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### On the Economics of the Jockey Club's 140 Mare Limit Proposal

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## **On the Economics of the Jockey Club's 140 Mare Breeding Limit Proposal**

*Dear Reader,*

*All but the last section (the addendum) of this paper remains substantially as written before the Jockey Club's "final rule" limiting mares bred was issued on May 7, 2020. An earlier draft of this paper, very much similar in coverage and recommendations to what follows, was submitted to multiple officers of the Jockey Club on March 2, 2020. Drafts of this paper were also sent to numerous other organizations and individuals in the industry in February and March of 2020.*

*Save for the addendum, the paper assumes that the Sept. 2019 Jockey Club Proposal will be implemented. That would have created winners and losers, and would have resulted in sudden and very substantial changes in the economics of the Thoroughbred breeding industry, including rather dramatic and immediate increases in the prices of stallion seasons for the most popular stallions.*

*The addendum discusses the economic adjustment process that is likely to occur as a result of the Jockey Club's final rule, which will entail a much more gradual economic adjustment that will occur over many years rather than the telescoped economic adjustment that would have occurred quickly had the original proposal by the Jockey Club not been modified. But, whether the Jockey Club's original proposal or its final rule had been adopted, the Thoroughbred industry will have changed significantly over the next 20 years or so, though its status in 20 years would have been unlikely to be significantly different in most respects whether the mare limit rule had been applied to all stallions immediately or nearly so (as per the September 2019 proposal) or phased in gradually (as per the May 7, 2020 final rule). The addendum contrasts the differences that will have occurred due to the differences between its original and final rules.*

*Robert L Losey, PhD, May 30, 2020*

### **Outline**

#### **Background**

#### **Focus of this Paper and Questions Asked**

#### **The Economics of Adjusting to a Breeding Limit**

**How Will the Most Popular Stallions be Affected?**

**How Will "Replacement Stallions Be Affected?"**

#### **Why Any Limit and Why a 140-Mare Limit?**

#### **Winners and Losers and Logical Phase-In Rules for Breeding Limits**

#### **Stallion Values and Stallion Exports**

#### **Summary**

**Economics of the Adjustment Process**

**Winners and Losers and Phase-In Rules**

**Stallion Values and Stallion Exports**

#### **Addendum: The Economics of the Final (May 2020) Rule**

## On the Economics of the Jockey Club's (Original) 140-Mare Breeding Limit

By Robert L Losey, PhD <sup>1</sup>

On September 6, 2019, the Jockey Club, in its role as de facto regulator of Thoroughbred breeding, "...announced its consideration of a rule to set annual limits on mares bred for individual stallions starting with the 2021 breeding season." This paper discusses the economic implications of a limit on the number of mares bred by each individual stallion.<sup>2</sup>

### Background

In 2009, 26 Thoroughbred stallions bred 140 or more mares, accounting for 9.2% of mares bred. Breeding by top stallions was much more concentrated in 2019, when 44 stallions bred 140 or more mares, accounting for 25% of mares bred. This increase occurred over a period when total mares bred dropped by 36%, from 45,317 to 29,217. Economists would point out that the Jockey Club's stated rationale for intervening in the marketplace by imposing a limit on mares bred is a classic case of addressing what the Jockey Club considers to be a "negative externality." Economists define a "negative externality" as a consequence of an activity that injures parties other than the party engaging in the activity. The Jockey Club fears that increasing degrees of inbreeding arising from large books by more stallions in recent years will result in future generations of foals being compromised if inbreeding trends continue, imposing costs on owners, sales companies, trainers, racetracks and others because it will be more difficult to generate healthy, quality runners. If deleterious, then inbreeding can be viewed in a similar way to the pollution that a plant releases into air or water. In the absence of taxes on, or fines of polluters used to compensate injured parties, the pollution imposes costs on others that should be borne by the polluter.

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<sup>1</sup>The author is a consultant, former chairman of the Dept. of Finance and Real Estate at American University in Washington, DC, and former faculty member in the Equine Business program at the University of Louisville. Though the following individuals may or may not agree with the analysis and conclusions in this paper, I am indebted to them for their helpful comments and/or contributions. Thanks to George Adams, Dr. Ernest Bailey, Terri Burch, Dr. Ann Gillette, Dr. Thomas Lambert, Dr. James Marsden, and Dr. Jill Stowe. Thanks also to Sarah Mitchell and Dorothy Losey for Excel and editing work respectively. Any errors that remain are mine alone.

<sup>2</sup>In addition to this paper on the economics of the Jockey Club mare limit proposal, this author and Dr. Thomas Lambert of the University of Louisville have published (on the University of Louisville's Equine Business program website) a paper that reviews recent literature on inbreeding and suggests modifications to the Jockey Club's proposed mare limit that are based on their reading of recent inbreeding literature and other equine-related research.

## Focus of this Paper and Questions Asked

Though the genetics and economic aspects of the Jockey Club proposal are intertwined, as much as possible this paper focusses on the economic implications of a limit on the number of mares a stallion can breed. Jim Gagliano, president of the Jockey Club, was quoted in a September 6, 2019, Thoroughbred Daily News article saying, *“We cannot predict the economic effects of a limitation because of the complexity of the interactions among participants in the breeding and selling markets.”* As explained in the following, significant economic consequences are predictable with considerable accuracy. Most especially in the short and intermediate terms, the economic outcomes of a significant limit on mares bred are in substantial part negative for breeders and racing, and those negatives consequences would appear to be justifiable only if a substantial improvement in the vitality of the breed would result from the genetic effects of a limit on mares bred. Additionally, the imposition of a 140-mare limit would raise significant fairness questions related to the allocation of benefits and costs arising from the imposition of a limit on mares bred.

The analysis in this paper will address the following questions regarding the economics of the Jockey Club proposal: What will the costs be and who will bear the costs? What groups will benefit and what groups will be disadvantaged? Are there significant “fairness” considerations? If so, what are they and how could they be addressed? Will a limit on mares bred affect the number and quality of foals produced? Will industry segments other than breeding be affected, most especially racetracks?

If there is an optimal limit on mares bred by a stallion, it is unlikely that it is the arbitrary number of 140, which is the same limit that the much smaller quarter horse breed imposed some years ago.

Nevertheless, given that 140 has been proposed by the Jockey Club, it will be used as the reference point for the analysis and discussion of the economic implications of a limit in what follows.<sup>3</sup>

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<sup>3</sup> This writer, a bank regulator in the early 1980s and, subsequently, a Washington, DC, area based professor and consultant to the Justice Department and bank regulatory agencies, finds it unusual that the regulator of Thoroughbred breeding did not present supporting research either before or coincident with their proposed mare limit. In the absence of imminent danger, significant regulatory changes are typically proposed after identifying a problem (or problems) and collecting and publishing research and comments. The Jockey Club has invited comments, but had not identified research that they viewed as justifying regulatory intervention, thus allowing both the regulator and affected parties ample time to interact and make well-informed decisions. The Jockey Club has identified a researcher, Dr. Emmeline Hill, well-known for her “speed gene” research, who they expected would provide research relevant to their proposal after their call for breeding limits. That researcher was one of seven co-authors who published a paper on inbreeding trends in February of 2020 that is relevant to the Jockey Club proposal.

This paper is composed of four sections: 1) the economics of adjusting to a 140-mare breeding limit, 2) the “logic” of the 140 limit, 3) phase-in limits, and 4) stallion values and the export problem.

### **The Economics of Adjusting to a Breeding Limit**

If stallions are limited to breeding 140 mares, the adjustment process necessary to comply with the new regulatory environment will likely involve more time and analysis than usual for mare owners because, as explained in the following, more stallions will fill their books and have to turn away mares. In order to demonstrate the logistics and economics of the adjustment process, this paper focuses on the likely adjustments that would have occurred if the 140 limit had been instituted prior to the 2019 breeding season. Similar adjustments would take place in any year that breeders are faced with a limit on mare numbers,<sup>4</sup> but those adjustments will vary somewhat each year because breeding patterns vary from year to year. A primary factor causing significant swings in breeding patterns is the popularity of newly-retired stallions. The 2019 breeding season saw more than the usual interest in newly-retired stallions. In contrast, 2017 saw less interest than usual in newly-retired stallions. (See Figures 1 and 2 reported later in this paper.) However, regardless of the swings in popularity of particular stallions, the general economic ramifications of a breeding limit will be much the same, with two primary results:

- 1) Stallion season prices will rise across the board. Price increases and economic impact will typically be substantial for most higher-priced stallions, moderate for mid-market stallions, and modest for low-end commercial stallions.
- 2) A breeding limit will create a significant reallocation of revenues to stallion owners, with revenues to popular stallions dropping for stallions that would have bred large books, while revenues to most other stallions will increase. Stallions that will benefit most from a limit on mares bred will be stallions that are reasonable alternatives to popular stallions that would have had very large books in the absence of a limit.

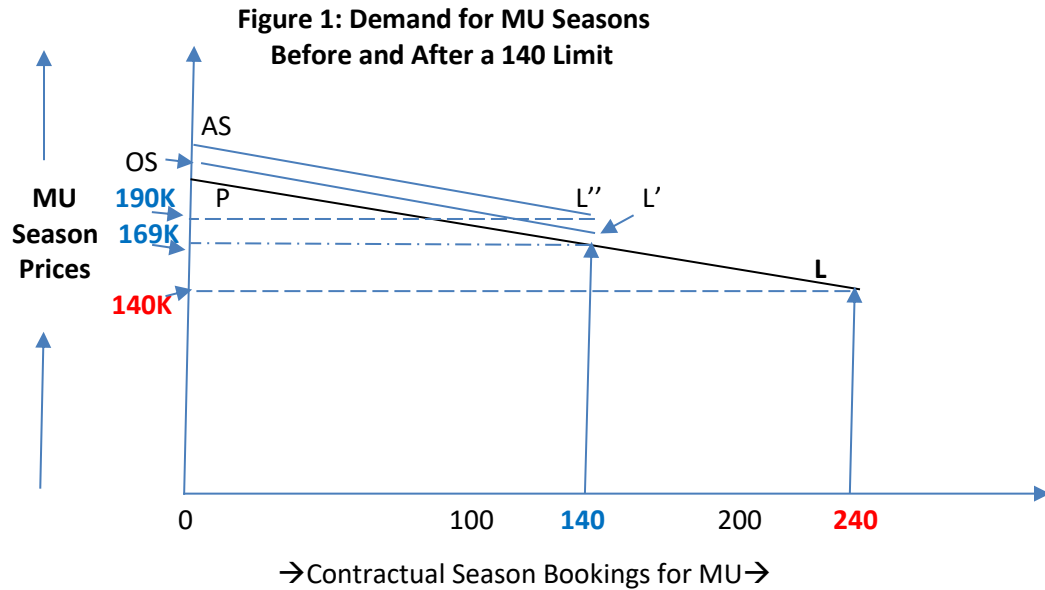
A useful approach to analyzing the adjustment process is to assume that a 140 limit had been put in place in September 2018 before any stallions had been booked for the 2019 breeding season. We know what stallion books looked like in the absence of the implementation of the 140 limit by analyzing the

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<sup>4</sup> Special thanks to Dr. James Marsden, University of Connecticut Professor Emeritus (His first foal on his Anderson County, Ky farm became a stakes winner). My discussions with him regarding his conceptualization of the mare displacement/replacement adjustment process flowing from a mare limit very significantly benefitted this writer.

data provided by the Jockey Club on actual numbers of mares bred by each stallion in 2019. The question is, “In what ways would new breeding patterns have differed after the imposition of a 140-mare limit?” Though we cannot determine specific end results for individual mares, major economic implications of the imposition of a mare limit are predictable with respect to season prices, quality of foals, and more. As analyzed later in this paper, a limit on mares bred would tend to at least marginally decrease the size and the quality of future foal crops, which would have negative effects on sales and racetrack handle and field sizes.

**How Will the Most Popular Stallions be Affected?** A major consequence of the introduction of a 140 limit implemented as of September 2018 would have been an increase in advertised stud fees for many stallions. Consider first the stallions that would have been likely to have bred 140+ mares in the absence of the new 140 limit. Let’s label these stallions the “140+ stallions,” and let’s label the mares that would be bumped from the books of 140+ stallions by a 140 mare limit the “overage” mares. The stud fees of the 140+ stallions would have increased, and the increase would have been highest for stallions that would have bred the most mares. It would be logical for stallion managers to raise advertised stud fees significantly for the 140+ mare group. An economist would explain the higher stallion season prices by noting that the regulatory limit on mares bred would allow farms to ration stallion seasons primarily to the 140 mare owners who offered the most favorable terms (prices, quality, fertility?) to be among the select 140. Figure 1 below represents the supply and demand conditions before and after the implementation of a 140-mare limit for the hypothetical stallion “Mischievous Uncle” (MU). Though the Jockey Club would not single out MU, for illustrative purposes, assume initially that only MU is subject to the 140-mare limit. That assumption is later relaxed.



Line P-L is the “pre-limit” demand curve for MU seasons. Because high-priced stallions face less competition, it is reasonable to expect that the demand curves they face will slope downward more than the (flatter) demand curves of lower-priced stallions. With no limit, assume that MU’s book would be 240 mares contracted to breed at a price of \$140,000. Now impose a 140-mare limit. A neophyte economics student might argue that MU’s connections could fill his 140-mare book at approximately \$169,000 because that is the price that the owner of the 140<sup>th</sup> mare would be willing to pay given demand curve P-L. However, it’s more complicated than that because mare owners now understand that they will find less congestion at the breeding shed as it will be easier to breed mares at optimal times to a less-busy stallion. This would tend to improve in-foal percentages and also the fraction of a stallion’s book that gets pregnant early in the breeding season. Another benefit to mare owners from being a part of a limited book will be the now increased rarity of foals produced by the very popular 140+ stallions. (Duncan Taylor of Taylor Made Farm refers to this effect in a Dec. 21, 2019, Bloodhorse article.) Realistically, the imposition of the 140-mare limit will result in a new higher demand curve given the 140-mare limit, the related decrease in breeding shed congestion, and the increase in the rarity of the stallion’s foals. The new demand curve would be higher, perhaps at the OS-L’ (One-Stallion Limit’) demand curve that is located above the P-L demand curve.

But the Jockey Club’s 140-mare limit would be placed on all stallions, not just MU. And that will create a further increase in demand for MU’s services. This is because mares (1397 in 2019) would be pushed out of books of the popular 140+ stallions that would have bred more than 140 mares. Those “overage”

mares will have to find new mates, and this will increase the demand for stallions that are reasonable landing places for overage mares. MU would be expected to be the beneficiary of the increased demand from overage mares, as some of their owners would view MU as the best alternative to the 140+ stallions no longer available to them. The implementation of the 140-mare limit on all stallions, not just MU, will create a further increase in demand that pushes demand above the OS-L' demand curve to a new AS-L'' (All Stallion Limit'') demand curve as represented in Figure 1.

So where will prices end up? In the MU example the equilibrium price is \$191,000, though this higher price will not be enough to make up for the loss of (in this case 100) mares. Moreover, under any set of reasonable assumptions that this writer can envision revenues to the 140+ stallions will fall.<sup>5</sup>

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**Estimating Revenue Changes When a Mare Limit is Implemented** – Revenue changes for particular stallions will vary based on popularity, distinctiveness, fertility, and more. Based on the parameters from Figure 1 and the assumptions that follow, MU would generate revenues of approximately \$24.2 mil. before a mare limit, and \$20.2 mil. after a mare limit. These figures are based on the following assumptions: 72% of his 240 pre-limit mares produce foals for which stud fees are paid averaging \$140,000 each. Alternatively, 76% of his smaller book of 140 post-limit mares produce foals for which stud fees are paid averaging \$190,000 each. MU's revenues would be almost 20% higher in the absence of a mare limit rule.<sup>6</sup>

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**How Will "Replacement Stallions Be Affected?"** While popular 140+ stallions will experience significant declines in revenues from season sales, the "replacement stallions" that gain the mares that 140+ stallions lose will experience the opposite. The overage mares "bumped" by the 140 limit would need to find new mates (replacement stallions), and demand for seasons for potential replacement stallions would thus increase. The "rarity factor" and the decrease in "congestion" that would tend to create upward pressure on prices of 140+ stallions would work in the opposite direction (putting downward pressure on prices) for stallion seasons of "replacement" stallions picking up more mares from the displacement of the overage mares, as rarity would decrease and congestion could increase in some

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<sup>5</sup>The demand curve of most stallions will probably be flatter than that shown in Fig. 1, suggesting an even greater decrease in revenues for 140+ stallions post-limit. A steeper demand curve that implies more market power might obtain if a stallion were the only "good outcross" to mare pedigrees in his price range. 140+ stallions that would have bred only 150 or so mares in the absence of a limit would see their revenues drop less than shown for MU,

<sup>6</sup>Sophisticated observers will correctly argue that stallion managers will often employ price discrimination practices that wring extra revenues out of mare owners. For a discussion, see Losey and Lambert's paper on stallion pricing at [https://www.academia.edu/42770300/Pricing\\_Stallion\\_Seasons\\_for\\_an\\_Individual\\_Stallion\\_April](https://www.academia.edu/42770300/Pricing_Stallion_Seasons_for_an_Individual_Stallion_April)



cases as replacement stallions gained mares.<sup>7</sup> Overall the increased demand for “replacement” stallion seasons and the increased quality of mares they garnered from mares leaving the 140+ mares would almost surely outweigh the now decreased rarity of their foals and the (possible) increased congestion<sup>8</sup> at their breeding sheds, resulting in increased revenues.

If the 140 limit had been put in place before the 2019 breeding season, the mares it would have directly affected would have been the 1397 “overage” mares that exceeded the 140 limit in the books of the 43 stallions that bred more than 140 mares. Certainly 1397, but also almost surely more mares, would have had to find new suitors. It’s not important to determine precisely which 1397 mares of the 7417 mares bred to the 140+ stallions would have moved to new stallions, but it’s reasonable to expect that the 1397 mares forced from the books of the 140+ stallions were some combination of mares unwilling to pay the new higher prices quoted by popular stallions in the post-140+ marketplace, and/or those no longer on stallion managers’ acceptance lists based on conformation and/or connections considerations.

Some of those 1397 mares would find new homes by displacing mares from other 140+ stallions. For instance, some overage mares originally targeted for Into Mischief might end up with Uncle Mo, bumping mares in addition to his original overage mares. But, whatever amount of reshuffling that occurs amongst the 140+ stallions, ultimately a minimum of 1397 overage mares would have had to find a new suitor outside the 140+ stallions, and further reshuffling would frequently occur in stallion books for “replacement” stallions that landed overage mares. It is instructive to take a look at both the characteristics of the 140+ stallions and to a logical potential group of “replacement” stallions, those bred to between 86 and 139 mares (henceforth the 86->139 mares) in 2019.<sup>9</sup> In the analysis that follows in succeeding paragraphs, both the original 140+ and the 86->139 mares analysis classifies both groups of stallions by their number of years at stud. In 2019, the 61 stallions breeding 86 to 139 mares accounted for 25% of mares bred in North America. Coincidentally in 2019, the 43 stallions that bred more than 140 mares in 2019 also represented approximately 25% of total mares bred.

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<sup>7</sup> See the citation from the previous footnote for more detail on stallion pricing.

<sup>8</sup>For many replacement stallions the increase in mares would not result in significant increased congestion at the breeding shed. Stallions moving from 90 to 100 mares would only occasionally force a mare to be disadvantaged due to breeding unavailability. Less fertile stallions attempting a 140-mare book might encounter significant congestion problems.

<sup>9</sup> There’s nothing magic about the 86-139 range, though this group did breed approximately the same number of mares as the 140+ mares actually bred in 2019. Similar conclusions will be reached whatever reasonable group of “replacement” stallions is chosen.

The 61 stallions that bred 86 to 139 mares had 1621 openings (slack) in their collective books if each of these stallions could service 140 mares. More likely a number of these stallions might already be at or very near their own personal limits of mares bred because of fertility, age, or syndicate restrictions. In the unlikely case that all 1621 openings were available for use, then the 1397 overage mares bumped from the 140+ stallions could conceivably fill  $1397/1621 = 86\%$  of the openings in the books of the stallions in the 86 to 139 mare group and have some room to spare.

Without a doubt the increased demand for seasons to the stallions that bred 86 to 139 mares would result in increased advertised prices for many or most in this group. Though theoretically there is room for the 1397 overage mares to find a spot in the 86 to 139 group, a review of data reported below indicates that it is likely that a combination of pedigree, conformation, pricing, location, and stallion fertility/syndicate restriction considerations would result in some of the 1397 overage mares dropping farther down to stallions that would have bred fewer than 86 mares in the absence of the imposition of the 140 limit. Additionally, the combination of overage mares dropping into the 86 to 139 group and higher advertised prices posted for seasons to the 86 to 139 stallion group would almost surely dislodge some mares originally targeted for the 86 to 139 stallions that would move down the ladder for financial reasons.

Because most of the 140+ stallions in 2019 (see Figure 3) were higher-priced stallions, the impact of the pricing adjustments would have been strongest for higher-priced stallion seasons, but there is little doubt that there would normally be pricing pressure down through the lower reaches of the price continuum of “commercial” stallions.<sup>10</sup> There are at least two reasons why we should expect this.

- 1) Stallions priced at marginally lower prices than the preferred target price range for a mare are almost always considered as possible substitutes. Often, a lower-priced stallion with more compatible pedigree and/or conformation affinity for a mare will be chosen over a stallion who fits the preferred budget requirement of a breeder; and

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<sup>10</sup> Dr. Jill Stowe of the University of Kentucky Agricultural Economics Program argues that price increases for lower level stallions will be inconsequential. This author is inclined to believe that there will be a small but significant increase in pricing pressure on \$5,000 to \$10,000 stallions. If Dr. Stowe was referring to stallions priced at less than \$5,000 before the implementation of a mare limit, I suspect she is correct.

2) In 2019, 12% of the 140+ overage mares had originally been targeted to modestly-priced stallions. Sharp Azteca, Klimt, Mor Spirit, and Cloud Computing, with stud fees from \$7.5 to \$10K were responsible for 169 “overage” mares. The displacement of these modestly-priced mares would have resulted in increased demand for other modestly priced stallions in addition to the “trickle down” effect of mares moving down the stallion pricing ladder as a result of the displacement of mares from both the 140+ stallions and some of the replacement stallions.

It’s reasonable to expect that the overage mares would have pursued a variety of alternatives rather than merely moving down to the next busiest group of stallions, or to stallions priced just below their original targets, and an analysis of data from Figures 1 and 2 below, which categorize mares by the year at stud of stallions to which they were bred, tends to reinforce that expectation.

**Fig. 1 - 2019 Overage Mares Compared to Slack\* for 2019 86->139 mare sires**

Overage Mares Bred			Slack Available*		
By sire Type	Number	% of 1397		Number	% of 1621
Yr. 1 Sires	595	43%		100	6.2%
Yr. 2 Sires	145	10%		295	18.2%
Yr. 3 Sires	23	2%		182	11.2%
Yr. 4 Sires	38	3%		306	18.9%
Yr. 5 Sires	166	12%		150	9.3%
Yr. 5+ Sires	430	31%		588	36.3%
	1397			1621	

\*“Slack” is narrowly defined here as the number of mare breeding openings Theoretically available to stallions breeding 86 to 139 mares in 2019.

**Fig. 2 – 2017 to 2019 Overage Mares**

Overage	Mares bred	% of 1397
Yr. 1 Sires	1210	33.0%
Yr. 2 Sires	326	8.9%
Yr. 3 Sires	167	4.6%
Yr. 4 Sires	252	6.9%
Yr. 5 Sires	550	15.0%
Yr. 5+ Sires	443	31.7%
Totals	3669	100%

Columns 1, 2, and 3 from Figure 1 above report “overage” mares (those that would have been “bumped”) if a 140-mare limit had been imposed for 2019. Note that in 2019, the fraction of overage mares from the books of Year 1 sires relative to total overage mares was high (43%) compared to the

average (33%) for the three years 2017-2019 reported in Figure 2. This reflects the variability in appeal of newly retired stallions from year to year: first-year sires were extremely popular in 2019 with 43% of overage mares. In 2017 newly retired stallions accounted for 15% of overage mares. The “slack,” or numbers of openings available as reported in columns 5 and 6 of Figure 1, are significantly less volatile from year to year than are the number of overage mares attributable to first-year stallions. Note also that in 2019 the overage numbers for stallions in their 3<sup>rd</sup> and 4<sup>th</sup> years at stud were very low. Though other well-known explanations<sup>11</sup> help explain the low overage figures for years 3 and 4 stallions in 2019, a partial explanation is that the popularity of first-year sires in 2019 pulled more mares away than usual from other unproven stallions.

Comparing the overage mares by stallion year to the slack from stallions that bred 86 to 139 mares in 2019 helps illustrate the likely complexity of the adjustment process. 595 (43%) of the overage mares were bred to first-year stallions in 2019. Almost half of these (288) were the result of the extreme popularity of three stallions, Justify, Mendelssohn, and Bolt d’Oro. But only 100 slots were available to first-year stallions breeding 86-139 mares in 2019. If their owners had strong preferences toward breeding to a 1<sup>st</sup>-year stallion, they would find the search for a substitute stallion involving very substantial trade-offs. A consideration of the range of stud fees for the overage mares helps to further illustrate the potential difficult tradeoffs that would have to be made. Figure 3 reports the advertised stud fees that the overage mares would have paid if not bumped by the 140 limit. Figure 4 reports the average advertised stud fee of stallions breeding 86->139 mares in 2019.

**Fig. 3: Pre-140 Limit Stud fees of Overage Mares**

**Fig. 4: Stud Fees of Stallions**

Stud fees	No. of mares	% of Overage	Cum	Breeding 86-139 mares
125-150K	365	26%	26%	
35-80K	331	24%	50%	
25-30K	233	16.7%	66.7%	No. of stallions =62
17.5-20K	235	16.8%	83.5%	
10-12.5K	178	12.7%	96%	No. of slack seasons = 1621
6-7.5K	54	4%	100%	
<b>Avg. = 57.6K</b>	<b>1397 = Total mares</b>			<b>Avg. slack stud fee = 23.4K</b>

The weighted average stud fee for the overage mares in 2019 was \$57,600. The weighted average of the stud fees of the slack seasons available from the 1621 available seasons (assuming all the slack seasons are actually available) from stallions that bred 86 to 139 mares is \$23,400, quite a come-down in stud fee for many of the overage mares. The dearth of obvious substitutes for the overage mares, especially overage mares from first-year stallions in 2019, illustrates the likelihood that overage mares would look for substitute stallions over a fairly wide range of potential substitutes, both with respect to

<sup>11</sup> Two reasons why stallions in the 3<sup>rd</sup> and 4<sup>th</sup> years at stud decrease in popularity are 1) that they are not as close in time to their “glory days” as runners, hence a diminished “advertising effect,” and 2) the foals from year 3 and 4 matings will typically be sold after runners from a stallion’s first crop have raced, and history suggests that more often than not those runners will have disappointing results.

breeding year of substitute stallions and stud fees. This reinforces the expectation that demand for a wide range of stallions with slack would be considered, including a significant number that had bred less than 86.

### **Why Any Limit and Why a 140-Mare Limit?**

Free-market adherents typically argue that the free market best allocates resources and that regulators should have compelling reasons to intervene in the free market. Under appropriate assumptions, most economists would agree, but would point out that an unfettered free market can occasionally lead to catastrophic conditions. Failures to limit the disposal of toxic chemicals in decades past and to regulate risky mortgage lending and risky mortgage derivative products in the run-up to the “great recession” are cases in point. Is the genetic diversity argument espoused by the Jockey Club (and previously by standardbred regulators) an example of a compelling need to regulate? The answer to this question is further complicated by arguments by a number of horsemen (e.g. Arthur Hancock – TDN Sept. 16, 2019) who seem to feel that limiting stallion books should be considered on economic grounds more so than on “genetic diversity.”

The Jockey Club’s proposed 140 mare limit is the same as the limit that became effective in 2009 for newly retired trotting stallions, though already-active pacing stallions were phased in by allowing them to breed 160 mares in 2009, 150 mares in 2010, then 140 in 2011 and thereafter (Source – [members.ustrotting.com/breeding.cfm](http://members.ustrotting.com/breeding.cfm)). Both in terms of numbers of mares displaced from 140+ books and mares displaced as a percentage of total mares bred, the Jockey Club proposal would be significantly more restrictive than was the standardbred limitation. The explanation why a 140-limit is significantly more restrictive for Thoroughbreds is two-fold:

- 1) The Jockey Club estimates that approximately 20,800 Thoroughbred foals born in North America in 2019 will be registered. (Source Jockey Club Fact Book). This is more than 2.6 times as many foals as the 7,600 or so standardbred foals projected for 2019. The larger population of Thoroughbreds not surprisingly has resulted in more significant commercial stallions and more stallions breeding larger books.
- 2) The Jockey Club proposal comes some 10-11 years after the imposition of the Standardbred mare limit. During that time improvements in both veterinary technology and market conditions have combined to generate a greater number of stallions breeding very large books, as exemplified by the 43 Thoroughbred stallions breeding more than 140 mares in 2019.

If for purposes of discussion we accept that the standardbred 140 limit is appropriate, it seems logical to question whether the same 140-mare limit is appropriate for two populations that are so different in size. Other things equal, larger populations tend to have greater genetic diversity. A 140 limit will have significantly more impact on the (likely) more genetically diverse Thoroughbred population than the 140-mare limit implemented in the much smaller Standardbred population.

### **Winners and Losers and Logical Phase-In Rules for Breeding Limits**

Phased-in limits applying to parties affected by new rules, as opposed to immediate and full adherence to a new set of standards, are preferred when immediate adherence would create undue hardships on some affected parties and/or would cause undue windfalls to other affected parties. When there are catastrophic conditions that must be addressed, the importance of balancing hardships and windfalls may need to take a back seat to addressing clear and present danger. The greater the need to make adjustments to address catastrophic conditions, the less compelling is the need for phase-in requirements.

As discussed in the economics and logistics section of this paper, the economics of a 140 breeding limit will rather dramatically create new winners and losers for particular stallions and for particular stud farms. Though in any given year which stallions benefit and which are disadvantaged will change based largely on current popularity<sup>12</sup>, the most obvious economic losers among proven stallions based on 2019 breeding numbers if the proposed phase-in limits were enforced would be Into Mischief, Uncle Mo, American Pharoah, Munnings, Kantharos, Candy Ride, Hard Spun, and Union Rags. The phase-in limits initially proposed by the Jockey Club would have these stallions limited to 140 mares in 2021. Limiting these stallions would have two major direct effects for their connections.

- 1) Though these stallions would be expected to increase stud fees substantially, the likely result would be that revenues generated by each of these stallions would drop. The most significant impacts would be on Into Mischief and Uncle Mo, which each bred 241 mares in 2019. In effect a change in mare limits would financially penalize these two stallions for being both exceptionally fertile and for producing high-quality runners.
- 2) The inevitable result of the implementation of the 140 limit, given the quality of this group of proven stallions, would be the loss of production of 150 or so of some of the best potential runners produced in North America.

If there is sufficient evidence to suggest that larger numbers of foals from outstanding proven stallions endanger future generations, then a case can be made for limiting the numbers of mares they breed. Otherwise, it seems that two factors argue for allowing a permanent exemption from a breeding limit for proven stallions. Curtailing the numbers of mares bred to quality proven stallions changes the limits from those under which the owners negotiated a purchase price for these stallions and is unfair to the owners, and would result in a windfall financial transfer to (typically) lower quality stallions. Limiting numbers of mares to high-quality proven stallions will also lower the average quality of runners produced during their breeding careers, and to the extent that it is important that the industry offer the best possible products, seems unfair to the racing industry that supports the breeding industry.

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<sup>12</sup> Dr. Jill Stowe made the good point to this writer that the fact that which stallions breed more than 140 mares each year changes significantly over time tends to automatically decrease the degree of heavy use by the same set of stallions and thus at least partially slow the trend toward decreased genetic diversity.

In the absence of the determination that only immediate dramatic changes in breeding patterns will save the industry, more appropriate from a fairness perspective than the proposed Jockey Club phase-in rules would be the following.

- 1) Grandfather (or slowly phase in limits on) all stallions now at stud. The logic for this is that their purchase prices may have presumed a set of conditions no longer possible, and that their expected revenues are significantly diminished by a limit on mares bred.
- 2) More lenient (and more fair) to stallions already in place would be to apply whatever mare limit is imposed only on stallions that were purchased or syndicated after a specified date, where that date would allow purchasers to correctly anticipate the constraints under which they must work given new Jockey Club rules.

If buyers know what the limits of the game are, they will make reasonable choices (with price being a major item of concern) and will not be ambushed by surprise regulatory changes.

There will be particular stallions that will be advantaged and disadvantaged under almost any new rules. For example, new top-level stallions will be worth less at stud in North America after the implementation of a mare limit. But on the other hand, at least in the early years after a mare limit is introduced, moderate and upper-midlevel stallions will be worth more because they will have access to mares cascading down as “overage” mares have to find new homes and generate a ripple effect down the stallion price and/or quality ladder. Thus, on average, it may be reasonable to expect that the total values of U. S. stallion prices will have changed little. Perhaps more importantly, the owner of a yet unraced stallion prospect is equally likely to benefit or lose from a previously set new set of rules, thus facing the usual business risk encountered by buyers and sellers.

### **Stallion Values and Stallion Exports**

James Keogh (TDN Sept. 26, 2009) is correct that the imposition of a limit on the number of Thoroughbred mares bred to any one stallion will cause the value of a stallion to fall if that stallion would have been expected to breed more than the imposed limit. As previously explained, a limit on mares bred creates an artificial scarcity in seasons for 140+ mare stallions and the prices of the newly limited seasons available will increase, but because the demand curves for seasons to stallions are almost assuredly gently downward sloping (“elastic” in this market that economists classify as monopolistically competitive), the decreases in volume of mares bred will diminish revenues more than the increases in season prices will increase revenues. Because the stallions that would otherwise have bred 140+ mares will now generate less revenue, their values in the North American market will fall. Fertile, high-quality stallions will be more likely than before to be the objects of buyout offers from foreign buyers from locations where there are no limits on mares bred.

Limits on mares bred will be decried by free-market supporters, but applying a mare limit to new stallions will at least partially appease Ryan McLean (TDN Sept. 26, 2019) and others who feel that limits might make sense given that new stallions are used by breeders more frequently than the ultimate racing success of their runners warrant. If a limit on mares bred creates demand for more stallion prospects to be retired early, the net short and intermediate-term economics effects will not be positive given that the very best newly-retired stallions may be marginally more likely to start their stallion

careers overseas. And even if a limit on mares bred increases demand for seasons to proven stallions, given that high-quality proven stallions would be limited to 140 mares under the Jockey Club's original proposal, and at least a fraction of the very best stallions may have been exported, it's likely that a limit on mares bred lowers the quality of runners. If the Jockey Club is correct however that a mare limit will increase genetic quality, over the long run it is possible that the limit will result in an offset against the loss of runners by high-quality stallions.

The displacement of mares from 140+ books will increase demand for stallions that are close substitutes to the 140+ mare stallions. The values of the seasons in these "replacement" stallions will rise as demand increases. They will further benefit in many cases from larger books, further increasing their revenues and values. These close substitute stallions will tend to be more valuable in the North American market than abroad. A cascade effect will ripple downward through the stallion market, most strongly buoying the upper middle market, but to a lesser degree the middle market and those (especially commercial) stallions below the middle market. It is not obvious what will happen to the total value of stallions in North America as a result of the 140+ limit. The decline in the value of the 140+ stallions could be offset by the rise in the value of less popular stallions that attract overage mares. Until more stallions are retired (probably over a multi-year period) the restrictions on mares bred may even cause the total value of North American stallions to increase slightly.

Two related effects will mitigate price increases:

- 1) Higher prices and lower available sire power because of the 140+ limit will almost surely result in a lower average quality of foals produced, which may discourage breeders from breeding marginal mares and lower the volume of foals produced.
- 2) Although initially the market will face a scarcity of stallions due to the 140+ limit (and potential losses of stallions due to exports as well), over time we will see an increased rate of retirements of mid and lower-level stallions attracted by higher stallion season prices, though stallions that would have been able to breed well over 140 mares when newly retired will not be as valuable in the North American market after the implementation of a 140 mare limit.

Whether or not a mare limit is implemented, Dan Vella's<sup>13</sup> (see this footnote) suggestion that Thoroughbred breeding should consider artificial insemination (AI) invites an explanation why the considerable savings and safety associated with AI<sup>14</sup> do not justify a regulatory OK? And if a mare limit is implemented, why not raise the mare limit to the extent that seasons are bought/sold internationally by allowing international AI so that U.S. breeders could access foreign stallions and U.S. stallions could sell abroad? This would help achieve the Jockey Club's goal of "genetic diversity."

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<sup>13</sup> See <https://www.thoroughbreddailynews.com/letters-to-the-editor-more-reactions-to-jc-cap/>

<sup>14</sup> See <https://thehorse.com/14368/artificial-insemination-for-horses/>



## Summary

### Economics of the Adjustment Process

In absolute terms, in 2019 the number of mares that would have been displaced from stallions that bred more than 140 mares would have been relatively low – only 4.78% of total mares bred. In 2019 these “overage mares” would predominantly have been bumped from high-priced stallions: 26% of overage mares would be bumped from stallions with stud fees of \$125K or higher, another 24% from stallions with stud fees from 35 to 80K. Prices for stallions in all ranges would almost certainly have increased as a result of the implementation of a breeding limit in 2019, with the strongest increases in prices for the 2019 breeding season occurring at the upper ends of stallion season prices for stallions that would have bred significantly more than 140 mares, most notably proven sires Into Mischief, Uncle Mo, American Pharoah<sup>15</sup>, Candy Ride, and Union Rags, first-year sires Justify, Mendelssohn, Bolt d’Oro, and Sharp Azteca, and second-year stallions Practical Joke and Klimt. But the demand created by the displacement of the 1397 overage mares would create a cascade effect that pushed season prices higher at all price levels, though with diminishing intensity at lower price levels primarily because of the increasing numbers of stallions available when considering stallions at lower price levels.<sup>16</sup>

Though the implementation of a mare limit will result in different degrees of impact on particular stallions in any given year, the general outlines of effects will be similar regardless of when a breeding limit becomes effective. We can expect that higher average prices for foals from top stallions will prevail (though this effect will be diminished if/when high-priced stallions are exported to more passive regulatory environments), but also to a lesser extent for mid-level stallions that now have better mares. The higher average prices for top-level stallions are part illusion, as they would generally have been left with the cream of the mare crop. For example, in 2019, Uncle Mo’s stud fee would have increased and he would likely kept many or most of the best mares that would have originally been bred to him. Even if the foals produced by those 140 mares would sell for the same prices as before the 140 limit is enforced, the Uncle Mo average would almost surely increase because his (mostly) lesser mares went to other stallions. Prices for the most popular stallion seasons will likely increase further because of (increased) rarity and (decreased) breeding shed congestion effects. The lower value of extremely popular new stallion prospects constrained by the 140 limit will at least marginally discourage them from retiring to stud in North America. The increase in stallion season prices for mid-level and below stallions will encourage new moderately-priced stallions to retire.

It’s likely that the overall money spent on stud fees will increase initially then fall back at least partially over time as more stallions retire. An increase in the frequency of very high-priced sales will be likely to occur due to the rarity effect for top stallions. But foals from mares that previously would have gone to

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<sup>15</sup> American Pharoah might better have been characterized as barely semi-proven, though his 2-year-olds impressed early at both the sales and the racetrack.

<sup>16</sup> Two related significant factors explaining the likely very modest price increases in lower-priced seasons are

- 1) Their demand curves are only very gently sloping upward (less steep than the demand curve from Figure 1), hence a limit on mares does not raise prices very much, and
- 2) There are many more lower-priced stallions than higher-priced stallions. As a result, the pricing pressure on lower-priced stallion seasons is dissipated as it is spread over more replacement stallions.

one of the top 6 or 7 stallion that now are bred to a 10-20 rated stallion will probably generate lower prices than they would absent the 140 limit. It's likely that the overall amount spent on sales horses will decrease or remain about the same at best, as the mix of stallions will now have fewer foals from the most popular stallions and more foals from stallions further down the ladder.

Breeders in the lower third of the market will probably be initially paying slightly higher prices for seasons to the formerly \$5K to \$10K stallions (who benefit marginally indirectly from the cascade effect, and directly from the breeding limitations place on popular lower-priced 140+ stallions). Foals by these lower-priced stallions will face cross-currents. The cascade effect will gain them modest numbers of additional mares, and foals from those good mares will tend to generate higher prices. But the increased numbers of foals produced by lower-priced stallions will generate downward pressure on foal prices. A third effect tending to push the lower end lower will be that more mid and lower-level stallions will be encouraged to retire because of the cascade effect's making more mares available to them, though an increase in numbers of foals from this lower-priced cohort of stallions may be minimal initially until more new stallions retire. Whether foals by lower-priced stallions generate slightly higher, approximately the same, or slightly lower prices is unclear, though the higher season prices for lower-priced stallions because of the cascade effect are likely to cause profit potential for sellers at this level to be no better than it would be pre-limit, and probably worse. If worse, expect some marginal breeders to drop out and fewer foals to be produced, with inevitable pressure on racetrack entries.

### **Why a Limit of 140 Mares Bred?**

The 140-mare limit on mares bred is the same as the limit set by the Standardbred breed some ten years or so ago. Given that Thoroughbred foals produced annually amount to approximately 2.7 times the number of Standardbreds produced annually, and that Thoroughbreds are likely significantly more genetically diverse, the obvious question is, why not a higher limit on mares bred for the Thoroughbred industry than for Standardbreds?

A related question should also be asked: "Why not a differential limit based on the perceived risk to the gene pool for different types of stallions?" Proven stallions pose greater chances of increasing the quality of the gene pool and less risk of introducing defective or inferior genes than do unproven stallions. If limits are to be imposed, why not adjust for these differences?

### **Phase-In Rules**

A reasonable case can be made for exempting high-quality proven stallions from limits on mares bred both on fairness and genetic quality considerations, or at the very least, phasing in limits on them very slowly. Unless it can be shown that the Thoroughbred breed faces a clear and immediate danger to the genetic well-being of the populations, fairness considerations also support the a cut-off date for implementation of new rules at a future point in time that will not significantly disadvantage investors who have purchased stallion rights who reasonably believed that the rules would not be greatly altered to their disadvantage.

### **Stallion Values and Stallion Exports**

High-quality, fertile stallions will become less valuable in the North American market as a result of the implementation of a limit on mares bred. As a result, they will be more likely to be purchased for overseas duty, thus diminishing the genetic quality of North American foals. Similarly, fertile, high-quality proven stallions will become more reasonable export candidates.

Reasonable substitute (replacement) stallions that will benefit from required smaller books for especially popular stallions will find both the quantity and the quality of the mares they breed will increase. Though decreased rarity of their foals and (typically minor) increases in breeding shed congestion will exert slight downward pressure on the market value of their seasons, the increased demand for their seasons from mares displaced by the 140 limit is likely to outweigh any negative effects. Their values will normally increase. This author argues that the values of \$5,000 to \$10,000 stallions will be modestly enhanced while Dr. Jill Stowe of the University of Kentucky opines that they are likely to change little if at all as a result of a 140 mare limit.

Increased numbers of foals by mid- and lower-level stallions will likely result in average prices of foals falling modestly, and some breeders will drop out given that stallion season prices are likely to increase (at least) initially. Sales firms will likely see modest decreases in revenues and racetracks will likely see modest decreases in runners as a result of the implementation of a limit on mares bred.

### **Addendum**

#### **Contrasting the Economics of the Jockey Club's Original Proposal and Final Rule**

##### **Popular, Replacement, and Low-Level Commercial Stallions (and the Adjustment Period)**

Implementation of the original (September 2019) Jockey Club Proposal would have resulted in increases in stud fees for most commercial stallions for the 2021 breeding season, with substantial increases in fees for very popular stallions, especially stallions with triple digit stud fees, lesser increases for second tier stallions, and modest/minimal increases for lower level commercial stallions. Because the final rule applies only to stallions born in 2020 or later, the final rule defers stud fee increases of any consequence until the first significant commercial stallion prospect from the 2020 crop goes to stud. That is likely to occur in 2025.

Part of the "bump" in stallion fees that would have occurred if the original Jockey Club proposal had been implemented would have come from the sudden scarcity of stallions, as most stallions would have been immediately limited to breeding a maximum of 140 mares. Because the final rule gradually phases in the 140 mare limit, that sudden bump in fees will not occur. Any breeding-limit-rule-related increases in season prices will initially be limited to a few very popular stallions that in previous years would have bred "superbooks" of well over 140 mares. This will occur beginning in 2025 if we assume that the first very popular stallion or stallions born in 2020 retire to breed as newly-turned five-year-olds.

Each succeeding year, an increasing percentage of stallions will be subject to the 140 mare limit. Very popular stallions that would have been likely to breed well over 140 mares in the absence of a mare

limit will charge higher prices than otherwise would have been the case, though the total revenues they earn will be lower than they would have been in the absence of a breeding limit. Stallions that benefit from the spillover of mares from popular new stallions subject to limits on mares bred will be likely to experience lesser increases in season prices than popular new stallions themselves. Under the final rule, modestly-priced commercial stallions will experience minor, perhaps no increases in season fees because the gradual phase-in of mare limits will easily allow newly-retired stallions to expand modestly-priced stallion rosters to meet increased needs.

The adjustment period that will begin (in 2025?) when the first very popular stallion subject to the 140 mare rule retires will continue until all stallions of consequence are subject to the 140 mare rule, either because of the Jockey Club rule or because of stallion managers' decisions to limit breedings. This writer estimates that well over 90% of that adjustment process will have occurred by the year 2037 when only stallions aged 18 or older are still allowed to breed more than 140 mares.

### **Winners and Losers**

Implementation of the original Jockey Club proposal would have significantly decreased revenues to popular proven stallions that are very fertile (most notably Into Mischief and Uncle Mo). It would (less dramatically) have benefited stallions that are reasonable substitutes for stallions that would otherwise breed well over 140 mares. The final rule grandfathers all stallions born before 2020, and in the process makes the rules change both more fair, and less likely to lead to litigation against the Jockey Club.

The final rule is likely to increase "genetic diversity" (if that is defined as less inbreeding) relative to what would otherwise have occurred. But, it will also decrease the availability of future "Mo" and "Mischief"-like outstanding proven stallions born in 2020 or later because they will be limited to breeding 140 mares. A question that can be debated ad infinitum is whether any "wins" for Thoroughbred breeders from increasing genetic diversity will offset "losses" associated with the decreased freedom of choice available to breeders, and most especially in this writer's view, the decreased numbers of foals by future super stallions that transmit outstanding racing genes.

### **Stallion Values and Stallion Exports**

If, had the Jockey Club 140 limit not have been in place, the first stallion from the 2020 crop would have bred well over 140 mares, then the non-market restriction on mares bred will almost surely mean that his stud fee (and that of other very popular stallions new stallions from the 2020 (or a later) crop will be higher than would have occurred absent the Jockey Club 140 limit.

Initially there will be little or no noticeable effects on demand for stallion seasons to stallions other than seasons of very popular new stallions. Yes, there would be a small number of mares that would have preferred to breed to that very popular first new stallion born in 2020 that will be squeezed out of his 140 book, but that small number (almost certainly less than 100) could be accommodated by the many other stallions available with only minimal increases in demand for the average alternative stallion.

Each year, as more new stallions from the 2020 and later crops are retired to stud, the number of popular stallions affected by the Jockey Club's 140 rule will increase. This gradual process of stallions retiring to stud will result in a slow but steady increase in the stud fees of popular new stallions that would have bred more than 140 mares absent the Jockey Club rule. Additionally, as the number of mares that would be blocked from breeding to new popular stallions increase, there will be an increase in demand for substitute (replacement) stallions to breed mares that in previous years would have been part of 140+ books. Thus, not only will prices of stallion seasons to very popular new stallions increase, but prices of (replacement) stallions breeding the spillover mares from stallions that would normally have been in "superbooks" will also increase.

### **On Transparency**

Unfortunately for the Thoroughbred industry, the deliberations the Jockey Club has taken that have led to its final rule of May 2020 limiting the number of mares Thoroughbred stallions can breed have been obscure. In September 2019 The Jockey Club said they were concerned about a "genetic diversity" problem without citing scientific support for that view. They concurrently asked for comments from interested parties. Eight months later they promulgated a final rule and thanked respondents for their comments but neither summarized those comments nor shared any of them with the public. The response to this writer's inquiry about their logic and/or the sources they relied upon was answered as follows:

Dear Robert,

I am sorry, but The Jockey Club has no comment on the rule other than what was provided in the release...

Shannon Luce

(From a May 22, 2020 email from the Jockey Club)

Though it is possible that the Jockey Club used best practices in constructing their final rule, their lack of transparency calls that interpretation into question. "Take our word for it" is not a response that is likely to give many people confidence that the Jockey Club scrupulously followed the best scientific evidence, put aside biases and conflicts of interests, and promulgated a rule that is in the best interests of the Thoroughbred industry as a whole.