-0.89	0.375	

criadorMainFE				
Avourneen	.1289657	.1315109	0.98	0.327
Carampangue	.3891044	.1167613	3.33	0.001
Don Yayo	-.365298	.1219228	-3.00	0.003
El Mallin	.0573201	.1117826	0.51	0.608
El Paraiso	-.1643833	.0439456	-3.74	0.000
Firmamento	-.1078559	.0453398	-2.38	0.017
La Leyenda	.2367892	.1145836	2.07	0.039
La Pasion	-.3156597	.0539576	-5.85	0.000
La Providencia	-.3998833	.0618877	-6.46	0.000
Orilla Del Monte	.1588564	.1945728	0.82	0.414
Other	.1120723	.1023634	1.09	0.274
Pozo De Luna	-.2818928	.0767563	-3.67	0.000
Santa Ines	-.4495382	.0601653	-7.47	0.000
Santa Maria De Araras	-.8807899	.0636162	-13.85	0.000
Tres Jotas	.3201476	.1198144	2.67	0.008
Vacacion	.2356546	.1300804	1.81	0.070
Vadarkblar	-.7363451	.1211918	-6.08	0.000
Vikeda	.0369451	.1205671	0.31	0.759
IncaballosRematados	.0245984	.0124051	1.98	0.047
dmi_mainAuction#mainAuction				
0 1	0	(empty)		
1 0	-.3483281	.0296861	-11.73	0.000
1 1	0	(omitted)		
_cons	9.488898	.2099297	45.20	0.000

Determinants of auction value (Firmamento)



What if Remote (GB) had been padrillo of the year in 2023?

	Rematados	Mean USDB	Min USDB	Max USDB	Total value	Difference
Original	17	13,508	2,533	37,812	229,636	
Padrillo of the year (1y ago)	17	20,750	10,724	42,027	352,750	123,114
Padrillo of the year (5y ago)	17	15,441	7,980	7,980	262,497	32,861

On average, Remote (GB)'s offspring price would have increased by 7,200 USDB. Their minimum price achieved would have increased by a factor of 5. This would have netted the sellers an extra ~123,000 USDB.

What if Vacacion's March auction was in August?

	Rematados	Mean USDB	Min USDB	Max USDB	Total value	Difference
March	49	35,262	11,993	89,948	1,727,838	
August	49	20,814	9,334	40,431	1,019,886	-707,952

The horses would have been valued, on average, ~15,000 USDB less than they were when selling them on March. The maximum value achieved would have dropped by ~49,000 USDB. The total loss would have been ~708,000 USDB

Value biases

Over and under pricing

Looking for biases

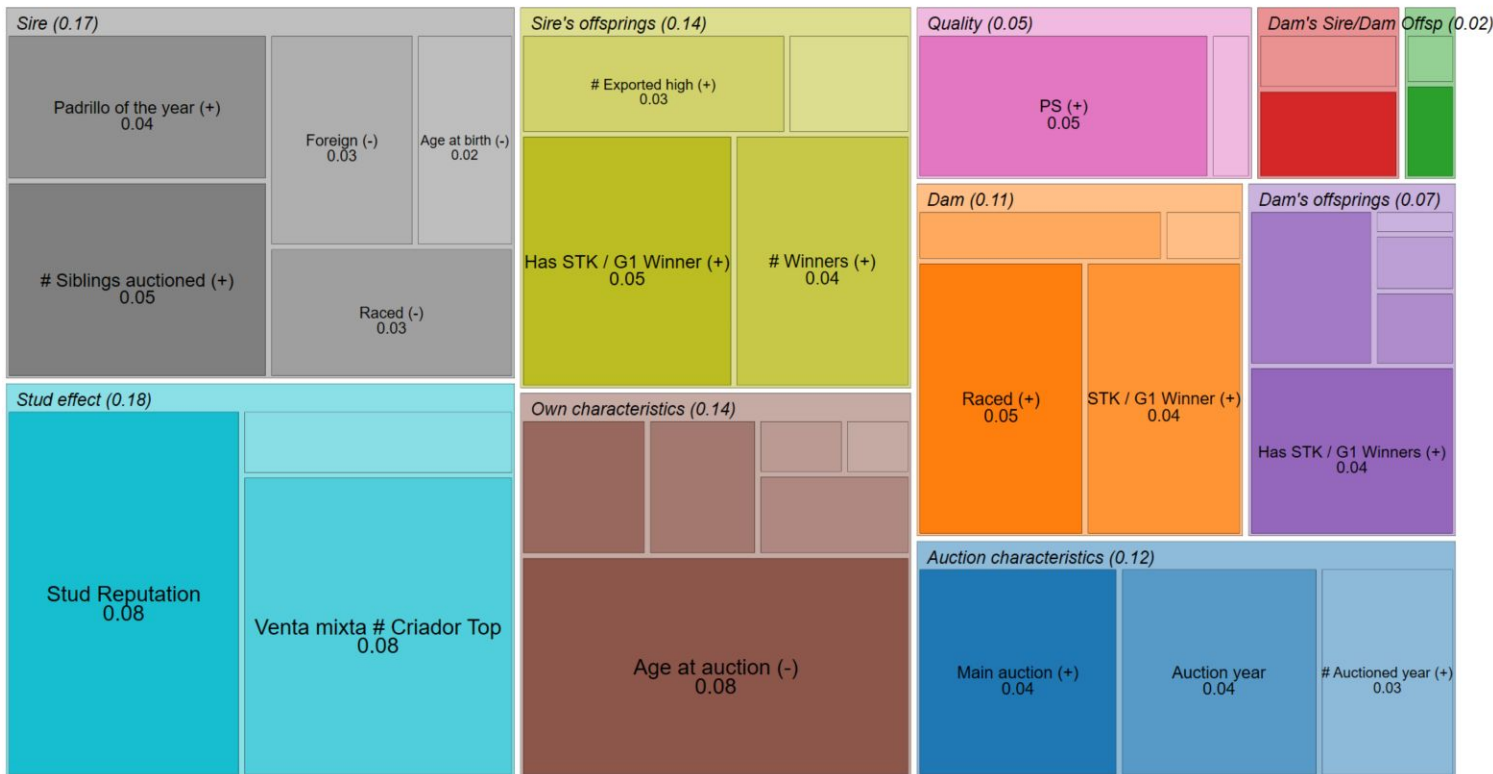
Once we control for quality (PRS), then any differences in valuation can be attributed to market biases. For example, take two horses which are identical in terms of quality. If one is sold for \$30,000 while the other is sold for \$10,000, then the factors that explain the difference are biases explained by - for example - wanting an offspring from a Padrillo of the Year.

This will help determine which horses will be contested or not, which can help maximize PRS as a buyer. For example, if you know a horse is going to be priced higher because he is coming from a specific criador but there's another horse **of the same quality** that comes from a lower-valued criador, then you know you should push for the second one.

As a seller - on top of the quality offered by the stud - **understanding public biases is key in order to exploit them and hence maximize profits over time.**

Quality is barely a determinant

Determinants of auction value



The **probability of racing** is not a good predictor of the **auction value of a horse**. The market does not consider PR when buying horses, which leaves an exploitable opportunity. Horses who have a mid PS but high PR are likely going to be valued much less than a high PS horse with low PR

Biases

Buyers will pay more for horses:

- From studs with **good reputations**: some undistinguished studs sell good quality horses, these will sell for cheaper, making them attractive options to look out for
- **Sold earlier** in the year: as a seller, you should move your auctions toward the first half of the year. As a buyer, look for high quality horses being sold later in time
- **Many father side siblings being auctioned**: the number of siblings sends a signal regarding the perceived quality of a sire by the stud - especially for sires in first few seasons. You may want to look for horses with few siblings being auctioned when buying (they will be less contested), and look to reduce the number of single-sibling horses you sell
- From a **Padrillo of the Year** - especially a recent one-: these horses will likely be heavily contested, making them less desirable cases to purchase and more desirable to sell
- Whose **siblings and/or dam have won stake and G1 races**: these horses will likely be more contested, making them less desirable cases to purchase and more desirable to sell
- Who are **sold at main auctions**: as a seller, you can take advantage of this by selling the best quality horses only in main auctions. As a buyer, look for miss-judged (high quality) horses in secondary auctions, they should be easier to acquire

What can Firmamento do to improve it's auction value?

1. Organize their main auction towards the start of the year, before June.
2. Be more selective about which horses are sold at secondary auctions, reserving the less quality ones for it.
3. Take advantage of buyer's biases by ensuring information they value is clear, well informed before and repeated throughout the auction.
4. Consider PR when buying horses: a **high PS** - **low PR** horse may be worse than a **mid PS** - **high PR** horse, and you would have to pay more to get it!