

Economic impact study of Britain's thoroughbred breeding industry

The Thoroughbred Breeders' Association
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Foreword



Neil Hampson
PwC Global Technology
Deals Leader

The UK Thoroughbred breeding industry plays an important role in the UK economy, environment and society. It contributes over £375m of gross value added (GVA) to the UK economy and supports 8,000 jobs directly, and a further 13,000 indirectly. The industry also facilitates Britain's racing programme, which in turn contributes approximately £4bn to the UK's GVA.

As well as these economic contributions, the industry provides important social and cultural benefits. The thoroughbred breeding industry supports an internationally renowned racing programme and has led to the third highest number of top ranked flat thoroughbreds training in GB, behind only the USA and Australia. In short, Britain's thoroughbred breeding industry is world class.

However, of late, there have been growing challenges to the industry. Some of these are familiar themes, such as rising inflation, trade obstacles, and the aftermath of Covid-19. Other challenges are unique to the industry, most notably the observation in this report that the majority of breeders operate at a loss, and that number has risen consistently since 2014. Unfortunately, on its current trajectory, it is predictable that these losses will worsen, leading to operators leaving the industry, and the number of elite thoroughbreds bred in Britain declining. On its current trends, any future report would paint a significantly worse picture in terms of losses and exits. These trends would bring into question Britain's status as a world leader in thoroughbred breeding.

Despite these challenges, our report has found that there is potential for market interventions to mitigate these trends. We have conducted a rigorous analysis of the initial impact of the existing Great British Bonus scheme, finding that it has had a significant impact on one of its stated objectives of raising the relative price of fillies. This suggests that carefully designed policy interventions can have positive and measurable impacts, with scope to mitigate some unsustainable trends in the industry.

Looking forwards, it is important that all relevant industry partners and participants develop a comprehensive understanding of the industry's challenges and opportunities. This should provide the basis for more concerted action to develop practical solutions and design potential interventions to address many areas of particular concern that we highlight.

To this effect, PwC are delighted to support the Thoroughbred Breeders' Association in preparing this economic impact study of Britain's thoroughbred breeding industry. Having conducted the two previous studies in 2014 and 2018, it has been gratifying to observe how our joint analysis has informed TBA policy and initiatives, providing a solid evidence base on which the TBA can act to best support its members. We hope that the current report will play its role in providing an evidence base for informing future policy change for the industry.



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We would like to thank all those that have contributed to this report

Our report would not have been possible without the generosity of multiple organisations and individuals that have engaged and helped us throughout our analysis

The TBA commissioned this report and have provided regular updates and insights throughout the four months of composition. We are grateful to the TBA for interrogating our analysis, providing constructive challenge to ensure robust results and assisting us with the data collection process. This report has also benefited from the wide range of meetings with industry operators that the TBA have helped to facilitate.



Weatherbys have been invaluable in providing data throughout the course of our analysis. We are grateful to Weatherbys and the International Stud Book Committee for providing the Bloodstock reviews stretching back to 2013, which have provided a rich source of data for much of our econometric analysis. Further to this, the report benefits in multiple places from other data sourced by Weatherbys, such as the Fact Book, Bloodstock review and bespoke data sources, for which we are grateful.



We would also like to thank The Horserace Betting Levy Board and the Racing Foundation for their generous support of this report, which has made the production of the current report feasible.



Our analysis has also benefited greatly from the engagement of industry operators, in the survey responses, interviews and handling of data requests. We are appreciative of the 139 participants that responded to our survey, giving us a broad understanding of the problems facing the industry and proving a solid foundation for our economic input - output analysis. We are grateful to all those that engaged in focused interviews, where we were able to better understand the practical problems facing breeders which underlies our qualitative analysis and the interpretation and explanation of much of our quantitative analysis. The analysis has also benefited from responses to particular data requests by survey respondents.

In addition, we are thankful for the British Horseracing Authority's (BHA) databank, that has provided us with numerous insights in our analysis, as well as those from the BHA that helped us to understand the important interlinkages between the thoroughbred breeding and racing industries in Britain.



Executive summary

1

The thoroughbred breeding industry provides rich benefits to the UK economy but faces significant challenges



c.£375m contribution to UK economy
Including a substantial £229m indirect supply chain impact



c.21,000 UK jobs supported
c.8,000 jobs directly supported and c.13,000 jobs supported more broadly.



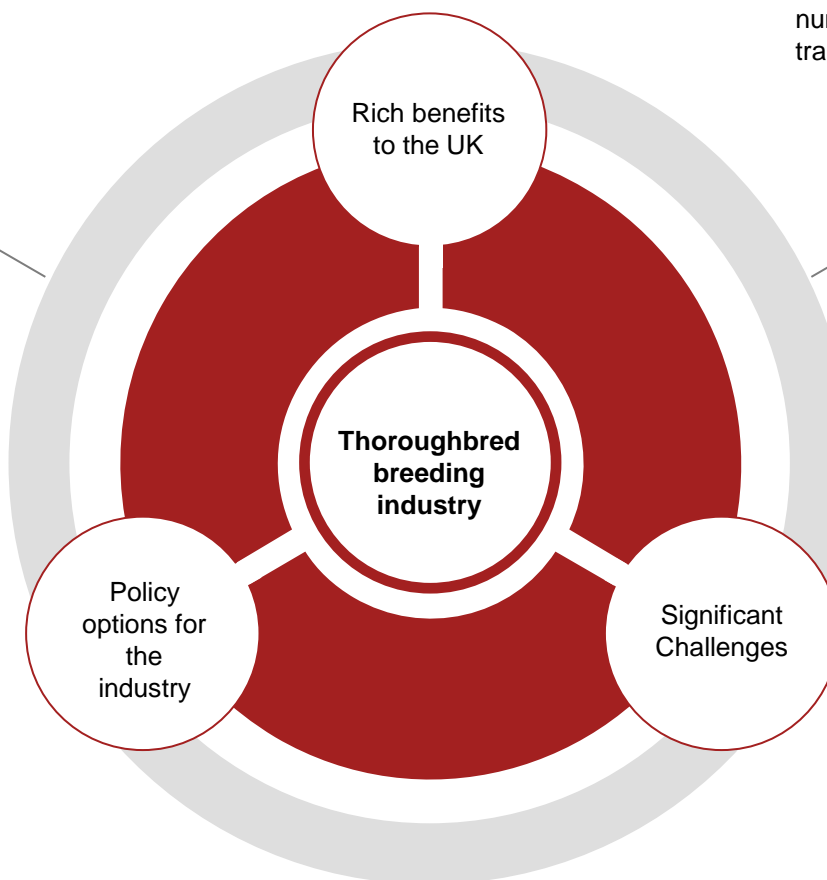
A world class racing industry
In 2021, the UK hosted the third highest number of top ranked races (17) and the third highest number of top ranked horses in training.



Significant positive GBB impact
GBB approximately halves the price differential between fillies and colts



Opportunities for targeted interventions should be carefully considered
In light of the challenges facing the industry, market and policy interventions should be considered to obtain its long term sustainability



Reduced profitability
The average and median sale of foals and yearlings across disciplines makes a substantial loss



Reduced foal crop projected
Given profitability levels, the foal crop could plausibly reduce to around 3,000 by 2050



Reduced stallion & broodmare numbers
The number of stallions standing and broodmares domiciled in GB has decreased significantly since 2007.



Racing programme under threat
A reduced foal crop in terms of number and quality will restrict the number of races that can be hosted in the UK



In light of the significant benefits the industry brings, policy interventions should be considered, to achieve its long term sustainability

- The UK thoroughbred breeding industry plays an important role in the UK economy, environment and society. **It contributes over £375m of gross value added (GVA) to the UK economy and supports 8,000 jobs directly, and a further 13,000 indirectly.** Given the distribution of breeders, this impact occurs mostly in the rural economy. The industry also facilitates Britain's racing programme, which in turn contributes approximately £4bn to the UK's GVA.
- As well as these economic contributions, the industry provides important social, environmental and cultural benefits. The thoroughbred breeding industry supports an internationally renowned racing programme, and has led to **GB having the third highest proportion of top ranked flat thoroughbreds in training worldwide**, behind only the USA and Australia. In short, Britain's thoroughbred breeding industry is world class.
- However, in recent years there have been growing challenges to the industry. Some of these are familiar themes, such as rising inflation, trade obstacles, and the aftermath of Covid-19. Other challenges are unique to the industry, most notably the observation in this report that the majority of breeders operate at a loss, and **that average loss made per GB sale has risen consistently since 2014.** Unfortunately, on its current trajectory, it is likely that these losses will worsen, leading to operators leaving the industry, and the number of elite thoroughbreds bred in Britain declining. On current trends, any future report will paint a significantly worse picture in terms of losses and exits. These trends would bring into question Britain's status as a world leader in thoroughbred breeding.
- Despite these challenges, our report has found that there is potential for market interventions to mitigate these trends. We have conducted a rigorous analysis of the initial impact of the Great British Bonus (GBB) scheme, finding **that the scheme has had a significant impact on raising the relative price of fillies**, its primary stated objective. This suggests that carefully designed policy interventions can have positive impacts, with scope to mitigate some unsustainable trends in the industry.
- Looking forwards, it is important that relevant industry partners develop a comprehensive understanding of industry challenges and opportunities. This should provide the basis for concerted action to develop practical solutions and design potential interventions to address areas of particular concern.



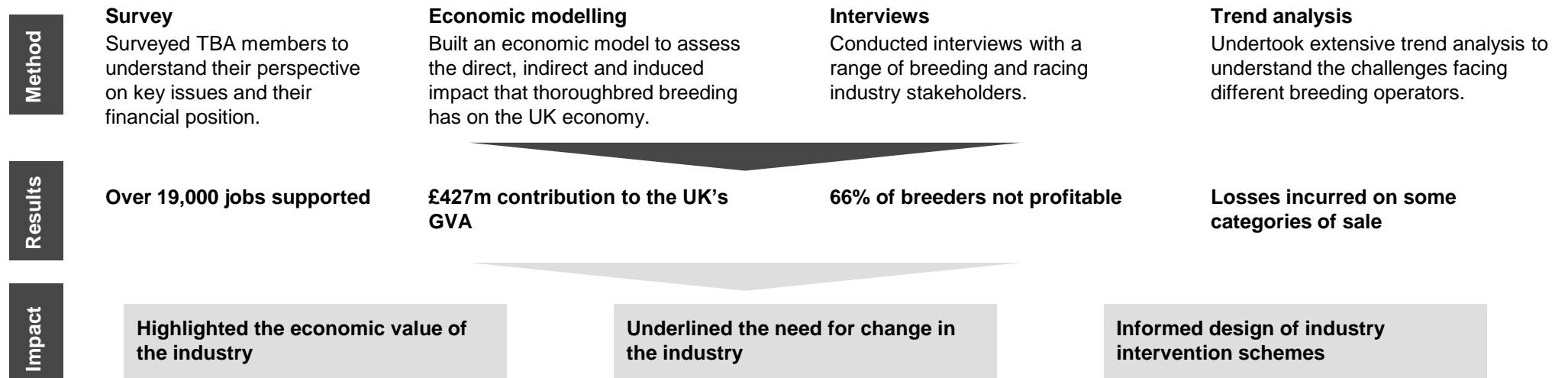
Introduction

Our economic impact study builds on two previous analyses, that underlined the need for change in the industry

Background and context

- The Thoroughbred Breeders' Association (TBA) has commissioned PwC to conduct an Economic Impact Study for the thoroughbred breeding industry, which builds upon previous analyses in 2014 and 2018.¹
- Our 2014 and 2018 analyses both underlined the value of the industry, with the 2018 assessment showing the industry contributes £427m of gross added value and over 19,000 jobs to the UK economy. However the assessments also underlined the need for change, as it showed most breeders were unprofitable, and emphasised the negative long-run impacts that this may have on the foal crop and racing industry.
- Partly on the basis of the evidence base provided by these assessments, the TBA and the wider industry introduced important initiatives to address issues such as support for small breeders, tax fairness, and interventions on the incentive structure for the breeding of stock. Of specific importance was the Great British Bonus (GBB), a widespread scheme to incentivise the ownership and racing of fillies.

Impact of our 2018 analysis



1. Previous Economic Impact studies are available for download here: <https://www.thetba.co.uk/breed-protection/industry-studies.html>

Our assessment expands upon the 2018 analysis by examining the reasons for low profitability in greater detail

Given the recent challenges to the industry posed by Covid-19 and the UK's departure from the European Union, the TBA has commissioned PwC to undertake a further assessment to examine the current state of the industry, analyse the prospects of the industry in light of these challenges, and assess the impact of the Great British Bonus scheme against its stated objectives.

As a starting point, we refreshed the core tenets of the previous reports, including the survey, economic model, interviews with stakeholders across the sector, and trend analysis. This allowed us to undertake a broad comparison between 2022 and 2018 in considering the health of the industry. Secondly, we expanded our analysis to undertake a detailed profitability assessment across years since 2013, from which we form projections on the foal crop and racing programme. We have also undertaken an econometric analysis of the drivers of demand at sale, helping us to understand the aspects of the breeding industry that may require support, and identify areas of opportunity for breeders. Finally, a further econometric study designed to isolate the causal impacts of the Great British Bonus (GBB) scheme allows us to understand the effectiveness of policy intervention in achieving a sustainable breeding industry.

Activities refreshed



Survey



Economic model



Interviews



Trend analysis

Activities expanded

Profitability analysis

A detailed assessment of the profitability of individual sales was undertaken. This was combined with nomination fee data to examine and explain the changes in profitability in greater depth.

Projections

Considered the link between profitability of breeders and the foal crop and formed some scenarios for long term profitability. These were then linked to the foal crop to produce a set of projections for foal crop and the ensuing impact on the racing programme.

Drivers of demand

Combined publicly available sales and stallion fee data in addition to wider industry metrics to estimate the drivers of demand using an econometric model.

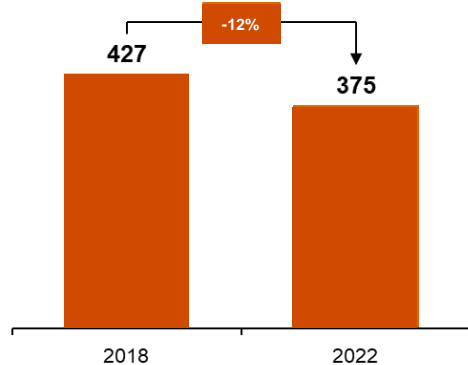
Policy evaluation

Econometric analysis of the effectiveness of the GBB scheme since its inception in June 2020.

The GB thoroughbred breeding industry is of substantial value to the UK economy and society

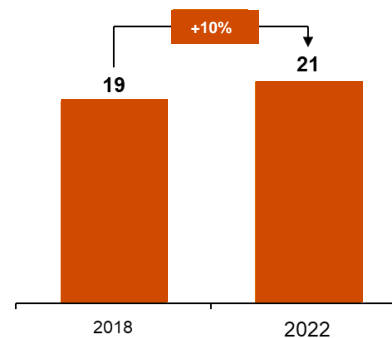
The thoroughbred breeding industry maintains a significant economic impact...

GVA – total impact, 2018 and 2022, £m



... and has a strong overall employment impact...

Employment – total impact, 2018 and 2022, thousands of FTE



...whilst playing a vital role in supporting the UK racing industry

Critical enabler to the UK's £4bn horse racing industry

In addition to the economic impacts that are captured by GVA, the industry is a critical enabler to the racing programme in the UK. **The UK horse racing industry is estimated to contribute approximately £4bn to UK GVA**, which is overwhelmingly reliant on the production of quality bloodstock.

The maintenance of the thoroughbred industry in the UK is of significance economically, as well as socially, environmentally and culturally.¹ **All these benefits are discussed in more detail in section 3 of this report.**



Britain consistently trains the second highest number of top ranked flat race-horses, and hosted the third highest number of top ranked races in 2021. This indicates the persistent quality of the breeding and racing environment in Britain.



Britain has garnered a reputation as the elite location for thoroughbred racing due to its climate and infrastructure being particularly conducive to breeding and training quality bloodstock. Britain has also uniquely benefited from the historic connection between the industry and the royal family.

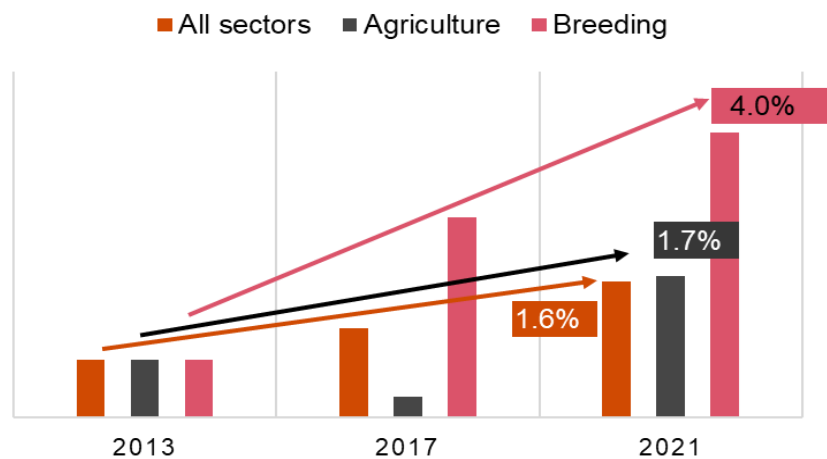


The thoroughbred breed is an important cultural pillar of Britain, with a large community of people devoted to the nurture of the breed. Research by The University of Exeter suggests that equine interaction is beneficial to mental health and wellbeing.²

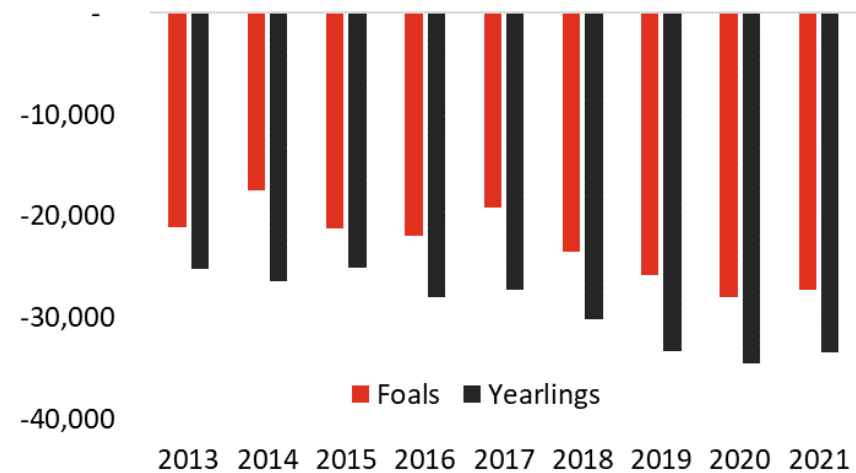
1. The TBA leads environmentally important work, including the completion of carbon calculations for the industry. Case studies are available here: <https://www.thetba.co.uk/advice-info/guidance-hubs/sustainability-hub.html>
2. For example, the University of Exeter report is available here: https://www.exeter.ac.uk/news/research/title_715469_en.html

However, despite the value created by the industry, increasing cost pressures have resulted in worsening losses since 2013

Index of price levels in the thoroughbred breeding industry and comparators, with average annual change in prices (%) labelled



Foals and yearlings, median profit per sale, after nomination fees (£)



Cost pressures have increased significantly in the breeding industry compared to the agriculture industry, and the economy as a whole. Since 2013, prices in the economy have risen at an average of 1.6% per year, comparable to the 1.7% average annual increase in prices for agriculture inputs.¹ Based on information from interviews with industry experts, the **average annual increase in prices of inputs in the thoroughbred breeding industry was 4.0% over the same period**. Though not covered by our data, anecdotal evidence suggests a higher increase in the cost of inputs for breeders in 2022, even against this backdrop. We provide detail as to the sources we used for the index of price levels in Annex A1.

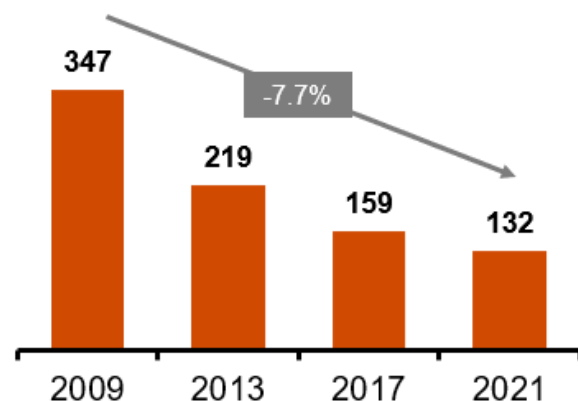
We analysed the profitability of sales using various data sources to understand the sustainability of the breeding industry in Britain. This exercise suggests that in 2021 the **profitability for the median yearling sale was around -£33k, and for foals was around -£27k**, meaning most horses are sold at a significant loss. Moreover, median losses have become larger over time, putting into question the sustainability of the breeding industry in Britain. **We explain the method in detail in section 5 of this report**. High inflation and rising interest rates will add to cost pressures in 2022, likely compounding this trend.

1. Please see Annex A1 for a note including the sources used for this assessment.

Worsening profits are likely driving down the number of broodmares and stallions based in GB, which in turn reduce the foal crop

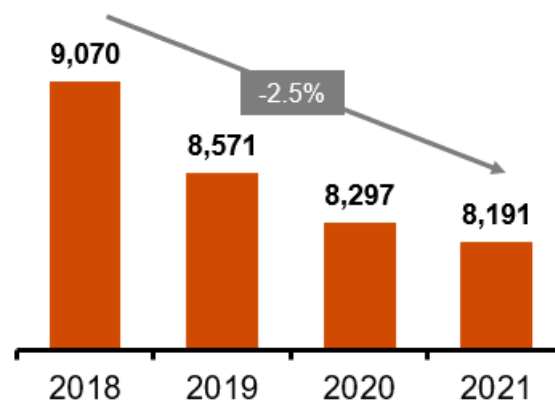
The challenging financial situation facing thoroughbred breeders in Britain is likely linked to the steady decline in the foal crop since 2009. The impacts can be observed more broadly, however, as the number of stallions standing in GB and mares domiciled in GB have also diminished. Taken together, these factors likely explain the falling foal crop. **These trends are explored in greater detail in section 4 of this report.**

Number of stallions standing in GB, with CAGR labelled



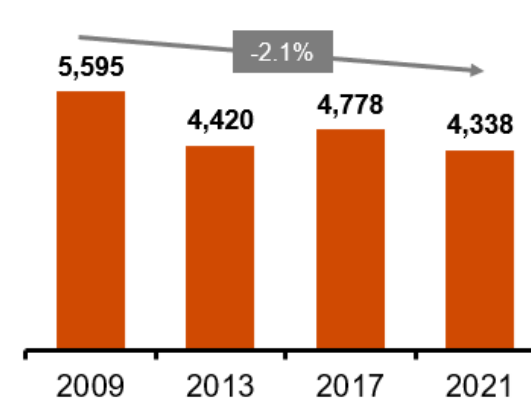
The number of stallions standing in GB has declined by an average annual rate of 7.7% since 2009. As described in further detail in **section 4** of this report, the downward trend in GB compares unfavourably to France and Ireland, which have both seen a significantly smaller decrease over the same period.

Number of mares domiciled in GB, with CAGR labelled [2018 - 2021]



The number of mares domiciled in GB has decreased steadily in recent years, dropping by around 1,000 since 2018. The number of broodmares is tightly linked to the foal crop, and as such this decrease goes some way to explaining the decrease in the foal crop, displayed on the right.

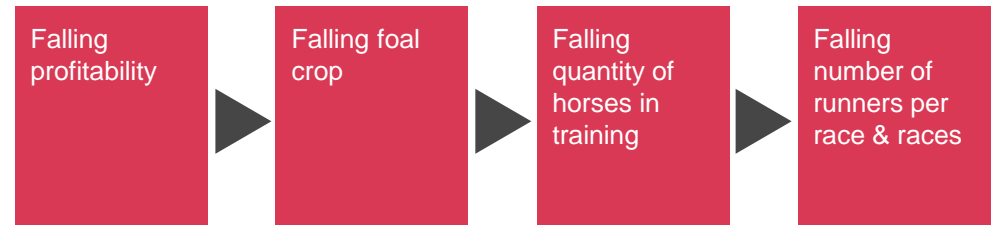
GB foal crop, with CAGR labelled



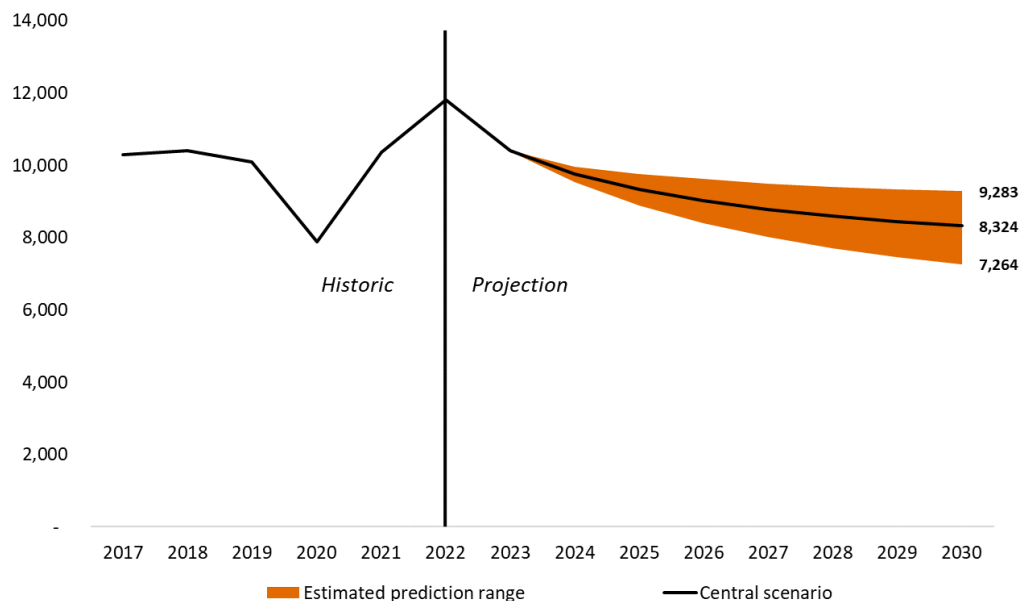
The foal crop has decreased at an average annual rate of -2.1% since 2009, falling by over 1,000 over this period. As with the number of stallions standing, this trend compares unfavourably to both France and Ireland in recent years, although the Irish foal crop did contract more significantly following the 2009 financial crisis.

Our economic analysis suggests that recurring losses in the breeding industry are likely to impact the racing programme

Interlinkages between the breeding and racing industry mean that any impact on the foal crop is likely to be felt in the racing programme. If low profitability drives breeders out of the industry, then this could reduce the number of races that can be sustained in Great Britain. Below we display our central projection and projection range for the number of races, given current industry trends.



Number of races, projections, GB, 2022 – 2030

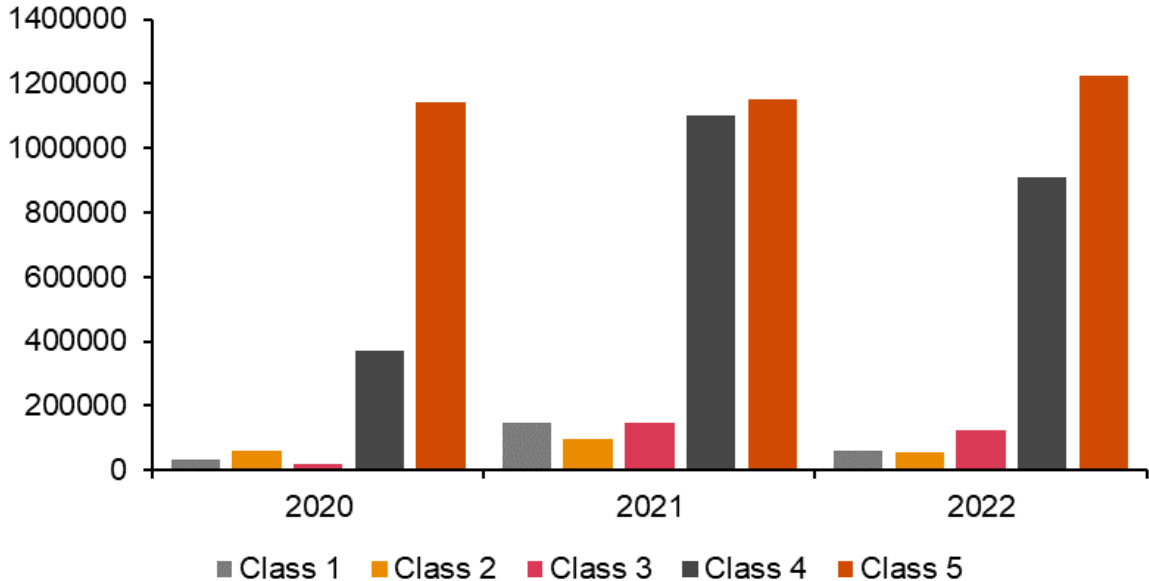


- There is a clear mechanistic relationship between the foal crop and the number of races that can be sustained in GB. All other things equal, a lower foal crop reduces the number of races that can be sustained in future years.
- Amongst other factors, the strength of this link depends on the responsiveness of imports to a falling foal crop. In our projections, we account for this to form a lower bound, upper bound and midpoint estimate for number of races in future years.
- **The assumptions underlying these projections and further projections are outlined in greater detail in section 6 of this report and Annex A3.**

Source: BHA, Weatherbys, PwC analysis

The Great British Bonus (GBB) scheme was introduced in June 2020 with the aim of incentivising filly ownership, increasing investment in British bred fillies and supporting the British racing programme

Total value of GBB bonuses from GBB-eligible races by race class and year (£)



The Great British Bonus (GBB) is a scheme introduced by the TBA in June 2020. Its aim is to incentivise the breeding and ownership of British bred fillies.

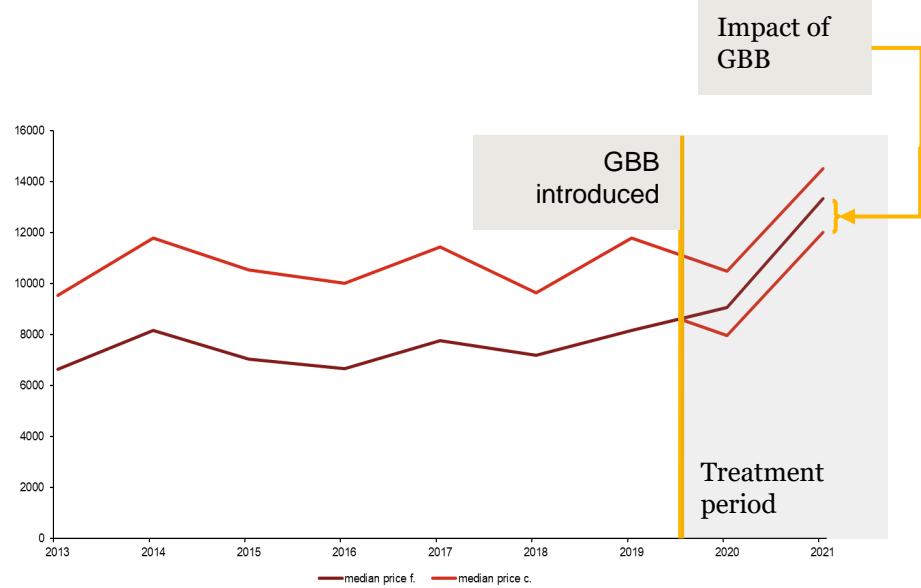
Owners, breeders and connections can win up to £20,000 in bonuses paid for winning GBB-registered fillies. The scheme has already seen substantial pay outs, as of August 2022 the bonus payout of the scheme was £6,445,837 with 367 filly and mare recipients since its inception. Many races are affected; in 2022 there will be an expected 3,000 GBB-eligible races.

The bonus is focused on British fillies, with a 50% reduction in the bonus for fillies sired by a foreign stallion and larger bonuses for filly-only races. The sizeable bonuses available in combination with the ability for a single filly to win multiple bonuses in eligible races has popularised the scheme amongst British breeders.

Note: 2022 values are up to the end of July

Our analysis shows that GBB explains a significant part of the recent convergence of sales prices between British born fillies and colts, acting as an innovative safeguard for British breeding

Average price of British fillies vs. colts GBB-relevant sales since 2013 (£)



Note: We used robust econometric techniques to build a counterfactual analysis to establish the causal impact of GBB on filly prices. In other words, we compare prices for fillies since the introduction of GBB with an estimate of prices for fillies had the scheme not been introduced.

Change in price of GBB- eligible fillies since June 2020

+16.3%
Increase in GBB-eligible filly prices

Change in filly prices by age

+30.7% Increase in GBB-eligible foal price
+14.8% Increase in GBB - eligible yearling prices

Change in filly prices by discipline

+13.4% Increase in GBB - eligible flat filly price
+26.5% Increase in GBB - eligible jump filly price

Conclusions

- **The industry is economically and socially important to the UK.** The thoroughbred breeding industry is of central importance to the racing industry, given its GVA impact of £375m on the UK economy and its role as a critical enabler for the c. £4bn racing industry. In addition to this, it supports around 21,000 jobs as well as significant broader social impacts, such as the intrinsic value of breeding to many involved in the industry. Together these suggest the maintenance of a world-leading thoroughbred breeding industry in GB is of pivotal importance.
- **Profitability has worsened significantly over the last decade.** Our analysis shows the profitability of the median sale for both GB foals and yearlings has fallen steadily since 2013. By 2021, our analysis suggested the median yearling sale resulted in around a £33k loss, whilst for foals this was around -£27k, after accounting for the nomination fee. These losses have reached a level of significance that calls into question the sustainability of the industry, and explains the fall in the foal crop and number of broodmares domiciled in GB over the last decade.
- **If unchecked, persistently and substantially negative profitability will have consequences.** If the losses incurred by thoroughbred breeders continue to worsen then the foal crop will continue to contract as breeders inevitably leave the industry. In our projections, we assume a return to a sustainable level of profitability across the industry in the long term, and show that without intervention this will result in a significant decrease in the foal crop. The global foal crop is also declining, therefore there would then be, in turn, an impact on the racing programme: and the various industries and jobs that the industry supports.
- **Net exports have been persistently positive.** In recent years, net exports have been significantly positive, as Britain has failed to make up for strong international demand at sales through import markets. This may have a lasting impact on the quality of the bloodstock retained in Britain.
- **The stallion market has become more polarised in recent years with the numbers standing in Britain reducing at a faster rate than those in Ireland and France.** Nomination fees for GB stallions have risen over the last decade and the level of nomination fee at which breeders 'break even' has increased dramatically. Total numbers and diversity in stallion profiles have both suffered. The impact of the UK leaving the EU on the movement of horses and additional health, administrative and financial burdens adds to concerns for the future shape of the GB stallion market.
- **Our price determinants analysis underlines the relative importance of stallions.** Our analysis shows that the level of nomination fee paid by breeders is the biggest predictor of price, with gender and the average value of broodmare progeny also important. This implies that the probability of a high-value foal depends on up-front investment by breeders, and confirms the relative importance of the stallion market.
- **Our econometric study suggests that GBB has had a significant impact on the price of GB born fillies.** Our study examined the trend in filly prices compared to that of colts, after controlling for a variety of factors that could influence the price of fillies. Our study found that GBB increased the price of fillies, all else being equal, by 16%, illustrating the effectiveness of the GBB scheme.
- **Major concerns with staffing have compounded the problems of breeders.** Survey results show high percentages of breeders facing recruitment, skills and retention challenges. The proportion of breeders facing these difficulties has risen significantly since 2019, with low numbers of applications with the required skills marked out as a particular issue. These staff shortages will be an important blocker to industry growth unless solutions can be found.

Recommendations

The GB breeding industry should reach sustainable profitability levels to ensure a strong foal crop and racing programme into the future. Channels that could be considered in obtaining this are as follows:

- **Recommendation 1:** Targeted interventions through carefully designed incentive schemes are likely to have a significant impact on the industry. GBB has demonstrated that such schemes can make a major impact, in short order. Our analysis has confirmed that a significant portion of the recent convergence in prices between British born colts and fillies can be attributed to the GBB scheme. Similarly designed schemes are likely to have an effect of similar magnitude.
- **Recommendation 2:** Growth in prize money remains fundamental to the future of the breeding industry by attracting owners to invest in bloodstock, and to breeder rewards through growing demand in the sales ring or increased returns if racing their own stock. The skewed distribution of sales prices as illustrated in **section 5** shows that the majority of sales currently make a loss, with a small number making a significantly positive return. This distribution reflects the small probability of very large wins, and hence why nomination fee and dam progeny are the strongest drivers of demand. Active intervention in owner and breeder rewards through prizemoney is therefore likely to be transformational in increasing demand for stock outside of the very elite top of the industry.
- **Recommendation 3:** There is a need for creative development in the funding of nomination fees. Because nomination fees are a strong driver of demand (and, therefore, price) smaller breeders are more likely to command higher sale prices if barriers to entry are removed. Recognising that nomination fees have risen and the impact this has on profitability, then there may be scope for arrangements such that both risk and reward are more equitably shared.
- **Recommendation 4:** Careful thought about how to counteract the concentration of the stallion market may aid breeder profitability. As displayed in **section 4.1** the number of stallions standing in GB has fallen significantly, along with the number of studs with stallions standing (**section 9.4**), meaning the variety of stallions, especially at the mid-fee range (esp. c. 20k – 75k), has diminished. Incentivising a greater number of stallions in the mid-fee bracket to stand in GB would likely ease pressure on broodmare owners facing the high travel costs abroad and may also allow for the development of progeny that return a profit at sale.
- **Recommendation 5:** There is a need to develop ownership models in the bloodstock industry that improve affordability and accessibility, as part of a range of initiatives to reverse the decline in breeder numbers and current ageing demographic profile.
- **Recommendation 6:** Considered thought and follow up engagement with employers is required in developing strategies to alleviate the growing issues around the recruitment and retention of staff in the thoroughbred breeding industry, with a focus on the supply side.



Value of the breeding industry

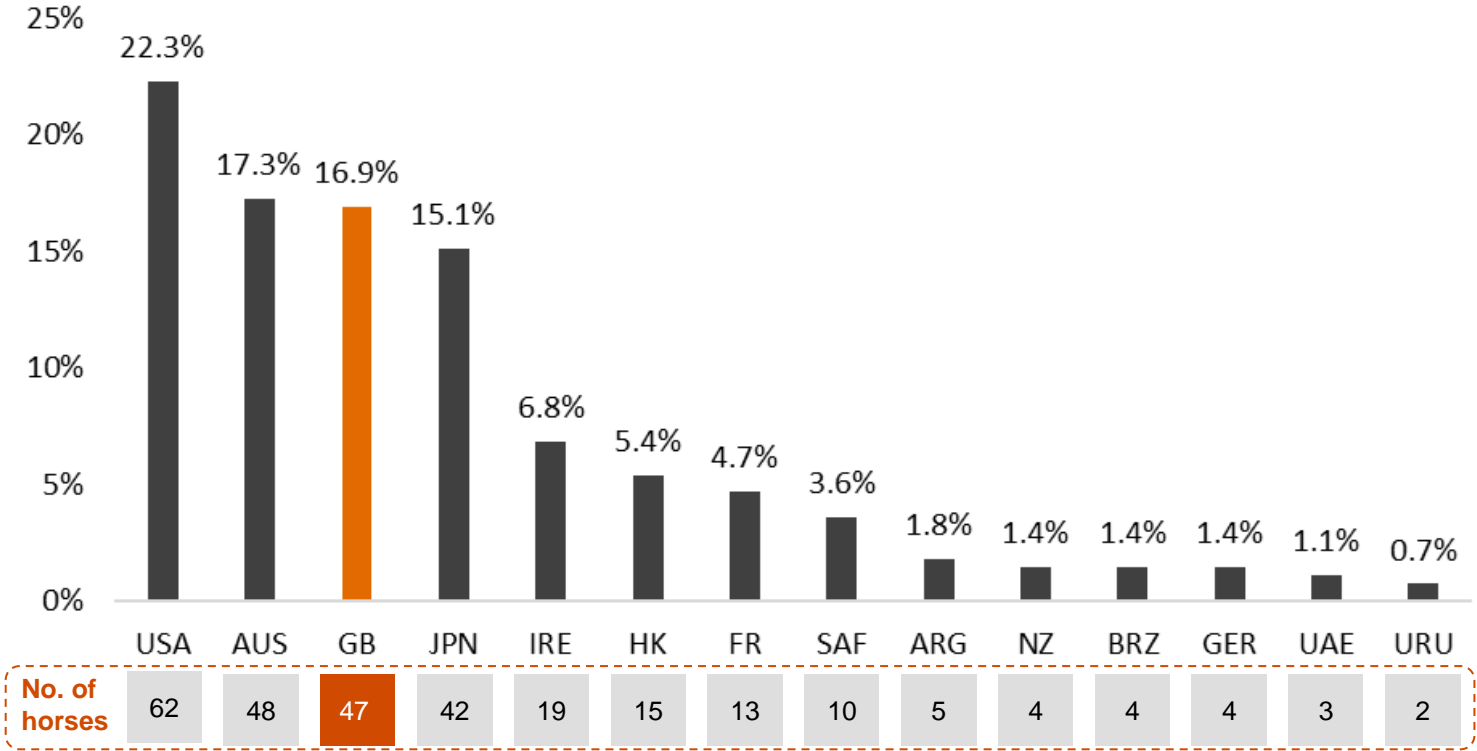
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3.1

The GB thoroughbred breeding and racing industries have an enduring global appeal

The third highest number of elite flat thoroughbreds in the world are trained in GB

Proportion of horses ranked within the LONGINES 2021 top 197 training in GB



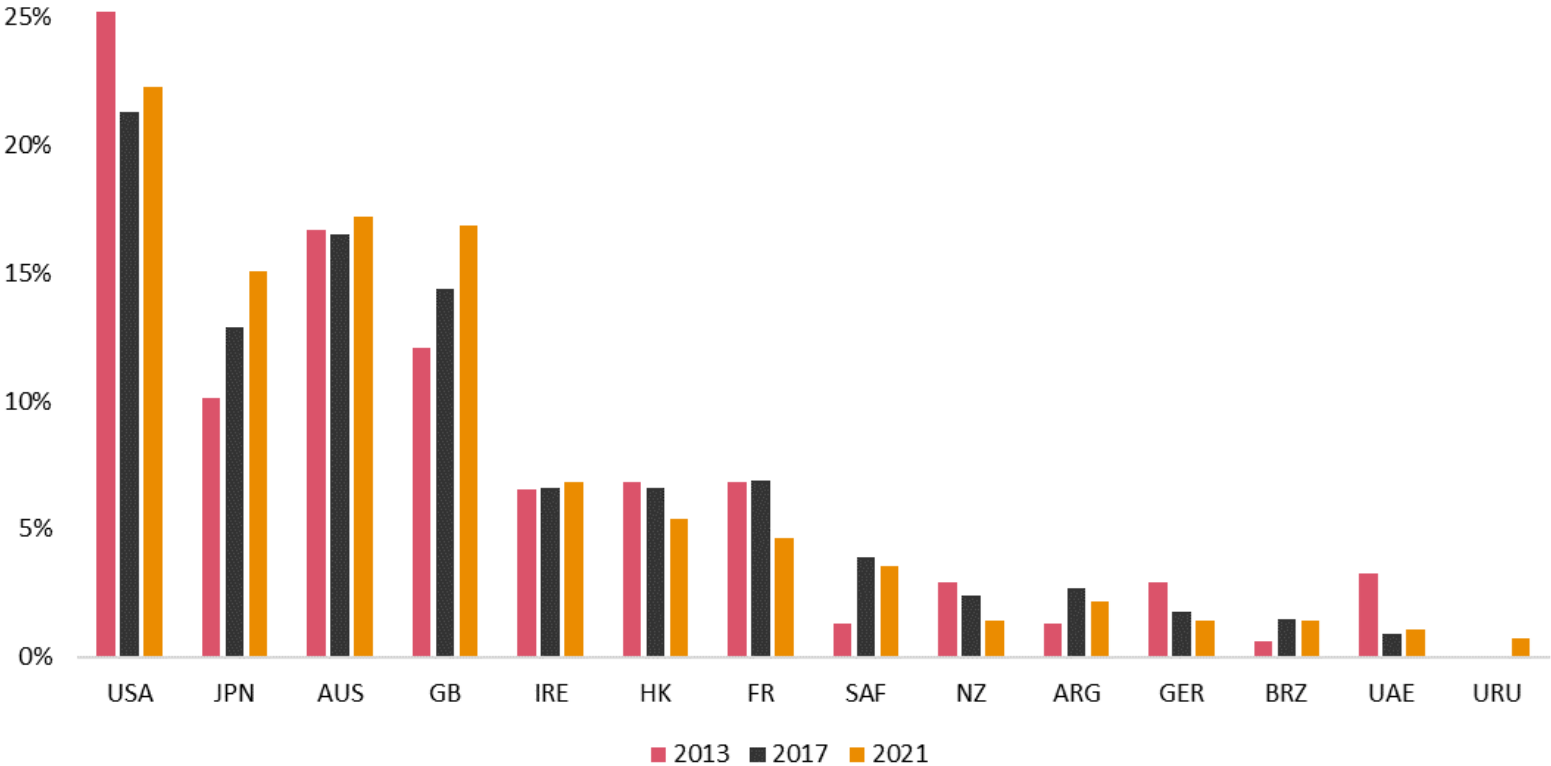
This data shows that 47 of the world’s top ranked horses were in training in GB in 2021. This was the third highest number globally, after the US (62) and Australia (48).

Note: As multiple horses have the same amount of ranking points, there are 278 names within the top 197 ranking places. The LONGINES rankings are based on the ratings earned by horses running worldwide, and compiled by the International Federation of Horseracing Authorities (IFHA) through racing officials and handicappers, who compile the ranking order by agreeing on the rating for each horse.

Source: IFHA, PwC analysis.

The performance levels of flat thoroughbreds trained in GB has risen since 2013

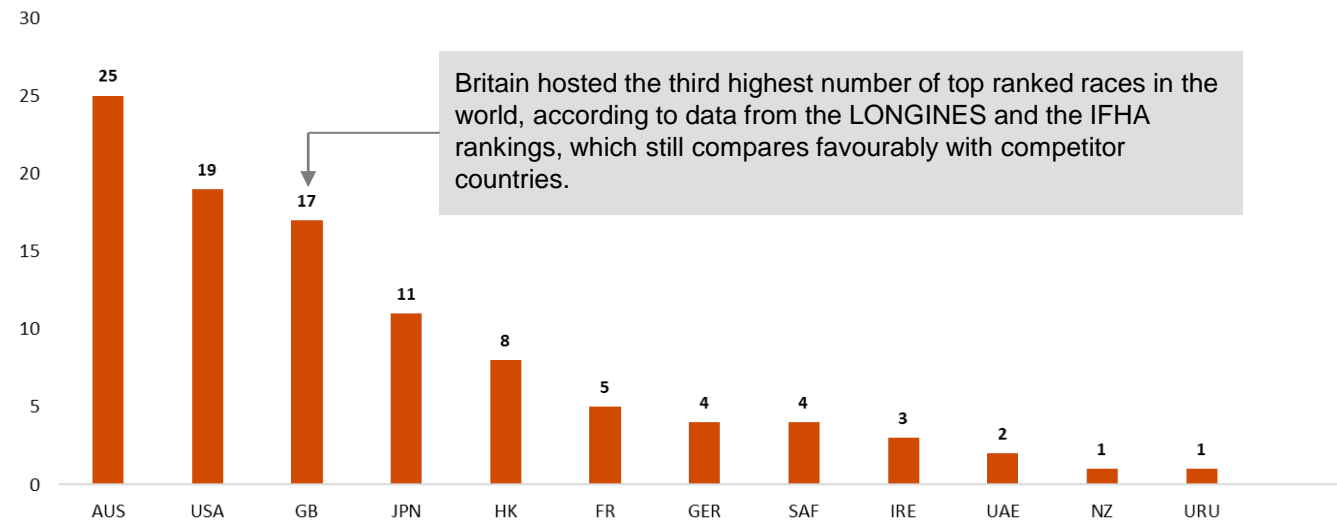
Proportion of horses trained by country within the LONGINES 2021 top 197 rankings (for 3 yr olds and upwards) for 2013, 2017 and 2021



- The proportion of top ranked horses being trained in GB has increased over time, rising from 12% in 2013 to 14% in 2017 and then to 17% in 2021. This shows that the relative quality of performance of flat thoroughbreds training in GB has increased over this time period.
- We note that there is significant volatility in these rankings, and they reflect only the health of the top end of flat racing. However these figures do suggest that GB remains a well-regarded destination for elite horses in training, demonstrating GB's global appeal.

Britain hosted 17 of the top ranked races in 2021, the third highest in the world

Number of top ranked races hosted by country



Other reasons supporting the success of the GB industry

Reputation

Britain has garnered a reputation as an elite location for thoroughbred racing due, in part, to its historic connection with the royal family, who have been invested in thoroughbred breeding, and the breed itself, for centuries.

Climate

Britain's temperate climate and infrastructure has provided the foundation for a productive breeding industry. This has led to substantial foreign investment in a range of breeding operations across the country.

History

The long history of thoroughbred breeding in Britain has grown a base of a skilled workforce with detailed knowledge of the breeding industry. This lays the basis for economies of scale that encourage inward investment in Britain's breeding industry.

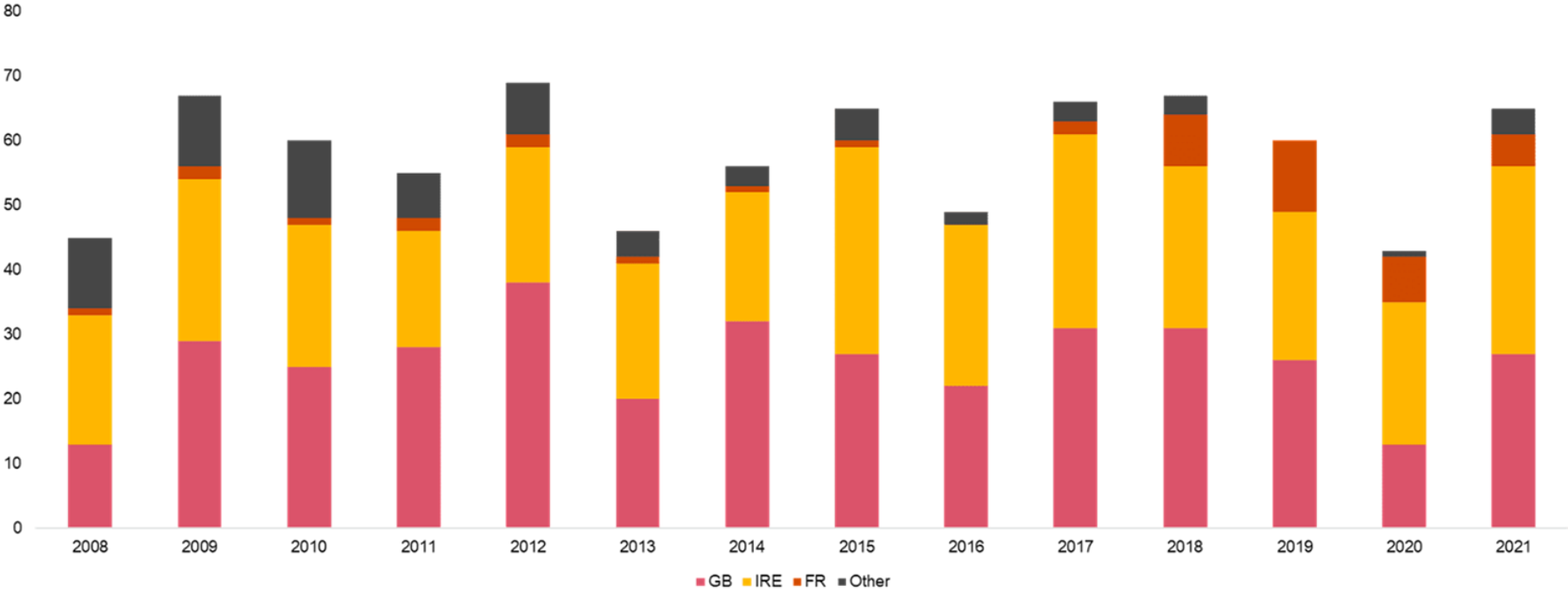
Source: IFHA, PwC analysis.

3.2

The GB breeding industry produces many top ranked horses

The number of top ranked British trained flat horses has oscillated since 2008, but has not seen a marked decline

Number of British trained top ranking horses by country of birth (LONGINES 2021 top 197)



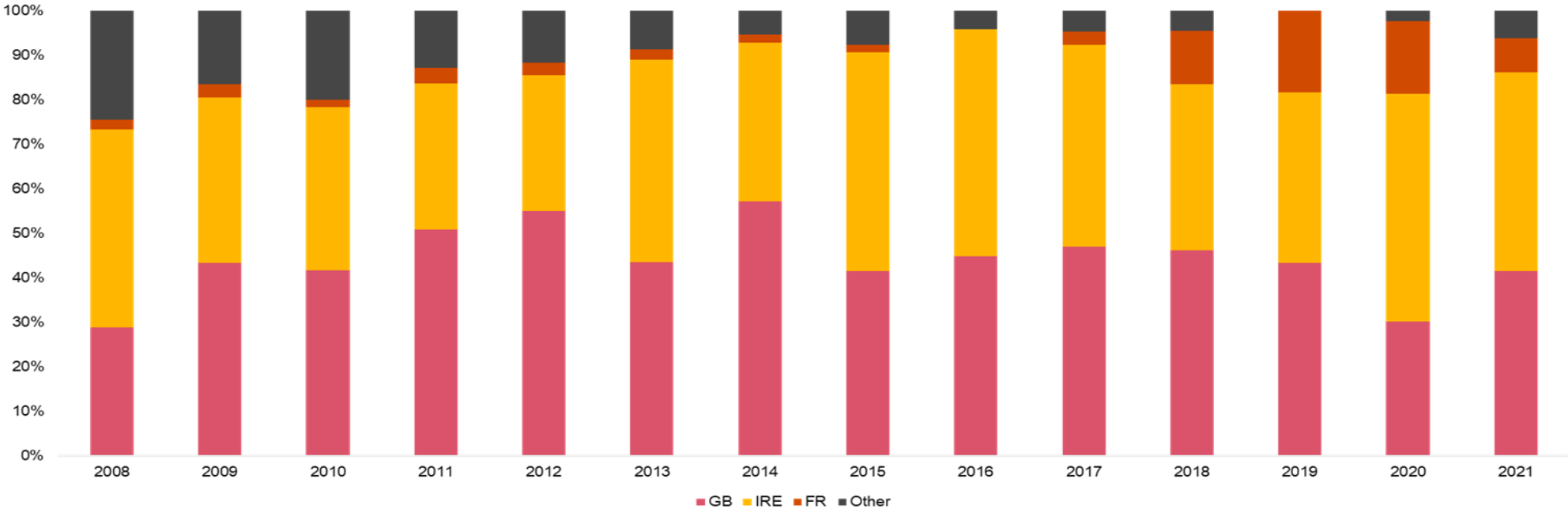
- There is no clear pattern in the number of top ranked British trained horses in the overall period, although there has been a slight decline since 2018.
- The number of British born top ranked horses training in Britain has also fluctuated over this period and also declines after 2018.

Source: IFHA, Weatherbys, PwC analysis

Note: Top ranked refers to Longines rankings, qualification being a horse must be rated 115+.

The proportion of the top ranked British flat trained horses born in France has increased significantly since 2008

Percentages for country of birth of British trained top ranking horses (LONGINES 2021 top 197)



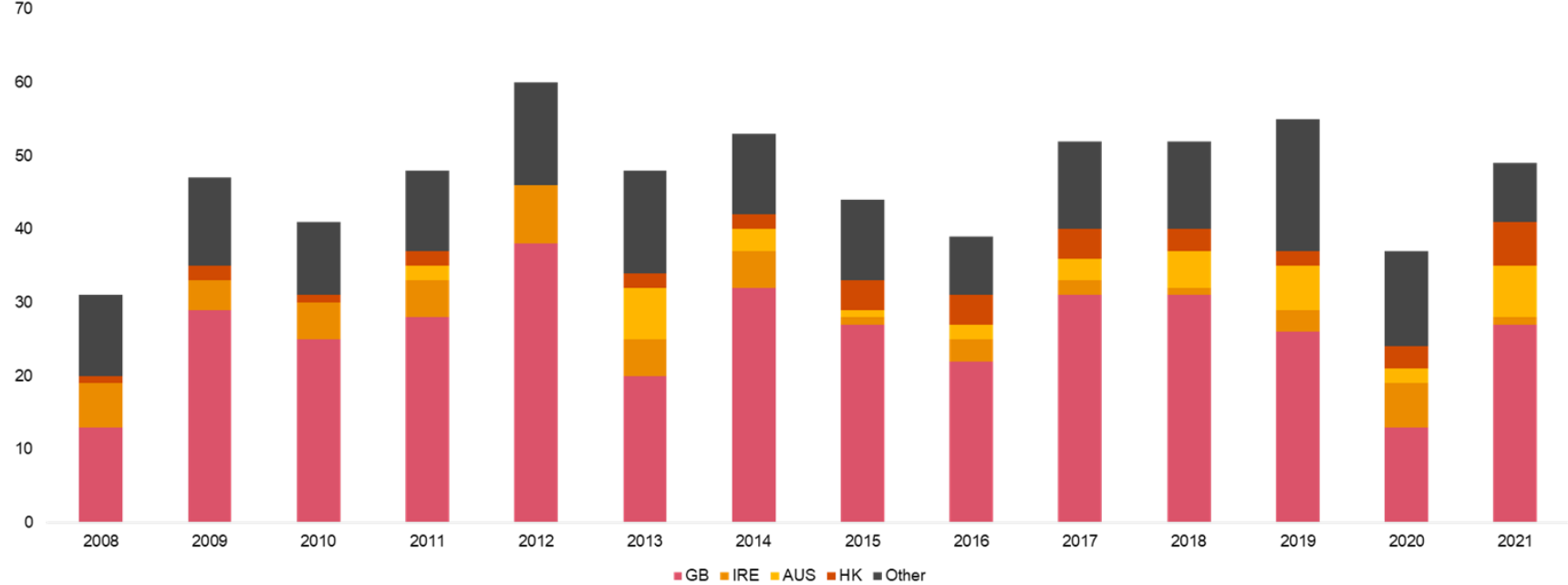
- The data shows that French born horses have increased significantly as a proportion of the top ranked British HIT
- Covid-19 has likely skewed the results of the analysis for 2020.

Source: IFHA, Weatherbys, PwC analysis

Note: Top ranked refers to Longines rankings, qualification being a horse must be rated 115+.

The number of top ranked British born horses in training globally has varied over the last 14 years

Number of top rated British born horses by country of training (LONGINES 2021 top 197)



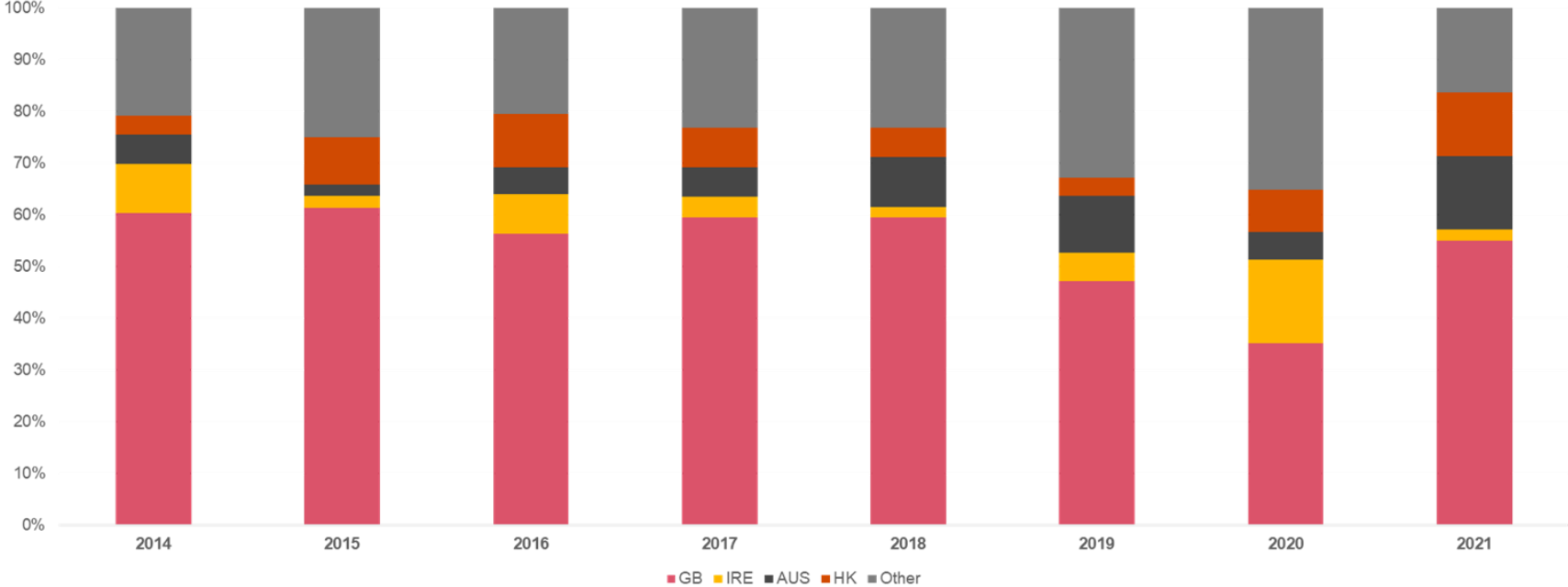
- The number of top ranked British born horses has also varied since 2008, with no clear upward or downward trend.

Source: IFHA, Weatherbys, PwC analysis

Note: Top ranked refers to Longines rankings, qualification being a horse must be rated 115+.

The proportion of the top ranked British born horses trained in Australia and Hong Kong has increased significantly

Percentages for country of training for top rated British born horses (LONGINES 2021 top 197)



- There has been a significant increase in the proportion of top ranked British bred horses being trained in Australia and Hong Kong.
- Since 2018, the proportion of horses trained in GB has been on an overall downward trend.
- Once again, Covid-19 has altered the distribution of results in 2020.

Source: IFHA, Weatherbys, PwC analysis

Note: Top ranked refers to Longines rankings, qualification being a horse must be rated 115+.

3.3

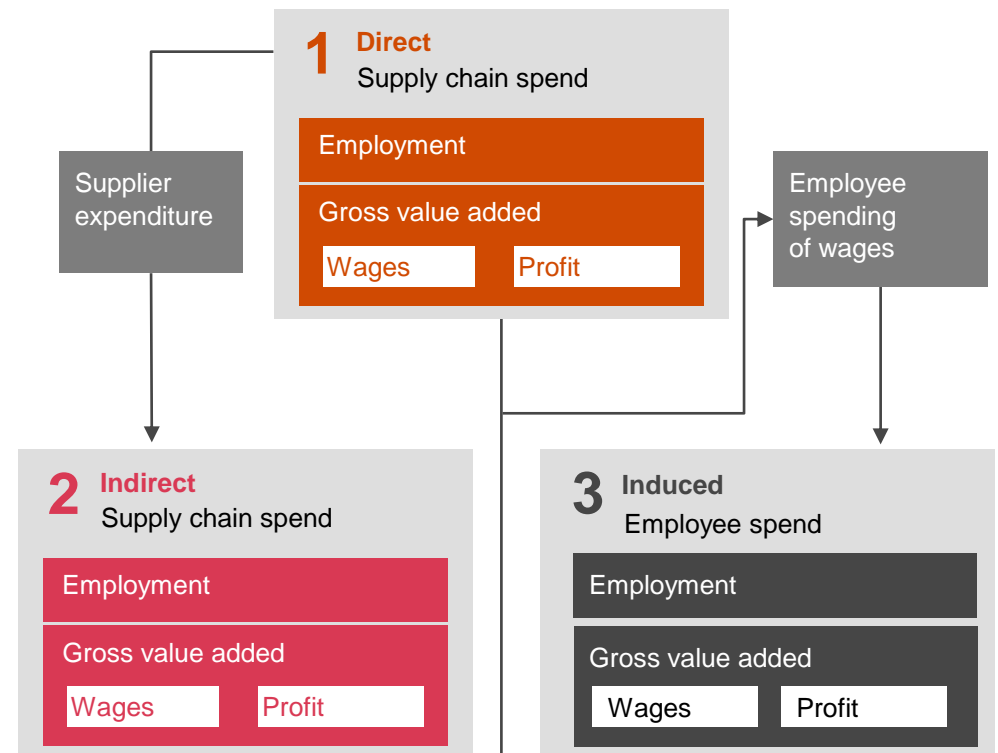
The thoroughbred breeding industry contributes substantially to the UK economy

We have used Input – Output modelling to estimate three forms of economic impact

Overview of modelling outcome variables and interrelationships

The aim of our modelling to understand the total economic contribution of the thoroughbred breeding industry to the UK economy. The two types of impact metrics we consider are GVA and employment:

- **Employment** is a fairly well understood impact, and is simply the number of full time equivalent (FTE) people employed as a result of the industry's operations.
- **Gross Value Added (GVA)** is a commonly used measure for assessing the economic contribution of a company, industry, or sector. GVA is equivalent to GDP, after taking off taxes on products (including imports), and adding back on subsidies on products (including any on imports). It is used for the avoidance of double counting, as it only adds the 'value added' at each stage of production, rather than the total value of that product.
- Standard input-output modelling accounts for three types of impact the – **direct, indirect** and **induced** impacts. The basic definition of each of these impacts is displayed in the diagram to the right, with slightly more detailed definitions offered on the following page. The diagram sets out the approach for estimating direct, indirect and induced impacts.

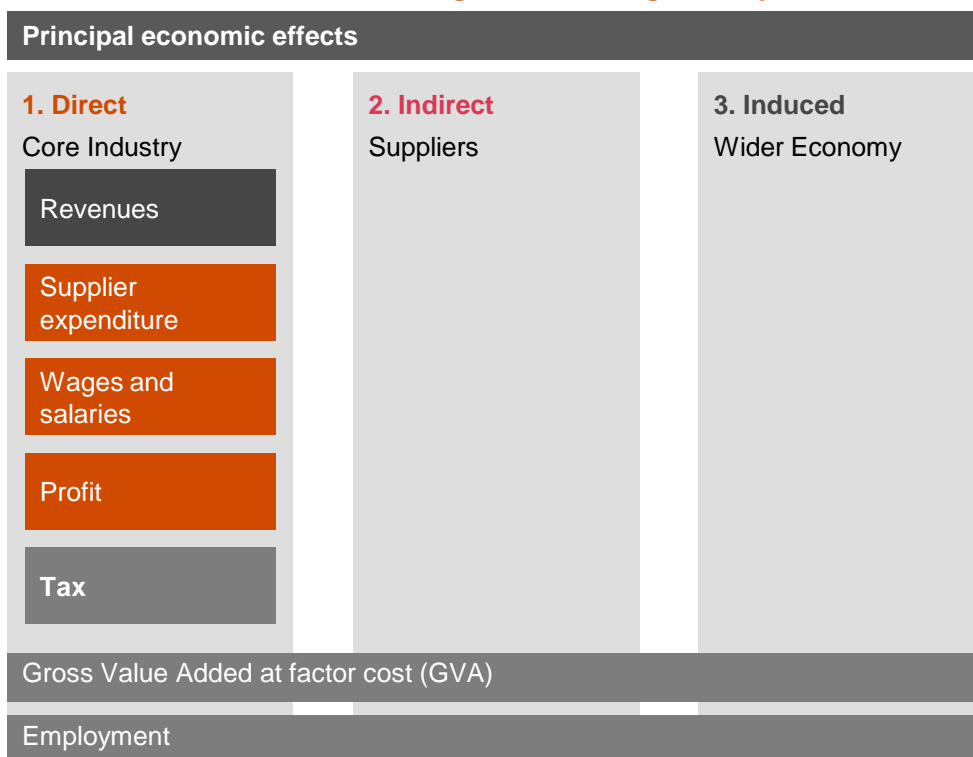


Note: All estimates presented in this study are gross rather than net, which means they do not take into account what would have happened to the economy if the horse-breeding sector did not exist – that is, they do not attempt to estimate the 'additive' impact of the industry.

Our model uses a variety of inputs to estimate these three forms of economic impact

We consider the direct, indirect and induced impacts as part of our input-output model, with the definitions for each offered below. The direct impact is the first round economic effect of the industry, and includes operational and capital expenditure, wages and salaries, net profits and taxes. The combination of these will add to the revenue of the firm. This spending then reverberates through the supply chain, an impact estimated by the indirect effect. The induced effect is the impact of employee spending, both of the firm and the suppliers in the supply chain. The direct GVA is equal to net profit, wages and salaries and taxes on production less depreciation. The indirect and induced GVA impacts are created by the supply chain and workforce spending as a result of the first round economic effect.

Economic framework of the thoroughbred breeding industry



Types of economic impact quantified

1. Direct

- The economic impact of all thoroughbred breeders in Britain.
- Includes profits and wages generated by all breeding operations (stud farms, individuals and partnerships).

2. Indirect

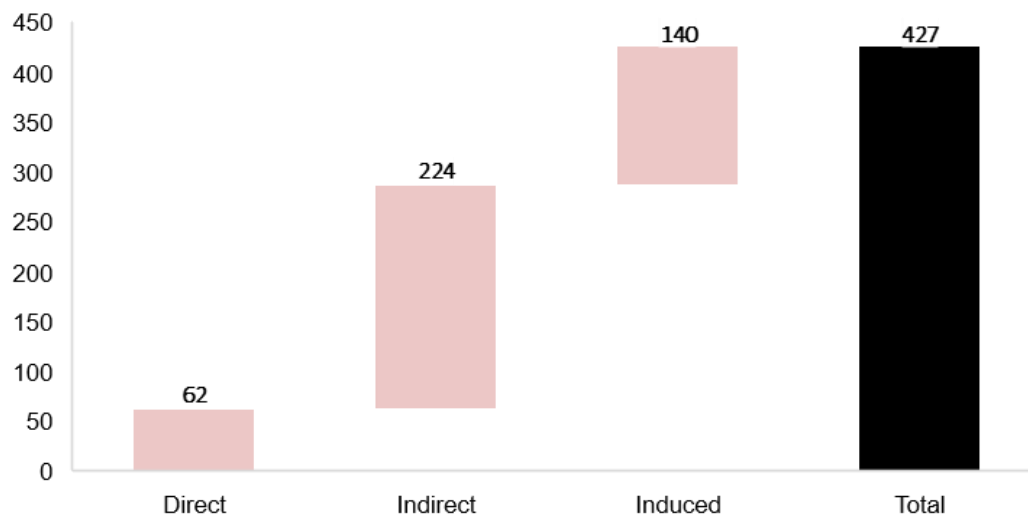
- The economic impact from the supply chain expenditure of thoroughbred breeders.
- Includes all expenditure on 'upstream' suppliers, such as feed, veterinary bills and rent.

3. Induced

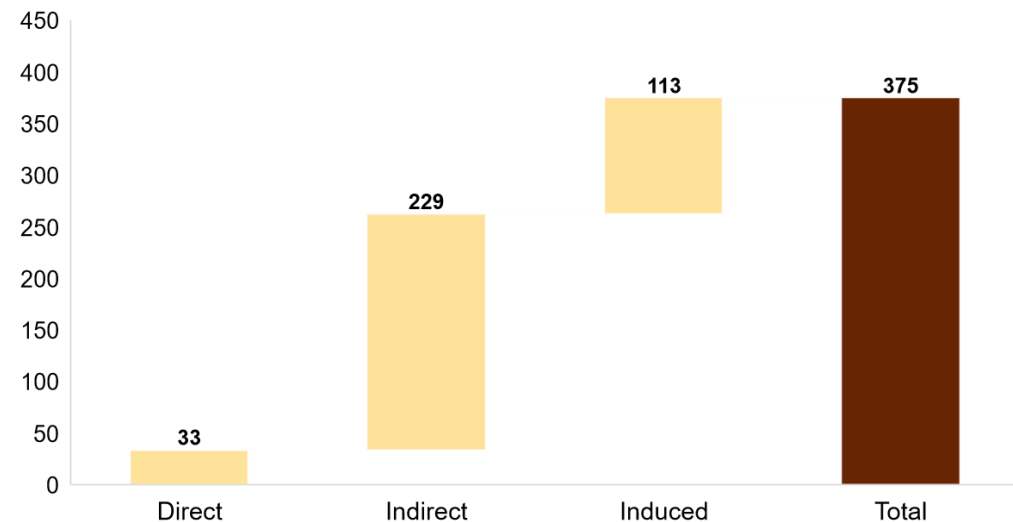
- Refers to the economic impact from the employees of thoroughbred breeders spending their wages.
- Also includes employee spending in the supply chain to thoroughbred breeders.

The 2021 total GVA contribution is roughly comparable to 2017, however direct and induced impacts have decreased

GVA – Direct, indirect and induced impacts, 2017, £m



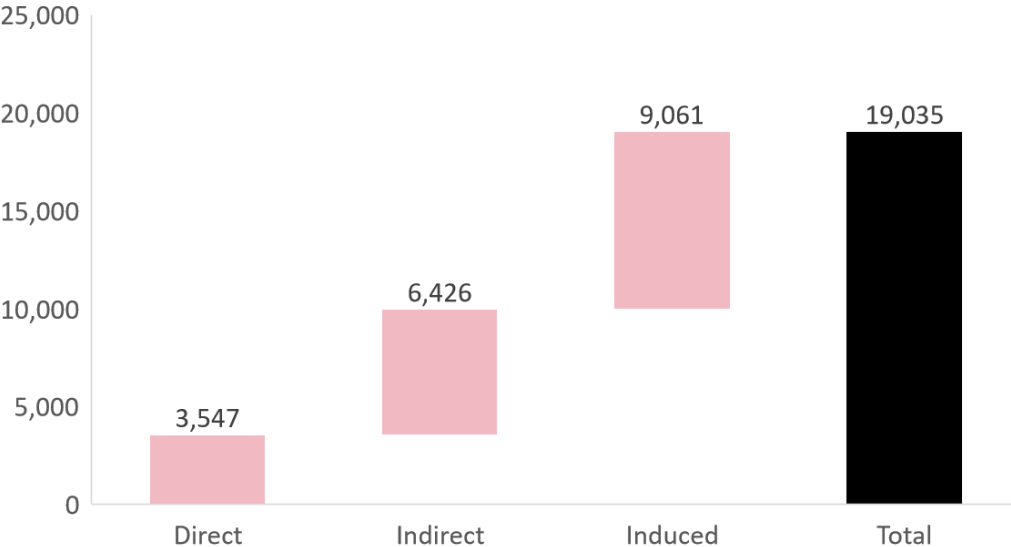
GVA – Direct, indirect and induced impacts, 2021, £m



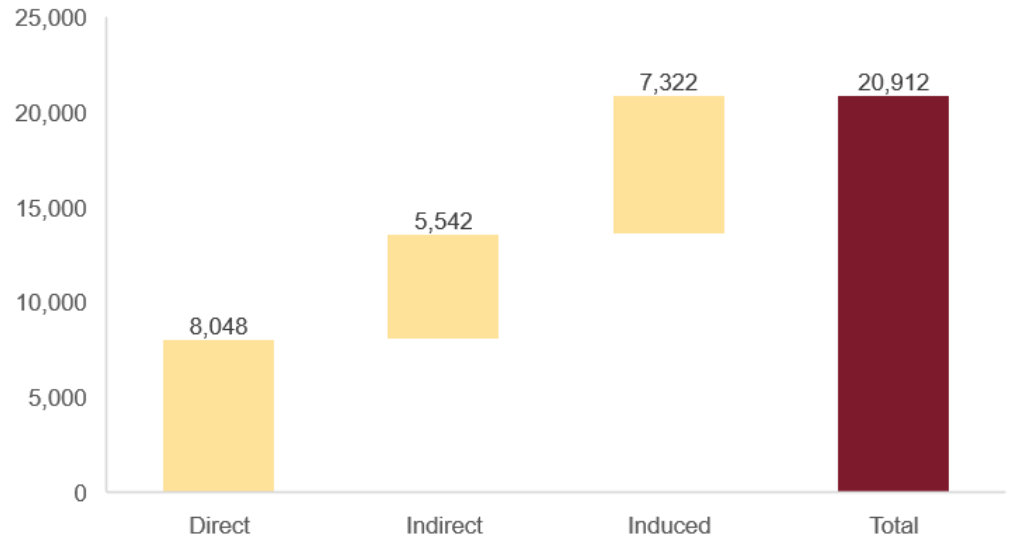
- Our analysis shows that the industry's overall GVA contribution is slightly lower than that estimated in 2017 as we find a **£375m total GVA contribution**, as compared to £427m in 2017.
- The direct contribution accounts for most of this difference, as we estimate it is £33m in 2021. It is noteworthy that the majority of the total contribution is constituted by the indirect and induced impacts, rather than the direct impact. This is because the profitability of the sector is low (especially after accounting for depreciation), but the sector itself makes supply chain purchases from sectors that are comparably more profitable. So even if the direct effect is modest, the industry still contributes significantly to the UK economy in overall terms.

Our estimates suggest a slightly higher employment impact in 2021

Employment – Direct, indirect and induced impacts, 2013, thousands of FTE



Employment – Direct, indirect and induced impacts, 2021, thousands of FTE



- According to our data, the overall impact on employment is approximately comparable to 2017, with 21k full time equivalent (FTE) jobs supported by the industry. The composition of this contribution has, however, changed over time. We estimate the direct employment impact to be c. 8k employees in 2021 as compared to c. 3.5k employees in 2017. This difference in direct employment is likely due to the survey response rate, which has been significantly higher in our latest analysis compared to in 2017.
- Indirect and induced impacts have decreased slightly. This result is intuitive when we consider that the indirect and induced employment figures are driven by supply chain spending, and employee spending, rather than the direct wage figure. As such, there is only a relatively weak link between the direct FTE and the indirect and induced FTE impact results.



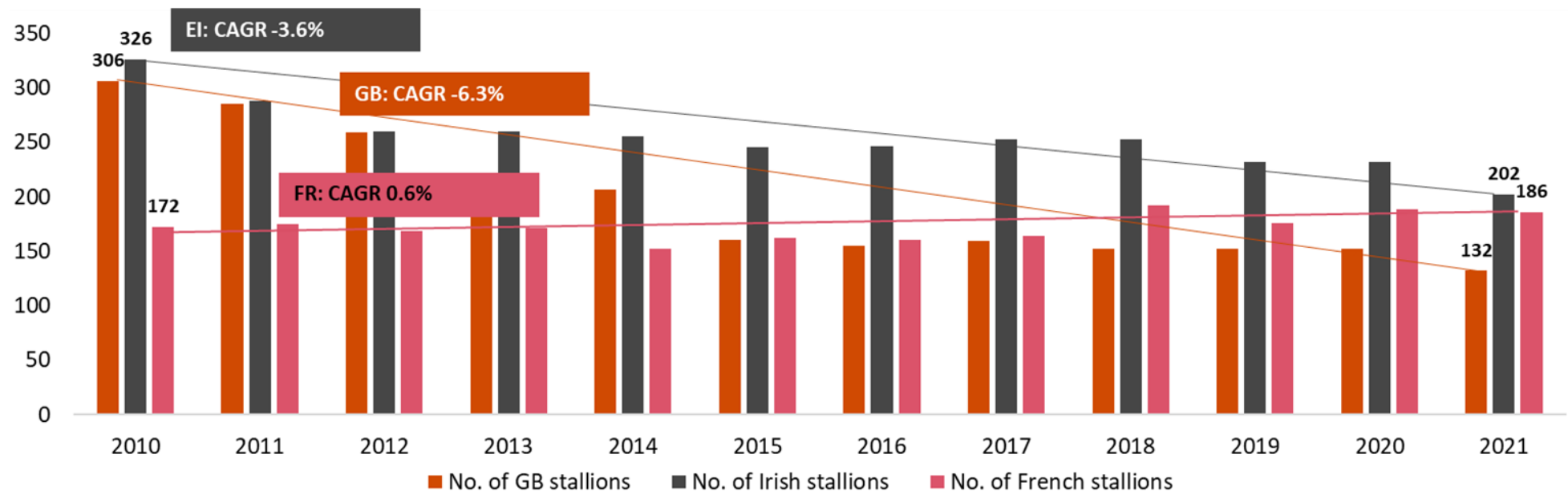
Industry overview

4.1

The GB stallion market has contracted in recent years

The number of registered stallions has fallen faster in GB than in comparator countries

Number of Stallions registered in GB, Ireland and France

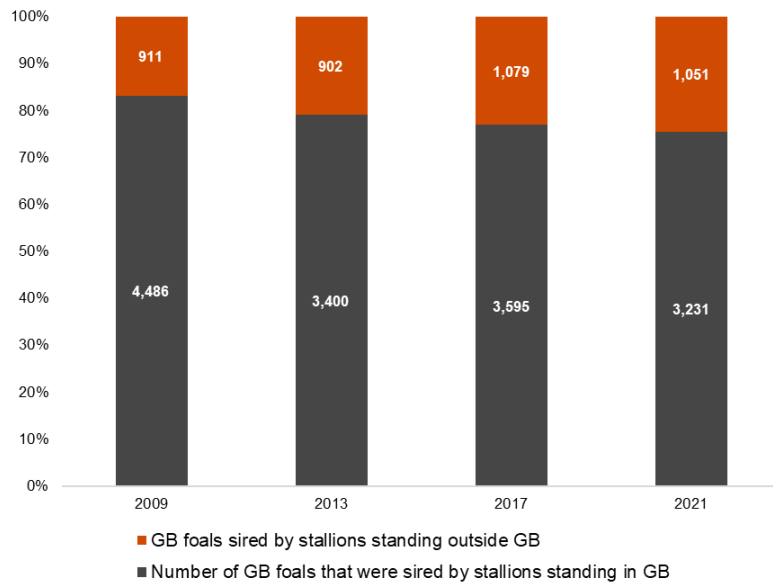


- The stallion count in GB compares poorly to both France and Ireland in 2021.
- The historic trend in stallion numbers also proves unfavourable for Britain: since 2010, the number of stallions standing in GB has fallen significantly more than in Ireland. In 2010, the number of stallions registered in the two jurisdictions was comparable. Since 2010, however, the stallion count has more than halved in GB whereas in Ireland numbers have fallen at a slower rate.
- In France, the trend contrasts both GB and Ireland, where stallion numbers have grown from 172 in 2010 to 186 in 2021.

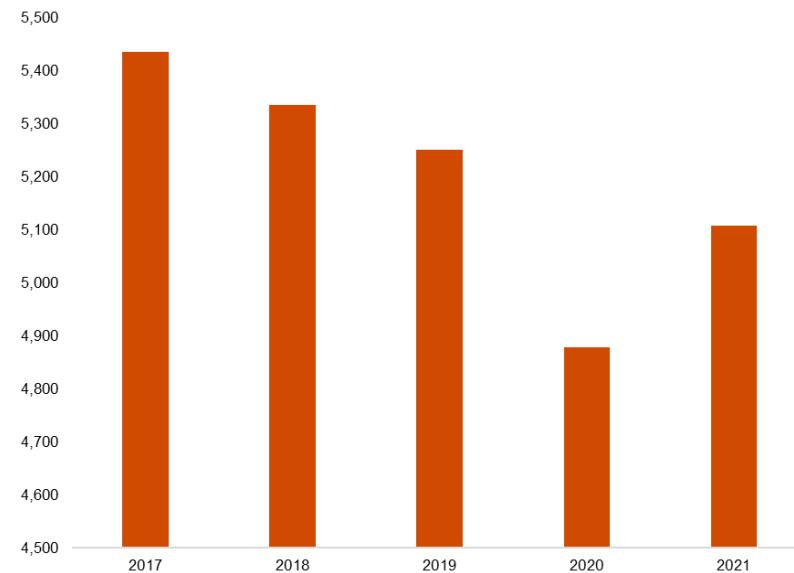
Source: BHA, Weatherbys, Statista, PwC analysis. Note, GB and France includes stallions for both jump and flat, we are still confirming the nature of the stallion count in France.

International competition has been a core factor in the decline of the number of stallions in GB

Percentage of GB foals sired by stallions standing in GB and outside of GB (with absolute numbers labelled)



Number of GB based mares covered by GB based stallions



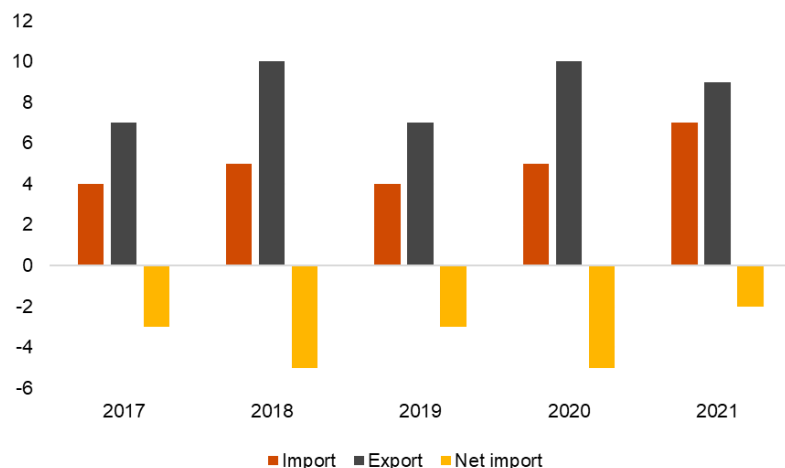
- The number of foals sired by stallions standing in GB has fallen from 4,486 in 2009 to 3,231 in 2021. This is in the context of a rising number of foals sired by stallions standing outside of GB, rising from 911 in 2009 to 1051 in 2021.
- Consequently, the proportion of GB foals sired by stallions standing in GB has fallen from 83% in 2009 to 75% in 2021. This decrease suggests an intensifying of international competition in the stallion market, for GB domiciled broodmares.

- The number of GB-based mares covered by GB-based stallions has fallen from 5,435 in 2017 to 5,108 in 2021.
- This indicates further weakness in the GB stallion market.

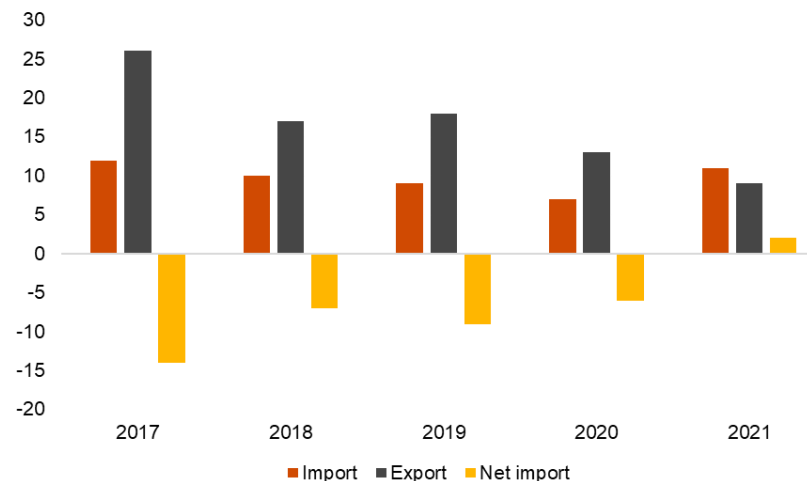
Source: Weatherbys, TBA, PwC analysis.

Persistently negative net imports of stallions lowers the number of stallions standing in GB

Net imports of stallions into GB, from rest of world (including Ireland), permanent exports



Net imports of stallions into GB, from rest of world (excluding Ireland), temporary exports



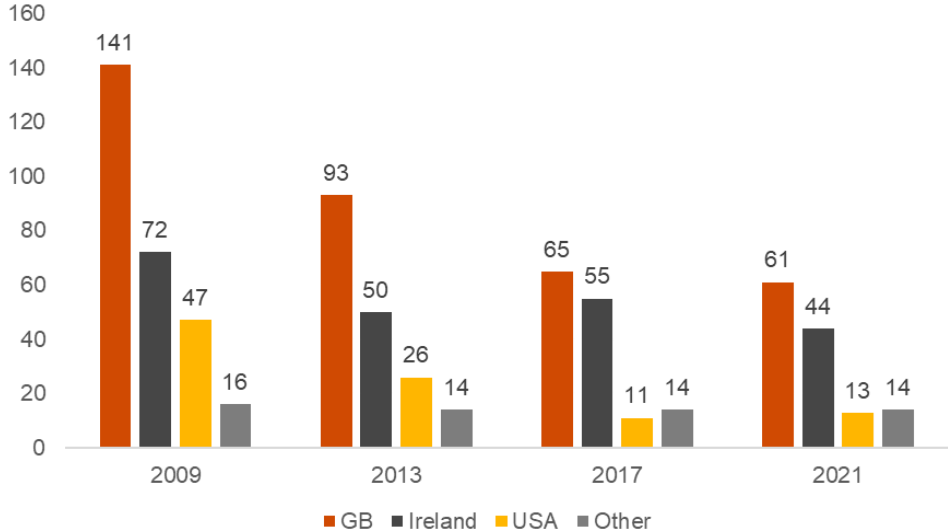
- These figures concern movements marked by Weatherbys as 'permanent', along with data on movements of stallions between GB and Ireland. Together, this can be taken to represent the permanent movement of stallions between GB and the rest of world.
- Overall, there has been a net movement of stallions away from GB since 2017.
- This trend in part explains the flat trend in the number of stallions standing in GB over the same period, whereas numbers have been rising in France and Ireland, as persistently negative net imports will diminish the total stock.

- These figures show only movements classed as temporary by Weatherbys, that is, movements only for the breeding season. This data does not include movement of stallions between GB and Ireland.
- The pattern for temporary movements reflects that for permanent movements, with a movement away from GB in every year except for 2021.
- Persistently negative net imports for temporary movements will not permanently diminish the stock of stallions in GB, but it does limit the number of stallions standing in GB in any given season. Taken together, these trends for permanent and temporary movements suggest a concerning weakness in the GB stallion market.

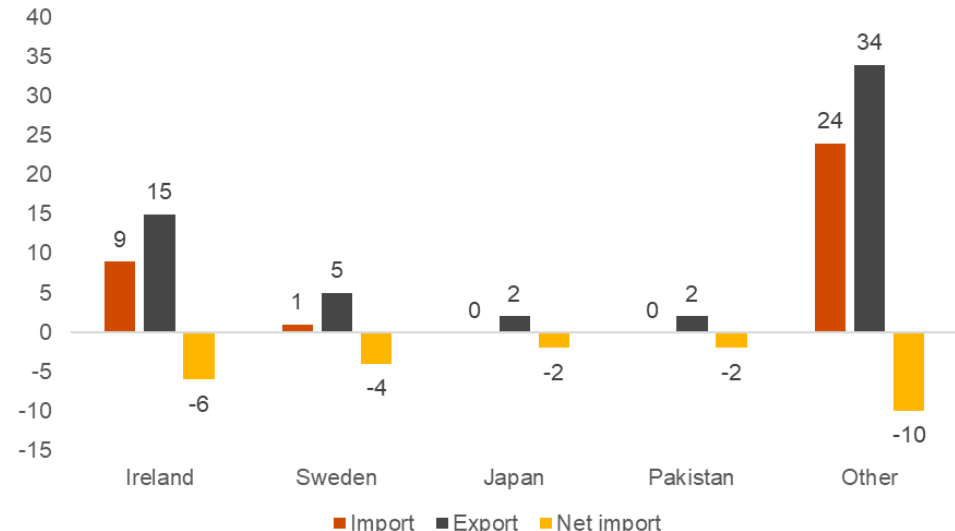
Source: Weatherbys, TBA, PwC analysis.

The number of GB born stallions in GB has diminished, further reducing stallion numbers in GB

Country of birth of GB based stallions



Net movement of stallions from GB, by country, 2017 – 2021 aggregate, including Ireland



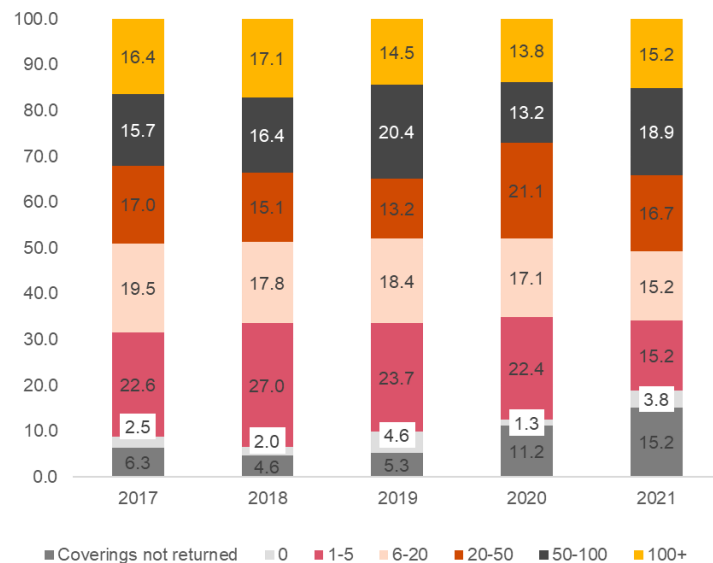
- The number of GB-born stallions based within the country has declined steadily over the past 11 years, falling from 141 in 2009 to just 61 in 2021.
- The number of Irish-born stallions based in Great Britain has declined since 2009 but at a slower rate than GB-born stallions. This suggests that a significant factor pushing down stallion numbers in GB is the inability to retain GB born stallions in GB.

- In the above chart, we display the net movement of stallions from 2017 – 2021. All countries where the net movement is equal to or greater than 2 stallions are displayed, which applies only to Sweden, Japan and Pakistan.
- Between 2017 and 2021 there was a net movement of 6 stallions from GB to Ireland. With that exception, the net movement of stallions does not depend heavily on any other country. The size of the 'other' category shows that the net movement of stallions from GB is to a wide range of destination counties.

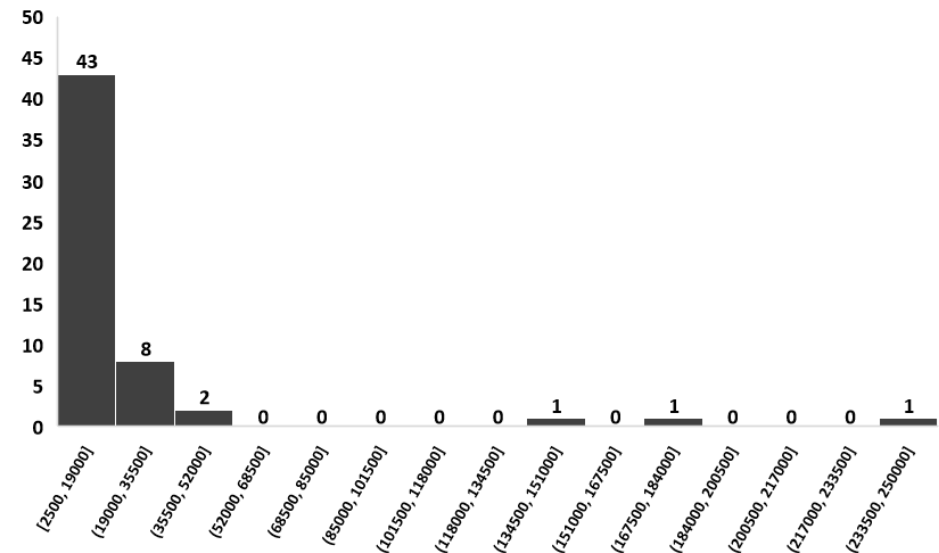
Source: Weatherbys, TBA, PwC analysis.

The number of stallions in GB has declined in part due to centralisation of the market

Mare coverings per stallion by % share of total coverings



Distribution of nomination fees according to OSL data for 2021 by nomination fee bracket



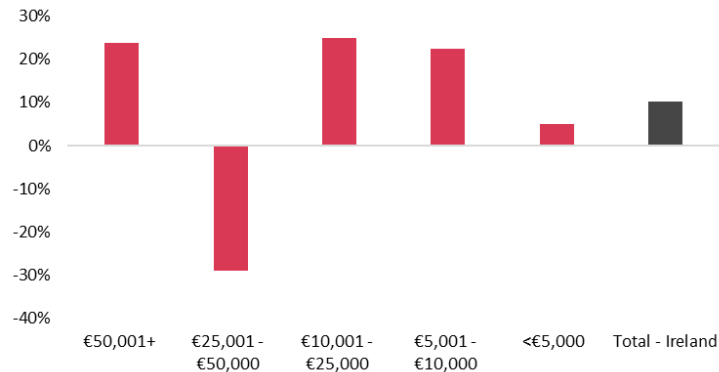
- The number of stallions covering 1-5 mares has fallen steadily.
- In contrast, those covering over 50 mares has risen, showing an increase in the concentration of the market.
- This suggests a centralisation of the market, with a greater reliance on a smaller number of stallions.

- Analysis on the distribution of stud fees shows a lack of stallions in the mid – high fee range bracket.
- Only 3 stallions standing in GB were listed by Oliver Lawrence Bloodstock (OSL) as having nomination fees greater than £50k.
- Although this only examines a segment of the flat side of the GB stallion market, it does indicate that there is a limited range of choice, which in part could explain the decreasing proportion of the GB foal crop birthed by mares covered by GB stallions.

Source: Weatherbys, TBA, PwC analysis.

Increasing transaction costs have also impacted stallion use

Change in number of broodmares from GB covered by Irish stallions (2019 – 2021), by nomination fee bracket (EUR)



Change in number of broodmares from GB covered by rest of world stallions (2019 – 2021), by nomination fee bracket (EUR)



Overview

- Over the course of our interviews with industry operators, a number of interviewees referenced higher costs in sending a broodmare to be covered by a stallion standing abroad as a result of regulatory changes following the UK's departure from the EU.
- Interviewees suggested these costs did not prohibit the movement of broodmares universally, but impacted the movement of broodmares for stallions with lower nomination fees.
- The two charts on the left hand side provide some evidence for this trend, showing, in general, a greater decrease in the number of broodmare visits at lower levels of nomination fee.

Method

- We use Weatherbys data on the number of GB broodmares using stallions in the rest of the world and Ireland, by stallion nomination fee.
- This data shows that the number of broodmares visiting stallions in Ireland has most impacted the €25k-50k and €0-5k categories.
- Meanwhile, the rest of world stallion use shows a clear negative correlation, with broodmare visits declining as nomination fee bands decrease.
- Overall, the data suggests that increasing costs for movement of broodmares has most impacted the visits for stallions with lower nomination fees.

Source: Paull Khan, Weatherbys, PwC analysis

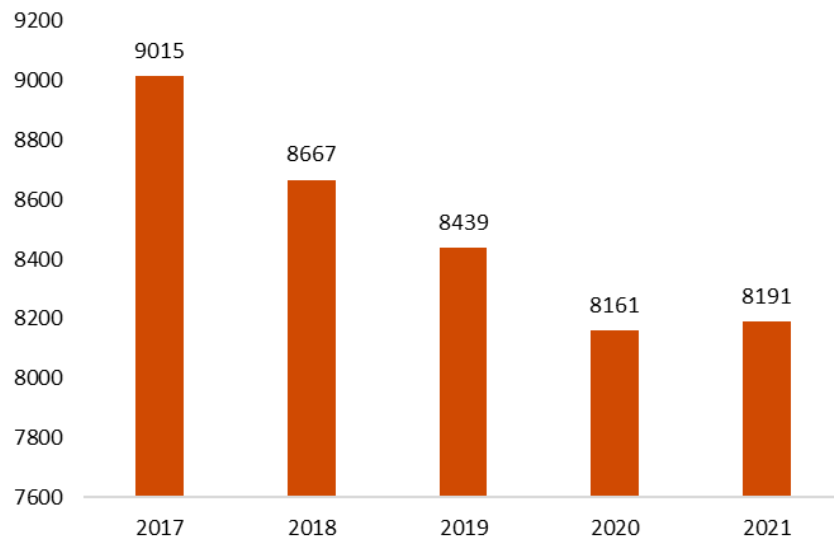
Note: in some instances 2021 figures may be incomplete

4.2

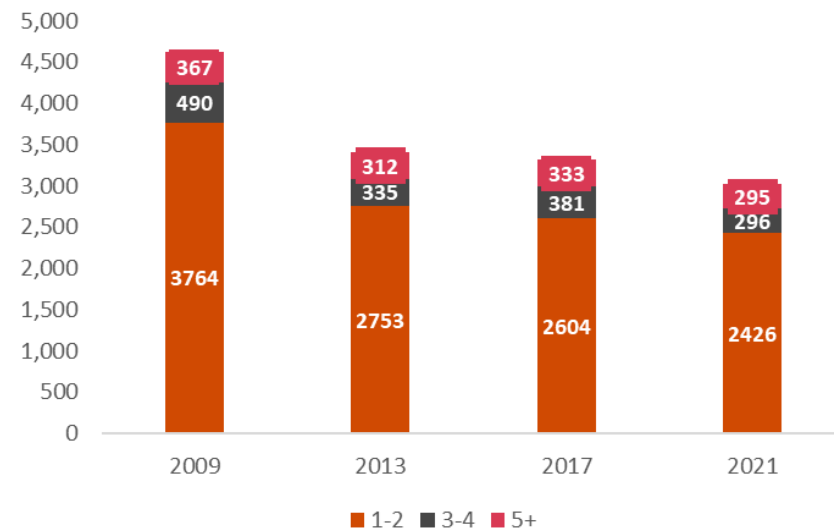
The number of broodmares domiciled in GB and the GB foal crop have both fallen in the recent past

The number of broodmares has decreased significantly since 2009 across all categories of breeder size

Number of GB broodmares at stud



Number of breeders by number of broodmares at stud



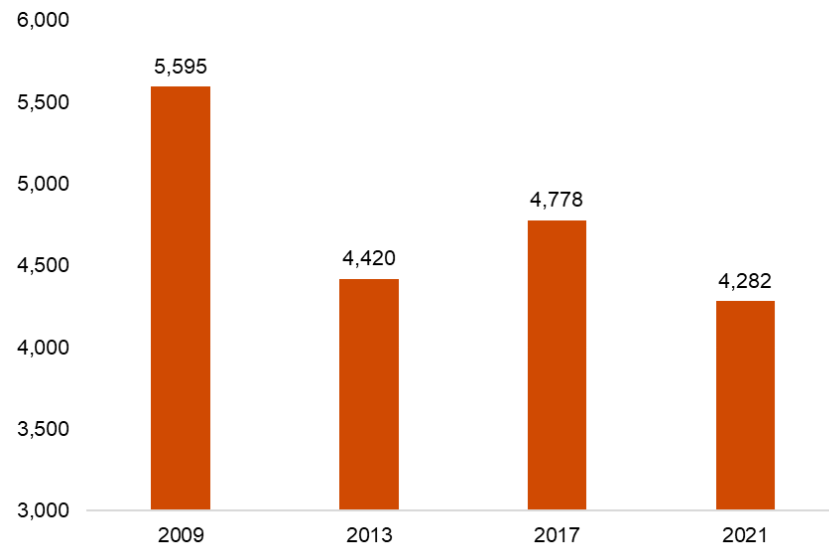
- The number of GB broodmares at stud decreased at a CAGR of -1.9% between 2017 and 2021.
- Covid-19 may have caused a disturbance in 2020, interrupting what otherwise appears to be a linear decreasing trend between 2017 and 2021.

- Since 2009, the number of GB breeders with 1-2 broodmares has declined by 1,338.
- The number of breeders that have over 5 broodmares has declined more gradually, meaning the proportional share increased from 8% in 2009 to 10% in 2021.

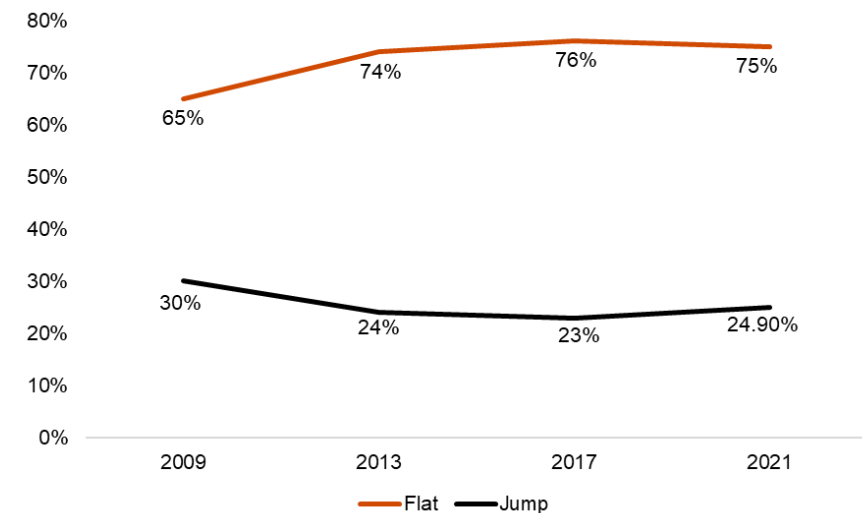
Source: Weatherbys, PwC analysis.

The GB foal crop dropped sharply between 2009 and 2013, and has since declined slightly

Total number of GB-born foals



Percentage of foals by intended career



- Between 2009-2013, the number of GB foals born each year declined at a constant annual growth rate (CAGR) of -5.7%.
- This trend reversed between 2013 and 2017, before declining once again until 2021.

- Over the last 7 years the proportion of foals intended for jump and flat has not changed substantially, illustrating the sustained popularity of flat racing.

Note: 'Unspecified' foals are not shown on the 'percentage of foals by intended career' graph, which is why the total percentage does not equal 100%. We have also incorporated those who stated 'dual' purpose into the total jump figures.

Source: Weatherbys, PwC analysis.

The decline in the GB foal crop is illustrative of wider global decline in foal crops

Global foal crop, 2006 – 2021

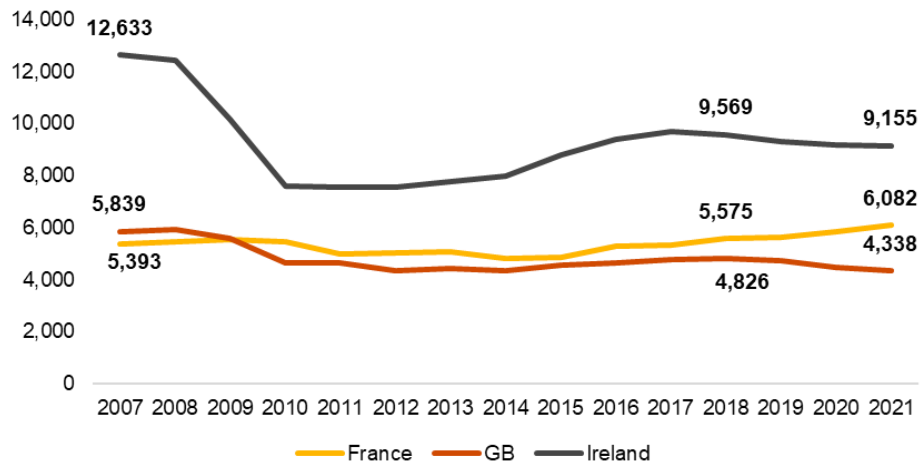
	2009	2013	2017	2021	Change
GB	5,632	4,420	4,674	4,338	-23.0%
IRE	10,167	7,757	9,689	9,155	-10.0%
FR	5,524	5,057	5,460	5,006	-9.4%
USA	29,500	21,377	20,900	16,899	-42.7%
AUS	16,112	13,365	13,823	12,737	-20.9%
JPN	7,453	6,665	7,079	7,549	1.3%

- Between 2006 and 2019, the global foal crop contracted significantly. This has generally been acknowledged to be, in part, a response to oversupply before the financial crisis in 2008.

Source: TBA, PwC analysis.

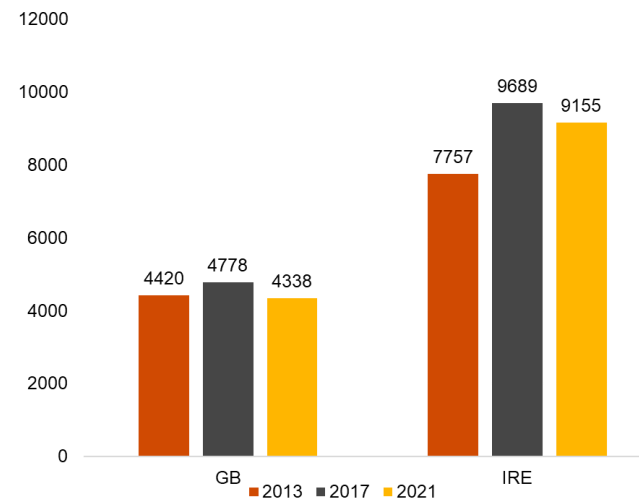
However, the foal crop in GB has diminished more starkly than Ireland and France

Number of thoroughbred births (2007-2021)



- Thoroughbred births in GB have declined since 2018, with a significant decrease since the 5,389 in 2007 to 4,338 in 2021 (it then increased to 4,518 in 2022, with registrations up to 30th of September 2022).
- This trend in GB compares unfavourably to France and Ireland, which have yielded consistently higher foal crops since 2010, with the French foal crop diverging from GB in 2018.

Number of thoroughbred births (2017-2021), GB and Ireland



Country Change between 2017 and 2021

Great Britain	-9.2%
Ireland	-5.5%

The decrease in thoroughbred births between 2017 and 2021 was greater by approximately 4 percentage points in GB compared to Ireland.

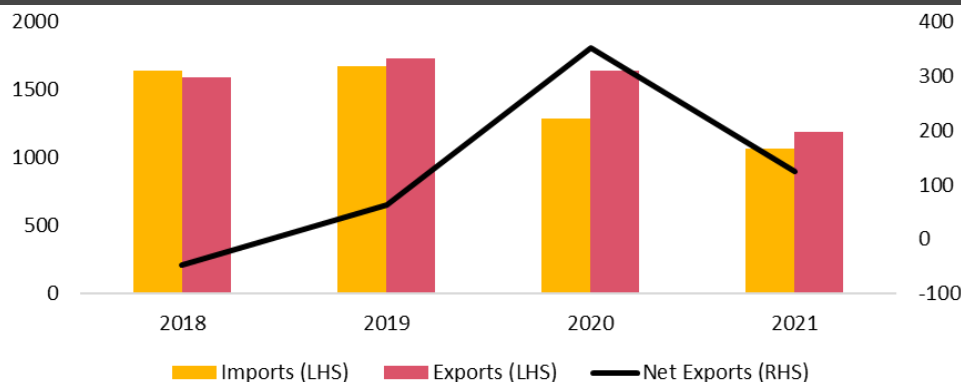
Source: IFHA, Weatherbys, PwC analysis

4.3

Persistently positive net exports
compounds the downward pressure on
the foal crop

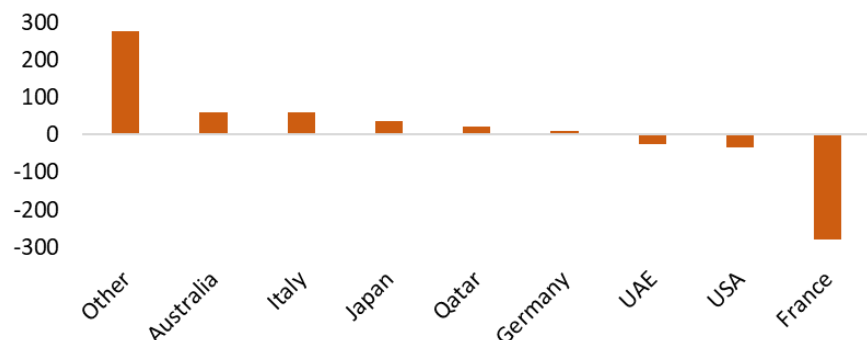
GB net exports have remained positive in recent years

Total number of colts, fillies and geldings imported and exported from GB, excluding Ireland



- Net exports are defined as the number of exports less the number of imports.
- Net exports have been positive since 2018, and currently stand at around 100 for 2021. This could have implications for the breadth of stock remaining in GB.

GB net exports to competitor countries, excluding Ireland



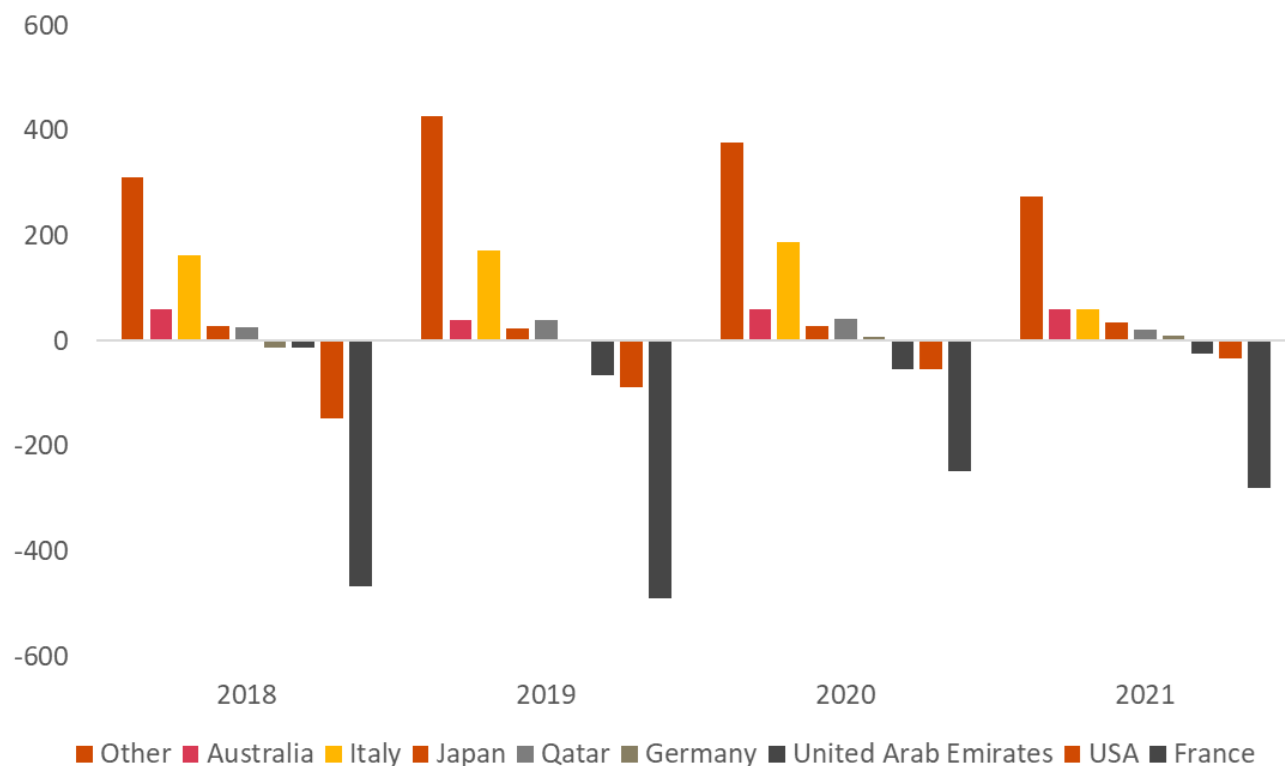
- GB depends heavily on France for its imports of stock.
- GB's export markets are more varied, with no one market dominant. Australia is the biggest single export market, with Italy and Japan also popular destinations.

Source: Weatherbys, PwC analysis

Please note: these trade statistics do not include movement of stock between Ireland and GB, as consistent with the Weatherbys Fact Book.

GB exports have remained strong over recent years, driven by international conditions

Net GB exports by country over time



- There have been recent increases in purchases across Australia and Hong Kong, where high levels of prize money leads to stronger demand for thoroughbreds.
- Since 2018, GB has imported fewer horses from France. This has been the main driver of the positive net export of stock in recent years.
- GB continues to export stock to a larger number of smaller export markets, as represented by the 'Other' category.
- There are rapidly expanding race programmes across the Middle East, which have led to increased thoroughbred purchases from GB.
- In addition to this, as a result of Covid-19, most Indian breeding programmes were shut down through 2020 and 2021 and there was a resulting increase in purchases from GB.

Source: BHA, PwC analysis

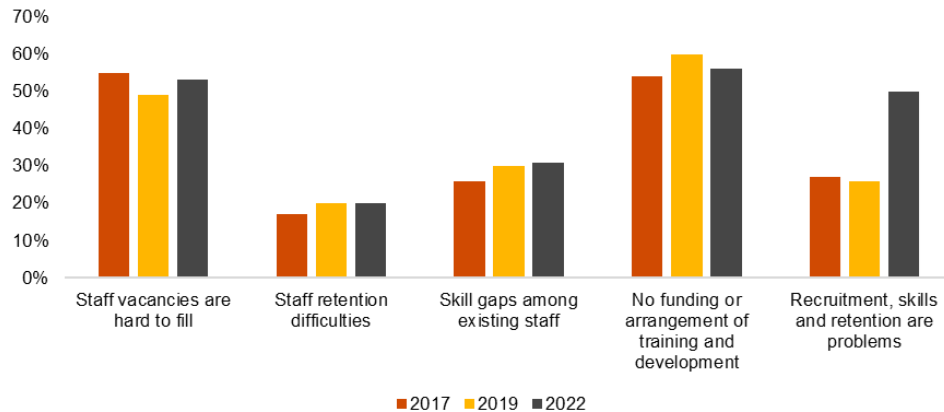
Please note: these trade statistics do not include movement of stock between Ireland and GB, as consistent with the Weatherbys Fact Book.

4.4

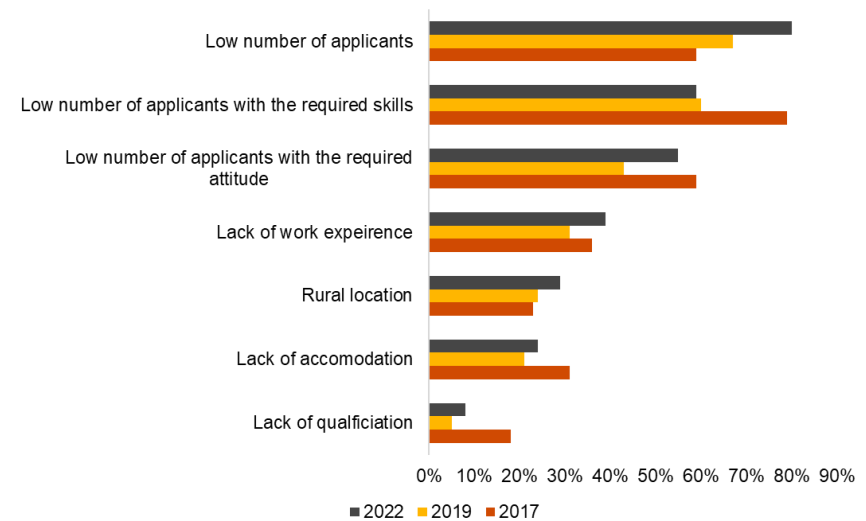
Breeders are experiencing intensifying labour market shortages

Breeders are facing increasingly significant staff shortages

Percentage of breeders facing recruitment, skills, and retention challenges



Reasons for hard-to-fill vacancies



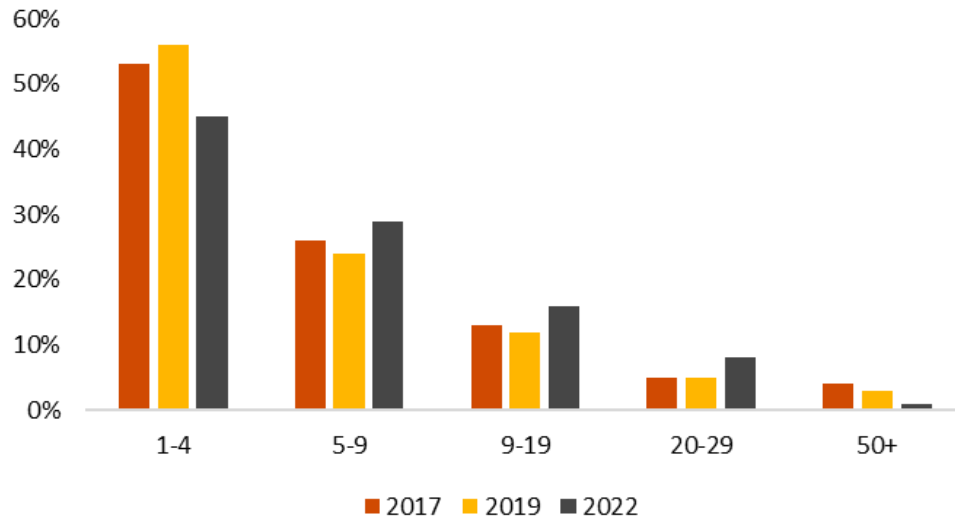
- Results from Public Perspectives Ltd.'s 'Racing and thoroughbred breeding industry recruitment, skills and retention survey 2022' shows there has been a significant increase in companies viewing recruitment skills as a problem.
- These staff shortages will be an important blocker to industry growth, as staff shortages may limit the number of broodmares that stud farms purchase.

- The biggest reason for hard to fill vacancies in 2022 was a low number of applicants.
- This suggests that the change is explained by an impact to the 'supply side' of the industry (for example, from a change in the outlook of the relevant labour market) rather than a demand side problem. This is supported by industry interviews which underscored the change in the outlook of the relevant workforce in recent years.

Source: Racing and thoroughbred breeding industry recruitment, skills and retention survey 2022 , TBA

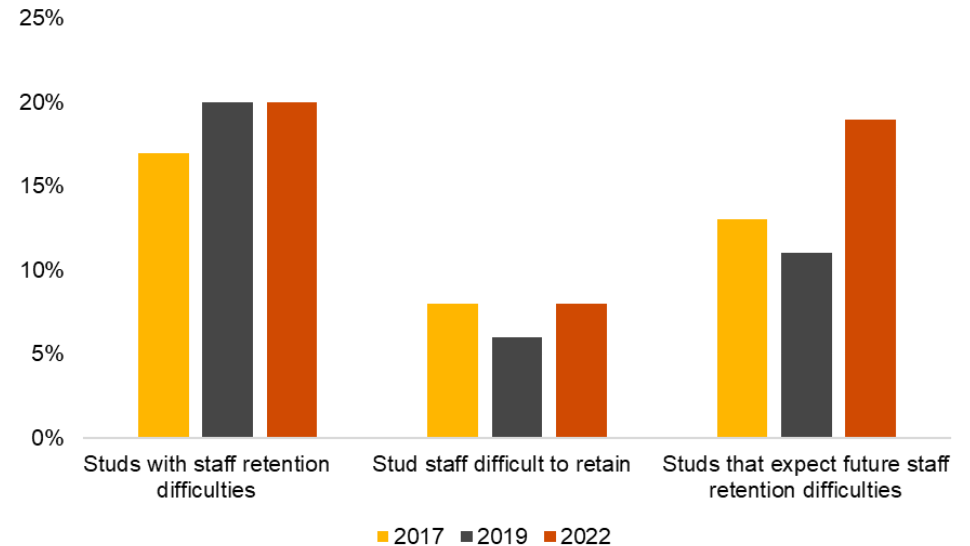
An increasingly ominous outlook for employees may, in part, explain the centralisation of the industry

Proportion of breeders grouped by number of employees



- The same results from Public Perspectives Ltd.'s survey shows that businesses with 1-4 staff only account for 14% of all employees, those with 5-9 staff account for 15%, those with 9-16 staff account for 16%, those with 20-29 staff account for 17%, those with 50+ staff account for 38%.
- There has been a shift towards a reliance on larger breeding operations since 2017.

Expectation of future retention difficulties



- Studs are expecting increasing difficulties with respect to staff retention, showing an increasingly negative outlook within the industry.
- This outlook may go some way to explaining the move towards larger studs, which are typically more robust to labour market difficulties.

Source: Racing and thoroughbred breeding industry recruitment, skills and retention survey 2022 , TBA, PwC analysis.



Trend analysis

5

5.1

Our profitability analysis shows declining average and median profits of foal and yearling sales in recent years

We have conducted a profitability analysis of horses at sale to assess the sustainability of the breeding industry

Overview of purpose and analysis

We have analysed the profitability of horse sales using a variety of data sources to better understand the sustainability of the racing programme. Our method for this analysis is outlined below:

- First, we used our database of horse sales included in the Weatherbys bloodstock reviews from 2013 – 2021. This was transformed into a useable format with over 150,000 sales entries.
- We then augmented this dataset with further information on nomination fees, from two data sources. At this stage, there were around 7.5m data points.
- Next, we transformed the database to include further variables, such as the nomination fee at year of nomination, and the number of days between birth and sale, where available.
- We then compiled data for most of the direct costs of breeding.
- We then merged this data on costs with the master dataset such that they were discounted and could be applied to the relevant year. At this point, there were around 15m data points. Our data only stretched to 2021, so we could not account for the likely large increases in cost facing breeders in 2022.
- We could then estimate profitability, per year, sale, and sale type.
- From this, we were able to offer projections for the foal crop based on this profitability assessment.
- Finally, we were able to estimate the impact of these scenarios on the racing programme.

Summary of method

Compilation of sales data: the output includes over 150,000 individual sales and 7.5m data points.



Input costs: we input assumptions on the costs for: broodmare, one-off foal costs, yearlings, sales, and nomination.



Model outputs: using our database of sales data and costs we model the profitability of sales and its potential impact on foal crop and the racing programme.



Note: Additional detail on the methodology is provided in Annex A2.

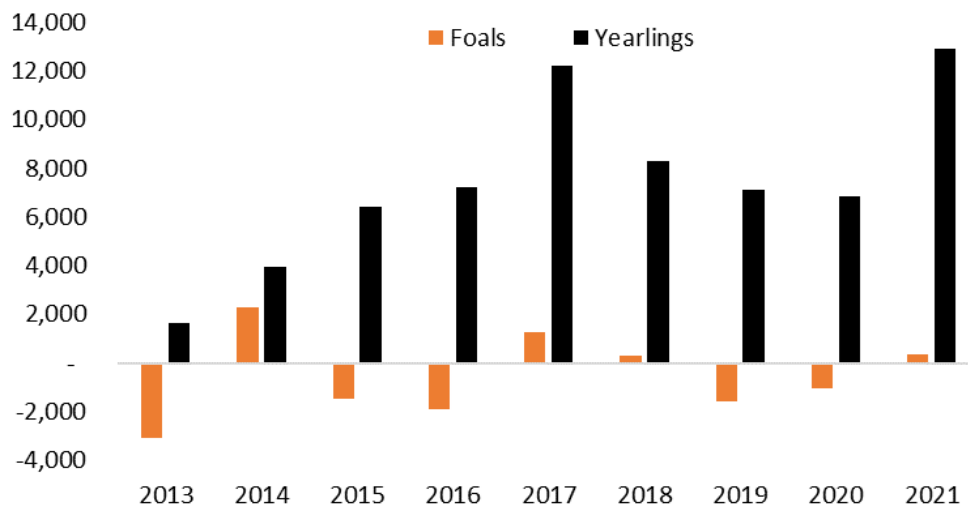


Strong sales have brought about increasing pre-nomination fee profits in recent years, but there is polarisation in the market

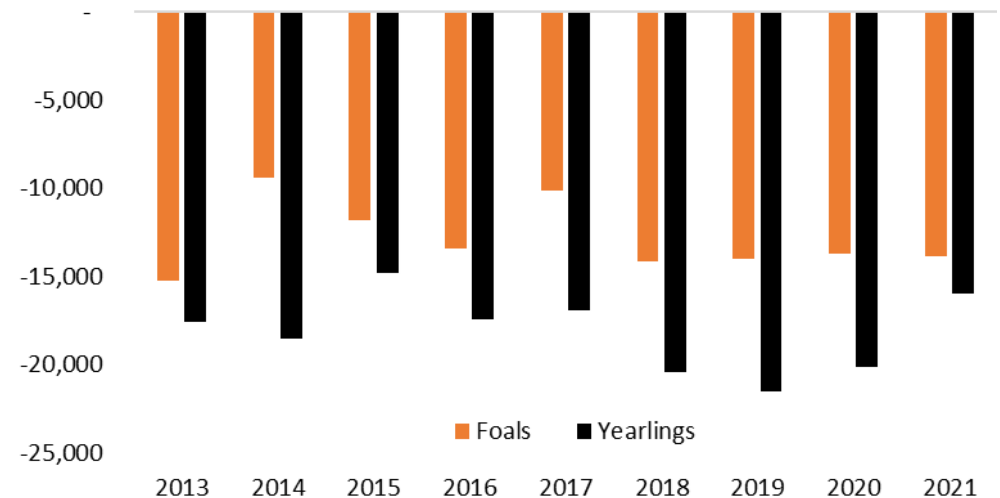


Model outputs

Foals and yearlings, mean profits per sale before nomination fees (£)



Foals and yearlings, median profits per sale before nomination fees (£)



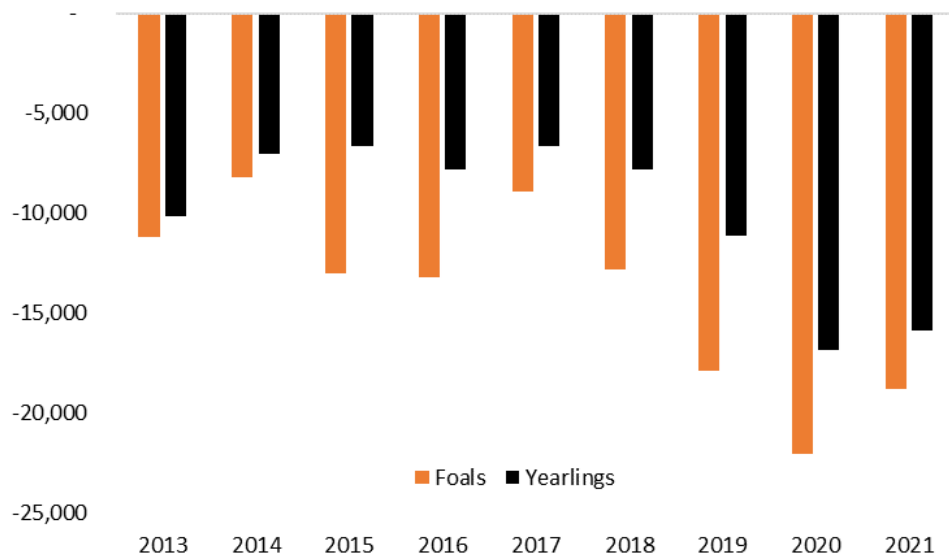
- Average profits have risen in 2021 due to strong sales results. Median profits have also risen, showing the effect of strong sales across all the market.
- There is a significant difference between average and median sales results. This shows the polarisation in the market, whereby the mean profit is supported by a smaller number of very profitable sales, whilst the 'typical' breeder, represented by median sales results, languishes with worse off margins.

After accounting for nomination fees, both average and median profits have decreased in recent years

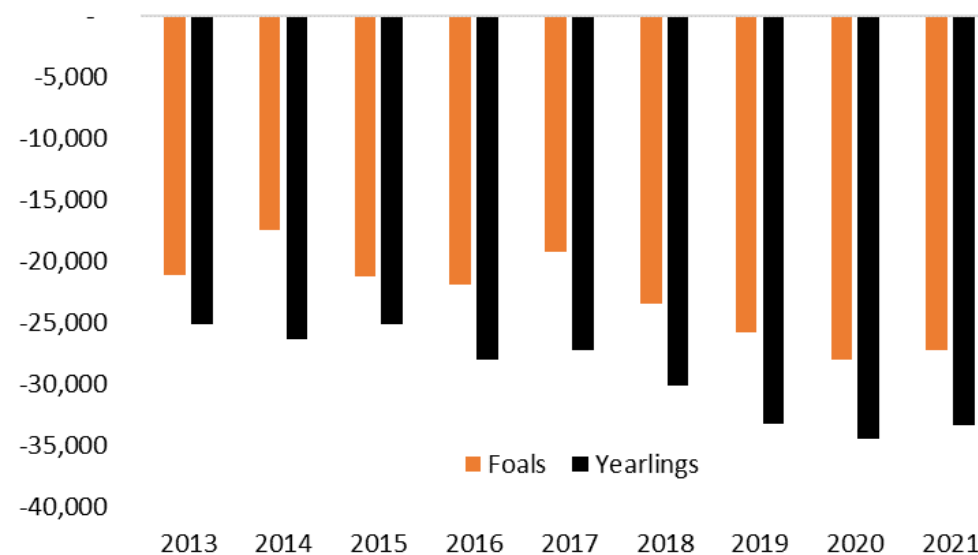


Model outputs

Foals and yearlings, mean profits per sale with nomination fees (£)



Foals and yearlings, median profits per sale with nomination fees (£)



- After accounting for the nomination fee, the mean profits are significantly worse, and the trend since 2017 is broadly downward.
- The trend in the median profitability, after controlling for the impact of Covid-19, has also been negative.
- The trends in profitability before and after accounting for nomination fees suggest these are a decisive factor in recent trends.

The distribution of profitability for foals has been skewed towards losses since 2013

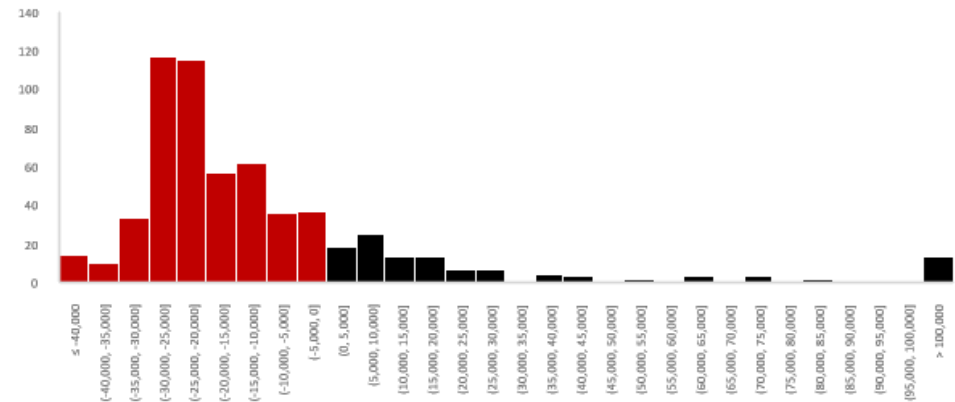
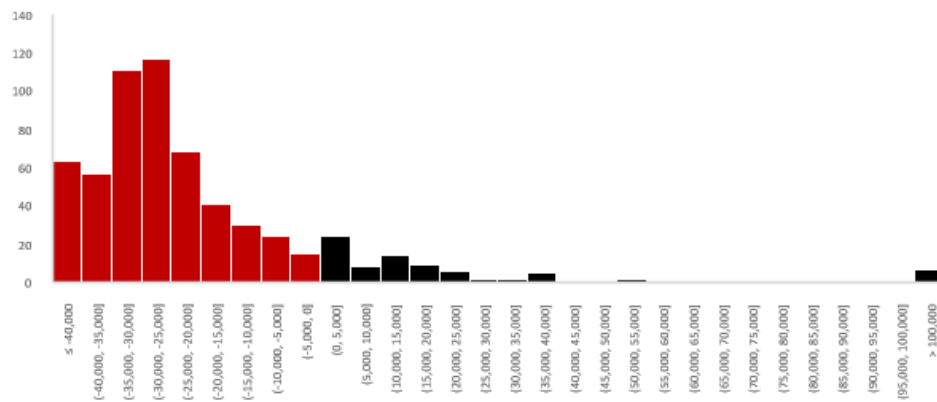


Model outputs

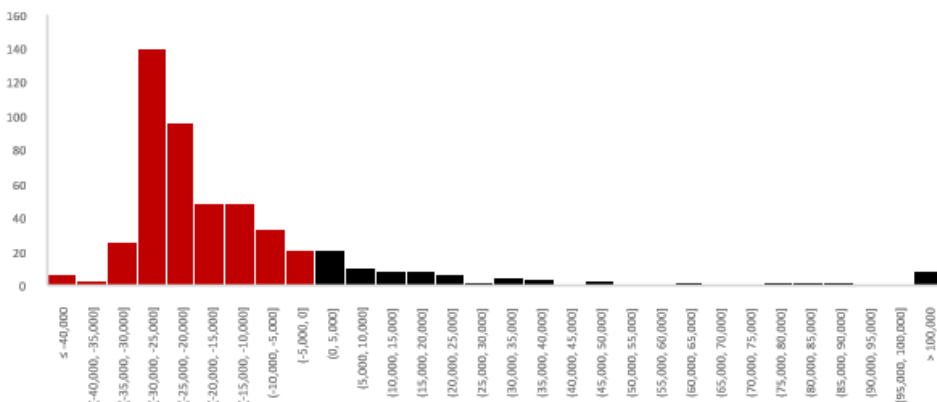
Key: ■ Operating loss ■ Operating profit

Foal profitability distribution (£), 2021

Foal profitability distribution (£), 2017



Foal profitability distribution (£), 2013



- These results show the distribution of profitability in 2013, 2017 and 2021 after accounting for the nomination fee.
- There is widening of the distribution over these years, as in 2013 the negative profits are much more restrained, before they widen both in 2017 and 2021.
- There is not much change to the distribution of positive profits across these years.
- As such, the skewness of the distribution has increased in these years.
- Note, profits are distributed in nominal terms, as we take current prices relevant to the year in question to provide consistent results.

Source: Weatherbys, expert interviews, OSL, survey responses, PwC analysis, France Galop

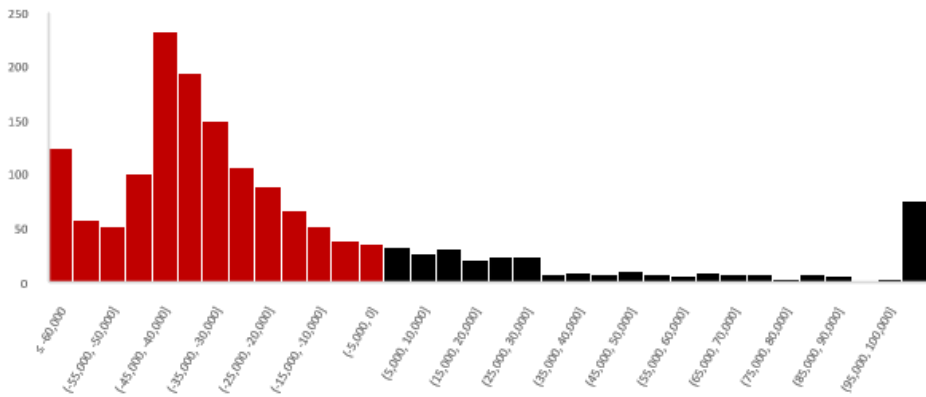
The distribution of profitability for yearlings has widened since 2013, and has also been skewed towards losses



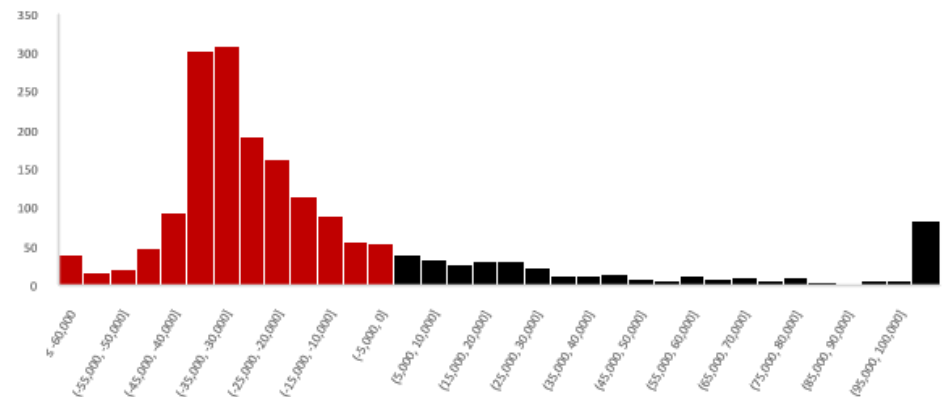
Model outputs

Key: ■ Operating loss ■ Operating profit

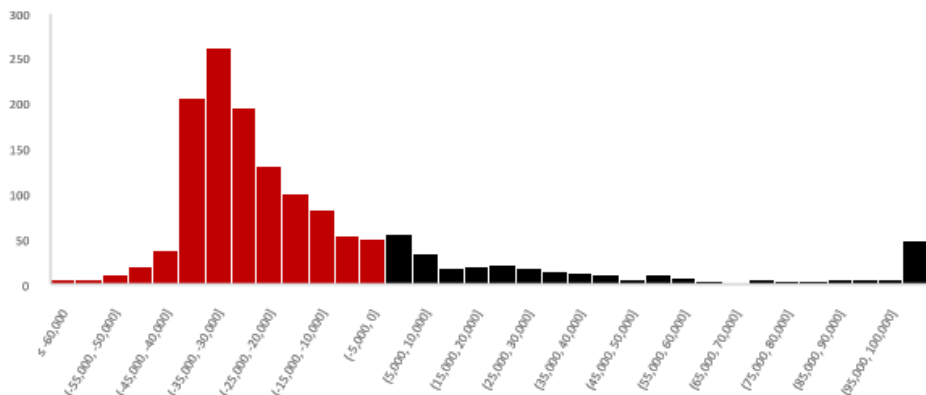
Yearling profitability distribution (£), 2021



Yearlings profitability distribution (£), 2017



Yearlings profitability distribution (£), 2013



- The distribution of profits has widened in both 2017 and 2021.
- Perhaps most markedly, profits at the lowest end of the distribution (i.e. significant losses) have increased in frequency.
- Hence, as with the sale of foals, the skewness of the distribution has increased since 2013.
- Relative to the number of observations, the number of very profitable sales has increased.
- As such, the kurtosis of the distribution has also increased, as the number of observations in the 'tails' of the distribution has increased.

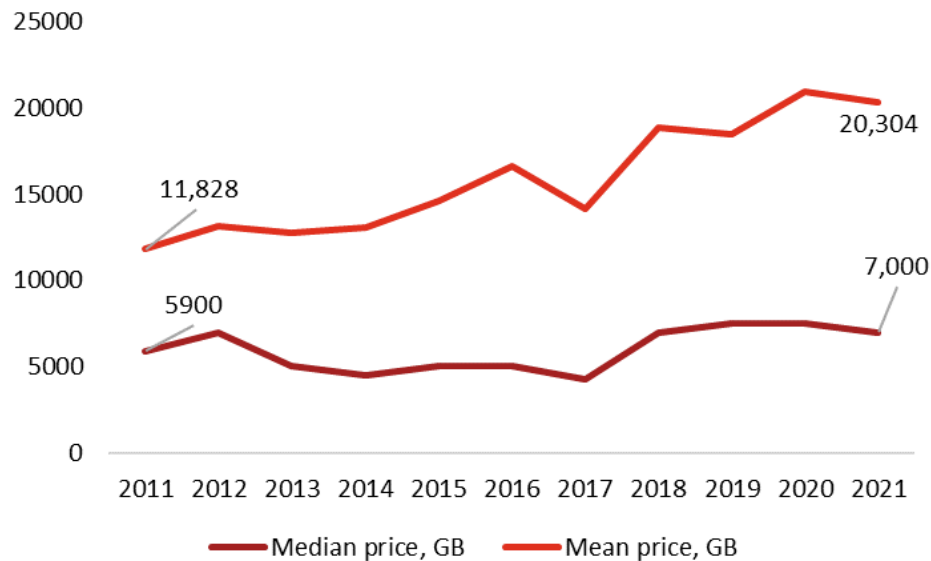
Source: Weatherbys, expert interviews, OSL, survey responses, PwC analysis, France Galop

5.2

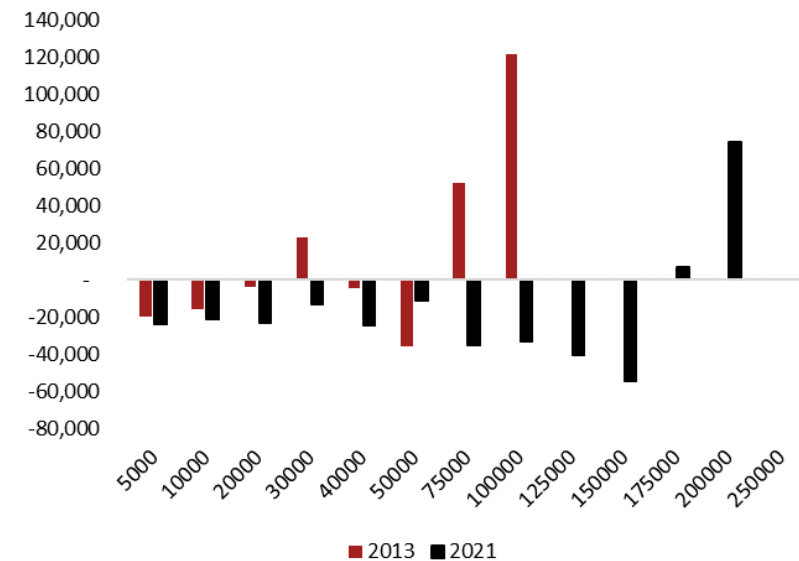
When considering foal and yearling sales, there has been a clear shift towards more expensive stallions

Despite rising nomination fees, polarization in the market elsewhere creates cause for concern

Average nomination fee for stallions standing in GB, 2011 – 2021 (£)



Average profit per bracket of nomination fee, yearlings, GB, 2013 and 2021 (£)

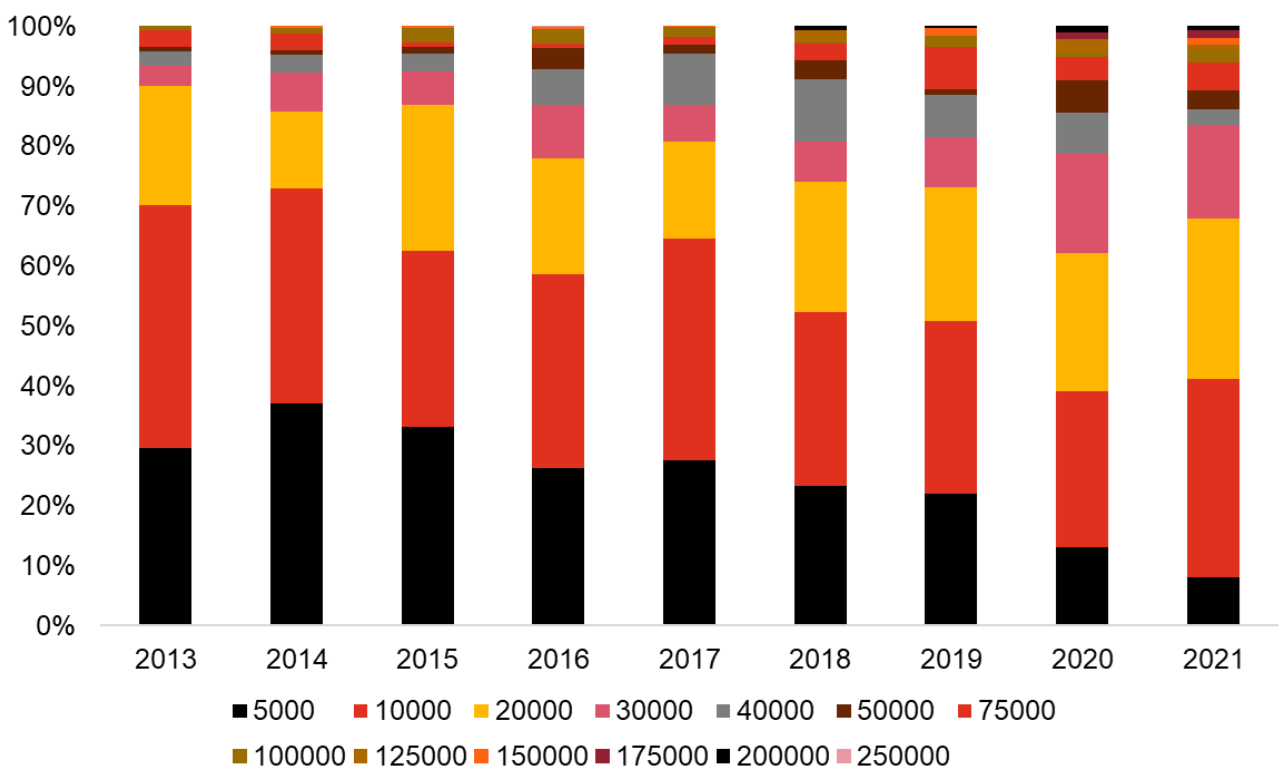


Nomination fees for stallions standing in Britain have risen significantly since 2011, with average prices rising from £11.8k to £20.3k in 2021 and median prices rising from £5.9k to £7.0k over the same period. **Section 4.1** and **section 9.4** contain further information on the stallion market in GB and associated nomination fees, which are substantially higher in GB than in France. Meanwhile, in **section 9 and Annex A3** we outline the method behind our profitability analysis, which examines the average profit by mares domiciled in GB.

Our profitability analysis suggests that ever higher nomination fees are associated with the 'break even point' for breeders. That is, whereas in 2013, yearling sales from nomination fees at £30k and above were generally in profit, in 2021 it was only for nomination fees at £125k or higher that the average profit in these categories was positive. This analysis, alongside rising nomination fees, suggests it is important to understand the determinants of demand at sale, to investigate the relative importance of the stallion market.

There has been a move in the global thoroughbred market towards the use of more expensive stallions, when considering foal sales

Model outputs Proportion of stallions by nomination fee bracket, foals, all regions (legend shows upper bound of fee in £)



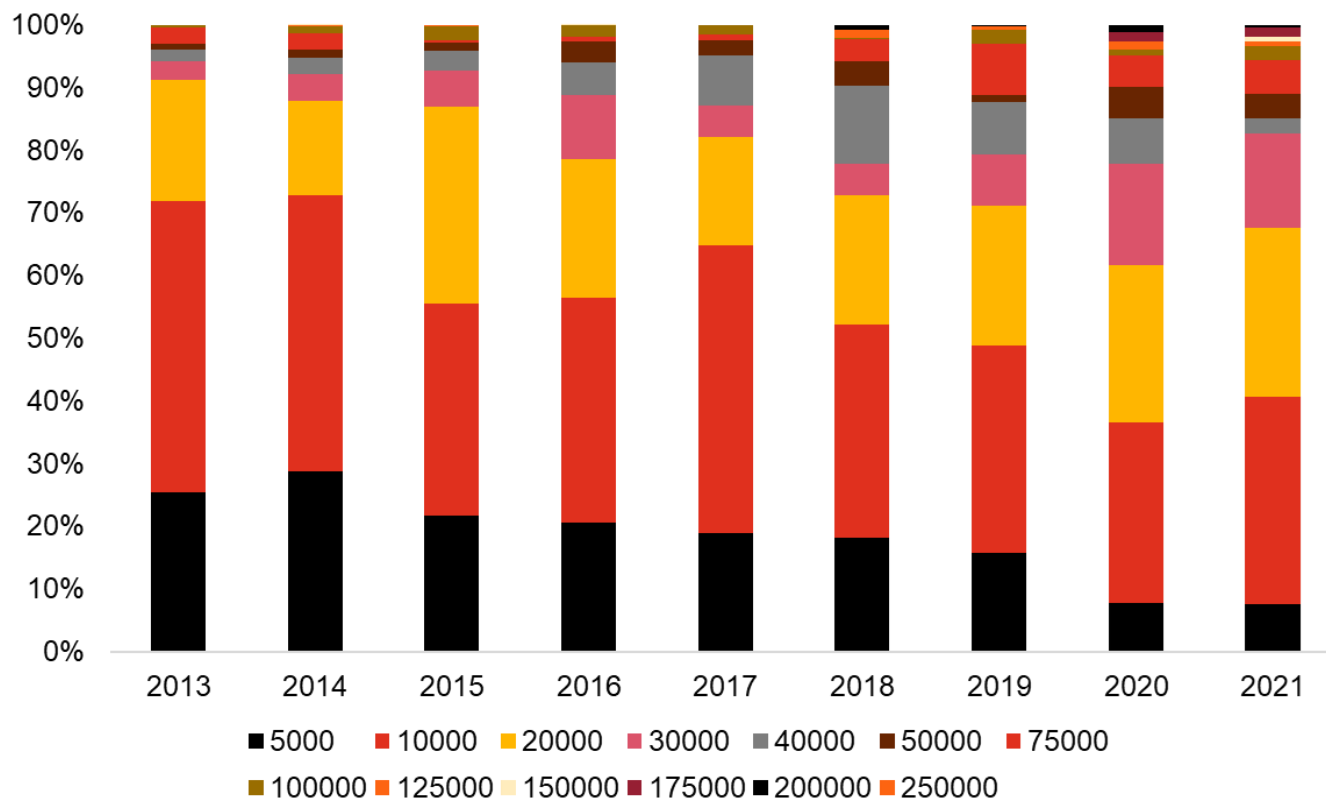
- In the profitability analysis we have combined sales data with nomination fee sources to examine the change in nomination fees incurred by breeders over time. These trends span both flat and jump and all regions with sales included in the Bloodstock review, but, at this point in the analysis, only considering foal sales.
- There is strong evidence of nomination fee payments increasing over time. This can be seen by the decreasing proportion of fees of £5k and less, and corresponding increase in categories of fee above £20k.
- This shows that a central part of breeders' costs (increased nomination fees) fits with a broader global trend for foal sales.
- For all the profitability analysis we use current prices, meaning part of this shift is explained by inflation over the period - however these trends outstrip inflation significantly.

Source: Sales data from Weatherbys Bloodstock Review, expert interviews, OSL, survey responses, PwC analysis

**Further detail on data underlying these results can be found on page 55*

This move towards the use of expensive stallions has been more marked in Britain, when considering foal sales

Model outputs Proportion of stallions by nomination fee bracket for foals, GB, (legend shows upper bound of fee in £)



- This analysis shows the proportion of sales by nomination fee for both jump and flat focused foal sales, for GB.
- The results also show a marked shift towards higher nomination fees paid by breeders since 2013. For Britain, both categories under £10k have decreased proportionally since 2013, as they fell from c.70% of sales in 2013 to c.40% in 2021, with the difference being made up for by increased use of fee brackets from £20k upwards.
- This trend should be interpreted with care, as it is not only driven by increased prices for nomination fees, but also changes in the nature of the market whereby breeders opt to pay higher nomination fees in order to make a return at sale. That is, there is a demand side as well as a supply side explanation for this change in nomination fee profile paid by breeders.

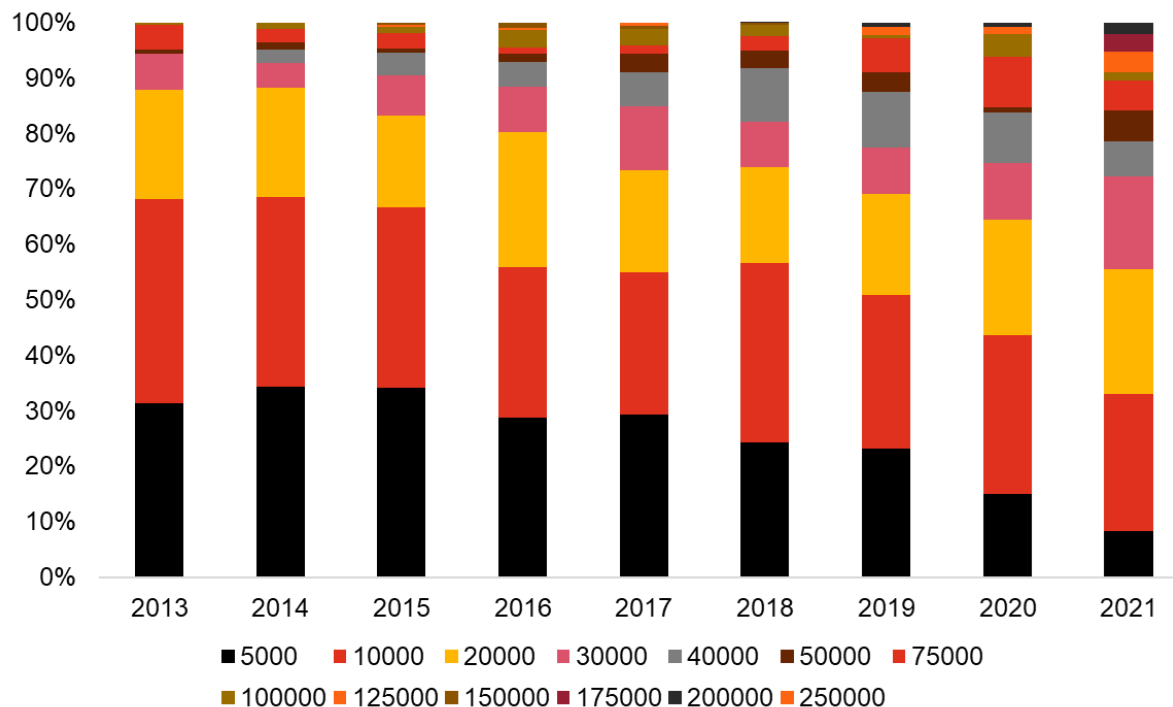
Source: Weatherbys, expert interviews, OSL, survey responses, PwC analysis

There has also been a significant global shift toward use of expensive stallions when considering yearling sales



Model outputs

Proportion of stallions by nomination fee bracket for yearlings, all regions (legend shows upper bound of fee in £)

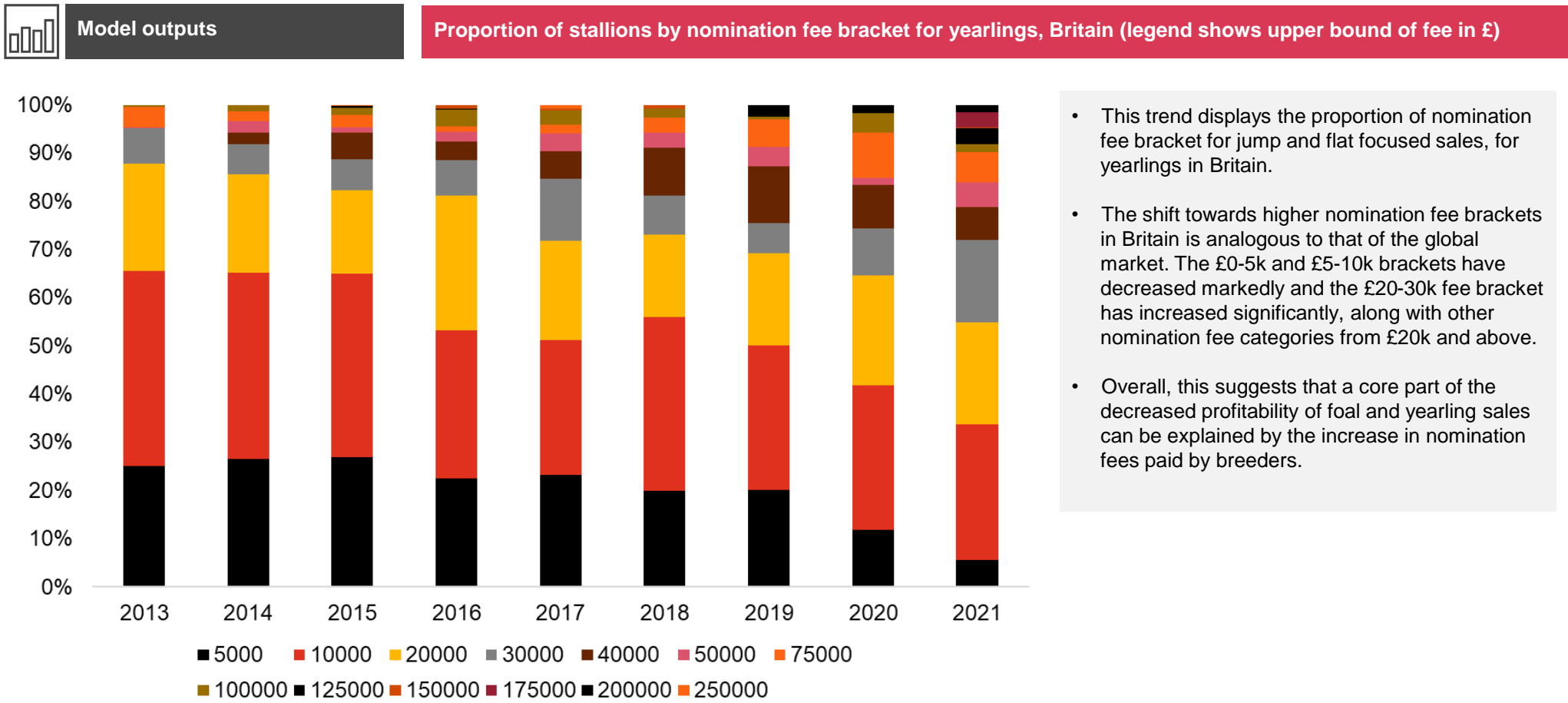


- The global market for yearling sales (jump and flat) shows a similar profile of change as for foal sales*.
- There has been a discernible shift from the £0-5k and £5-10k brackets towards the higher nomination fee categories.
- It is worth noting that the data takes the year in which the nomination fee was paid, so for a yearling sold in 2021, the nomination fee (we assume) was paid in 2019, i.e. in the same calendar year in which the broodmare was covered.
- This analysis affirms the global shift towards higher nomination fee brackets.

Source: Weatherbys, expert interviews, OSL, survey responses, PwC analysis

Note: This dataset includes all sales as covered by our data, including the Doncaster Sales from January 2021. As such, some data on NH yearling sales is captured within the dataset and is included within this analysis.

The shift toward the use of more expensive stallions has also taken place in Britain, when considering yearling sales




Source: Weatherbys, expert interviews, OSL, survey responses, PwC analysis

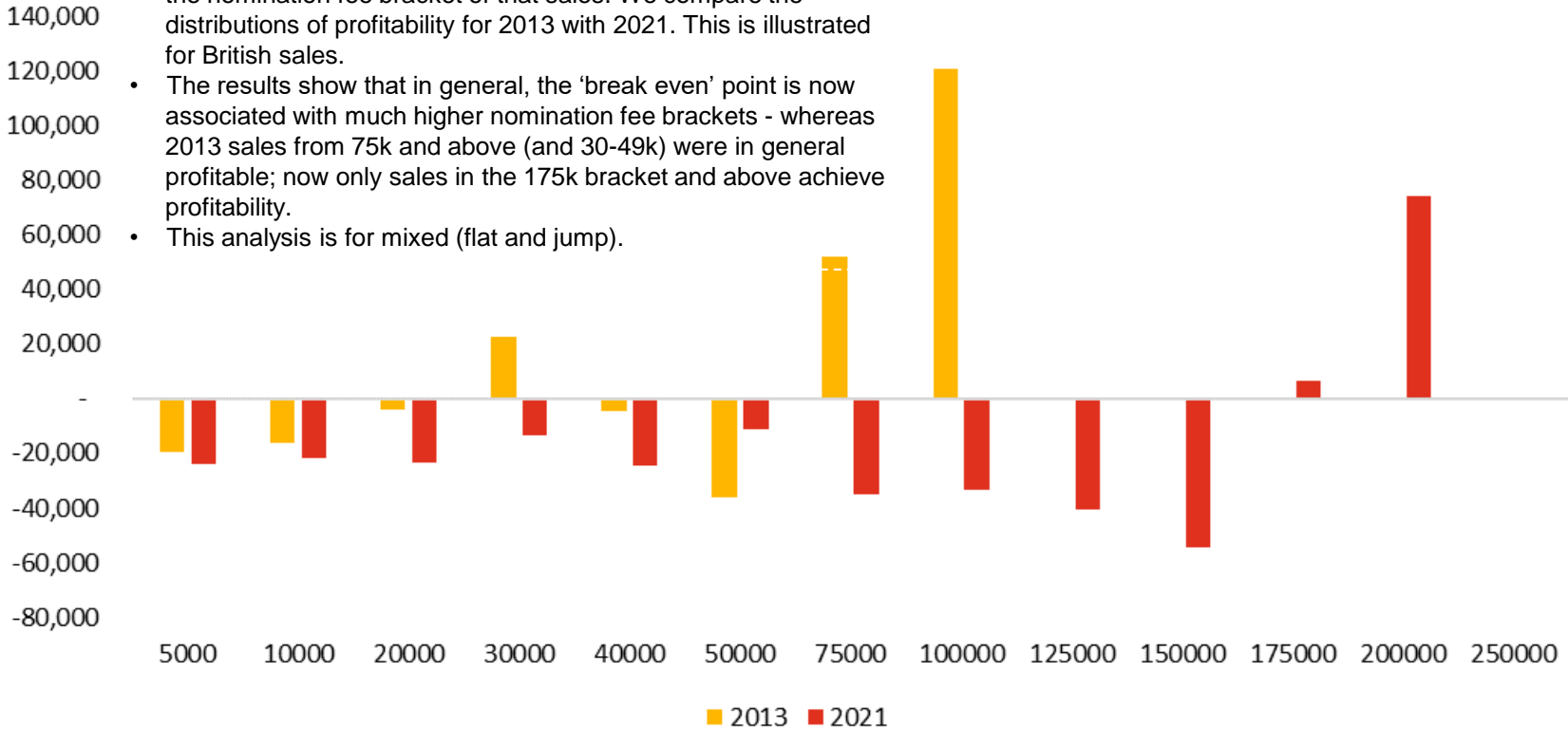
5.3

The 'break even' point is becoming increasingly associated with higher nomination fee brackets

Average profits per stallion bracket show the ‘break even’ point for breeders in Britain is becoming increasingly associated with higher nomination fee brackets

 **Model outputs** Average profit per bracket of nomination fee, foals, GB (legend shows upper bound of fee in £)

- In this analysis, we distribute the average profitability of sales by the nomination fee bracket of that sales. We compare the distributions of profitability for 2013 with 2021. This is illustrated for British sales.
- The results show that in general, the ‘break even’ point is now associated with much higher nomination fee brackets - whereas 2013 sales from 75k and above (and 30-49k) were in general profitable; now only sales in the 175k bracket and above achieve profitability.
- This analysis is for mixed (flat and jump).



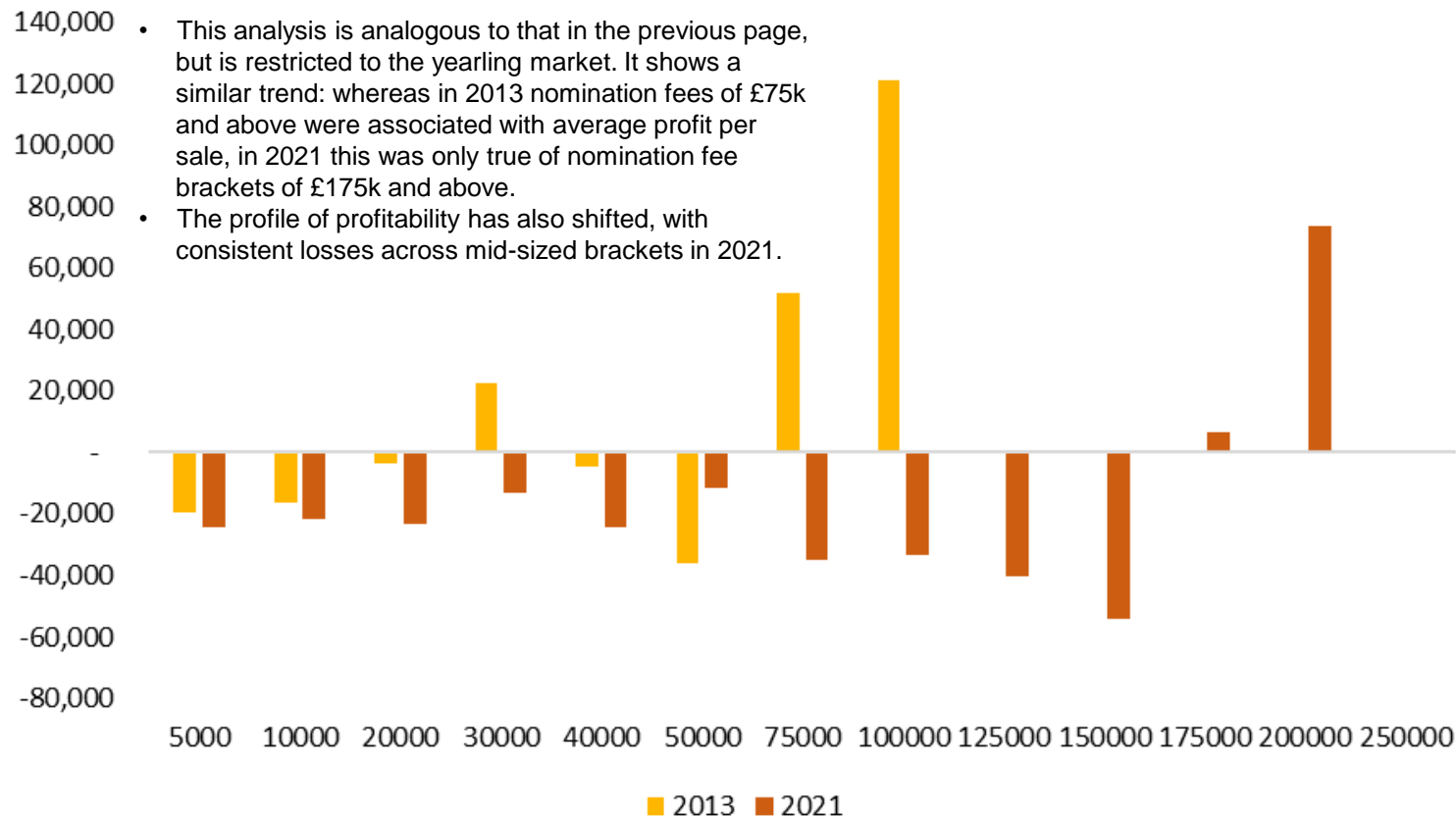
Source: Weatherbys, expert interviews, OSL, survey responses, PwC analysis

For yearlings, the 'break even' point for breeders in Britain is also now associated with a higher nomination fee bracket



Model outputs

Average profit per bracket of nomination fee, yearlings, GB, (legend shows upper bound of fee in £)



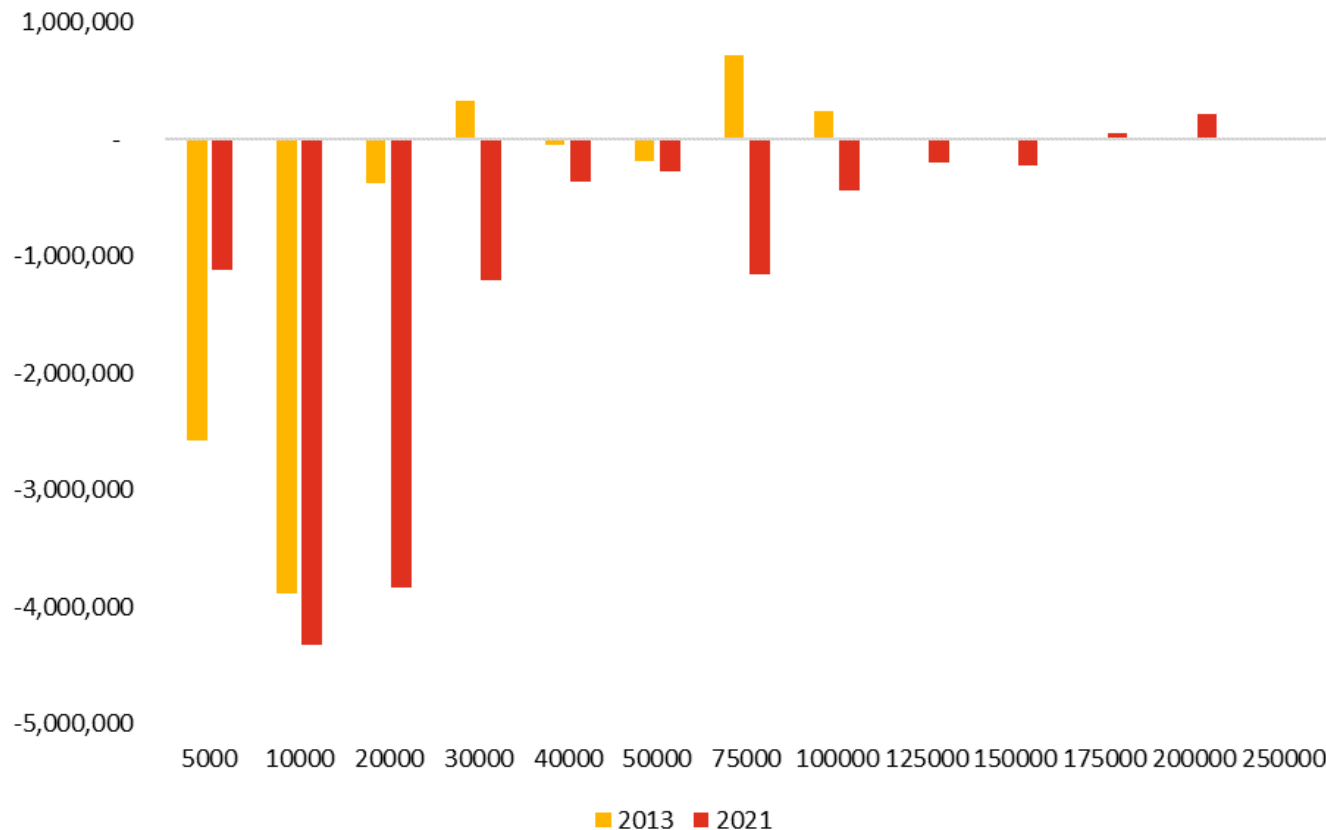
Source: Weatherbys, expert interviews, OSL, survey responses, PwC analysis

Summed profit by nomination fee also shows a shift towards higher nomination fee brackets for profitable sales in Britain



Model outputs

Sum of profit per bracket of nomination fee, foals, GB, (legend shows upper bound of fee in £)



- In this analysis, we sum the return on sales by nomination fee categories (in contrast to taking the average profit per category in the two slides above). This analysis, restricted to the sale of GB foals, gives an indication of where the aggregate losses are accrued. For the lowest two nomination fee brackets, the situation in 2021 is strikingly similar to 2013, and in fact, aggregate losses in the £0-5k category have decreased - driven mostly by decreased use of this nomination fee bracket.
- For almost all nomination fee categories from £10-20k and above, the aggregate losses in 2021 are greater.

Source: Weatherbys, expert interviews, OSL, survey responses, PwC analysis

5.4

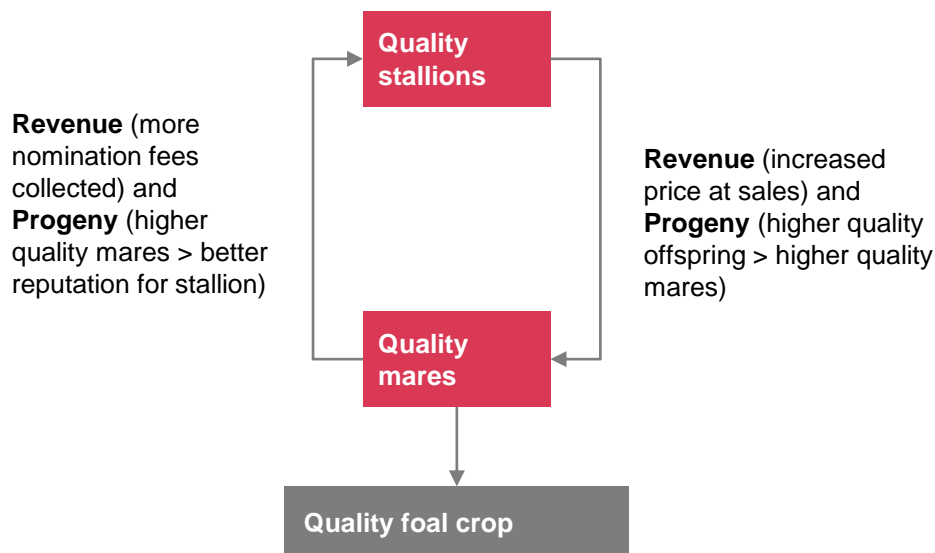
Trend Analysis: Headline findings

Our analysis suggests that the centralisation of the stallion market is relevant to the challenge to breeders' profitability

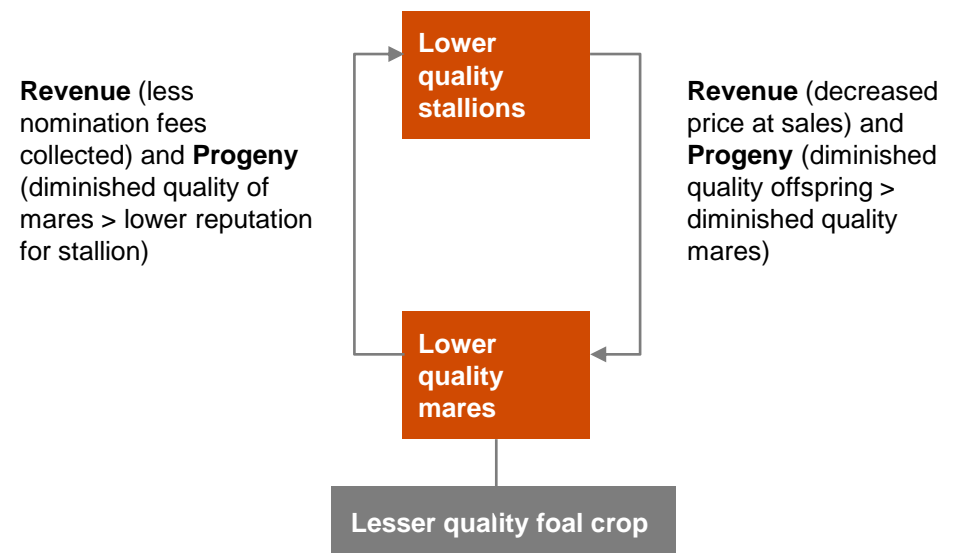
- Our analysis shows that the profitability of sales has been decreasing steadily but significantly since 2013, with the loss incurred on the median sale increasing from -£25k in 2013 to -£33k in 2021, and from -£10k in 2013 to -£16k in 2021, for the average sale.
- It is important to consider the role of nomination fees in breeder profitability: our analysis shows that ever higher nomination fees are required for breeders to achieve a 'break even' price point at sale, and nomination fees have comprised an increasing proportion of breeder costs.
- There is a steadily decreasing number of stallions in the middle market. Without a range of stallions, it is even more difficult to obtain a diverse spread of mares. This further polarises the market and initiates a negative cycle.
- Whilst paying higher nomination fees does, on average, increase sales revenue, it also represents increased risk. Our analysis therefore suggests that the industry should consider the importance of sustainable practices and arrangements for nomination fee payments, such that breeders are not put off from accessing the highest quality stallions by the high up-front investment and uncertain returns.
- Our analysis also identifies a shortage of stallions in the middle market. To ensure a healthy spread of mares, avoid market polarisation and prevent a negative cycle, it is important to ensure a healthy spread of stallions through the middle market.
- Ensuring breeders have access to the highest quality stallions is crucial to their continued operational viability, and the quality of the foal crop. By extension, this is also an important consideration for continued stallion master profitability.

Losses are likely to be compounded by the symbiotic relationship between nomination fees and the profitability of breeders

Scenario 1: the virtuous cycle in the stallion market



Scenario 2: the vicious cycle in the stallion market



- Scenarios 1 and 2 above illustrate the interrelationships between the profitability of stallion masters, breeders, and the quality of the foal crop.
- If stallion masters operate at a higher end of the market, with a higher number of quality stallions, and higher average revenues, our drivers of demand analysis suggests this would lead to higher prices being achieved for progeny at sale.
- The higher quality of progeny has an indirect benefit of increasing the demand for the stallion, benefitting stallion masters, as a higher quantity of high quality broodmares will lead to higher demand for use of stallions.
- This cycle, over time, increases revenues for both breeders and stallion masters, and the quality of the foal crop.
- In the alternative scenario, where there are few high quality stallions standing in GB, revenue for both stallion masters and breeders decreases. This, in turn, reduces the quality of the foal crop. Whilst the 'virtuous cycle' takes time to build the quality of the stallion and broodmare base, the unravelling of this cycle, represented by the 'vicious cycle' can occur very quickly.

Creative pricing practices could help to move the industry into a more favourable equilibrium

Overview

The previous page underlines the mutual beneficial relationship between stallion masters and breeders and how, where interests are well aligned, this can result in a virtuous cycle of growth. However, whilst paying high nomination fees does increase the probability of receiving a return, this also represents a higher exposure of risk to breeders.

We therefore conclude that the industry should explore alternative payment mechanisms for nomination fees that represent a pareto improvement, that is, a new equilibrium in which both parties are 'better off'. In the case of the stallion market, this would involve the introduction of practices which increase profits both for breeders and stallion masters, to the detriment of neither party. This means leveraging the 'virtuous circle' presented in the previous slide to achieve overall revenue growth in the industry.

The economic viability of buying and standing stallions in the UK is somewhat limited by high initial purchase prices and concentrated ownership across the 'big 6'. Potential solutions to this issue are grounded in 'sharing' mechanisms. Shared ownership, syndication and breeding clubs all make standing stallions more achievable in GB as risk can be shared across multiple parties. Syndication in particular allows owners to buy a 'share' in a horse, granting owners equity as well as breeding rights.

Source: TBA, PwC analysis

Pricing options

Below we set out a number of potential mechanisms that we consider likely to achieve more sustainable outcomes for breeders by improving their access to high quality GB stallions. As with all economic interventions, these would need to be carefully designed, refined, and tested, including extensive consultation with industry operators in their evaluation. Some initial avenues that are likely worth exploring include the following:

- **Foal sharing:** While foal sharing is already common practice, this option allows effective risk sharing. No nomination fee is charged, but the resulting progeny is sent to sale as a foal where proceeds are split 50:50 across parties. For broodmare owners facing high nomination fees, this would be a good way of lowering risk and cost associated with breeding, whilst stallion masters could gain a higher return in a year's time.
- **Top slicing:** already present in the industry, top slicing occurs where the stallion owner is paid a different amount for sale prices that exceed a certain threshold. This practice also allows for effective risk sharing, with more sophisticated options available compared to foal sharing. Given the likely higher risk tolerance of stallion masters, in general, this could therefore be mutually beneficial with the construction of terms that would benefit both parties.
- **Micro-shares:** there are an increasing number of syndicates in the breeding industry, which act to allow owners and breeders to pool resources, and risk. One benefit of this has been increasing accessibility for ownership to those that otherwise could not have viably purchased or bred a thoroughbred. However this practice is rarely applied to the ownership of stallions, and in this case there could be similar and different benefits. Firstly, increasing the accessibility of ownership would allow broodmare owners to share the benefits of higher nomination fees. Secondly, syndicates would allow for broodmare owners to engage in 'buy backs' to a greater extent.



Projections

6

We project changes in the foal crop using different scenarios for profitability, forecast into the future

Profitability levels in the industry form the basis for our foal crop projections

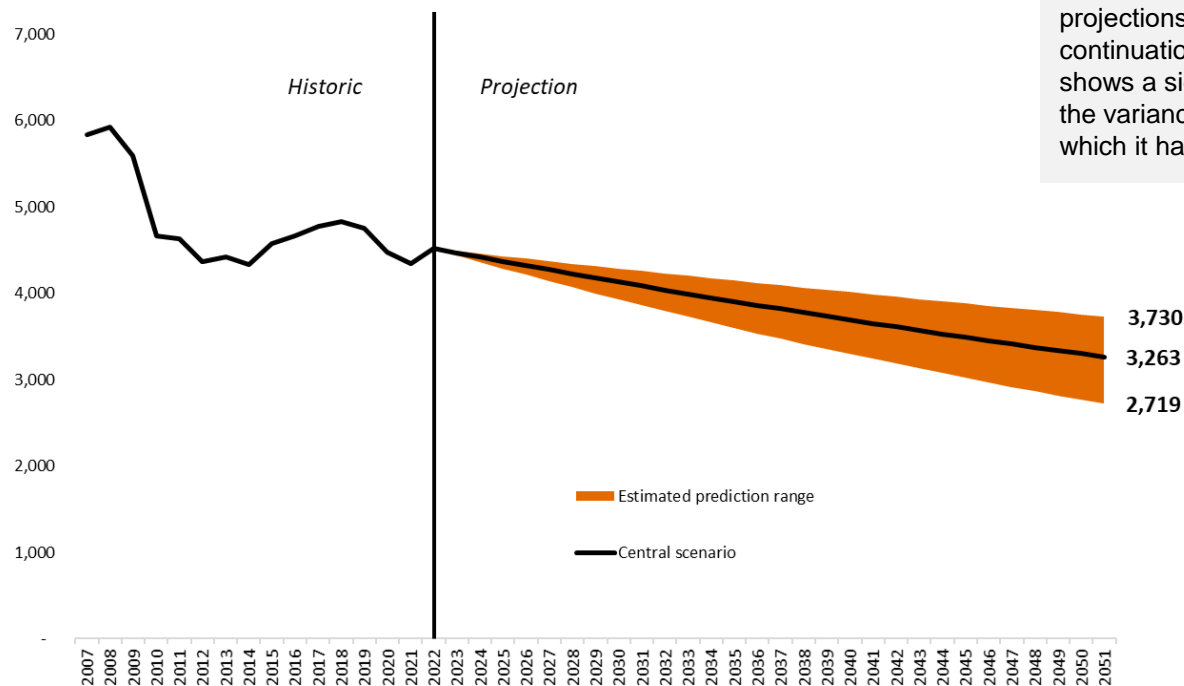
Most of our assumptions for projecting forward the GB foal crop are based on a sustainable level of profitability being obtained in the thoroughbred breeding industry. Our Input – Output analysis shows that profitability levels are low at the level of the breeder (most breeders are not profitable) and our trends analysis shows that profitability levels are low at the level of sale (most sales are not profitable). It is our consideration that these low levels of profitability will impact the foal crop. This is for two reasons:

1. First, the trends analysis shows that profitability at the level of the sale has fallen over time. Hence, even if low levels of profitability were sustainable in 2013, the new, more substantial, losses being accrued in 2021 may not be.
2. Secondly, the industry overview shows that the foal crop and number of broodmares domiciled in Great Britain has fallen over this period. Whilst we have not conducted an econometric analysis to examine whether there is a causal relationship, a descriptive link is sufficient to underlie our projections so long as this link is not spurious. There is good reason to believe this link is indeed not spurious, as:
 - a. A simple and theoretical link exists between profitability and output. Basic economic theory suggests that in the absence of clear market failures, high profitability levels will cause output of that product to increase, and industry losses will cause production of that product to decrease. The market functions sufficiently well in the thoroughbred breeding industry for this dynamic to operate.
 - b. Our interviews with industry participants suggest this link is operational, as respondents noted their decisions affecting output (such as the number of broodmares they own) are in part determined by the profitability of their stock at sales.

In light of this, we project changes in the foal crop using different scenarios for profitability, forecast into the future. We assume these changes to profitability take place by 2051, in 30 years' time, as by this time there will have been widespread generational change in the industry.

If current profitability trends are not reversed, worsening losses could have serious implications for the foal crop

Foal crop projections, GB, 2022 – 2051



The outcome of our analysis shows that there may be significant implications on the size of the foal crop if the current profitability trends are not reversed. These projections assume 'no action', and show what may happen given the continuation of the current policy climate. Although our worst case scenario shows a significant decline over time, this would not be unprecedented given the variance in foal crop that has been observed since the financial crisis, after which it has reduced from around 6,000 to just over 4,000.

Our estimated prediction range for the foal crop is from 2,719 (worst case scenario) to 3,730 (best case scenario) by 2051. Our central scenario is c. 3,300, which would be a significant reduction compared to the current level.

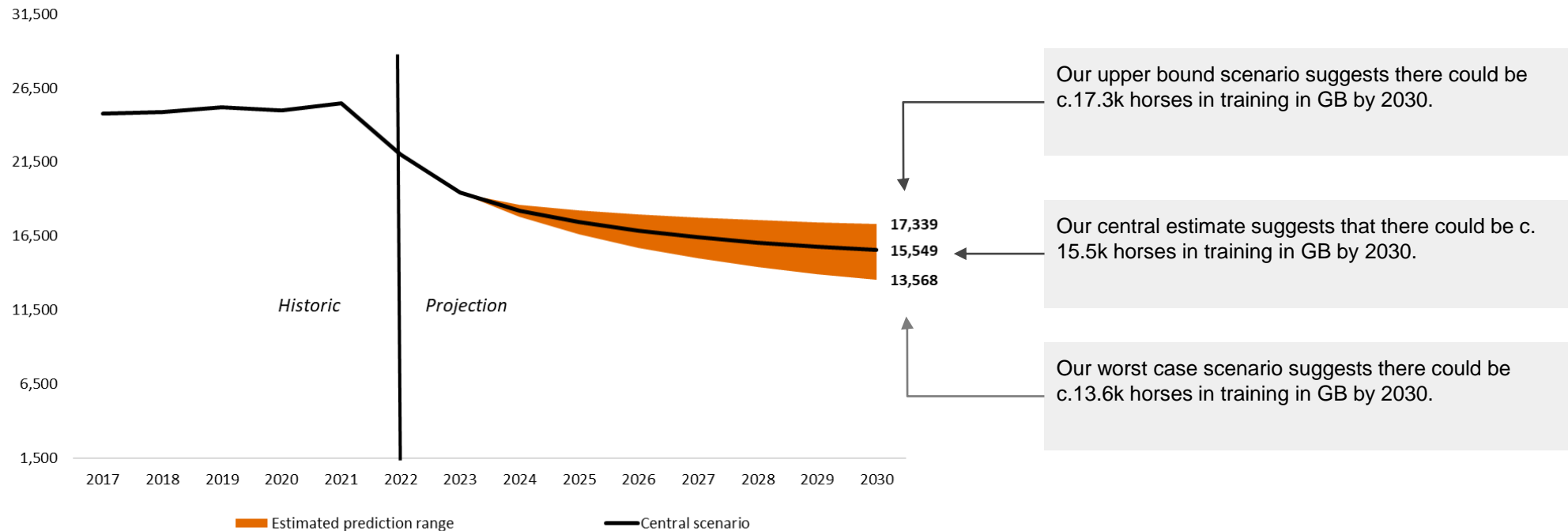
Source: Weatherbys, PwC analysis

Note: Detailed information on how scenarios have been formed is included in annex A3

Our model suggests changes in the foal crop would reduce the number of horses in training (HIT) in GB

Number of horses in training projections, GB, 2022 – 2030

On the basis of our assumptions listed previously, we project forwards the number of horses in training in Britain. Our projections span to 2030 rather than 2051, given the heightened uncertainties that stem from our additional assumptions required for these projections compared to those for the foal crop. This timespan is sufficient to display three clear scenarios, below.

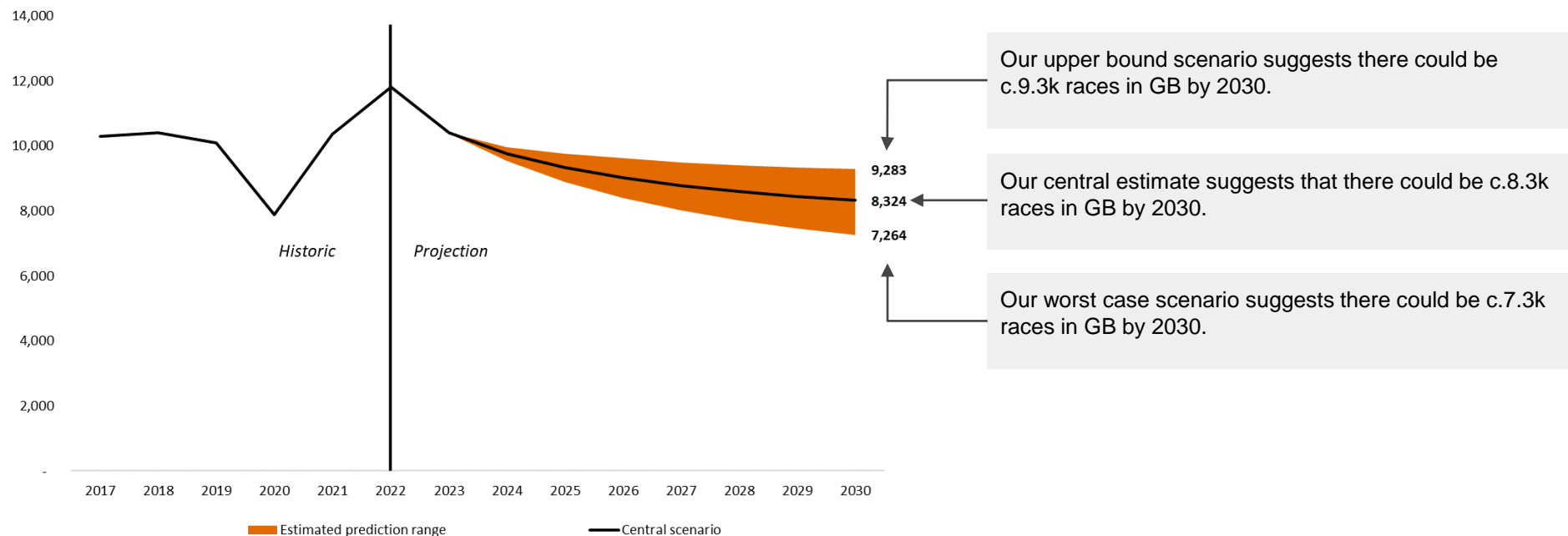


Source: BHA, Weatherbys, PwC analysis

Changes in the number of HIT could then impact the total number of races

Number of races, projections, GB, 2022 – 2030

The transformation from HIT to the racing programme assumes the average (mean) runs per horse and runners per race are constant, leaving only the number of races to vary in response to the falling HIT. Hence, the range in outcomes is driven only by the range of projected HIT numbers in our analysis. Even if there is some movement in the average number of runners per race, unless it falls drastically (see next slide) then there will be a direct reduction in the number of races that can be supported as the population of HIT falls.

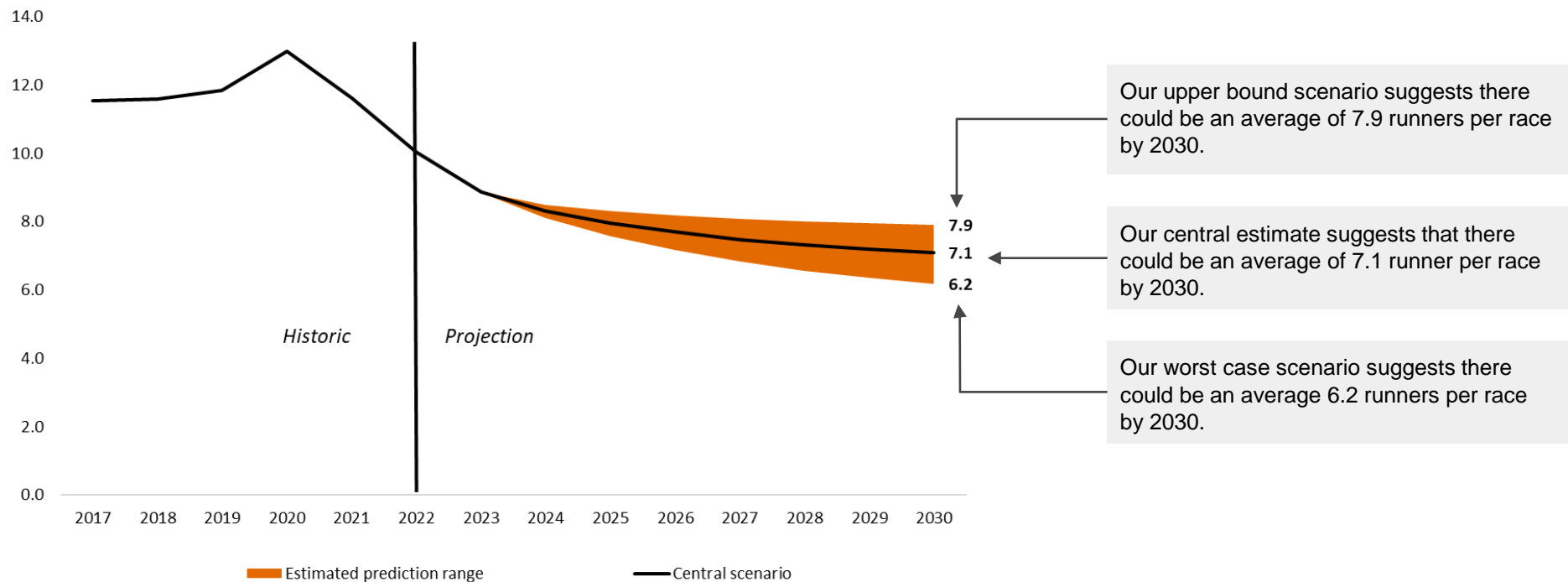


Source: BHA, Weatherbys, PwC analysis

Changes in the number of HIT could also impact the average number of runners per race

Average number of runners per race, GB, 2022 – 2030

The transformation from HIT to the average (mean) number of runners per race assumes the number of races and average runs per horse are constant, leaving only the average number of runners per race to vary in response to the falling HIT. If the number of races does fall, then it will lessen the fall in runners per race, but, as above, unless the number of races falls substantially, then there will be some reduction in the runners per race. As with the projections for the number of races, the range in outcomes is driven only by the range of projected HIT numbers in our analysis.



Source: BHA, Weatherbys, PwC analysis

Summary conclusions from our projections

1

Even if recreationally focused breeders remain invested in the industry, there is still likely to be a large reduction in the foal crop, without a change in profitability.

Our central case scenario assumes that only commercially focused breeders adjust their output in response to low levels of profitability. Even given this assumption, the foal crop is projected to decrease to 3,263 in our 30 year projection (to 2051). As such, though precise projections are hard to substantiate accurately, the rough magnitude and direction of the projection is robust to a range of breeder responses to falling profitability. Given this trend, some action to increase the profitability of domestic breeders is required to underscore sustainable foal crop production in GB.

2

The number of horses in training is sensitive to the domestic foal crop.

Our model accounts for the possibility that race horse owners in GB will likely increase their consumption of foreign bred stock in response to falling domestic production. However even given this assumption, our central scenario shows that the number of HIT could fall to around 15.5k by 2030 if the foal crop restricts as modelled. Once again, the reasonable nature of our assumptions underlying these projections suggest the order of magnitude and direction of the projection is concerningly robust, given no significant policy changes and intervention.

3

The number of races is sensitive to the number of horses in training

Intuitively, the number of races is sensitive to the number of HIT in GB. As a result of the declining foal crop, the number of races in Britain will likely decrease.

Our projections concerning the average (mean) number of runners per race show that this could fall to around 7.1 by 2030. However, the number of runners per race and number of races are of course tightly interlinked. Between these two variables one or both must decline following a reduction in the domestic foal crop. Our understanding is that the number of runners per race is more likely to have a floor below which it will not fall rather than the number of races. The projection of the average number of runners per race should, then, be taken to illustrate the amount by which the number of runners per race would have to fall (however infeasible) in order to sustain the number of races with a declining population of HIT.

Source: BHA, Weatherbys, PwC analysis



Drivers of demand

7

We have conducted an econometric analysis of the factors which determine the sale price of thoroughbred horses

Description and purpose of this analysis

This analysis aims to show the main determinants of the price of thoroughbred horses at sales. The analysis considers all the sales reported in Weatherbys Bloodstock sales reviews from 2013 until 2021, reporting sales in Britain, Denmark, France, Germany, Ireland, Italy, Sweden and the USA. The purpose of this analysis is twofold:

1. First to confirm or challenge common assumptions about the significant factors in determining the price of horses at sales. As a starting point, we accomplish this by showing both whether a factor is statistically significant in determining price. We then indicate the extent to which this factor determines price.
2. Secondly, this analysis can be used to indicate the health of the thoroughbred sales market. By showing the significance of various factors, the nature of change that may be required in the industry can be better understood. This is elaborated on in our **section 9** concerning the GBB policy evaluation.

Below, we summarize the method we used for our analysis. We provide further detail on each of these in the pages to come.

Summary of method

Qualitative assessment

1

- First, we worked collaboratively with the TBA to identify a list of factors that could be significant in determining the price of a horse at sale.
- This list was expanded with information received from expert interviews.

Data gathering

2

- Second, we gathered data on as many factors of importance as possible.
- This allowed us to test the importance of various quantifiable factors.

Econometric specification

3

- We have built an econometric model to analyse the importance of factors that we are able to include.

7.1

Approach to analysis

Together with the TBA, we have compiled a list of factors that could impact the price of a thoroughbred horse at sale

Qualitative Assessment

1

1

Factor	Intuition for positing potential impact on price
Sire	Genetically significant, with widespread recognition of the sire's importance in determining price.
Dam	Genetically significant, and broad recognition of importance in determining price.
Age	Descriptively big differences between mean price of stock grouped by age.
Gender	Descriptively big differences between mean price of fillies / colts and broodmare / geldings.
Sale	Descriptively big differences between mean prices of stock at different sales.
Sale position	Sales further down the order could impact price if interest of buyers change as sale goes on.
Vendor / consignor	Reputational differences between vendors could impact buyers' willingness to pay.
Scarcity of stallion (by year)	Theoretically, scarcity should increase nomination fee, but also price.
Output of gambling industry	The strong links between the gambling and racing industry may create a channel between gambling yield and price at sale.

2

Factor	Intuition for positing potential impact on price
GBB	Widespread anecdotal evidence of GBB impacting the price of fillies at sale
Racing revenue in races abroad	Given the tight links between the racing and breeding industries, this could impact price.
State of premium schemes abroad	These may have impacted the price of sales in relevant countries.
CPIH	Inflation could impact buyer confidence.
Race revenue in GB	The tight relationship between racing and breeding industries means this could impact price.
GDP	This can impact prices of products, especially if supply is inelastic.
Disposable income levels	Typically this is associated with higher prices for luxury goods.
Physical confirmation of animal	There are a range of tests a buyer undertake, before deciding the amount they are willing to pay.
Fashion / social trends	Social factors such as the popularity of a stallion, may impact the price of its progeny that year.

We have gathered information using a wide variety of sources on many of these factors of potential importance

Data gathering

2

Factor	Data gathered?	Source / reason for exclusion
Sire	✓	Weatherbys
Damsire	✓	Weatherbys
Age	✓	Weatherbys / TBA analysis of sales
Gender	✓	Weatherbys
Sale	✓	Weatherbys
Sale position	✓	Weatherbys
Vendor / consignor	✓	Weatherbys
Output of gambling industry	✓	Gambling Commission
GBB	✓	TBA
CPIH	✓	Office for National Statistics (ONS)
Race revenue in GB	✓	British Horseracing Authority (BHA)
GDP	✓	ONS
Disposable income levels	✓	OECD
Scarcity of stallion (by year)	✗	Captured by nomination fee
Racing revenue in races abroad	✗	Data could not be gathered comprehensively
State of premium schemes abroad	✗	Not observed, captured by time trends
Physical confirmation of animal	✗	Not observed
Fashion / social trends	✗	Not observed, captured by time trends

We have designed a model to estimate the comparative impact of various of these factors

Econometric
specification

3

Model overview

We have used an ordinary least squares (OLS) model to estimate the main determinants in the sales price of thoroughbred stock. In order to account for the skewed nature of the sales price (which typically have a very long 'tail', with lots of very high sales values) we have taken the logarithm of the sales price as our dependent variable. This also allows for a more intuitive interpretation of the results of the regression.

Many of the potential determinants of demand are unobserved, for example fashion / social trends, or racing revenue abroad (in all countries). To ensure this variation is fully captured we specify the model with time (year and quarter) fixed effects, which capture unobserved time variant factors. Not accounting for these factors would bias the estimators on the variables we do observe.

This approach does, however, mean that we are unable to isolate the impact of factors that we do observe but are perfectly correlated with time (e.g. GDP). However, we judge that the specification set out below is the best available model to deliver unbiased estimates of the determinants of price in the available data.

We used a form of this model to estimate the importance of variables in both the flat and jump market. We have separated the two on the understanding that the two markets operate distinctly, and thus it is more intuitive to provide results specific to each.

Model specification

$$\begin{aligned} \ln(\text{price}_{ht}) = & \beta_1 \ln(\text{nomination fee}_h) + \beta_2 \ln(\text{dam progeny}_{ht}) + \beta_3 \text{Female}_h + \beta_4 \text{Foal}_h + \beta_5 \text{Yearling}_h \\ & + \beta_6 \text{Breeze} - \text{Up}_h + \beta_7 \text{Sale Position}_h + \beta_8 \text{GBB}_t + \beta_9 (\text{GBB}_t \cdot \text{Female}_h) + \sum_{q=1}^{q=4} \delta_q \text{Quarter}_t \\ & + \sum_{y=2013}^{y=2021} \gamma_y \text{Year}_t + \varepsilon_{ht} \end{aligned}$$

7.2

Drivers of Demand: Headline findings

For flat and jump sales, we found various factors statistically significant in determining the price at sale

	Flat	Jump
Sire (Nomination fee)	Significant	Significant
Dam (Mean progeny value)	Significant	Significant
Gender (Female)	Significant	Significant
Age (Foal)	Significant	Not significant
Age (Yearling)	Significant	Not significant
Age (Breeze-up – Flat / Store – Jump)	Significant	Not significant
Lot	Significant	Not significant
Year	Significant	Significant
Quarter	Significant for all	Significant for all
Total variables significant	9	5

Supplementary econometric analysis shows that the sale price of thoroughbred horses' are dependent on nomination fees, dam progeny, age, and gender

Flat		Jump	
0.73%	For a 1% increase in nomination fee paid, all else equal, there is a 0.73% increase in the price at sale.	Sire (Nomination fee)	For a 1% increase in nomination fee paid, all else equal, there is a 0.22% increase in the price at sale.
0.12%	For a 1% increase in the average (mean) value of the Dam's progeny, all else being equal, there is a 0.12% increase in the price at sale.	Dam (Average (mean) progeny value)	For a 1% increase in the average (mean) value of the Dam's progeny, all else being equal, there is a 0.09% increase in the price at sale.
-34%	Female horses, all else being equal, sell for 34% less than male horses.	Gender (female)	Female horses, all else being equal, sell for 74% less than male horses.

After gender, the most significant drivers of demand were found to be dam progeny and nomination fee. Both of these results imply that to perform well at sales breeders are required to make a significant upfront investment.

We additionally find that **age is an important factor in determining price in flat sales.** Holding all else equal, there is a 20% premium paid for foals, a 51% premium paid for yearlings, and a 93% premium paid for breeze ups, over and above older stock. We believe this to be largely driven by selection effects: as younger horses age, uncertainty around performance potential decreases.

Excluding the impact of GBB, the price for female horses is significantly lower than for males (the differential is 34% for flat and 74% for jump). As breeders have no control over the gender of foals, and there is no difference in the cost of production between males and females, this represents a financial risk to breeders.

In order to better understand the intuition behind the high coefficient on the nomination fee, of 0.73%, we recommend consideration of the results in **section 5** which laid out the descriptive relationship between nomination fee paid and profitability: given this is after accounting for the nomination fee, it shows the substantial impact nomination fee must have on the price at sale. As such, we consider the coefficient on nomination fee to be intuitive.

For flat sales, there were a further three statistically significant variables

Other Statistically Significant Variables (Flat)

Foal
(vs. 'other')

Foals, all else being equal, sell for 20% more than 'other' stock (that is, stock that are not foals, yearling or 2 year olds breeze-ups. In our dataset, based on Weatherbys bloodstock reviews, we had no further specific information on the age of this other category).

20%

Yearling
(vs. 'other')

Yearlings, all else being equal, sell for 51% more than 'other' stock (as defined above).

51%

Breeze-Up
(vs. 'other')

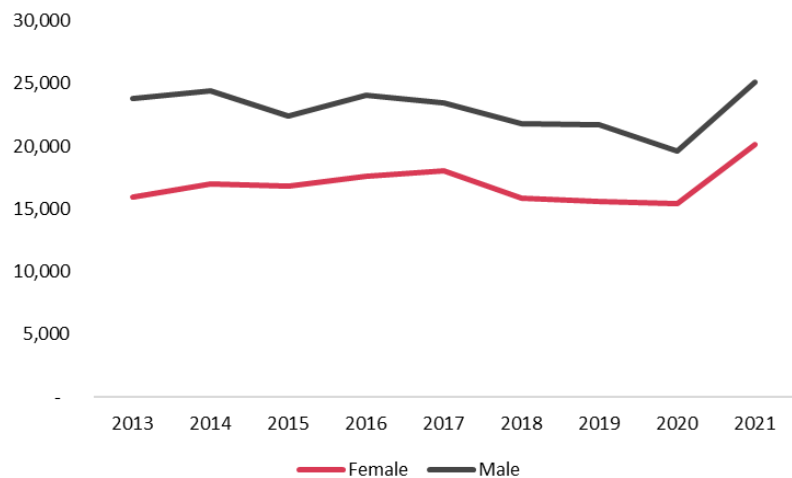
2 year old breeze-ups, all else being equal, sell for 93% more than 'other' stocks (as defined above).

93%

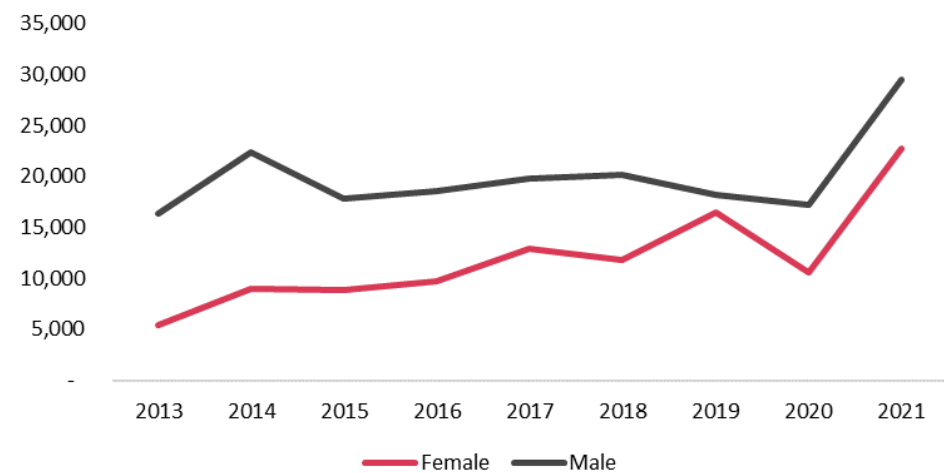
We understand that the result of our model with respect to the impact of 'Breeze-up' on price could be unintuitive. As such, in the next two slides we provide descriptive statistics to help explain the intuition underlying this result.

Median prices for females are proportionately lower for jump sales compared to flat, providing intuition for the impact of gender on price

Flat, comparison of median real prices by gender, GB sales (£)



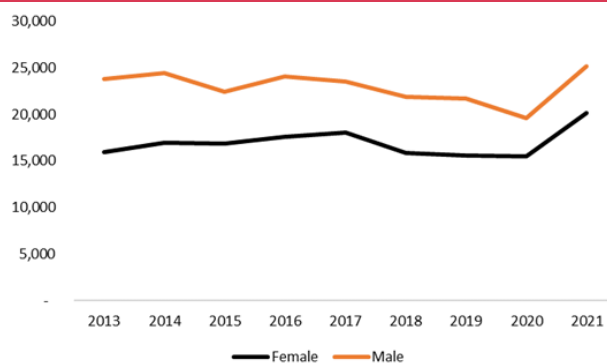
Jump, comparison of median real prices by gender, GB sales (£)



- The median prices for GB jump focused sales show a significantly bigger difference between prices for female and male stock, since 2013, compared to flat focused sales.
- This difference between prices of the two genders has closed at a much faster rate in recent years for jump stock, compared to flat stock.
- Both the above trends, in part, explain the negative coefficient for female sales compared to male sales, in the modelling results. They also show why this coefficient is significantly lower for jump compared to flat, given the historically bigger difference between mean sales prices for female compared to male.
- Median prices for both flat and jump sales have risen significantly in 2021. This is likely driven by strong global demand throughout the thoroughbred breeding industry.

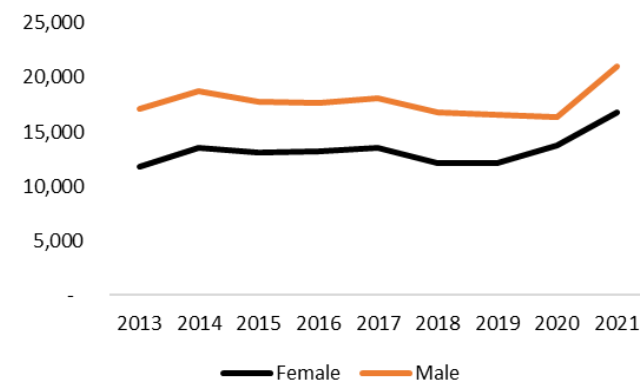
Our analysis also shows a persistent ‘gender gap’ in average prices for jump and flat sales in Britain

Jump, comparison of average (mean) real prices, GB (£)

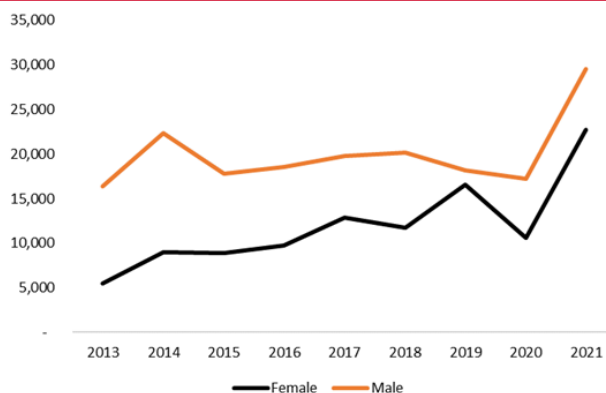


Our analysis uses all the data recorded in the bloodstock sales reviews from 2013 – 2021. After converting the series to real terms, we find a significant difference between prices for male and female sales, although this began to close after 2020.

All sales, comparison of median real prices, GB (£)

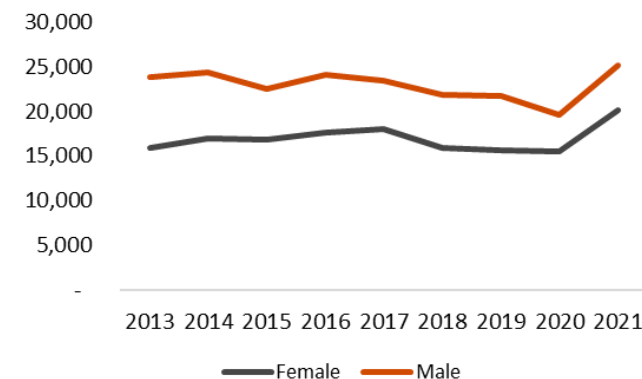


Jump, comparison of median real prices, GB (£)



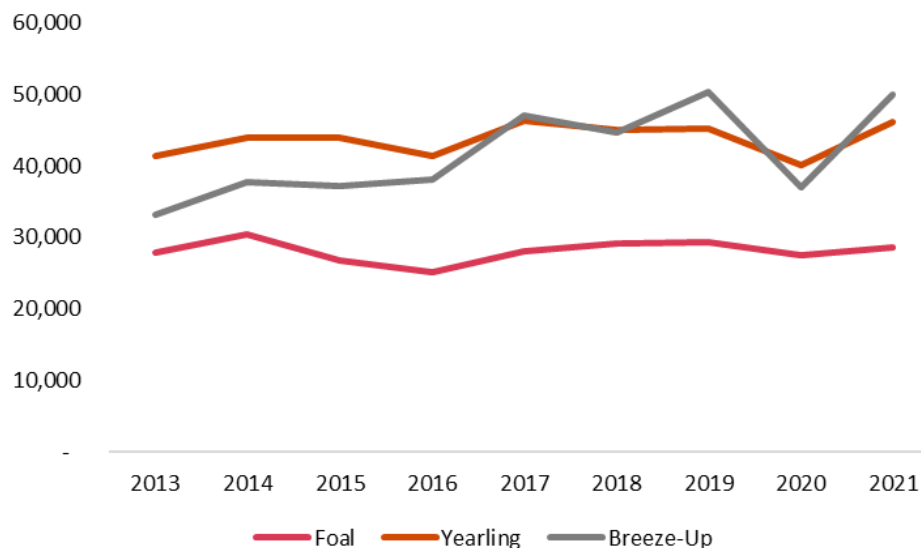
Median prices specific to jump and flat both show a difference between the price of male and female sales despite a relative lessening of the gap in recent years. In **section 9** we explore these trends in further depth, and examine whether the general lessening of the gap in 2020 can be attributed in part to the Great British Bonus scheme.

Flat, comparison of median real prices, GB (£)

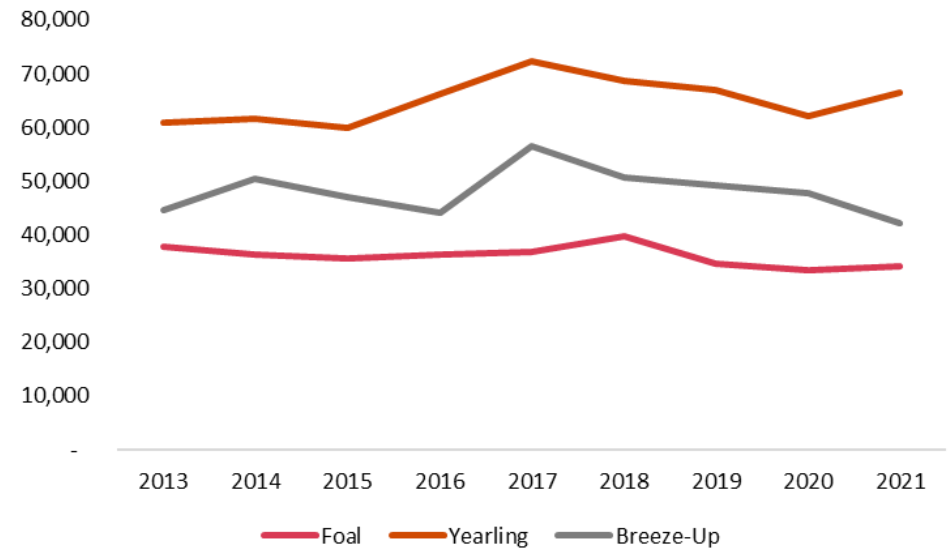


Average prices for yearlings and breeze-ups are comparable at the global level, with yearling prices higher in the GB market

Flat, comparison of average (mean) real prices by age, all sales, (£)



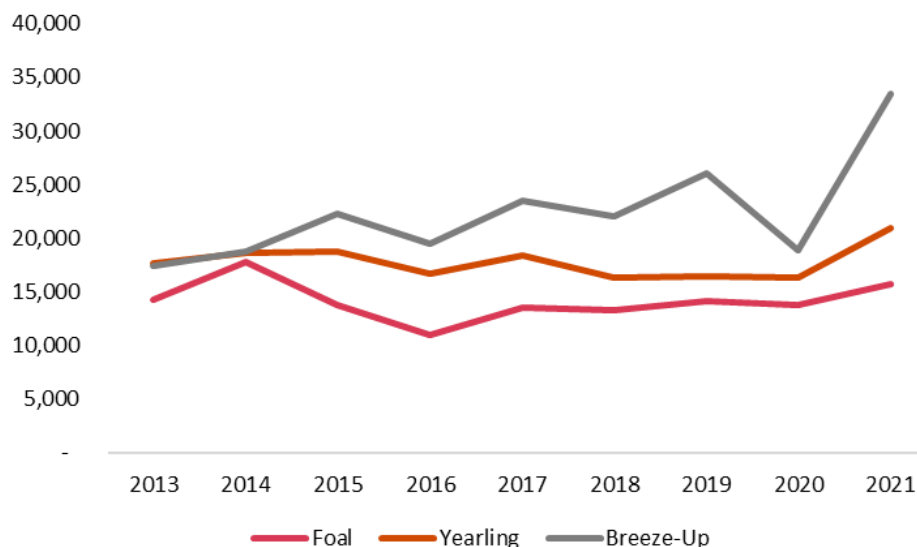
Flat, comparison of average (mean) real prices by age, GB sales, (£)



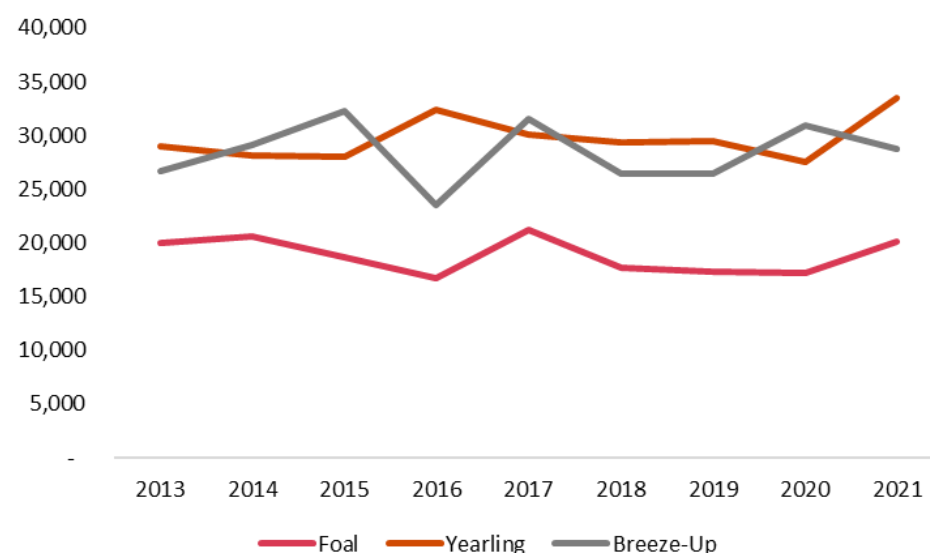
- Average breeze-up prices are similar to that for yearlings across all sales, but when looking only at the GB market, the prices for yearlings remain significantly higher.
- The differences in median prices shows increased profitability is partly what drives the higher coefficient on breeze ups compared to yearlings in the modelling outputs.
- Overall, the descriptive statistics suggest the average (mean) and median prices are not significantly higher for breeze-ups compared to yearlings. As such, the econometric results shows that breeze-ups obtain higher prices conditional on other characteristics that would otherwise decrease the price of that sale. In the next slide, we explain what these reasons are likely to be: namely, 'age' bias - as horses develop there is more opportunity for underperformers to drop out the sales market; and 'selection' bias - Pinhookers identify promising prospects to train and sell on as breeze-ups, so increasing the prices at sale.

Median prices for yearlings are lower than breeze-ups at the global level, but are comparable in GB

Flat, comparison of median real prices by age, all sales, (£)



Flat, comparison of median real prices by age, GB sales, (£)



- When looking across all sales, the median price for breeze-ups in 2021 rose far higher than that for yearlings.
- When restricted to GB, the median price for breeze-ups was comparable to that for yearlings.
- The median price for breeze up horses has risen substantially, in 2021 compared to 2020. When compared to 2019, this price rise is lower, and is partly explained by changes in the schedule of sales, e.g. the omission of the Ascot Breeze-Up Sale* in 2021, which in 2020 had a significantly lower median sales price.

Note: * Tattersalls Confirms 2021 Breeze-Up Fixtures, available here: <https://www.tattersalls.com/news/tattersalls-confirms-2021-breeze-up-fixtures>

7.3

Implications of results

The results of our analysis have implications for breeders

After gender, the most statistically significant determinants of sale price are **nomination fee** and **dam progeny**.

- This implies that the probability of commanding a high price depends on upfront investment by breeders.
- There is a secondary implication that the quality of the foal crop supplied to the racing programme depends on breeders being in a position to make significant upfront investment.
- The risk of such investments is, at present, wholly owned by the breeders.
- There is therefore potential for breeders to increase revenues, and for the quality of the foal crop to rise, if mechanisms to share the risk of upfront investment with studs are explored.



In the market for flat horses, **age is also important:**

- Holding all else constant, prices increase substantially with age – before falling dramatically for older horses.
- One explanation for this is that as horses develop from foal through yearling to breeze-up, purchase risk decreases as their development potential becomes clearer.
- However, this is likely to be driven in part by selection bias: more promising horses are likely to make it to formal sale (and we do not observe the informal market).
- In particular, high returns for breeze-ups may be driven by resales (where successful horses purchased as yearlings are resold later as breeze-ups, whereas less successful horses are sold outside of the formal market).



With thanks to Adam Smyth for supplying the photographs

Economic impact study of Britain's thoroughbred breeding industry

PwC

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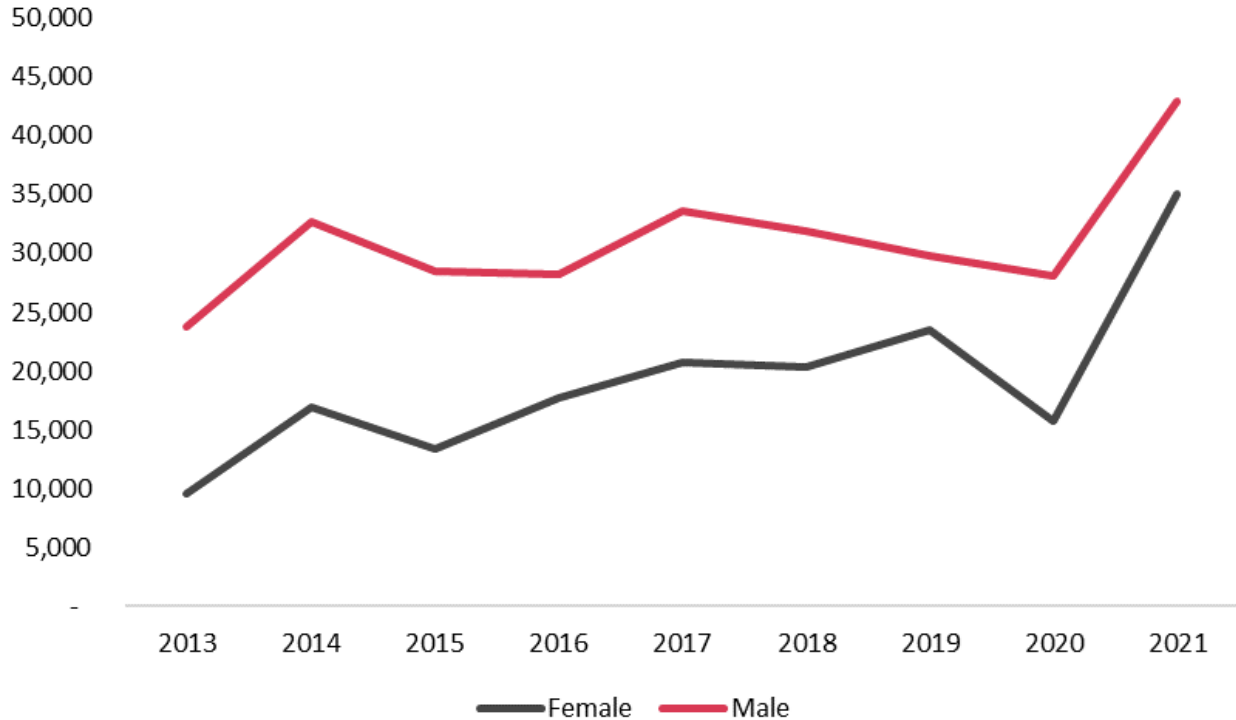


Jump market focus

8

Our analysis has shown a relatively higher impact of GBB on filly prices in jump sales compared to flat

Jump, comparison of average (mean) real prices, GB (£)



The analysis showed that the GBB scheme has had a substantial effect on the average (mean) price of fillies, controlling for other factors that may influence price. With respect to the jump market, the results indicate that GBB has had a proportionally larger impact on the prices for jump fillies as compared to flat fillies.

According to our model, GBB led to a 13.4% increase in the price for flat fillies compared to a 26.5% increase in price for jump fillies. The graph to the left aligns with this impact. Although the descriptive analysis pictured doesn't control for other factors that influence price, it still shows a convergence between the prices of fillies and colts for the jump market after GBB was introduced in June 2020. This shows the intuition behind our econometric finding that GBB has had a sizeable impact on the price of fillies in the jump market.

- When looking specifically at jump sales, the Average price for females rose significantly, compared to those for male sales, in 2020.

Econometric analysis focused on the jump market shows that the Sire, Dam and Gender of stock were statistically significant in determining prices in jump sales

Summary of statistical significance	
Aspect	Jump
Sire (nomination fee)	Significant
Dam (average (mean) progeny value)	Significant
Gender (female)	Significant
Age (foal)	Not significant
Age (yearling)	Not significant
Age (store)	Not significant
Lot	Not significant
Year	Significant
Quarter	Significant for all
Total significant variables	5

Coefficients outputs	
<p>Sire (Nomination fee)</p> <p>For a 1% increase in nomination fee paid, all else equal, there is a 0.22% increase in the price at sale.</p>	0.22%
<p>Dam (Average (mean) progeny value)</p> <p>For a 1% increase in the mean value of the Dam's progeny, all else being equal, there is a 0.09% increase in the price at sale.</p>	0.09%
<p>Gender (Female)</p> <p>Female horses, all else being equal, sell for 74% less than male horses.</p>	-74%

The Elite NH Mares' Incentive Scheme (EMS) was introduced by the TBA in 2012 to incentivise the standing of jump stallions in GB

Description

The EMS directly rewards the owners of mares that are themselves top performing by providing subsidised or free nominations to select British based stallions. In this way, the scheme as a first step incentivises TBA members who own eligible mares to cover them with quality British stallions. As a second step, it incentivises the owners of stallions to stand in Britain, by increasing the demand for their services. Linked to both steps, it aims to increase the number of quality jump broodmares domiciled in GB, and so underpin the sustainability of jump breeding in GB.

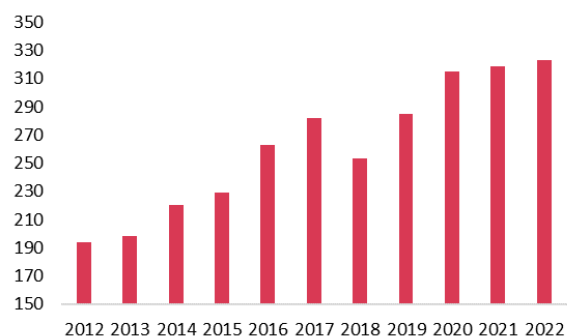
Overall effect

The scheme directly encourages owners of elite mares to make use of high quality jump stallions standing in GB, and indirectly encourages owners of high quality jump stallions to stand their stallions in GB. A central tenet of the scheme is to encourage quality stock bred in GB, as it only applies to highly regarded mares and stallions in GB. Anecdotal evidence of success has been provided, with public statements from major UK breeding operations, such as Overbury Stud and Shade Oak Stud, that the reason for their investment in stallions standing in GB is the EMS, which provides a solid basis of elite mares, helpful especially for stallions near the beginning of their career. The effect of the scheme may also be indicated by the increased number of eligible mares, showing the breadth of quality of broodmares domiciled in GB has increased since the scheme's introduction, displayed below.

Technical details

Full TBA members who own jump mares rated above 130 are eligible for a free or subsidised nomination to a British based stallion which also meets the criteria and has been registered for the scheme. Mares are eligible for the scheme if they have achieved a given Official Rating above 130 (split into three categories) or else have produced a horse that has achieved a given rating of above 135. The three categories grant a reward of £4,000, £3,000 and £2,000 respectively, which goes to subsidise the nomination fee of an eligible British based stallion (this is either a full or a partial subsidy depending on the level of the nomination fee).

EMS, number of known eligible mares, historically

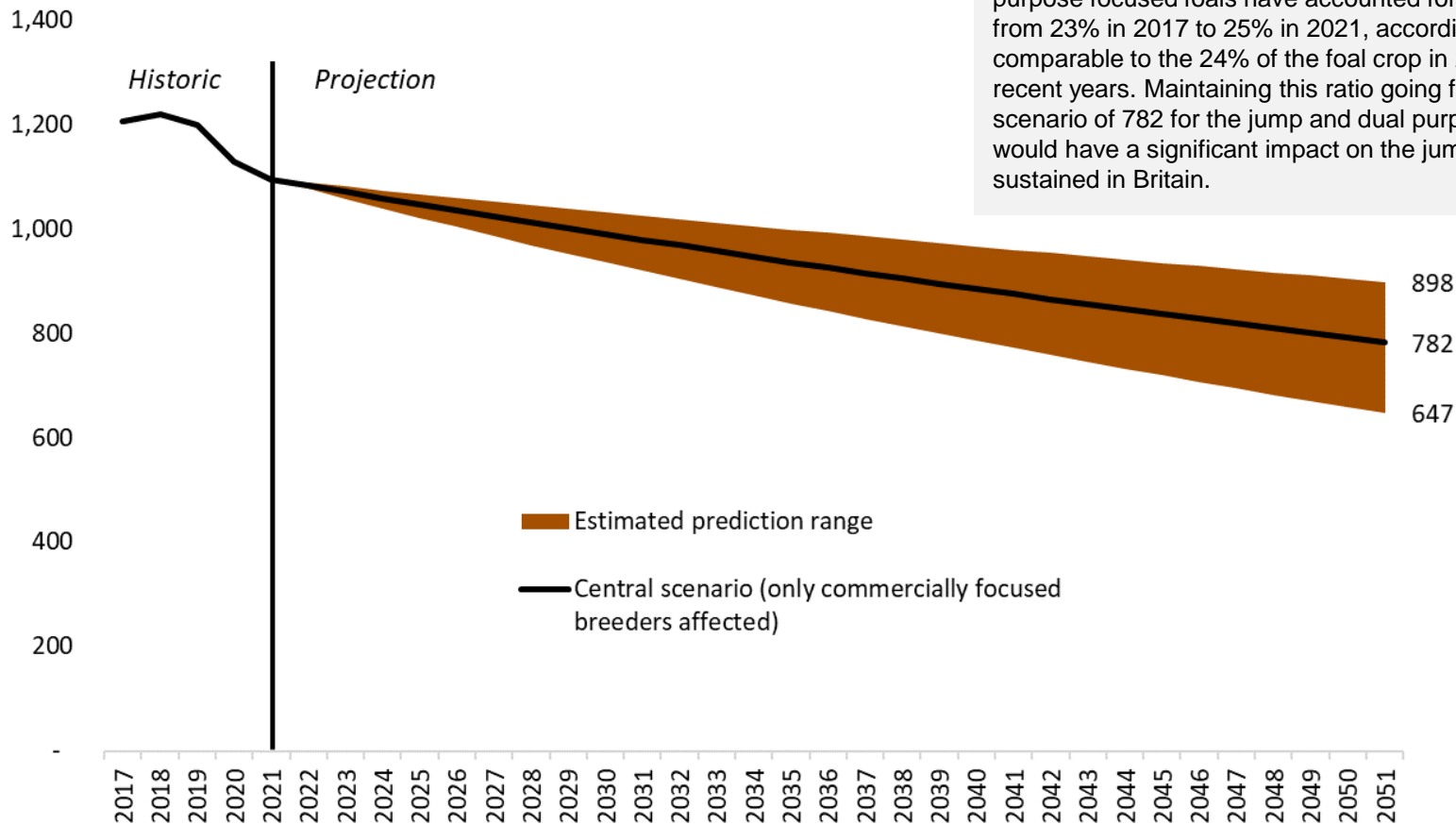


Source: Weatherbys, GBB survey, PwC analysis

The worsening losses previously identified could have serious implications for the jump foal crop

Foal crop projections, GB, 2022 – 2051

Our profitability analysis can also be applied to the jump market specifically, illustrating the potential decrease in numbers that could result from low profitability levels in the industry. Over the past four years, the jump and dual purpose focused foals have accounted for around 25% of the foal crop, ranging from 23% in 2017 to 25% in 2021, according to Weatherbys data. This ratio is comparable to the 24% of the foal crop in 2013, showing a broad stability in recent years. Maintaining this ratio going forwards, this provides a central scenario of 782 for the jump and dual purpose focused foals in 2051. This would have a significant impact on the jump racing programme that could be sustained in Britain.



Source: Weatherbys, PwC analysis



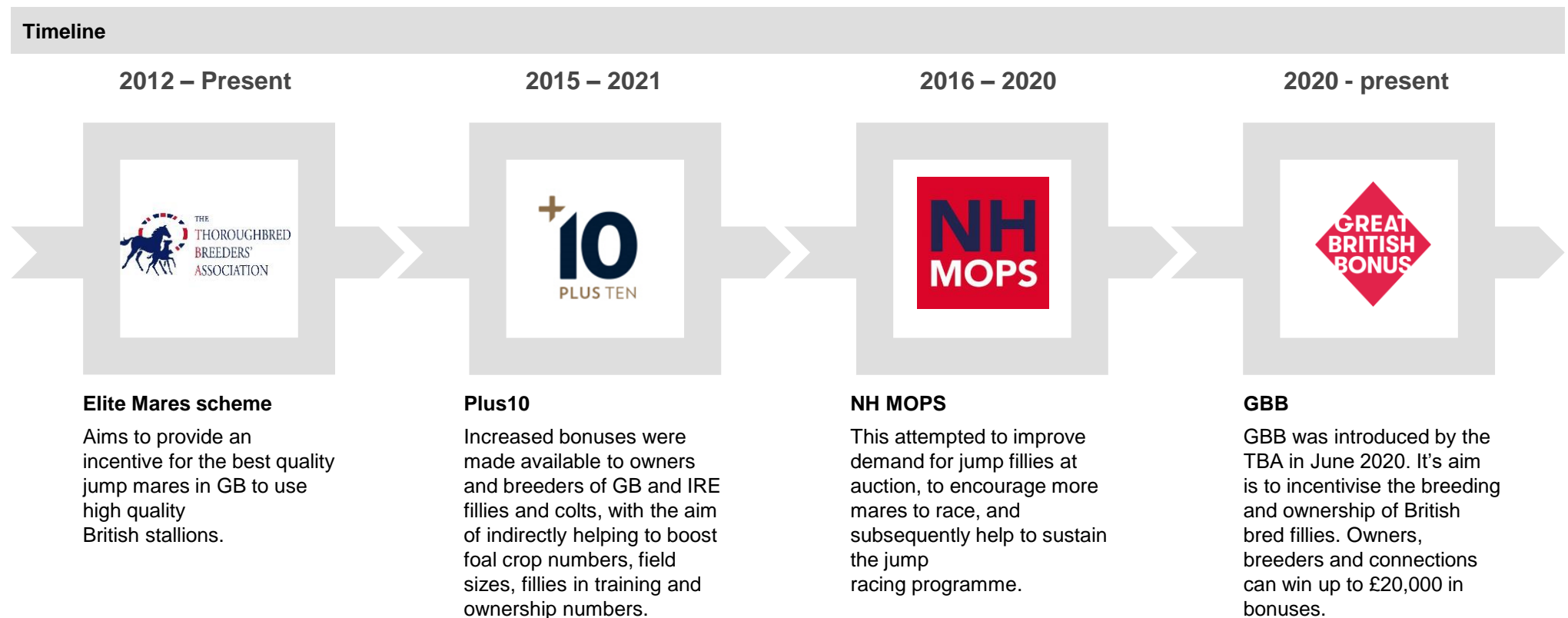
Policy evaluation: The Great British Bonus

With thanks to Adam Smyth for supplying the photograph

9.1

Background and context of GBB

GBB sits against the backdrop of a number of incentive schemes in the breeding industry



The Great British Bonus scheme has been introduced to mitigate the profitability pressure on fillies

Description

- The need for GBB arose because, as a general rule, fillies were perceived as unprofitable, due to their perceived weaker racing prospects which led to poor demand and low prices at sales. The TBA and BHA worked to improve the racing programme for fillies and mares and schemes such as those referenced in the previous slide were introduced to provide the financial incentive.
- The Great British Bonus (GBB) is a scheme introduced by the TBA in June 2020. It is primarily funded by the HBLB, supported by registration fees. Its aim is to incentivise the breeding and ownership of British bred fillies. Owners, breeders and connections can win multiple bonuses of up to £20,000 for fillies winning GBB-eligible races.
- The scheme has already seen substantial pay outs; as of August 2022 the bonus payout of the scheme was £6,445,8375 with 367 filly and mare recipients since its inception.
- In 2022, over 3,000 races will fall under the GBB banner with the greatest financial gains to be made in Filly and Mare only races. In combination with the ability for a single filly to win multiple bonuses in eligible races, the scheme has become popular amongst British breeders.

Technical details

While paying out up to £20,000 per eligible winner, the scheme's precise payout for any given winner depends on various other factors:

- One of the big determinants is the winner's parentage. Foals born in GB and sired by a stallion standing in GB are entitled to the largest payout, whereas GB bred foals sired by a foreign stallion are entitled to 50% of the available bonus in any qualifying race.
- Second is the type of race. £20,000 is the maximum payout in select fillies-only Flat races, with £10,000 available in Flat races open to both sexes. In jump races, £20,000 is available to mares-only hurdles and steeplechases and races with £10,000 available in mixed sex races and mares-only flat jump races (Bumpers).
- Lastly, the distribution of the bonus between stakeholders sees the registered owner receiving 65%, with 10% given to the foal registrant and 10% to the yearling registrant. Meanwhile, 7.5%, 5%, and 2.5% is paid to the trainer, jockey, and stable staff respectively.

Source: Weatherbys, GBB survey, PwC analysis

Other similar schemes have been employed abroad – evidence from the US

New York – New York Sired Bonus Programme

New York Thoroughbred Breeding and Development Fund Corporation operates an incentive programme for thoroughbreds foaled in New York who race on New York tracks. The programme was introduced in 1973, and provides incentive awards to participants and purse enhancements to New York-breds, to encourage the establishment of thoroughbred farms in New York.

New York sired		Non New York Sired	
Position	Breeder bonus (% of prize money)	Position	Breeder bonus (% of prize money)
1st	30%	1st	15%
2nd	15%	2nd	7.5%
3rd	15%	3rd	7.5%
Cap per award		\$40,000	Cap per award \$20,000

California – Cal-Bred

Cal-Bred is a \$30m incentive programme operated by the California Thoroughbred Breeders Association, designed to incentivise thoroughbred breeding in California, and attracting stallions to stand in California. It consists of:

- **Breeders' award:** paid to the breeder of a registered California-bred thoroughbred finishing first, second or third in any race run in California and any graded stakes races conducted within the United States. Breeders will receive 75 percent of the remainder of the total incentive award monies after owner awards are paid, with an individual breeder receiving a prorated share of this breeders fund.
- **Owners' award:** Owners can receive at least a 20 percent bonus on the finisher's share for finishing first through fifth in an open allowance or overnight stake race and up to a 20 percent bonus for finishing first in an open starter allowance above \$15,000 and open non-maiden claiming races with a claiming price of \$40,000 or greater in Southern California and \$20,000 or greater in Northern California.

Additionally, there is a **maiden bonus** paid to the owner of a registered California-bred or registered California-sired foal for winning a maiden special weight race.

Other similar schemes have been employed abroad – evidence from Australia

New South Wales (NSW) – BOBS

Since 2003, Racing NSW has administered BOBS, an incentive scheme with the stated objective of encouraging investment in NSW bloodstock.

- BOBS bonuses are paid to owners who race their horses on NSW racetracks, adding a payment of up to \$20,000 to each win for two-year-old and three-year-old horses.
- In the 2021 racing season over \$11.5 million was paid out, and \$174 million has been paid out since the scheme's inception.
- To be eligible for BOBS, a horse must be sired by a BOBS eligible stallion and nominated for the scheme.
- A winning owner can choose to take the winning cash bonus, or elect to take a Double-Up Voucher and earn twice the value by reinvesting the money in a BOBS eligible yearling or unraced BOBS eligible 2YO sold at public auction Sales.
- Double-Up vouchers can also be used to pay for service fees to participating NSW based stallions.

Victoria – VOBIS

Thoroughbred Breeders Victoria operate VOBIS, a scheme designed to incentivise investment in Victorian bloodstock. There are three iterations of the scheme, aimed at horses of different ages:

- **Super VOBIS:** 2-3yo races, with prizes of \$10-30k available to the winners of 840 races annually.
- **VOBIS gold:** This is an extension of Super VOBIS. It is open to horses of any age, eligible horses race in the VOBIS Gold Premier Race Series, consisting of 19 races between which \$5.25m total prize money is distributed.
- **VOBIS sires:** Horses nominated for Super VOBIS or VOBIS Gold, and who are also the progeny of VOBIS sires, are eligible to compete in two additional races:
 - The Showdown: For 2yo progeny of VOBIS Sires, \$1m prize. There is also a nominators Bonus, \$50k split between the stallions whose progeny win a place in the showdown.
 - VOBIS Sires Guineas: For 3yo progeny of VOBIS Sires, \$500k prize.

Other similar schemes have been employed abroad – evidence from France

France Galop owners' premiums

France Galop administers an incentive scheme designed to encourage domestic production of thoroughbreds. The scheme pays a premium to owners and breeders of horses born and bred in France (or which have been assimilated) that have won prize-money in a race.

- For Jump races, the premium varies from 10% for overseas races where horses are born and raised in France, to 16% in premium races in France.
- For Flat races, the premium varies between 13% in open races and some foreign races, to 16% in domestic races for horses that are French-bred or by a stallion based in France

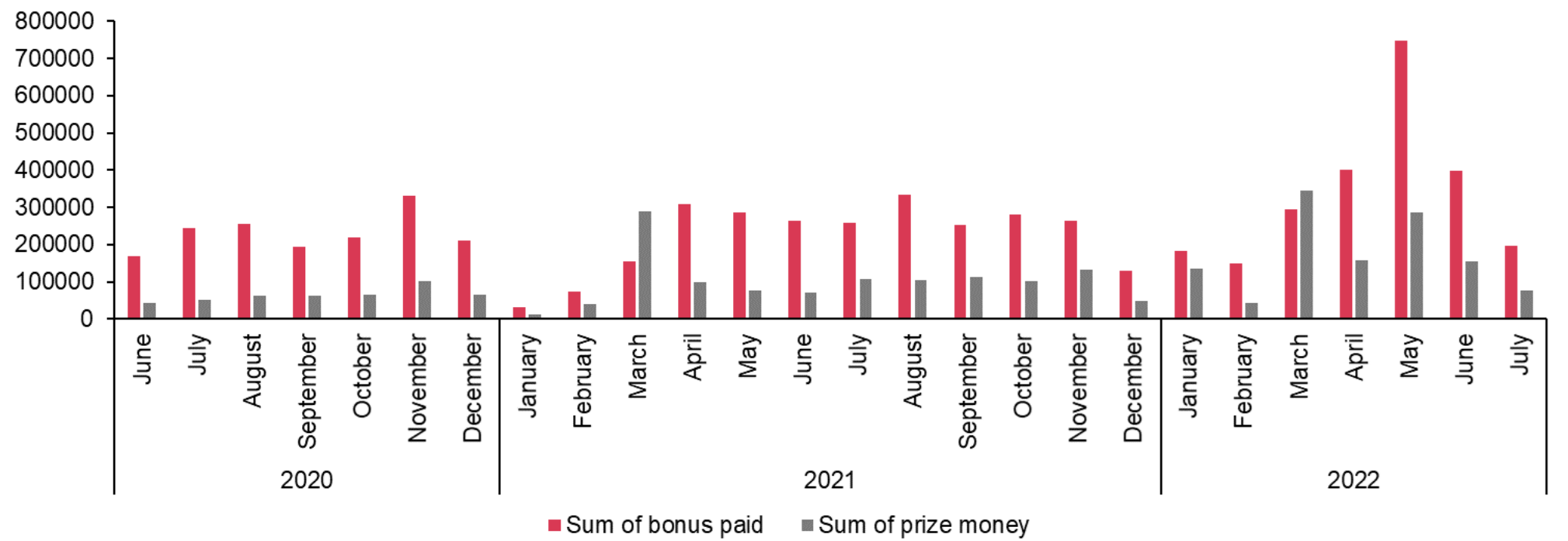
There is some indicative evidence that the scheme is having a positive impact in France.

- In 2017 approximately 5,300 foals were born in France, almost unchanged from the figure in 2008. Over the same period the number of foals bred in Britain has fallen from 5,920 to 4,778, a reversal of more than 1,100 in the space of ten years.
- An increasing number of stallions are being located in France, and they are covering more mares. In 2021, 206 stallions were standing in France, as compared to 169 in Britain, as the numbers of stallions standing in France have grown since 2009 where they have decreased in Britain over the same period.
- The quality of stallions standing in France has also risen over the same time horizon.

GBB bonuses are contributing a significant amount to winners' compensation

TBA data

GBB bonuses relative to other winnings in GBB eligible races (£)

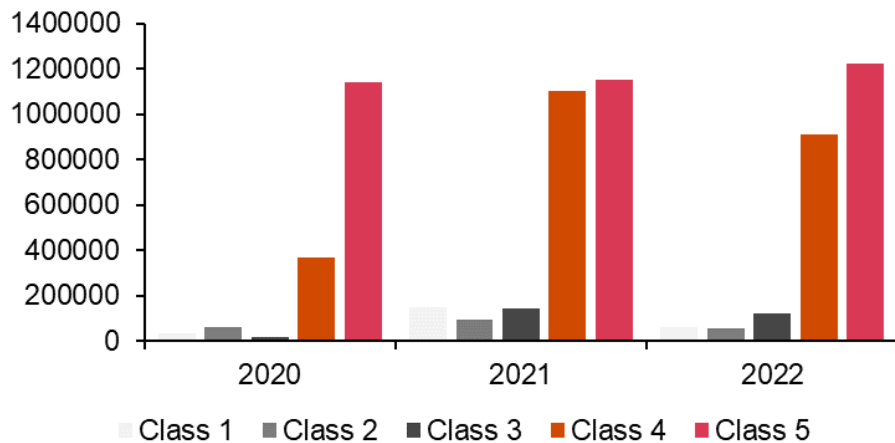


- GBB bonuses have consistently contributed a large proportion of winner's contribution since 2020.
- May 2022 saw a record sum of bonus paid by GBB, reaching nearly £800,000.

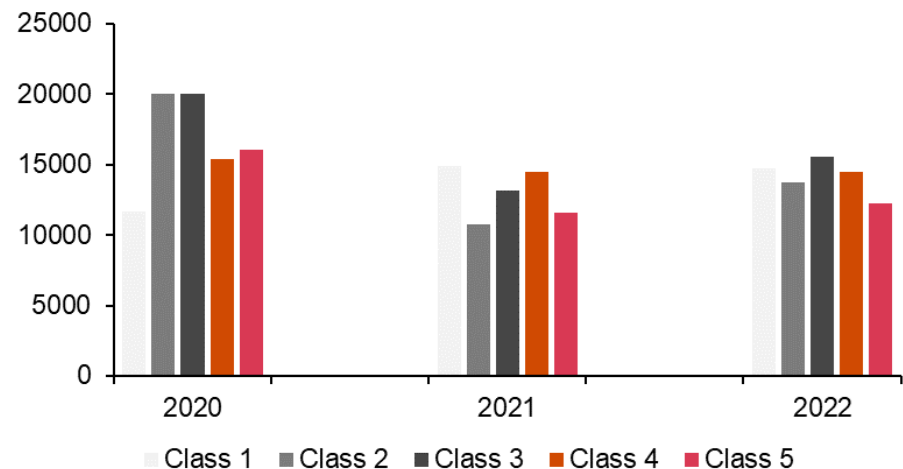
GBB bonuses are contributing a significant amount to winners' compensation

TBA data

Total value of GBB bonuses won in GBB – eligible Flat races by race class and year (£)



Total value of GBB bonuses won per number of GBB-eligible Jump races held by race class and year (£)



- For the Flat, the largest bonus payouts have consistently been to class 4 and class 5, reflecting that these are the races targeted by GBB.
- Class 4 races received smaller payouts in 2020 due to a low number of races.

- For the Jump, bonuses are more evenly distributed by race class as GBB seeks to support all Jump races.
- In 2020 class 1 races were underrepresented whilst class 2 and 3 races are relatively overrepresented.
- However, by 2022, the benefits of GBB bonuses have been felt evenly over class types.

Note, all 2022 values are to the end of July

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9.2

GBB key performance indicators and
descriptive evidence

GBB is focused on a select number of Key Performance Indicators (KPIs)

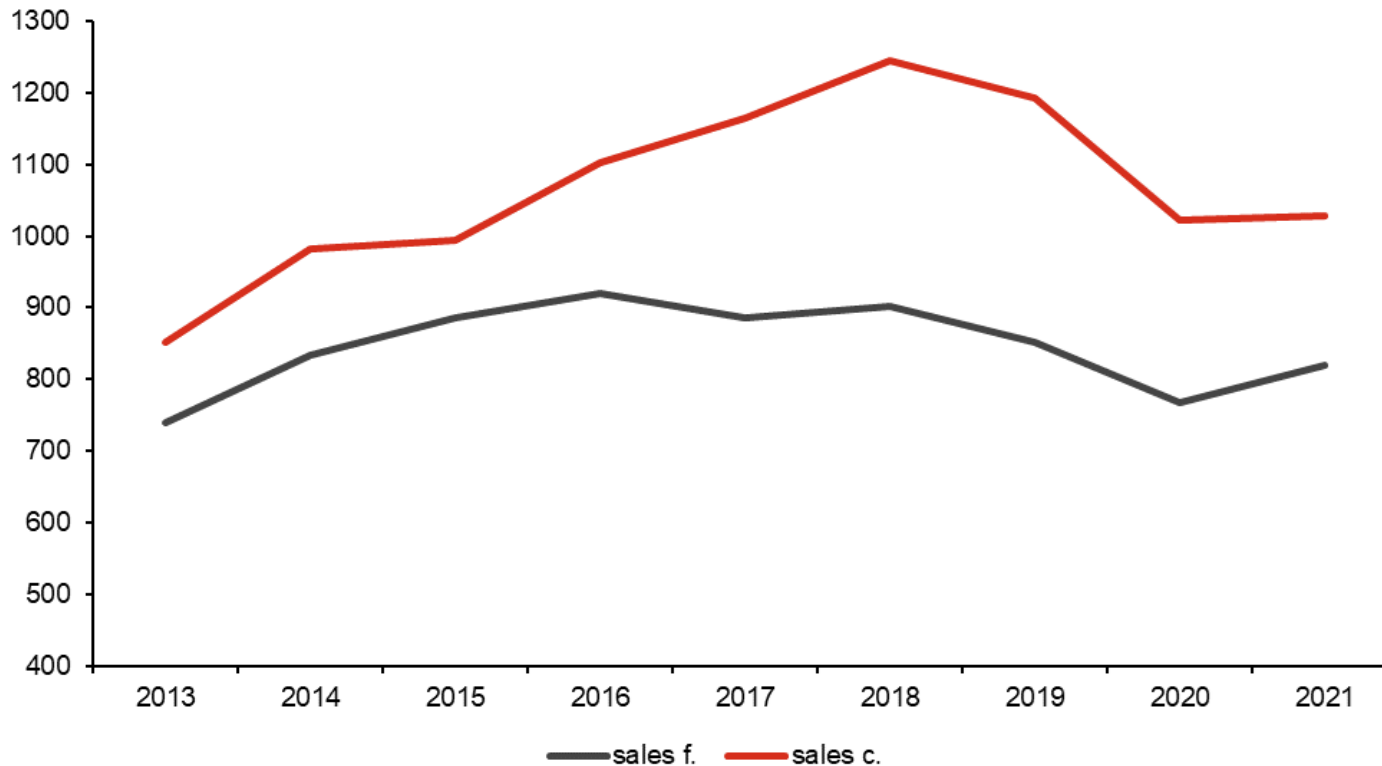
						
KPI	Percentage of foal-crop registered to GBB.	Change in foal crop bred in GB.	Change in British domiciled mares covered by British domiciled stallions.	Change in median value of GBB fillies c.f. non-GBB fillies.	Change in the number of GB-bred, filly and mare horses in training.	
Description	This mechanical KPI reflects the adoption of the scheme: the more fillies registered and stakeholders involved in the scheme, the more impactful GBB will be. Registration rates also provide some indication of the perceived attractiveness of the scheme.	This impact KPI pertains to a pillar of the scheme of promoting British breeding. If the scheme is aligning incentives well then current stakeholders will be encouraged to remain in the market and to breed more as well as encourage new entrants.	This impact KPI is a reflection of the GB breeding KPI but on the stallion side – TBA wants to ensure both foal parents are British in order to aid the health of the British stallion market.	This mechanical KPI helps to measure the significance of the scheme through the additional value being GBB-registered gives to a horse. If GBB offers a real chance of winning a large bonus, buyers should be willing to pay a premium for GBB registration.	This impact KPI relates to racing rather than breeding. If fillies are to be made attractive in the long-term, filly and mare horses in training need to attract more attention in the community. The vision of GBB is that the scheme should kick-start this trend.	
2021 result	77%	-3%	+4.7%	-	- 1.6% (Flat)	+4.4% (Jump)
Targets for 2023	80%	+5%	+5%	+3%	+3% (Flat)	+3% (Jump)

Filly foal sales have recovered faster than Colt sales after COVID-19



Change in foal crop bred in GB

Total sales of British Fillies and Colts at GBB-eligible sales since 2013



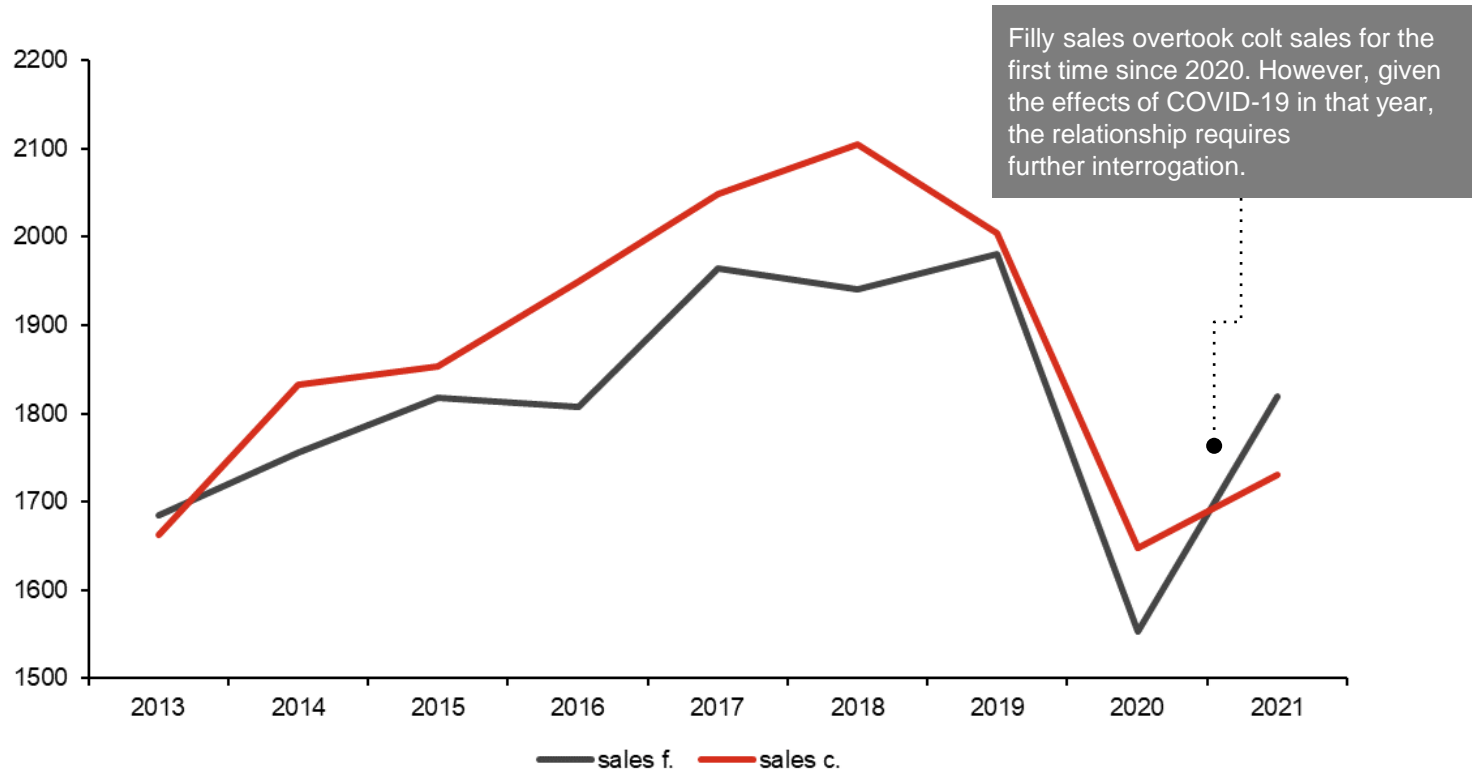
- The rise in the volume of sales of British fillies and colts is also seen in fillies and colts sold at GBB relevant sales.
- After a sharp fall in both colt and filly sales in 2020, 2021 saw a strong recovery for fillies vs. colts.
- Whilst it is difficult to isolate the impact of GBB from Covid-19, this does represent suggestive evidence that GBB positively impacts filly sales volumes.

Filly sales have recovered faster than Colt sales after COVID-19 (continued)



Change in foal crop bred in GB

Total number of sales of all British-born Fillies and Colts since 2013



- Sale of British fillies and colts rose continuously since 2013 until the impact of COVID-19.
- After a sharp fall in both colt and filly sales in 2020, 2021 saw a strong recovery, especially for fillies.
- Once again, it is difficult to isolate the impact of GBB from Covid-19, but is suggestive of a GBB impact.

1) We define a British born filly as those fillies with dams that are domiciled in GB. This definition follows from data availability.

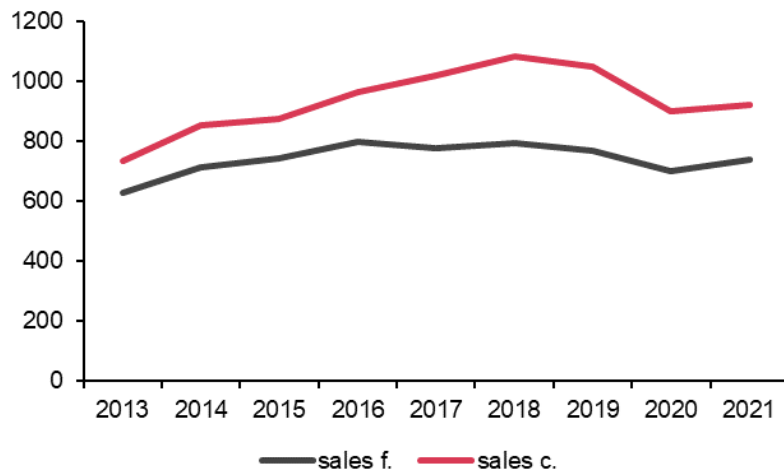
Source: Weatherbys, PwC analysis

Filly foal sales have recovered faster than Colt sales after COVID-19 for both flat and jump



Change in foal crop bred in GB

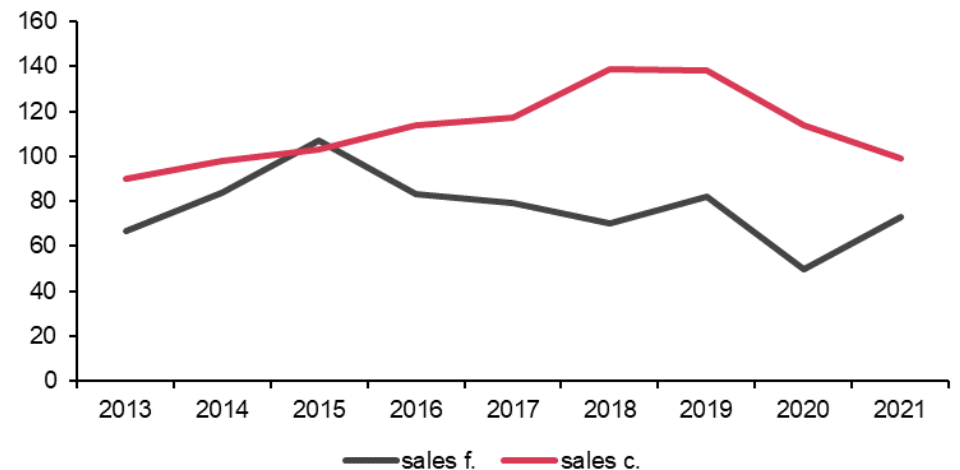
Total sales of Flat Fillies and Colts in GBB-relevant sales since 2013.



- Sales of British flat fillies and colts rose continuously since 2013 until the impact of COVID-19.
- There has been an uptick in the sales of fillies and colts at GBB relevant sales in 2021.

Source: Weatherbys, PwC analysis

Total sales of Jump Fillies and Colts in GBB-relevant sales since 2013.



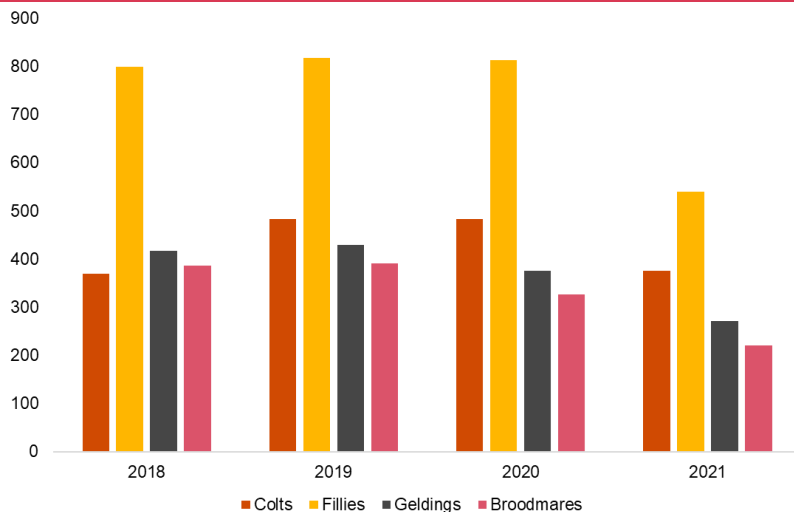
- Sales of jump fillies and colts at GBB-relevant sales was much more volatile in the pre-COVID years.
- Sales of jump fillies recovered far better in 2021 vs. colts, the latter continuing to decline.
- Note, the number of GBB relevant sales is far lower for jump horses, hence a relatively small sample is used to form this graph.

Imports and total trade of fillies have dropped more for fillies than for colts or geldings

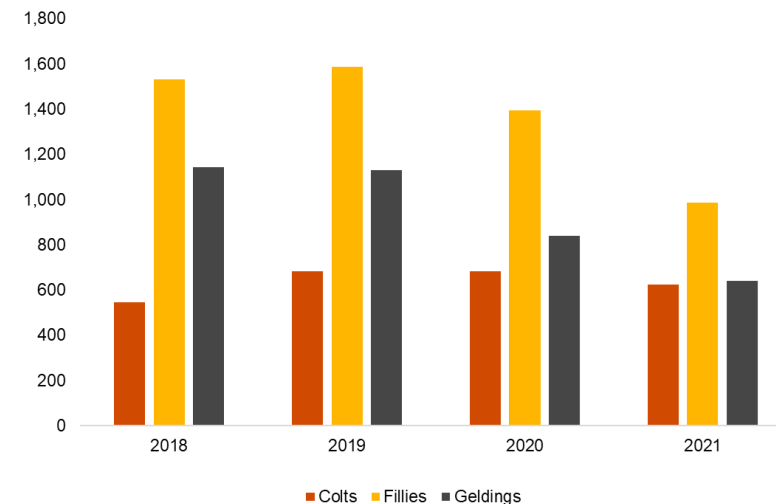


Change in foal crop bred in GB

Exports of colts, geldings and fillies in GB, 2018-2021



Total trade of colts, geldings and fillies in GB, 2018-2021



- An indirect way to gauge the impact of GBB on the foal crop bred in GB is by examining the trend in total trade of fillies. Net exports are not a good indication of the policy's impact as it could be expected to decrease both exports (as it becomes more lucrative to retain GB fillies as an owner breeder) and imports (as it becomes more attractive to purchase a GB filly as opposed to a filly bred abroad). However if both imports and exports in fillies decrease, the impact on net export of fillies would remain unchanged.
- A better way of indicating the possible impact of GBB on trade, and hence on the proportion of foal crop bred in GB, is by examining the change in total trade. This shows a decrease in all categories from 2019 to 2021, **however the decrease in trade is more pronounced for fillies than for colts, geldings or broodmares**. There is no impact in 2020 itself, possibly due to the lag in decision making from GBB effectiveness. There are not enough observations to examine this econometrically, however descriptively this suggests that GBB has preceded a fall in total trade of fillies, compared to trade in other categories of stock.

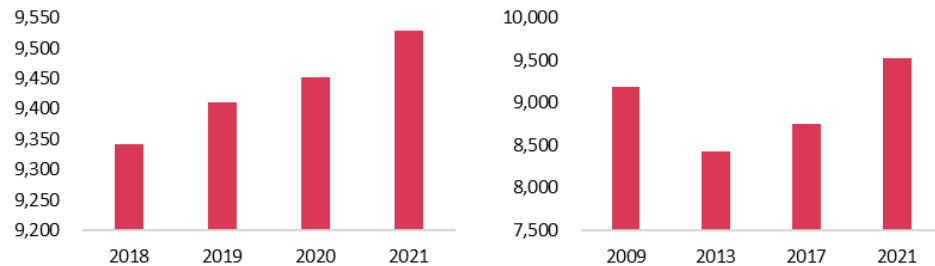
Source: Weatherbys, PwC analysis

Imports and total trade of fillies have dropped more for fillies than for colts or geldings

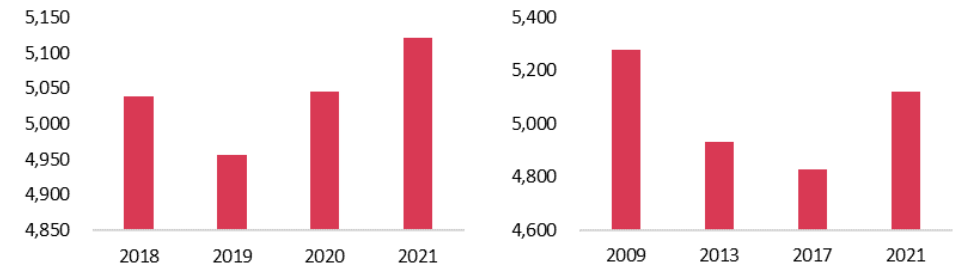


Change in the number of GB-bred, filly and mare horses in training.

No. of fillies in training, GB



No. of fillies in training, GB, GB born only



- A further way to gauge the impact of GBB is the impact on the number of fillies in training in GB, that are GB born. The GBB scheme aims to make owning fillies in training more lucrative, so would provide some indication that the scheme is operating effectively. Data from Weatherbys shows that the number of fillies in training has increased from 2019 – 2021, but in the case of all fillies, this trend stretches back to before GBB (introduced in June 2020).
- When examining only GB born fillies, however, the existing upward trend does not exist in the same way. The difference between the two trends provides some evidence that the upward trend is not accidental, as GBB born fillies in training specifically increased from 2019 – 2020, whereas it has decreased in years previous.

Source: Weatherbys, PwC analysis

9.3

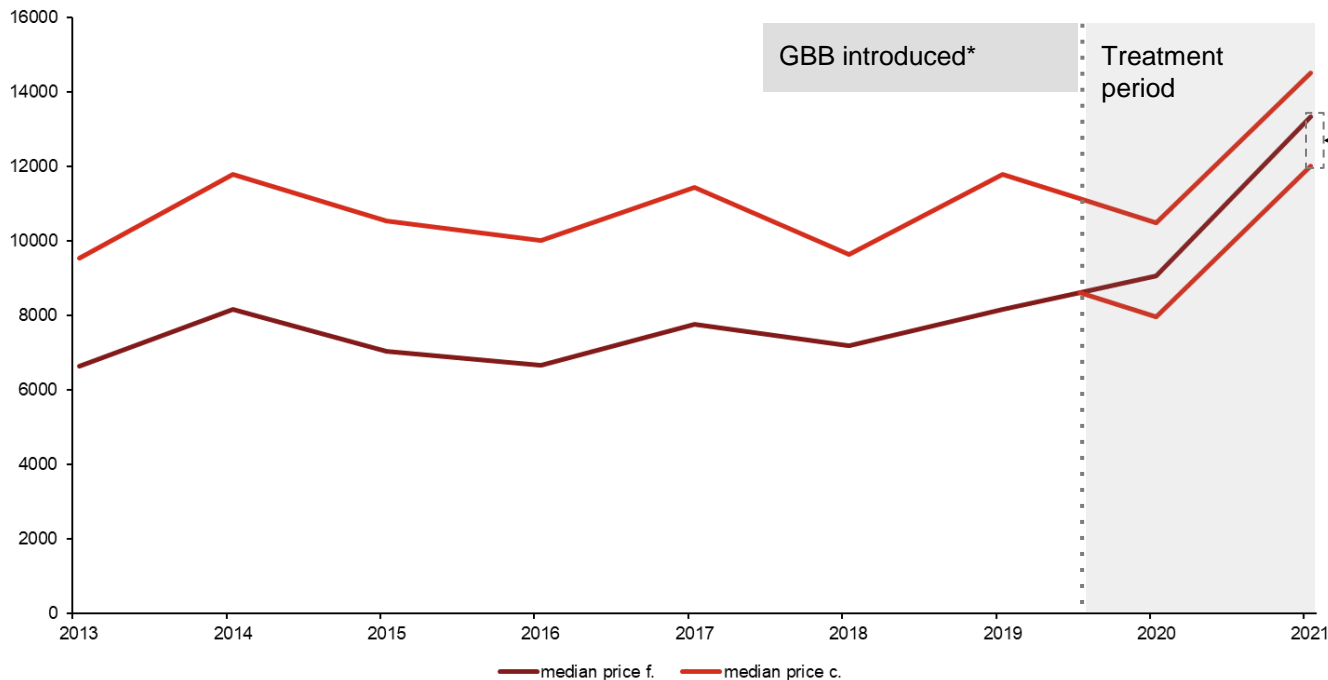
Econometric analysis of the impact of
GBB on filly prices

Isolating the impact of GBB: Difference-in-difference modelling



Change in Median value of GBB fillies c.f. non-GBB fillies.

Price of British fillies vs. colts in GBB-relevant sales since 2013 (£)



The difference between the actual path of filly prices and the counterfactual (the 'difference in the difference') is the isolated impact of GBB.

Footnotes: *GBB was actually introduced in June 2020 and in the formal analysis (which was conducted monthly) this is recognised. For simplicity of visualisation, annual data is used, hence why GBB appears to be introduced in January 2020.

Source: Weatherbys, PwC analysis.

The median price of British fillies has increased by a significant margin due to GBB



Change in Median value of GBB fillies c.f. non-GBB fillies.

Change in price of GBB- eligible fillies since June 2020

+16.3%

Increase in GBB- eligible filly prices.

Historic filly discount relative to Colt

-33.5%

2013 – May 2020.

Change in filly prices by age

+30.7%

Increase in GBB- eligible foal price.

+14.8%

Increase in GBB - eligible yearling prices.

Change in filly prices by discipline

+13.4%

Increase in GBB- eligible flat filly price.

+26.5%

Increase in GBB- eligible jump filly price.

Econometric analysis

A difference-in-differences model has been estimated using ordinary least squares to isolate the impact of GBB on filly prices. Regressors include:

- **Year indicators** – These are used to holistically capture fixed effects which occur in each year. E.g. an indicator for if the sale occurred in 2020 will capture some of the effects of COVID-19.
- **Quarter indicators** – These are used to capture the seasonality of horse trading.
- **Filly Indicator** – This signals to the model that the sale was for a filly.
- **Treatment period indicator** – This signals to the model that the sale occurred in the treatment period.
- **Filly and Treatment period indicator** – This is the crucial term which captures how these two indicators interact: how did GBB affect filly prices.

Analysis was conducted on a strictly defined subset of Weatherbys bloodstock reports. TBA expertise informed which sales were of most relevance, only British-born horses were considered, and only those horses whose prices fell in the lower 75 percentiles were considered.

For robustness, we additionally included GBB coefficients and interactions in a version of the econometric analysis of the drivers of demand presented in **section 9** of this report. That model was estimated using a different specification, in a different sample, results were not statistically different from the results presented here. This is strongly suggestive of statistical robustness of these findings.

9.4

Conclusions from our GBB analysis

Anecdotal evidence from within the industry suggests the Great British Bonus has served as an innovative safeguard for British breeding

The Great British Bonus is widely recognised as having provided a lifeline to the industry during a difficult period.

The Great British Bonus is stimulating demand for fillies in a way that smaller, previous schemes could not.

“We bought a filly from Book 3 for just 9,000gns back in October. Her dam had already produced five winners to fast stallions and she was 100% GBB registered, so an attractive prospect. To win a £20,000 GBB bonus on her debut run was just fantastic, she’s already earned back double her purchase price and we’ll be targeting another race shortly. She’s not our first bonus winner and she’ll not be the last! The scheme really makes a difference and we’ll be looking for more GBB fillies this year.” – **Trainer**

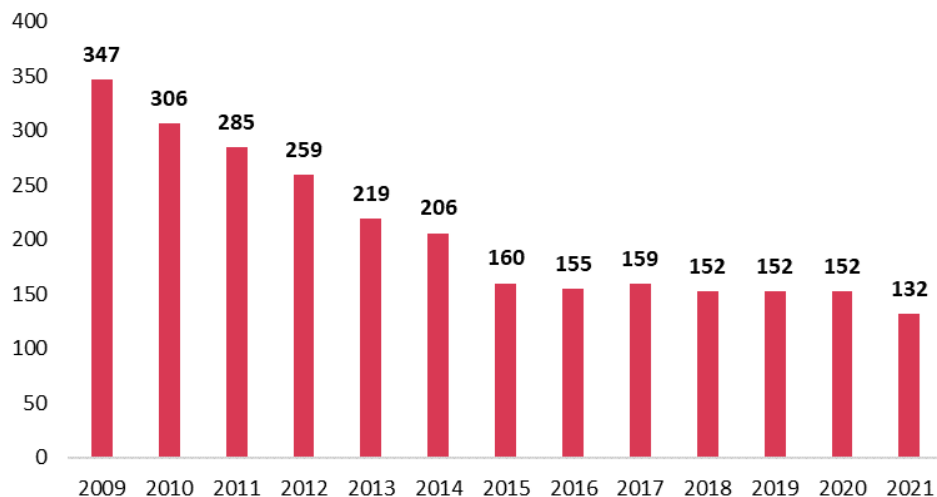
“The GBB scheme is the most supportive new innovation for British breeders since I started in the industry. It helps at every level, whether you breed commercially or breed to race. The £5,000 yearling filly that was very tricky to sell is now regularly making up to £20,000. Winning owners are so much keener to continue when they see the bonus has covered much of their costs for the year.” – **Stud farm manager**

“GBB has really been a game changer for us. Selling fillies was traditionally always tough but GBB ensures there is good demand for and a good price to be found for these fillies. Not only that, but as breeders, we see returns when they win the bonuses which is fantastic!” – **Breeder**

Source: TBA

Decreasing numbers of stallions standing in GB suggest there may be a place for further incentive schemes in the industry

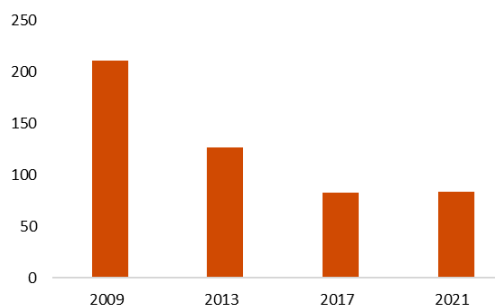
Number of stallions standing in GB



The problem: number of stallions standing in GB are decreasing.

- The number of stallions standing in GB has decreased from 347 in 2009 to 132 in 2021.
- Meanwhile, the number of studs with stallions standing has decreased from 211 in 2009 to 84 in 2021.
- This suggests a possible need for further incentive schemes in the industry to arrest the decline in stallions standing in GB.

Number of studs with stallions standing, in GB



There are various policy avenues that could counteract this decline.

The previous section illustrates how targeted incentive schemes can be an effective tool for change in the industry. Various similar policies could be used to work against this decline in stallion numbers. The actual design and implementation of these policies would require careful research, analysis and testing, so we list only the high level options that could be explored without commenting on the likely extent of their effectiveness or practicability:

- Adjustment of GBB scheme to further incentivise GB based stallions: e.g. reduce payout for winners sired by a stallion abroad or boost payments to winners sired by a stallion standing in GB beyond their current level.
- Introduction of a separate scheme rewarding owners of stallions standing in GB whose progeny win a relevant race, perhaps adjusted to apply only to a particular segment of the stallion market (e.g. a scheme like California's – Cal-Bred).
- Set aside races reserved for progeny of sires standing in GB, with prize-money granted to the first of a select number of finishers (e.g. a scheme like Victoria's VOBIS Sires).

Summary conclusions from GBB analysis

Increase in market price

- We identify a 16.1% increase in filly prices in GBB-relevant sales, compared to modelled prices in the absence of the policy.
- This is comprised of a 13.4% increase for flat, and 26.5% increase for jump.

No change in sales volumes

- We do not find a significant change in the volume of sales of fillies vs colts in GBB relevant sales.

Decrease in total trade

- Imports of fillies has decreased since the introduction of GBB, though it is too early to determine whether this is statistically significant.

Annex

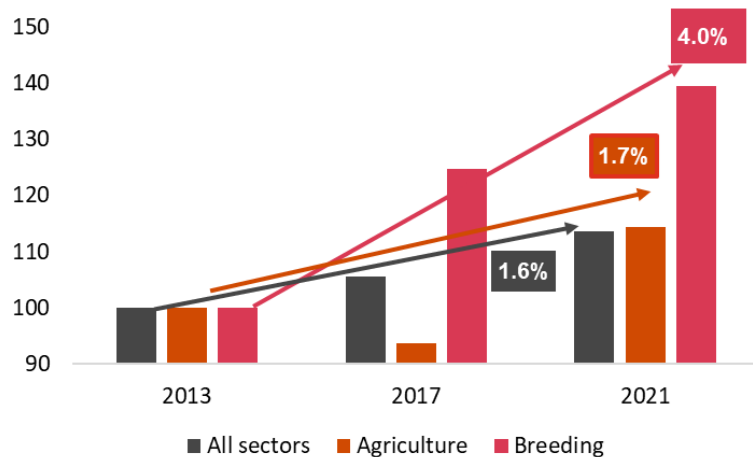
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A1

Overarching Methodology

We used various data sources to estimate cost increases

Index of price levels in the thoroughbred breeding industry and comparators, with average annual change in prices (%) labelled



Data sources we used as part of this analysis

- The 'all sectors' price index is taken from the ONS series: 'CPIH INDEX 00: ALL ITEMS 2015=100'.
- The Agriculture index is taken from the ONS series 'Imported Inputs of Products of Agriculture, Hunting and Related Services' and so reflects the cost of inputs to agriculture sectors, which represents the change in cost for operators in the agriculture sector.
- The 'breeding' index is based on detailed cost information supplied through our expert interviews, which was then weighted according to operator spend in 2021.

The average annual change in prices is simply the compound annual growth rate of the relevant index between 2013 and 2021.

Cost pressures have increased significantly in the breeding industry compared to the agriculture industry or all sectors. Since 2013, prices in the economy have risen at an average of 1.6% per year*, comparable to the 1.7% average annual increase in prices for agriculture inputs. Based on information from interviews with industry experts, the **average annual increase in prices of inputs in the thoroughbred breeding industry has been 4.0% over the same period.**

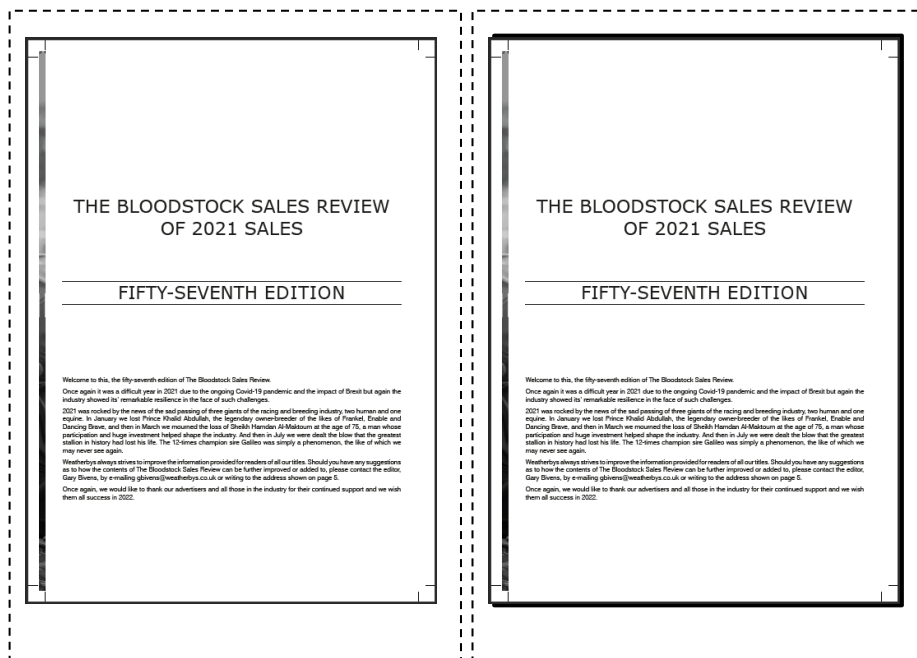
Though not covered by our data, anecdotal evidence suggests a higher increase in the cost of inputs for breeders in 2022, even against this backdrop.

A2

Trend Analysis: Detailed Methodology

We use sales data from Weatherbys Bloodstock review as the starting point for our analysis

Compilation of sales data



Overview and rationale of dataset

- We have used the bloodstock sales reviews as the starting point for our analysis, kindly shared with us by Weatherbys. These sales reviews are for the years 2013 until 2021, inclusive.
- The advantage in using these reviews is their comprehensive nature, covering 110 sales, across disciplines and countries. This provides unparalleled coverage of sales data, with accompanying characteristics.
- The process to transform these data from pdf form into a usable dataset was extensive and involved, but provided the characteristics noted below.

Characteristics of dataset

- **Sales covered:** 104 sales across Britain, Denmark, France, Ireland, Italy, Japan, Sweden and the USA. Not all of these sales were active over all 9 years of our dataset.
- **Stock (always included):** the data on the sale includes its gender (filly, colt, gelding or broodmare), age (foal, yearling or older horse) and colour.
- **Stock (sometimes included):** sometimes data was also included on the name of the stock sold and its date of birth.
- **Stallion:** data on the stallion includes its name, country of birth, dam and sire.
- **Dam:** data includes dam name and country suffix
- **Damesire:** includes name
- **Sale:** includes sale code, which has been mapped to sale name
- **Nomination fee:** only included for some of the dataset, in either GBP, USD or Euro.
- **Sales price:** in Guineas, Euros and GBP.

We input estimates for core costs of preparing stock for sale

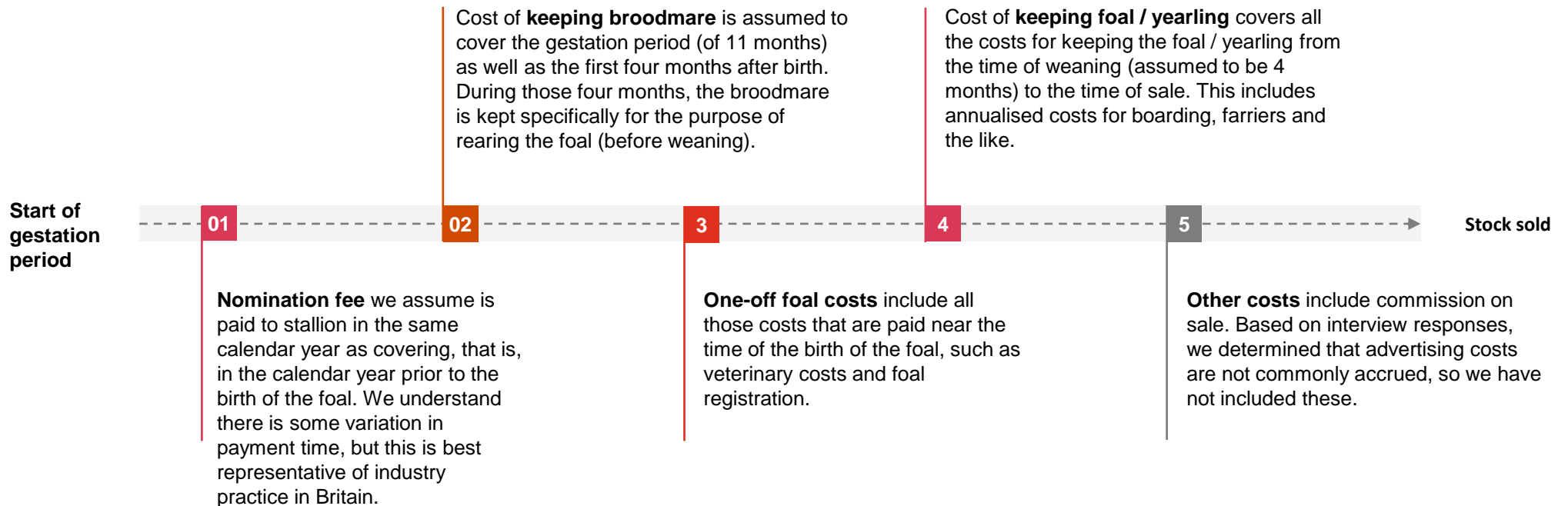


Input costs

Overview of approach

We have included various costs associated with the sale of stock. Our approach is to include only those costs for which we can obtain good estimates of cost, and exclude costs that require generalised assumptions. For instance, we have not included broodmare depreciation, as we do not have data on the cost of broodmares in the dataset. This means that our overall cost estimate is likely to be lower than the true cost of sale.

Timeline of cost assumed for our analysis



We used three different sources to obtain refined estimates for nomination fees



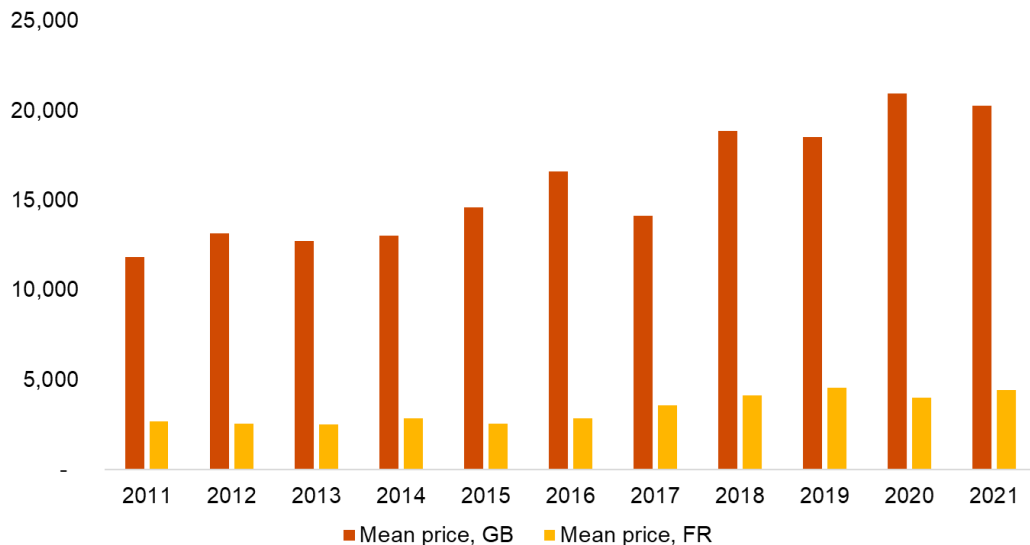
Input costs

1

Overview of sources

- Our first source for nomination fee data was the Bloodstock Review. However, this does not always provide information regarding the stallions standing in GB.
- Our second source of information is the OSL list of nomination fees for stallions standing in GB, Ireland and the rest of Europe. The addition of this data source filled numerous gaps in our dataset. This leaves us with a dataset weighted strongly by flat, with only a small proportion of jump present, due to data limitations.
- Finally, we used information shared with us by the TBA from the French horseracing authority, France Galop. This provided yet more information to fill the gaps in our analysis.

Comparison of mean nomination fees in Britain and France (£)



Notes on data source

- The OSL and France Galop data sources illustrate the divergence between nomination fees in Britain and France.
- Some of this discrepancy may be caused by different coverage of data, however it does show that nomination fees in France are significantly lower than in Britain.
- Using this data, we apply the nomination fee to the year of nomination of sales, using a unique combination of stallion and year, allowing us to connect the Bloodstock, OSL and France Galop databases.

We input detailed estimates for the core costs of preparing stock for sale



Input costs

Our method used to input cost data

- To input cost data, we used inputs from specialist interviews and desktop research. We did not aim to get maximally precise data from this exercise, but instead focused on getting representative data that would allow us to illustrate the trends in the market over time. The cost assumptions we have used do not include broodmare depreciation costs nor nomination fees, as these will vary according to each sale. A simple broodmare depreciation metric is included below for the purposes of estimating the cost associated with any one sale.
- In this exercise, we included boarding fees for broodmares and yearlings, which we note may not represent those breeders that keep their broodmares on their own stud. However, by using boarding fees as the basis for our estimate, we better reflect the economic (or opportunity) cost of keeping a mare.
- It is important to note that the upper and lower estimates should not be interpreted as the upper or lower bounds – these bounds will likely be far lower and higher than the lower and upper estimates provided. Rather, the range in our estimates reflects the differences resulting from our research and interviews. The midpoint estimate takes the mean of the two, and it is that estimate that underlies our profitability estimate below in this section.

2

Annual broodmare cost, including with foal at foot (£, 2022 prices, to nearest £100)

Lower estimate	13,300
Upper estimate	15,800
Midpoint estimate	14,600

3

One off foal cost (£, 2022 prices)

Lower estimate	3,400
Upper estimate	3,600
Midpoint estimate	3,500

4

Annualised cost of yearling and weaned foal (£, 2022 prices)

Lower estimate	7,900
Upper estimate	15,600
Midpoint estimate	11,800

5

Other costs (£, 2022 prices)

Entry fee	Included in foal and yearling costs
Commission fee	5% of sale cost
Stallion fee	As indicated by data



*

Broodmare depreciation:

There are various acceptable methods of estimating depreciation, the method used for the purposes of our calculations is as follows. Taking the lifespan of a broodmare at 10 years, we assume a depreciation of 10% of the initial value of the broodmare off every year. E.g. for a broodmare that cost £10,000, the annual broodmare depreciation would be $10\% * £10,000 = £1,000$.

Using our new dataset, we have good coverage of the foal crop, without accounting for nomination fees

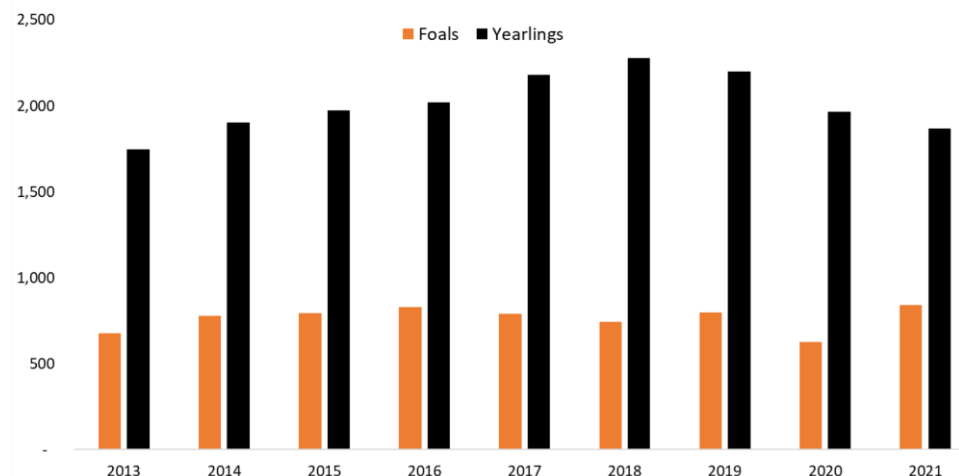


Model outputs

Foals and yearlings, number of entries in our dataset, without nomination fees

Notes on data coverage

- The number of foals and yearlings covered in our dataset is roughly constant over the time period, suggesting representativeness.
- The proportion covered (table below) is also fairly high.
- This assumes GB birth from GB mare (we exclude non-GB sales from our analysis).



Year	Foals	Yearlings	Breeze up	Store	Total included in dataset with GB dam	Total GB foal crop	Proportion covered
2014	778	1,974	223	229	3,204	4,328	74%
2015	793	2,019	246	226	3,284	4,569	72%
2016	829	2,181	246	238	3,494	4,663	75%
2017	790	2,276	187	117	3,370	4,674	72%
2018	745	2,199	90	247	3,281	4,826	68%
2019	798	1,964	169	na	2,931		
2020	626	1,869	na	na	2,495		
2021	841	na	na	na	841		

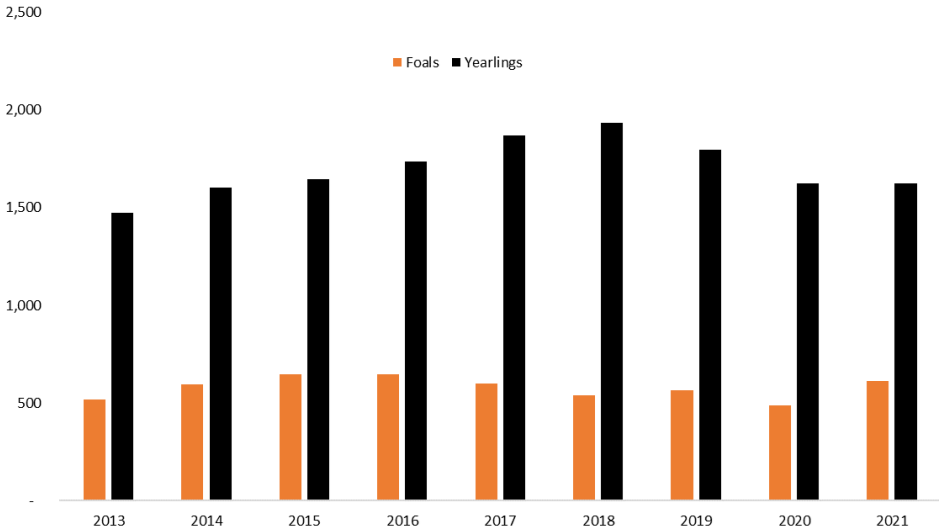
After accounting for nomination fees, the coverage of data remains high

 **Model outputs**

Foals and yearlings, number of entries in our dataset, without nomination fees

Notes on data coverage

- The proportion covered (table below) remains high even after accounting for only those data points for which we have information on nomination fee.
- This proportion also remains stable over time, further suggesting it is representative.
- This also assumes GB birth from GB mare.



	Foals	Yearlings	Breeze up	Store	Total included in dataset with GB dam	Total GB foal crop	Proportion covered
2014	597	1646	174	141	2558	4328	59%
2015	648	1734	212	134	2728	4569	60%
2016	646	1870	205	121	2842	4663	61%
2017	598	1932	166	66	2762	4674	59%
2018	538	1795	77	132	2542	4826	53%
2019	565	1626	132	na	2323		
2020	489	1622	na	na	2111		
2021	611	na	na	na	611		

A3

Detailed methodology for our projections

We have formed various scenarios by projecting profitability into the future

We assume a linear relationship between industry operators and foal crop

Our core assumption is that aggregate profitability in the thoroughbred breeding (TB) industry will eventually have to reach sustainable levels. The assumed mechanism is that the least profitable operators in the industry will exit the industry until aggregate levels of profitability adjust to this new sustainable level. According to our data from survey responses, we could not draw a clear enough link between the size of the breeder and their profitability, so we assume a linear relationship between breeders exiting the industry and the foal crop decreasing.

We use the agriculture industry as an indicator of comparable sustainable levels

We use the agriculture sector as a comparable sector from which the analogous profitability level can be determined. This sector, as with the horse breeding industry, has high barriers to entry and fairly high sunk costs along with a degree of stickiness in participation based on cultural factors. However a report by the Department for Environment Food and Rural Affairs shows that in 2020 / 21, 18% of firms made a loss compared to 59% for the thoroughbred breeding industry, according to our survey results. Based on this, we have developed three scenarios, displayed to the right:

- **Worst case scenario:** in our worst case scenario, the average number of operators across the whole industry that incur losses reduces to 18%. The foal crop in 2021 is 4,338, of which we estimate 1,773 was produced by operators that are profitable, and this level is assumed to remain constant until 2051. We estimate that the foal crop associated with loss making operators in 2021 was around 2,565. In our projections, this number reduces to 389 in 2051, according to the following calculation: Foal crop produced by non-profitable operators = Foal crop produced by profitable operators * New profitability level in TB industry / (1 – New profitability level in TB industry). This gives a total foal crop of 2,162 in 2051, according to our worst case scenario.
- **Central scenario:** The central scenario assumes that the only reduction in foal crop stems from a reduction in the number of commercially focused breeders. This assumption recognizes the particular dynamics of the TB industry whereby a proportion of breeders do not seek a commercial return, and these breeders may be less inclined to exit the industry or reduce their foal crop amidst lower profitability. To account for this, we apply the % reduction in the worst case scenario (50.2%) by the proportion of commercially focused breeders (57%) to get an overall foal crop reduction of 29% by 2051. The estimate from the proportion of commercially focused breeders is sourced from data on GBB registrations, provided to us by the TBA.
- **Best case scenario:** The best case scenario assumes resilience to lower profitability levels to the extent that operators do not leave the industry to an increased extent than presently. To do this, we reduce the foal crop by the linear trend from 2010 – 2021, so excluding the distortionary effects of the aftermath from the financial crisis.

On the basis of our foal crop projections, we have formed projections for the number of horses in training in GB

Primary assumptions underlying our horses in training projections:

Using our foal crop projections as a starting point, we have undertaken some projections for the number of horses in training (HIT) in GB. These projections rely on four important assumptions, as follows:

1. **Retirement rate of 25%:** In our scenarios we assume the average (mean) time a horse spends in training in GB is 4 years. This translates into a retirement rate of 25% per year. This represents the only exit channel from the number of HIT.
2. **Constant rate of transformation of foals to HIT:** We assume that a constant proportion of the foal crop enter HIT, based on empirical data from previous studies, allowing for a proportion of foals to enter the leisure market, for instance. This reflects the reality of the racing industry whereby the substantial cost of keeping a HIT means that some stock will not enter training.
3. **Base level of net imports continue at 2021 levels:** As a starting point, we take the 2021 level of net imports into future years. This is the net import level derived from Weatherbys data for colts, fillies and geldings.
4. **Import substitutability parameter ranges from 0.25 – 0.75:** Modelling the number of HIT is not a straightforward process, as it is very sensitive to the responsiveness of imports to a fall in domestic production. As the foal crop falls, it is likely not the case that HIT will fall by the same amount (given the time taken for this to feed through) as some owners will turn to import horses to maintain their stock levels. However it is not likely that this turn to imports will make up for all of the shortfall in domestic production. This is for two reasons:
 - a. First, there are barriers to importing thoroughbred horses as compared to purchasing domestically. These include the cost of transport and administration, which have risen substantially in the aftermath of the UK's exit from the EU and high fuel prices. Further to this, there are linguistic and cultural barriers that introduce friction in trade of stock. From interviews with industry operators, we understand that a high degree of trust in relationships between breeders, purchasers, agents, vendors and sellers undergirds the sale of each horse. This web of relationships tends to be stronger domestically as compared to internationally. More simply still, almost all purchasers seek to confirm their stock visually before purchase, and domestically bred stock is often sold in a another sale or market.
 - b. Secondly, there may not be a perfect substitution for domestically bred stock internationally. As such, if there is a lower supply of stock for a particular type of race, then the number of HIT for that particular race will diminish.

As such, we conclude that imports will make up for some of the shortfall in domestic production, but not for all the shortfall in domestic production. Further detail on the reasoning underlying the range from 0.25 - 0.75 is provided on the following slide.

We form our import substitutability parameter based on standard macroeconomic theory - assuming constant elasticity of substitution and Cobb-Douglas utility functions

Import substitutability parameter

As discussed in the previous slide, an important assumption underlying our projections is the appropriate range of the import substitutability parameter. We have assumed that imports will make up for some of the shortfall in domestic production, but not all the shortfall. To establish a reasonable range for this parameter, we first assume a Constant Elasticity of Substitution (CES) between imported and domestically produced horses, in line with standard macroeconomic theory. From this CES utility function of race horse owners between domestic and imported horses, we take intermediate values of the substitutability of the parameter in the Cobb-Douglas (CD) function to be around one, thus denoting the standard CD utility function. This parameter illustrates the change of imports demanded on the basis of changes to the domestic / imported price levels, however, so it still needs to be transformed into changes in the domestic quantity of horses produce. To do this, we then assume a linear demand curve, that is, a directly inverse relationship between domestic production and price of domestic produce, such that a decrease in domestic production of 10%, for instance, would increase the price of domestic stock by 10%. On the basis of this demand curve, this could reasonably give an overall quantity – substitutability parameter in the range of 0.25 – 0.75 with a central estimate of 0.5. This, in turn, gives that a reduction in domestic output of stock (that is, a reduction in the domestic foal crop by, e.g., 100) would lead to an increase in imports in the range of 25 to 75, with a central estimate of 50.

Assumptions underlying our three scenarios

Using our range for the import substitutability parameter taken in conjunction with the three assumptions underlying our foal crop projections, we obtain three scenarios on which to base our projections of the number of HIT:

Our 'worst case' scenario assumes all types of breeders are affected by adverse profitability (in line with our assumptions used for the foal crop projections) and uses the lowest end of the range of our import substitutability parameter of 0.25.

Our central scenario assumes that only commercially focused breeders are affected by adverse profitability (in line with our assumptions for the foal crop projections) and uses the mid point of our import substitutability parameter of 0.5.

Our 'best case' scenario continues the linear trend since 2010 (in line with our assumptions for the foal crop projections) and uses the higher end of the range for our import substitutability parameter of 0.75.

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Glossary

Glossary

Term	Definition
TBA	Thoroughbred Breeders' Association
BHA	British Horseracing Authority
IFHA	International Federation of Horseracing Authorities
CAGR	Compound Annual Growth Rate: this is a measure of the mean annual growth rate over multiple time periods
GVA	Gross Value Added: comparable to Gross Domestic Product (GDP) but at basic prices, that is, excluding some taxes
GB	Great Britain
GBB	Great British Bonus: an incentive scheme initiated by the TBA, described in section 9.
EMS	Elite Mares Scheme
NH MOPS	National Hunt Mare Owners' Prize Scheme
BOBS	Breeder Owner Bonus Scheme
VOBIS	Victorian Owners and Breeders Incentive Scheme
FTE	Full Time Equivalent
HIT	Horses in training
CPIH	Consumer Prices Index including owner occupiers' housing costs

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