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Algorithmic competition – Note by South Africa

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More documents related to this discussion can be found at
<https://www.oecd.org/competition/algorithmic-competition.htm>

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1. Introduction

1. The Competition Commission of South Africa (“CCSA”) has been active in exploring the role of algorithms in how they shape competition in various markets and has obtained valuable insights in this regard. This submission will deal mostly with a broad delineation of the types of algorithms that the CCSA has had experience with and the corresponding theories of harm that emanate from the application of these algorithms. Two broad themes of how algorithms affect competition are explored, namely how algorithms affect ranking on digital platforms and how this in turn shapes competition in online markets, and the role that price recommender systems and AI tools play in an online world and the role it has in facilitating tacit collusion.

2. How Algorithms Shape Online Competition

2. Algorithms used to rank search results on digital platforms are ubiquitous. This is the case for general search and specialised search engines such as online intermediation platforms used in travel and accommodation, eCommerce, food delivery, online classifieds etc. Displays on search engines, be it general search or specialised search, play a pertinent role in determining the winners and losers in digital markets. Visibility is key, meaning the ranking, display and size of search results is imperative to who gets lucrative real estate on the search results page. In all this, algorithms play a role in determining who gets ranked first, who gets the richer display and who gets the result with the larger size.

3. General search, for example, shape the winners and losers of online intermediation platforms as this is the main starting point for the consumer journey and is the most important source of online traffic, customer acquisition and online transactions. For example, in online travel and accommodation intermediation approximately 60% of online traffic in South Africa comes from general search.¹ Visibility on the search engine results page (“SERP”) is a critical component for intermediation platforms as it has an impact on discoverability and website traffic. Ranking matters as consumers show a predisposition to click on the first results assuming they are most relevant to the query. Research on general search queries indicates that around 99% of all clicks occur on the first SERP² where the click through rate (“CTR”) on the first result is approximately 33%, halving for the second result and halving again for the third result.³ This means that the real estate at the top of the SERP is the most valuable and is where general search engines generate most of their revenues⁴.

¹ Own calculations using Similarweb data. Also see the OIPMI Provisional Report, Chapter 2. Figure 11. Page 52. Available at: <https://www.compcom.co.za/online-intermediation-platforms-market-inquiry-provisional-report/> [accessed 3 May 2023].

² According to Barrell, J. (2021). 31 SEO statistics for 2021 and what they tell us (+ VIDEO). Available online: <https://www.impactplus.com/blog/seo-statistics> (Accessed on 17 April 2022).

³ Dean, B. (2019). We analyzed 5 million Google search results. Here’s what we learned about organic click through rates. Available online: <https://backlinko.com/google-ctr-stats> (Accessed on 17 April 2022).

⁴ For example, Google Search accounted for 57% (or \$162bn) of Alphabet’s revenues, Google’s parent company, in 2022. Own calculations from Alphabet SEC 10K Form for the year ended 31 December 2022, page 32.

4. Similarly, in specialised search, such as those used in online intermediation services like travel and accommodation intermediation, eCommerce, food delivery and online classifieds, visibility on these platforms are paramount to driving business. Again appearing on the top search results following a consumer's search is important. Not only is a service or product "billboarded" on the first results (which creates brand awareness), the top results following a query get the lion share of consumer traffic and subsequent bookings, with the first result getting the most traffic⁵. Here algorithms play an important role in determining the winners and losers as they determine where a business user's product or service is ranked on the search results page. While ranking is largely due to relevancy, other factors such as commercial considerations such as cost-per-clicks ("CPCs") and commission fees payable affect where a result is ranked. The concept of relevancy is also opaque as firms invest copious resources to make results relevant through search engine optimisation ("SEO"), often a process that in itself is opaque and unpredictable. This is discussed in more detail in the next section.

3. Theories of Harm relating to Algorithmic Ranking in Digital Markets

5. It was discussed previously that algorithmic ranking shapes the winners and losers. This is true for platforms and business users that depend on general search and specialised search to drive online consumer traffic, acquisitions and transactions. Winners often have deeper pockets and can pay their way for more visible results on platforms or have the resources to "invest" in optimising their "free results" on the search results page of any search engine. This reinforces their position in markets dependent on online traffic to drive business and creates a virtuous circle that favours big players and entrenches them.

6. Losers typically include small and newer players where their ability to pay for or sponsor their rankings on digital platforms or fund extensive SEO is limited more by their lack of resources and less by how competitive they are. This invariably raises the barriers to expansion for these small and new players in the online space, because competing head-on with larger players means that they would have to outbid them on paid or sponsored search results or invest significant resources into SEO to optimise "free" organic results in order to secure lucrative real estate on the search results page. Small platforms and to a large extent small business users dependent on online distribution of goods and services often end up operating in niche sub-markets given their resource limitations to compete head-on with larger platforms and business users. This means that in the online space, larger platforms and business users face little competitive constraints by smaller competitors.

7. A common feature of general search engines and online intermediation platforms is that they sell visibility to platforms and business users dependent on them. Payments for improved visibility on intermediation platforms can take different forms, including (i) payment (or bidding) for a specific position (e.g. ad at the top of the page in a software app store or classifieds query SERP), (ii) payment (or commission increase) for a ranking boost (e.g. higher commission fee in travel & accommodation), (iii) enhanced impressions that stands out more (e.g. a larger impression with more pictures in property classifieds), (iv) various forms of brand building through display advertising or impression branding (e.g. on eCommerce or classifieds), (v) the offer of discounts or loyalty programme support to attract travellers, or (vi) cost-per-click bid prices for general search.

⁵ OIPMI Provisional Report, Chapter 2, paragraph 215. Available at: <https://www.compcom.co.za/online-intermediation-platforms-market-inquiry-provisional-report/> [accessed 3 May 2023].

8. The CCSA has not had a detailed look into how the more sophisticated algorithms work on platforms that use them. This may be because these platforms use complicated machine learning systems using multiple algorithms that often offer personalised default search results to users. This contrasts to other platforms, often smaller ones with fewer resources, that use simpler “algorithms” to determine the ranking score on a platform. Here commercial imperatives like commissions payable or belonging to a loyalty programme or exclusive programme has a significant effect on ranking scores, where each parameter constitutes a specific weighting of the overall ranking score. For platforms using more sophisticated algorithms, the parameters that affect ranking on the platform are made known, but it is not clear what their weighting is of the overall rank score. It may be the case that due to the personalised nature of these algorithms, machine learning will vary the weightings of various parameters to different users and as such there is no hard weighting per se. Parameters influencing ranking in online travel accommodation intermediation, for example, include the conversion rate, average daily rates, cancellations, property page views, review scores, quality parameters such as the attractiveness of room pictures, room availability, and commercial parameters such as higher commissions, free breakfasts, etc.

9. Online platforms need to remain sufficiently relevant to users and this acts as natural constraint on the platform. However, notwithstanding this constraint, online platforms seek to maximise their profits (i.e. they balance profits and relevancy). As such parameters that are most important to online platforms often have the biggest weighting, particularly those that balance relevancy and profit maximisation. Examples include conversion rates (i.e., the likelihood that a search result ends up in a booking or purchase) for online intermediary platforms or cost-per-impression (i.e., the likelihood that a result will be clicked for a given query) for general search and price comparison sites. As such these parameters already embody the commercial incentives that online platforms have over and above the more obvious ones (e.g. pay for position, increased commission payments, etc.).

10. In areas where commercial parameters do not impact rankings such as “free of charge” organic search results in general search, the observation is that they also tend to favour older, more established and larger platforms. This means that small and new platforms and business users must invest significant resources into SEO. This typically takes longer to achieve meaningful consumer traffic and is more unpredictable given that search engine algorithms are effectively black boxes and change frequently⁶. This pushes smaller platforms and business users to use paid or sponsored ranking as the more effective way to drive consumer traffic, notwithstanding the fact that they are stymied from effective expansion and competition by larger platforms with deeper pockets (as discussed before).

11. There is a tendency for platforms to sell more and more visibility over time because it does not degrade the consumer experience sufficiently to result in consumer loss. The opportunity to sell more visibility exists once a platform has a sufficiently large number of listings for the same product or service (e.g. “running shoes” or “hotels in cape town”) such that many listings are relevant to the consumer query so as not to degrade their experience, and business users are willing to pay as otherwise they may appear far down the search results page and lose sales. The general lack of ad identification by some platforms makes it even less likely to degrade the consumer experience.

12. This leads to another theory of harm, exploitation of platforms and business users dependent on general search and online intermediation platforms, especially those with

⁶ For example, Google made more than 3500 updates in Search in 2019. Google, oral submission at public hearings, presentation pages 6 - 9. Available at: <https://www.compcom.co.za/oipmi-public-hearings-presentations-02-29-november-2021/> [accessed 4 May 2022].

large networks and market power. As a platform becomes more indispensable for a business user to distribute its goods or services, the more gatekeeper or intermediation power it has. The platform can leverage the all-important visibility on its search results page to effectively extract more rents from business users. The same is true of platforms dependent on general search for online consumer traffic. This means that as a platform's gatekeeper or intermediation power grows, the more it can profiteer or exploit its business users. Platforms do this by charging increasing commission fees, cost per clicks, etc. over time. This invariably raises the customer acquisition costs, which at some point, will be directly or indirectly passed on to consumers.

4. Price Recommender Systems and AI Tools

13. Research into the online travel and accommodation space, reveals the use of price recommender systems and AI tools such as software used to aid businesses in monitoring prices as well as recommending prices. These AI tools use machine learning algorithms which also scrape vast amounts of publicly available price data online, and where possible, quantities and capacity data. They often provide services that gauge what demand in a market will look like and offer price recommendations. Usage of these tools have found a place in travel and accommodation given that the nature of the inventory sold is perishable i.e., if it isn't sold it goes to waste⁷.

14. There exists a fairly ubiquitous service called "rate shoppers" used by hotel chains, larger independent hotels and online travel agencies ("OTAs")⁸. By crawling millions of price points on the internet, rate shoppers appear to be used to monitor online prices across various distribution channels including price comparison sites (often referred to as metasearch engines in travel), OTAs, hotels and other accommodation providers websites. For example, rate shoppers can be used to monitor an accommodation provider's own prices across different online distribution channels, rival's prices and can also be used to enforce price parity by OTAs.

15. Rate shoppers fall within a broader ecosystem of artificial intelligence ("AI") tools offered by price recommender system software service providers such as RateGain and Fornova. For example, RateGain offers "Competitor Pricing Intelligence" services for OTAs and metasearch sites, airlines, hotels, car rentals, package providers and cruises and ferries⁹. Fornova provides competitive and revenue intelligence tools and allows its users to "*shop competitor rates, compare pricing, products & inventory with suppliers, partners & competitors from any platform, any channel, any location, and at any time*"¹⁰.

16. In the online distribution of travel and accommodation services, price recommender systems pervade several levels of distribution. Most notably they are typically used by Revenue Management Systems ("RMS") by business users. For example, car rental operators might use fleet management service providers such as Bluebird (Rentall¹¹) and

⁷ For example, an unsold hotel room or car rental on any given day.

⁸ See OIPMI Provisional Report, Chapter 2, para. 211. Available at: <https://www.compcom.co.za/online-intermediation-platforms-market-inquiry-provisional-report/> [accessed 3 May 2023].

⁹ RateGain (2023). Available at: <https://rategain.com/rate-intelligence-overview/> [Accessed on 6 February 2023].

¹⁰ Fornova OTA (2023). Available at: <https://www.fornova.com/online-travel-agency> [Accessed on 6 February 2023].

¹¹ See: <https://www.autorentalnews.com/10153097/bluebird-thermeon-navotar-combine-to-form-rentall> [Accessed on 7 February 2023].

TSD Mobility Solutions¹² with price recommendation features built in¹³. RMS is commonly used by hoteliers, for example, Siteminder, the world’s largest channel manager, connects hotels with a wide range of RMS to keep rates optimised¹⁴. RateGain also provides its own hotel channel management solution including RMS inputs¹⁵. The CCSA’s understanding is that RMS has a major influence on pricing.

17. Price recommender system inputs appear to occur at various tiers of online intermediation (see figure below). For example, this includes business-to-consumer (“B2C”) platforms where average daily rates feature in OTA’s ranking algorithm, Booking.com has a Genius Dynamic Pricing¹⁶ service which determines discounted prices for Genius members and Airbnb offers Smart Pricing tools to its hosts¹⁷. The figure below provides a rudimentary illustration¹⁸ of how various influences, especially AI price recommendation tools, which appear to affect the online (and to some extent offline) consumer facing retail price of travel and accommodation services. In order to understand the impact that price recommender systems have on the final price of travel and accommodation services, one would have to have a broad understanding of all the influences on the final price. As such an assessment of pricing from first principles would be necessary.

¹² See: <https://tsdweb.com/solutions/> [Accessed on 7 February 2023].

¹³ For example, TSD appears to partner with Rate Highway and Bluebird with RateGain. See: <https://www.barsnet.com/bluebird-and-thermeon-partner-with-rategain-to-help-maximize-revenue/> [Accessed on 7 February 2023].

¹⁴ SiteMinder (2023). Revenue Management Systems (RMS) Integrations. Available at: <https://www.siteminder.com/integrations/revenue-management-systems/> [Accessed on 7 February 2023].

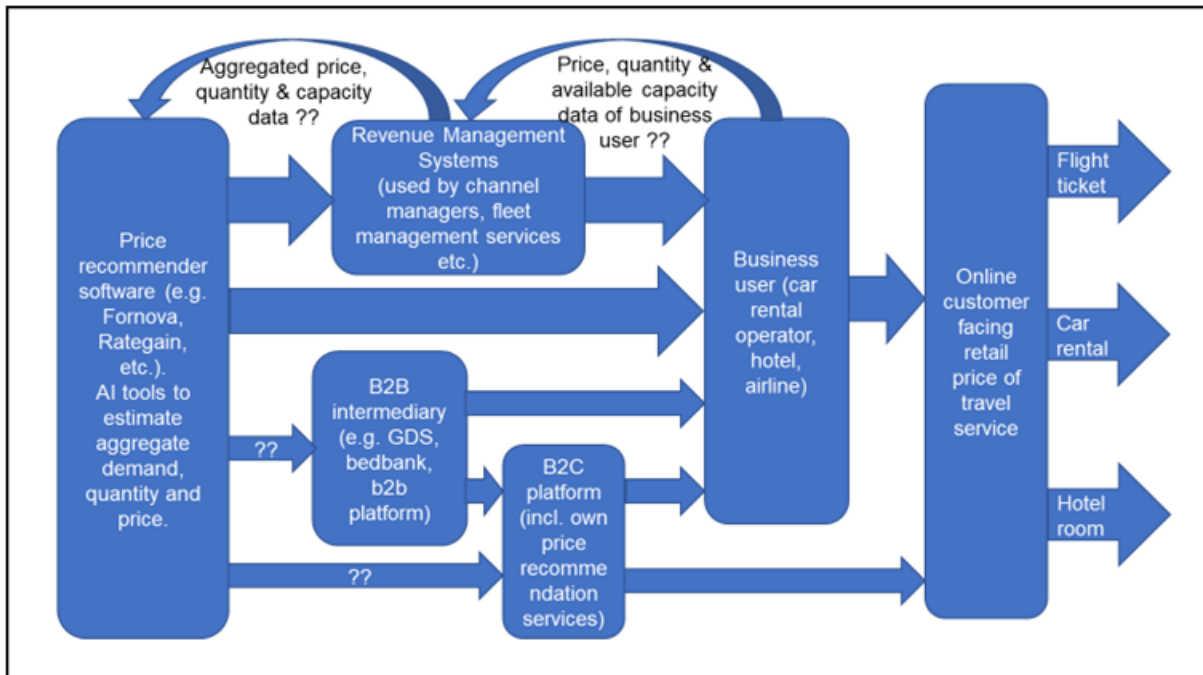
¹⁵ See: <https://rategain.com/hotels/connectivity-channel-manager/#:~:text=RezGain%2D%20Smart%20Hotel%20Channel%20Manager%20Software&text=It%20is%20a%20one%2Dstop,%2DBanks%2F%20Wholesalers%20%26%20OTA's> [Accessed on 7 February 2023].

¹⁶ Booking.com Partner Hub. Available at: <https://partner.booking.com/en-gb/community/property-management/genius-dynamic-pricing-discount> [accessed 3 May 2023].

¹⁷ Airbnb (2023). Help Center: Smart Pricing. Available at: <https://www.airbnb.co.za/help/article/1168> [Accessed on 7 February 2023].

¹⁸ This is a rudimentary depiction. Further research is needed for a more specific and conclusion depiction.

Figure 1. Rudimentary depiction of price recommendation and other influences on online prices of travel and accommodation services



Source: Own compilation based on own insights. (?? - relates where the CCSA is unsure of certain relationships and further research is needed).

18. AI tools and price recommender systems appear to impact prices, quantities, demand and capacities in the online travel and accommodation market¹⁹. They take advantage of the vast and widely available data (e.g. prices), a feature of online markets, and possibly non-publicly available data that they may have obtained from other users of their services (e.g. inventory volumes) to provide price recommendation services. Price recommender systems feature in software such as RateGain and Fornova, and feature strongly in Revenue Management Systems used by travel and accommodation business users. Furthermore, other tiers operating in online travel and accommodation retail such as B2C platforms have price recommender systems of their own.

19. Beyond online travel and accommodation, it is also recognised that AI tools and price recommender systems are used in, for example, automated bidding in the ad tech space, used car sales, etc. The use of AI tools and price recommender systems are likely to gain more traction over time. There also seems to be an assumption that dynamic pricing is an efficient solution in dynamic markets. Notwithstanding this assumption, there is a genuine need to deep dive and understand from first principles how prices are determined in dynamic markets such as rental cars, flights and hotels that use automated software to determine prices. As such, further research into the role of how AI tools and price recommender systems impact prices, quantities, demand and capacities in the car rental, airline, and accommodation space as well any other market deemed necessary for such an assessment is needed. To do this, a deep dive into how online prices shown to consumers are determined, building up from first principles, is necessary to understand the broader

¹⁹ These features (price, quantities, demand and capacities) also influence price recommendation software in a feedback loop.

impact of dynamic prices and the role that AI tools and price recommender systems play in the marketplace.

5. Tacit Collusion and Price Recommender Systems

20. As in with travel and accommodation, AI tools are used in markets that demonstrate limited capacity, market segmentation, low marginal costs and perishable units of inventory i.e. if you don't use it, you lose it (e.g. hotel rooms)²⁰. These markets are characterized by dynamic pricing where, on the one hand, AI tools can enhance allocative efficiencies and allow travel service providers to navigate seasonality where they can recoup losses in periods of low demand through higher prices in periods of high demand. Having said this, there is no guarantee that travel service providers are making losses in periods of low demand and may in fact (with the assistance of AI tools) be making very high or supra-competitive profits in high demand periods.

21. Broadly speaking, the online world creates transparency where firms can easily monitor millions of price points including their competitors' online prices and make automated updates in real time²¹. AI tools intensifies the ability of firms to monitor broader market prices, and in some cases quantities and aggregate demand. It seems that the online space has created an environment where information that would have previously been considered commercially sensitive is now in the public domain. The CCSA has also observed exchanges of commercial information at a surprisingly granular level, although this is technically publicly available. In the car rental space, for example, RevAI notes that it provides “A *single dashboard with price monitoring tool for car rentals* [that] *allows revenue managers to get all the insights needed to review pricing, map competition and see availability easily for chosen competitors*”. It also notes that it provides “*customizable dashboards to go granular and track your competitor position in the market*”²².

22. Many AI tools advertise themselves as being able to maximise and improve the revenues of their users²³. If such claims are true and manifests itself in the form of higher profits²⁴, then collectively speaking (given limited industry constraints), one could assume that overall prices are increasing as a result. For example, sophisticated tools can potentially take advantage of consumers' willingness to pay²⁵ at each iteration and in effect cause a transfer of consumer surplus to producer surplus. This represents a transfer of wealth from less sophisticated consumers to more sophisticated producers, which may be problematic

²⁰ Gaudix, J. ; Cortes, P. ; Onieva, L. & Munuzuri, J. (2008). Technology Revenue Management System For Customer Groups In Hotels. Note a fifth characteristic delineated by the authors is future demand is uncertain, however, since 2008, predictability of future demand has improved with AI tools.

²¹ E.g., RateGain's Optima MarketDRONE Insights. See: <https://rategain.com/hotels/rate-intelligence/> and in the airline industry see Kong Chung Wai of Singapore Airline's testimony: <https://airgain.ai/> [Accessed on 7 February 2023].

²² RevAI (2023). [Car Rental Management System and Competitor Rate Intelligence Tool – Car Rate Shopping – Rev-AI](https://rev-ai.io/travel-software/car-rate-shopping/). Available at: <https://rev-ai.io/travel-software/car-rate-shopping/> [Accessed on 6 February 2023].

²³ RateGain (2023). Available at: <https://rategain.com/about-us/> [Accessed on 6 February 2023]

²⁴ See RevAI (2023). Available at: <https://rev-ai.io/>; Fornova (2023). About Us. Available at: <https://www.fornova.com/about-us/>; TUV SUD (2023) TUV SUD Used Car Pricing Tool. Available at: <https://www.tuvsud.com/en/industries/mobility-and-automotive/retail-and-leasing/automotive-remarketing/it-tools/car-pricing-tool/>; Pricepoint (2022). Pricepoint – Automated Revenue Management Software for Hotels. Available at: <https://pricepoint.co/fully-automated-revenue-management/>

[all sites accessed on 6 February 2023].

²⁵ See RevAI (2023). Available at: <https://rev-ai.io/> [Accessed on 6 February 2023].

in exacerbating inequalities or driving up prices in an already highly inequal country as South Africa.

23. A more nefarious outcome, however, could be AI tools recommending capacity restrictions in a market already characterised by limited capacity. For example in the USA, AI software used by property owners appear to have recommended restricting capacity, charging higher prices and making more profit. As a result, clear deadweight losses accrue where vacant rooms and homelessness coexist in the name of AI facilitated profits²⁶. The role of AI tools in areas such as the car rental industry would constitute suitable candidates for further research where prices, for example in South Africa, appear to have more than doubled in 3 years²⁷ and volumes appear to have decreased significantly.

24. Naturally, the overarching concern of price recommender systems in a world with copious amounts of publicly available commercial data such as prices and quantities, is that this data can be crawled and processed to estimate overall demand and recommend prices accordingly. This intensifies tacit collusion and the increases the probability of it occurring, especially in markets where there is popular use of these price recommender systems and a large proportion of users adhering to the recommended prices.^{28 29}

6. Alleged Cartels Abusing Algorithms

25. A recent case that the CCSA referred to the Competition Tribunal of South Africa for prosecution highlights the potential for firms to abuse an online platform's algorithm to achieve a collusive outcome³⁰. The case involves two competing companies selling personal protective equipment (PPE) during the height of the Covid-19 pandemic on Takealot, South Africa's largest online eCommerce marketplace. It is alleged that the two firms colluded to fix prices of face masks and divided the market around times that they would feature more prominently on the platform.

26. The firms achieved this outcome by making use of features of Takealot's algorithm to influence their relative ranking position and visibility, in turn impacting on sales volumes to consumers. Takealot takes variables such as price and stock availability into account in its algorithm which then affects visibility of suppliers to customers. For example, a supplier that has a cheaper product and available stock is likely to have its product more visible to customers on the Takealot platform than a supplier with a higher price and less stock. The visibility in turn impacts on sales volumes as consumers tend to click on more prominently displayed results.

²⁶ The effect of this behaviour can be seen in markets with fairly widespread use and adoption of recommended prices. In this example, the widely used software, YieldStar, had about 90% of suggestions adopted by apartment managers. (See Vogell, H., Coryne, H., & Little, R. (2022). ProPublica – Rent Going Up? One Company's Algorithm Could Be Why. Available at: <https://www.propublica.org/article/yieldstar-rent-increase-realtor-rent> [Accessed on 7 February 2023].

²⁷ For example, a weekend (2 day) rental at King Shaka Airport in Durban in July 2018, cost R448.01 (incl. VAT) but had increased by 276.8% to R1688 per day for the same rental in October 2022.

²⁸ Ezrachi, A. and Stucke, M.E. (2017). Artificial Intelligence & Collusion: When Computers Inhibit Competition. *University Of Illinois Law Review (Vol. 2017)*

²⁹ This could be through the use of software such as Revenue Management Systems, platform automated or info tools, or the platform itself could be aligning strategies between business users (kind of like a hub-and-spoke arrangement).

³⁰ See media release at: <https://www.compcom.co.za/wp-content/uploads/2023/01/Competition-Commission-charges-face-masks-sellers-for-price-fixings-26-January-2023-.pdf> [accessed on 5 May 2023]

27. It is alleged that the two companies, through telephonic discussions, allocated days to each other. However, to try avoid detection through more obvious conduct such as not selling on particular days allocated to the other party, the firms sought to engage in conduct that would impact on their ranking based on the Takealot algorithm. It was also agreed to alternate the days where each would price higher than the other, and where stock availability would be reduced. This meant each firm would have a day to charge a higher price with limited stock availability followed by a day to charge a lower price with greater stock availability. The switching would be at 5 pm each day when the parties would adjust their respective prices and stock availability according to which day was allocated to them. The firm with the higher price and low stock availability would be relegated down the ranking, making them less likely to contest the other for consumer attention and sales.

7. Conclusion

28. Competition in online markets is shaped by algorithms in the form of ranking, display and size of a business users results on the search results page. This is because algorithms determine where a result is ranked, how its displayed and what size it will be. Visibility on an online platform is paramount to the performance of a business and is the key driver of online consumer traffic to that business' website. Here online platforms, especially those with market, intermediation or gatekeeper power, can shape the winners and losers who depend on the platform for online discoverability, and distribution of goods and services. In the online space, large players are the winners as they have the resources to outbid rivals on paid and sponsored search and invest in substantial resources to dominate SEO. This creates a virtuous circle that reinforces their entrenchment. Small players are the losers because establishing a presence on organic search takes a long time and is resource intensive and they are typically outbid by larger players on paid or sponsored search. This creates a market structure where large platforms dominate the bulk of consumer traffic and small and new players face significant barriers to expansion and are relegated to catering for niche markets.

29. Price recommendation systems and AI tools are becoming ubiquitous in the online space. By crawling online data such as prices and quantities they can provide services such as allowing users to monitor their own and rival's prices on various online distribution channels, providing estimated industry demand, and offering price recommendation services. While some might argue these services have the capacity to improve allocative efficiencies, a real concern for tacit collusion exists. This is concern is heightened by the vast amount of publicly available data online of a commercial nature and at a granular level. If done what is promised, to maximise their client's profits and this is done collectively for these clients, it may be the case that price recommender services lead to a collusive outcome. Furthermore, if there is wide-spread usage of price recommender systems in a given industry, and the bulk of these users adhere to these prices recommendations, it is likely that this will result in a collusive outcome.