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Self-Preferencing and Foreclosure in Digital Markets: Theories of Harm for Abuse Cases

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Self-preferencing and foreclosure in digital markets: theories of harm for abuse cases*

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Abstract

Antitrust agencies all over the world have been investigating large digital platforms for practices which may constitute an abuse of dominance. Here I discuss practices (including 'self-preferencing' and denial or degradation of interoperability) which can be interpreted as foreclosure in vertically-related or complementary markets. I discuss in particular a few high-profile cases involving Amazon, Apple, Facebook and Google. I focus on possible theories of harm for such cases and show that both original simple models and well-established economic theories (adapted or interpreted) provide a rationale for anti-competitive foreclosure.

Keywords: Self-preferencing. Abuse of dominance. Monopolization. Exclusionary practices. Digital platforms. Two-sided markets. Vertical foreclosure.

JEL Classification: D40, K21,L10, L40

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1 Introduction

In the last few years, the big digital platforms have been at the centre of the attention of commentators, policy-makers, academics and the press. Their pervasive presence in our lives, their constant expansion well beyond their original markets, and their entrenched market power have raised worries in several quarters. As a result, many countries have considered (and in some cases already adopted) legislative initiatives, and antitrust agencies (which have been criticised for their initial inaction) have stepped up their efforts in dealing with the big tech companies, by starting market inquiries on some of their activities, scrutinising their mergers, and opening abuse of dominance (or monopolisation) investigations on their practices.

I focus here on this last category of competition concerns in digital markets. More precisely, I will deal with practices — sometimes described with the new term "self-preferencing" — which can be thought of as foreclosure in adjacent markets, that is, markets where products or services at issue are either complementary or vertically related. I aim to identify possible theories of harm for a few high-profile abuse cases of this type.[1]

To this purpose, not only do I rely on well-known exclusionary theories, but I also develop original simple models which aim at capturing the essence of the cases at issue. There are at least new insights these new models offer. First, they show that while the introduction of a copycat version of a product offered by a firm in an adjacent market might be pro-competitive, the denial or degradation of interoperability by a dominant platform is always anti-competitive. Second, and differently from previous papers in the literature, a dominant platform may have both the ability and the incentive to exclude a potential competitor operating in a vertically-related or complementary market even when it does not operate itself in such a market.

There are several reasons why this topic might be of interest. Firstly, we all know (and often use) the companies involved and at least some of the practices at issue, so I hope that some readers may want to satisfy their curiosity even if competition policy is not their usual domain of interest. Secondly, abuse of dominance (or monopolisation) is certainly the most controversial area in competition policy,[2], with very different enforcement standards in Europe and the US, and with differing views among lawyers and practitioners as to the rationale behind exclusionary practices.[3] All the more so when it comes to digital markets, which are characterised by certain features (e.g. zero prices for consumers, significant innovation rates) which may lead some to be sceptical about possible harm to consumers. Thirdly, in the EU the regulatory changes introduced by the Digital

[1]Foreclosure of (actual or potential) rivals in adjacent markets (sometimes for shortness I may refer to it as 'vertical foreclosure' even if it may also concern complementary markets) are by no means the only anti-competitive practices considered in abuse of dominance cases in the digital sector. For instance, in *Google Android* the EC found Google had abused its dominant position by, inter alia, engaging in tying and exclusivity payments; in *Google AdSense* the practice at issue was exclusive dealing; in Germany Facebook had been found guilty for exploitative conduct; and the *Apple v. Epic* case in the US is, in my opinion, closer to an excessive price case than a vertical foreclosure one.

[2]See also Vickers (2005). Things have not much changed since, in this respect...

[3]Vertical foreclosure is certainly no exception to this. In the US, after *Trinko*, the standard of proof for finding an anti-competitive refusal to deal is extremely high. In the EU the conditions for an anti-competitive finding in cases of refusal to deal (or license), margin squeeze, self-preferencing, and degradation of interoperability are certainly much weaker than in the US. See e.g., Fumagalli et al. (2018).

Market Act have largely been inspired by the European Commission's abuse of dominance cases, so understanding the latter may also help assess the pros and cons of the former.

I should also clarify upfront that my knowledge of the cases I discuss in this paper is limited to public information, which is often, and especially when a decision or judgment has not been issued yet, very limited (in Europe, antitrust agencies do not publish any document before issuing their decision, nor do they discuss cases in public). This also means that I might not have all the necessary information to assess whether the theories of harm I will propose are fully consistent with the facts of the case, whether there exist efficiencies or objective justifications for the practices at hand, and whether ultimately consumers have been harmed by them.

This article continues thus. Section 2 briefly summarises the recent literature on vertical foreclosure and sketches the main arguments which I shall dwell on later. Section 3 is the core of the paper. In it, I will briefly describe a few high-profile cases and propose a foreclosure rationale for them. The section is organised around the three broad theories of harm for vertical foreclosure summarised in Section 2, and will also include new simple models I use to adapt those theories to the digital market cases at hand. These models are relegated to 'technical' sections indicated by an asterisk, and the reader not interested in formal models can skip them. Section 4 concludes the paper.

2 Theories of vertical foreclosure

Vertical foreclosure refers to a situation where a firm which owns an input denies it (or makes it less compatible or more difficult to use, or significantly raises its price of access) to an independent firm which makes use of it, typically in competition with a downstream affiliate of the input owner. (Similarly, foreclosure in complementary markets refers to a situation in which a firm which owns a primary product or service — say, a platform — denies access to a firm which sells a complementary product or service — say, an app. For shortness, I will often use the term 'vertical' foreclosure even if it may refer to complementary markets.)

Legally, refusal to supply (or to deal, or to license), constructive refusal, denial (or degradation) of interoperability, and excessive price of the input (in jurisdictions where exploitative abuses are covered by competition law), are all examples of vertical foreclosure practices. And the list is non-exhaustive. For instance, the term 'self-preferencing', to my knowledge first used by the European Commission to describe Google's behaviour in the *Google Shopping* case, which describes a situation whereby a vertically integrated firm discriminates in favour of its affiliate to the detriment of its competitors, also belongs to the category of vertical foreclosure conducts.

Whether, and if so in which circumstances, vertical foreclosure has an economic rationale, has long been controversial. To fix ideas, the question is whether in a market like the one illustrated by Figure 1, an integrated firm whose upstream affiliate U_1 is dominant in the provision of a certain input which is used by both its downstream affiliate, D_1 and some other independent downstream rivals such as D_2, would have an incentive to (partially or totally) limit D_2's access to the input, either by non-price conduct (e.g., refusal to supply) or by an appropriate choice of the access price $A(q_2)$

— where $A(q_2)$ establishes the price firm D_2 has to pay for the purchase of q_2 units of the input.

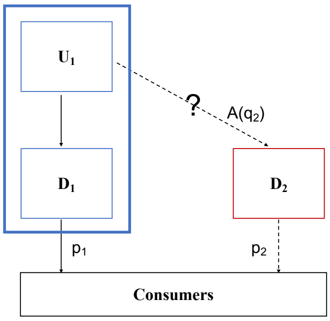

Figure 1. Vertical foreclosure

For a while, economic theory found it difficult to explain the rationale for vertical foreclosure. The Chicago School had indeed been successful in offering a theory which denied such a rationale. The 'one monopoly profit' theory is based on the idea that an input monopolist has the *ability*, but not the *incentive* to exclude an efficient downstream competitor because it would make higher profits by supplying it and extracting rents through appropriate pricing of the input, $A(q_2)$, than by excluding it and therefore reducing industry profits.

Since the 90s, though, economic theory has identified at least three broad groups of situations where the Chicago School result does not hold, which I briefly summarise in the following three sections.[4] Let me also reiterate that, *mutatis mutandis*, the discussion also holds for foreclosure in complementary (rather than vertically-related) markets.

2.1 Imperfect rent extraction

The Chicago School theory is based on the idea that the input monopolist has sufficient freedom in its pricing instruments, and hence in extracting rents from the users of the input (or of complementary products). However, there may be situations where there exists *imperfect rents extraction*, and if the amount of profits made by serving independent downstream rivals is low enough, then the vertically integrated firm *might* make more profits by foreclosing rivals and increasing sales of its affiliate. An obvious example is when the input is subject to economic regulation. If the regulator imposes sufficiently tight price caps, then the vertically integrated firm could make more profits by selling directly to consumers rather than making use of independent downstream sellers.[5]

[4]See Fumagalli et al. (2018) for a more detailed discussion and a description of the state of the art on vertical foreclosure.

[5]Of course, a straightforward refusal to supply is unlikely to be approved by the regulator, so the vertically integrated firm will have to find a disguised way not to supply, or to reduce, the input available to downstream rivals. But regulated utilities have often found such ways, e.g. by claiming technical difficulties, insufficient capacity, or quality concerns.

There may also be other circumstances in which the input supplier is unable to extract high profits from the downstream firms it supplies. The problem of opportunism, identified by Hart and Tirole (1990) is one such case. If the input monopolist is unable to commit to terms of access with its retailers, it may have the incentive to renegotiate such terms with any one of them to the detriment of the others. But anticipating this possibility, each retailer would only be willing to accept more favourable terms of trade, so that the input owner will not be able to extract monopoly profits. In turn, this may give it an incentive to engage in vertical foreclosure.[6]

One can find other examples of imperfect rent extraction in the digital industry. For instance, Google's monetisation through search advertising implies that neither users nor sellers whose links are listed in *organic* search pay for the inclusion of such links in the Search Engine Results Page (SERP),[7] and this may give Google an incentive to bias the algorithm which ranks organic results to foreclose sellers competing with Google's own services. I will argue that this rationale applies to *Google Shopping* and that similar considerations also offer a rationale for understanding the *Google Privacy Sandbox* case.

Most of the theories of vertical foreclosure are based on models with a vertically integrated firm and one downstream rival (or several *identical* downstream rivals). Discriminating terms of access among downstream firms (other than the own affiliate) is therefore not an issue in those models. But suppose now that there are different downstream independent retailers which are using the input. Perfect rent extraction would call for flexibility in input pricing, including the possibility to discriminate among retailers. If the input owner was for some reason unable to price discriminate, then rents extraction would be imperfect. Mobile app stores such as those of Apple and Google, and marketplaces such as Amazon, typically commit to *uniform terms of access*, to avoid the possible consequences of opportunistic behaviour (a software developer which needs to adapt its app to a particular mobile OS would not want to incur in the hold-up problem).[8] This will in turn limit their chances to extract rents from the apps or merchants they host on their platforms. I will argue that when a third-party seller is particularly successful and given the inability to raise fees and commissions to that seller, a platform may prefer to copy its product or service to extract more profits from users rather than rely only on third-party sales. This strategy may help understand cases such as *Apple Music* and *Amazon Marketplace* (although I should add upfront that this conduct may not necessarily have anti-competitive effects).

2.2 Dynamic vertical foreclosure

The setting considered by the Chicago School and by most of the subsequent literature is static, in that it assumes a given structure of the market. In particular, the vertically integrated firm has a

[6]See also Rey and Tirole (2007) and Reisinger and Tarantino (2015), as well as Fumagalli et al. (2018) for a textbook discussion.

[7]Organic search results are those which are determined uniquely by Google's algorithm. Other links on the page of a user searching for a certain term may instead be sponsored links, that is advertising announcements whose position and presence are established by a real-time auction triggered by the search and in which merchants will bid.

[8]Another reason for adopting uniform terms of access may also be that consumers and users show a strong dislike for price discrimination, and may react to it if the platform adopted it.

safe monopoly of the input (or equivalently a platform has a safe monopoly of, say, the app store or the marketplace). But there may exist situations in which the market conditions may change in the near future and new entry may be possible, either by a current competitor which decides to integrate upstream (or in the primary market) or by another firm. The likelihood of entry may depend on the market success of rivals in the downstream (or complementary) market. For instance, a downstream rival may need large enough profits before investing further upstream; and/or a firm selling a complementary product or service may need a strong enough customer base — in an environment with network effects — if it wants to reach sufficient demand for the primary product. If that is the case, then the input (or primary product) monopolist may have the incentive to foreclose a downstream (or complementary) rival as a way to protect its core upstream (or primary) market.

This setting is illustrated by Figure 2 (where U_R might or not belong to the same firm as D_2).

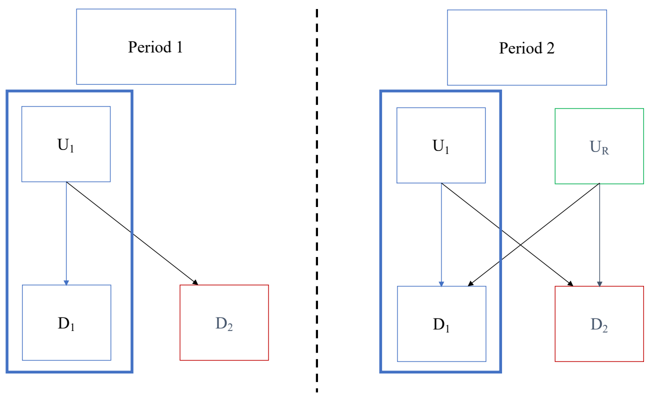

Figure 2. Foreclosure in a dynamic setting

Most readers will have already understood that this story is fundamentally the same as Carlton and Waldman (2002)'s theory of leverage tying, inspired by the *US v. Microsoft* case: their paper formalises the idea that Microsoft tied Internet Explorer to its Windows OS to gain market share from Netscape in the browser market. Microsoft engaged in this strategy not because it was interested in the browser market in itself, but because it was worried by Netscape being a driving force for middleware such as *Java* to bypass Windows. In their two-period model, there is no reason for the monopolist of the primary product to foreclose a rival in the complementary market in a static perspective; the rationale for foreclosure comes from the fact that the rival's success in the complementary market would lead to entry in the primary market in the following period. Hence, foreclosure happens for 'dynamic' reasons and is motivated by the protection of the monopoly in the primary market. Fumagalli and Motta (2020) adapt and extend this theory of harm in an environment where a vertically integrated firm serves a downstream rival which may support upstream entry.[9]

[9]Although intuitively complementary- and vertically-related markets are very similar, the extension of the theory of harm to the latter is technically not straightforward. Fumagalli and Motta (2020) also show that foreclosure may also occur when the upstream monopoly is bound to end (e.g., because a patent expires) and cannot be protected, simply

In this paper, I will show that in certain circumstances foreclosure may also occur when a platform is not integrated: if an app or a merchant's success is the stepping stone for a potential competitor to develop a substitute platform, excluding the app or merchant from the platform or reducing its customers — e.g. through denial or degradation of interoperability — may reduce the scale of the rival and protect the incumbent platform's monopoly, thereby harming consumers.[10]

I shall argue that this dynamic theory of foreclosure provides a theory of harm for the *FTC complaint against Facebook*. The complaint reports internal documents which show that Facebook executives were particularly worried by the possible challenges to its social network monopoly coming from firms operating in adjacent markets, such as messaging apps or apps with social functionalities. This led not only to the acquisition of Instagram and WhatsApp, but also to allowing interoperability to such apps only under strict (and strictly enforced) conditions, *inter alia* obliging firms not to compete (nor to support apps which could compete) with Facebook.

This dynamic theory also echoes the arguments by the UK's CMA in a recent market study[11] where it argues that Apple requires other browsers to use *Apple's WebKit browser engine* on its iOS operating system, thereby hindering the development of some apps and services, such as *cloud gaming* and *web apps*, which would allow users to access content without relying on its app store. If future investigations confirmed this allegation, the theory of harm would be very similar to that of the DoJ in the aforementioned *US v. Microsoft* case, in that exclusion would be motivated by a dominant firm's perceived threat of disintermediation of its Operating System.

2.3 Raising rivals' costs

The standard Chicago School model assumes that the upstream good is produced in monopolistic conditions. One may think that if not even an input monopolist has an incentive to foreclose, a fortiori a firm which has less than monopoly power would not have it. But Ordover et al. (1990) show that this is not necessarily the case. Consider a vertically integrated firm which faces two rivals, one upstream and the other downstream, as illustrated in the left panel of Figure 3.

Given that there is competition at both levels of the supply chain, perfect rent extraction is out of the question. In particular, upstream competition will drive down the input prices, which will keep downstream costs low and make downstream firms aggressive in the product market. However, if the vertically integrated firm was able to commit not to supply its input to the downstream rival, the latter will have to buy its input from the upstream independent firm, which is now effectively monopolising the supply to it. This increases the input price and hence the cost of production for the downstream independent firm, which will necessarily be less aggressive in the product market. In

because having a monopoly downstream would allow for a higher share of profits when there is upstream competition.

[10]There may be other strategies which, by reducing scale and profits of the potential competitor, help an incumbent protect its core market. Motta and Shelegia (2021) show that one such strategy would consist in copying the app or product of a third-party seller which may launch its platform. With copying, though, there may be harm to the competitor but not necessarily to welfare: consumers will benefit from the competition induced by the incumbent's 'me-too' product, and if the new platform does not add much to welfare (e.g. it is more business-stealing than market-expanding) the former effect may dominate the latter, i.e. platform suppression, effect.

[11]See Competition and Markets Authority (2022b).

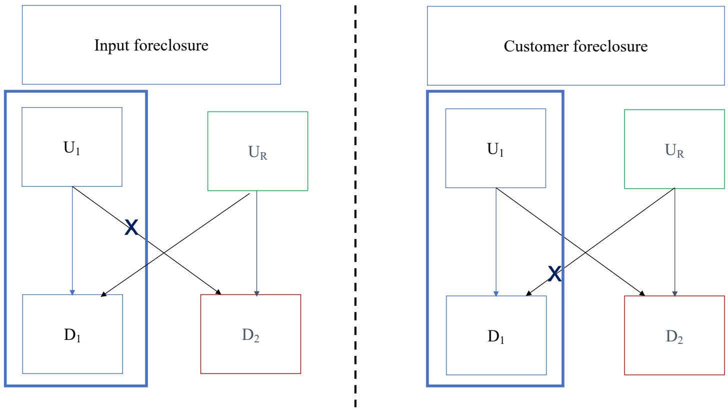

Figure 3. Input or customer foreclosure to raise rivals' costs

turn, this will increase sales and profits of the downstream affiliate of the vertically integrated firm, which therefore benefits from foreclosure.[12]

Given that most digital markets are characterised by zero prices to consumers (and hence it is difficult to think of relaxing price competition as a motive for foreclosure), and above all that most of the abuse cases feature a platform which is an undisputed monopolist, it is hard to think of immediate applications of this theory of harm to abuse cases in digital markets. However, consider the following 'customer foreclosure' variant of the raising rivals' costs story. (See the illustration in the right panel of Figure 3.) If the downstream affiliate of the vertically integrated firm commits not to buy the input of the upstream rival, the scale of production of the latter will fall, and its cost will increase, which will also tend to make the downstream independent firm less competitive in the final market.

This theory of harm seems to fit a recent decision, *Amazon Logistics* by the Italian Competition Authority (see Section 3.3.1). The ICA found that Amazon discourages third-party sellers from relying on logistic services competing with Amazon's own FBA (Fulfilled By Amazon) services. By denying scale to rival logistic services, rival marketplaces cannot rely on efficient shipping and would in turn be less attractive for consumers relative to Amazon Marketplace.

3 Selected foreclosure cases, and possible theories of harm

In this section, I will briefly discuss a few selected high-profile cases involving digital platforms, and propose models which help shed light on the rationale for foreclosure in such cases. I organise the discussion following the three broad categories of theories of harm summarised in the previous section. In Section 3.1 I deal with cases where imperfects rents extraction is in my opinion the rationale for foreclosure; in Section 3.2 with those where the main objective of foreclosure seems to be the protection of the monopoly of a platform or app store facing a future threat; and in Section 3.3

[12] Of course, for this strategy to be profitable, it is necessary that the loss coming from not supplying the downstream rival is outweighed by higher downstream profits.

I will refer to *Amazon Logistics*, where the Italian authority has made use of a raising rivals' costs theory of harm.

3.1 Theory of harm: Imperfect rent extraction

This section is organised thus: Section 3.1.1 discusses the *Google Shopping* case and Section 3.1.2* introduces a simple model which formalises a rationale for foreclosure in that case. In Section 3.1.3 I discuss the *Google privacy sandbox* case, which shares some of the features of *Google Shopping*. Section 3.1.4 describes the *Apple Music* case, followed by a rationalisation of the case, first informally in Section 3.1.5, and then with a simple model in Section 3.1.6*.

3.1.1 Google Shopping

This is probably the first case of abuse of a dominant position (or monopolisation, as it would be called in the US) by a digital platform investigated by an Antitrust Authority.[13] The European Commission imposed a (then) record fine to Google for positioning and displaying its comparison shopping service (CSS) more favourably than rival CSSs, and for demoting the latter in the ranking of generic search results, due to the application of 'adjustment algorithms', in particular the 'Panda' algorithm, which systematically ranked CSSs (other than Google's own) very low.[14] The EC argued these practices had the effect of decreasing visibility and traffic for rivals (which could not effectively replace traffic from other sources), and that they caused harm to consumers and merchants. The Commission's Decision was fully upheld by the General Court (but it is under appeal at the Court of Justice).

The EC and the General Court have characterised this case as one of self-preferencing (or discrimination) and leveraging, with Google making use of its market power in Google Search to promote its CSS, which until then had not been successful ('Froogle', Google's first CSS, had disappointed Google's executives and had not managed to make an indent in a market where many CSSs had been successfully operating for some time).

Google argued that the case was one of refusal to supply and that according to the case law the EC should have proved that access to Google Search's organic results was indispensable. The General Court dismissed this argument by saying that the jurisprudence had not established the necessity of showing the indispensability of the input owned by the dominant firm in leveraging (as well as margin squeeze) cases. While not stating it was an indispensable input, the General Court did stress that the visibility and traffic provided by organic results were very important and not replaceable for CSSs. Whatever the interpretation one may give of the jurisprudence, from an economic point of

[13] European Commission Decision, 27 June 2017, upheld by the General Court of the European Union on 10 November 2021 (Case T-612/17, Google and Alphabet v Commission (Google Shopping)). For a discussion of the case see also Fumagalli et al. (2018).

[14] Google claimed that the ground for the demotion was the lack of original content in comparison shopping services (indeed, by their nature CSSs do not have original content). The EC said it would have not objected if the new algorithm had demoted *all* such services, but Google's own CSS was not submitted to the same criterion and it continued to be displayed prominently.

view ‘indispensability’ of the input is not necessary to achieve the ability to foreclose: if instead of a full monopoly, a vertically integrated firm had a quasi-monopoly of the input, and for instance, it faced inferior upstream competitors, this would not prevent it from exercising market power.,[15] But of course, the more upstream competition the lower its ability to engage in vertical foreclosure.

Google also maintained that its conduct was part of competition on the merits and its comparison shopping service was an innovation, an argument which was dismissed by the Court, *inter alia* because it could not see what innovation there may be in a search engine which favours its own specialised results over third-party results.[16] In particular, it would be difficult to argue that the demotion of rivals could be an innovation, and that preventing consumers from seeing links to rival CSSs does not harm them.

As customary in the Commission Decisions (and in the Community Courts’ judgments), a theory of harm is unfortunately not explicit, so let me spell out a possible one.

Whatever the legal definition of the practice at issue, in my opinion, the case can be seen as one of vertical foreclosure, with Google having upstream market power (even if the input — organic links in Google’s Search Engine Results Pages, SERPs — was strictly not indispensable, it certainly was crucial for the visibility and traffic of CSSs), and simultaneously competing downstream in the market for CSSs. The market structure to be considered can therefore be proxied by the usual one discussed above, with a vertically integrated incumbent facing one or more downstream competitors. (In Figure 1, U_1 would be replaced by Google Search, D_1 by Google Shopping, and D_2 by rival CSSs.)

However, the Chicago School’s argument according to which the vertically integrated incumbent does not have the incentive to exclude would not apply here. Indeed, Google’s business model is based on monetisation through attracting users’ attention and then exposing them to advertising, and it does not charge third-party websites for inclusion in its SERPs, nor consumers to access them, for that matter. Therefore, CSSs did not have to pay for being listed in organic search results (in terms of Figure 1, $A(q_2) = 0$), and Google could not extract rents from them. Hence, the Chicago School’s ‘one monopoly profit theory’ does not apply here.

Demoting the rival CSSs and promoting its comparison shopping service, Google could increase profits: prospective buyers searching for products were directed to Google’s CSS (with links to merchants’ offers) or directly to merchant sites,[17] and when clicking on merchant sites, Google would monetise.[18]

[15] See e.g., Hart and Tirole (1990) and Reisinger and Tarantino (2015).

[16] “[G]iven the universal vocation of Google’s general engine, which [...] is designed to index results containing any possible content, the promotion on Google’s general results page of one type of specialised result — its own — over the specialised results of competitors involves a certain form of abnormality.” (General Court, at para. 176. See also 177 to 179.)

[17] After the introduction of the so-called ‘Shopping Unit’, there are richly presented links, including pictures, to the websites of the merchants which win the auction (triggered by specific keywords searched for by a user) to appear in a prominent position in Google’s search page.

[18] In theory, if the rival CSSs intended to keep visibility in Google’s SERP, they could have tried to participate in pay-per-click AdWords auctions, and again if consumers clicked on their links, Google would receive a payment. However, the EC offered evidence that consumers would not have the same propensity to click on ads as on organic search results, and that CSSs did not find advertising on Google a possible compensation for the diminished visibility on organic search.

It is also plausible that Google intended to avoid that over time consumers would become loyal to particular CSSs, and might therefore at some point go directly to their web pages, thereby making it unnecessary to start their shopping process from Google Search. From this point of view, the theory of harm would be the elimination of the risk of disintermediation of Google Search when consumers engage in shopping (see Section 3.2 below).

The following section offers a simple model of foreclosure inspired by the Google Shopping case. The model has two objectives. First, to formalise a situation where the incumbent platform does not charge for access and show that it has the incentive to engage in anti-competitive foreclosure. Second, to show that the input supplied by the incumbent does not need to be indispensable, in the sense that downstream rivals can reach a group of consumers directly, without having to access the incumbent's input. Readers who are not interested in formal models can move directly to Section 3.1.3.

3.1.2 A simple model of foreclosure when the incumbent platform does not charge for access*

There is a search engine monopolist, G, which has an input — 'organic' links to websites searched for by users and identified by an algorithm — and which does not charge for including such organic links in its SERPs. We consider two categories of users.

The first category consists of individuals who look for Comparison Shopping Services (CSSs) and who are ultimately interested in shopping. A proportion α of them does not directly look for CSSs but through the search engine. For instance, if they look for a racing bike, they will enter the keyword 'price of racing bike' in the search engine, which (in the benchmark case where CSSs are listed in the SERP) will offer a list of differentiated CSS websites, which they will eventually visit to compare prices and models of bicycles. A proportion $1-\alpha$ instead, will find other ways to access the websites of the CSSs, for instance they have already visited them in the past and know how to reach them directly.

Although they access CSS information in different ways, these consumers have identical preferences. They are distributed uniformly on the real line and have utility $U_i = 1 - t \mid \theta - l_i \mid$, where $i = A, B, G_S$ refers to one of the firms offering CSSs, $\theta \in \mathbb{R}$ identifies the position of a user on the real line, $t \in (0, 2)$ is a disutility parameter and l_i is the location of CSS website i. We assume for simplicity that CSSs are to be located on $[0, 1]$, and in particular when the game starts $l_A = 0$, $l_B = 1$, and if G_S, which is the CSS subsidiary of the search engine, decides to enter, it will be located at $l_{G_S} = 1/2$. Note that consumers are neither charged for searching nor for accessing a CSS. They will eventually have to pay the merchant if they buy from it, but we are not interested in their product market decisions, so their preferences for the products they search for and intend to purchase are not modelled. However, true to the two-sided nature of CSSs, we assume that on average each consumer visiting a CSS website will give the website a revenue equal to β_S, collected from the merchants who list their products on the CSS website.[19]

The second category of users is composed of N individuals who visit the search engine to look

[19]See also Choi and Jeon (2021) for this simple formalisation of two-sided markets.

for all sorts of other information, and who may (or may not) trigger some real-time auction for sponsored links when doing so. On average, these individuals give an advertising revenue β_N to the search engine, and they do not have to pay for their inquiries on the search engine webpage. They will play no role in what follows (apart from giving revenue to the search engine, which otherwise would make zero profits in the benchmark case), so we do not need to be more specific about their preferences or behaviour.

Finally, we assume for simplicity that all firms have zero costs. We study and compare three configurations.

1. Benchmark **(b)**: the search engine monopolist is not active in the CSS market, only firms A and B are.[20]

2. Entry with interoperability **(∅)**: the search engine enters with its service and competes with the rival CSSs without self-preferencing or demotions. This would represent the (hypothetical) counterfactual had Google continued to rank CSS websites without discriminating in favour of its service.

3. Entry with demotions or denial of the input **(d)**: This is the market configuration arising after Google Shopping becomes active and it is given prominence while the rival websites do not appear in the (first pages of) organic search listing.

Benchmark Whether they go first to the search engine or otherwise, to identify the demands of individuals interested in CSSs we need to look for the indifferent consumers between using A and not using the service at all; between using A or B; and between using B and not using any CSS. By solving $U_A = 1 - t\theta = 0$; $U_A = 1 - t\theta = U_B = 1 - t(1 - \theta)$; and $U_B = 1 - t(1 - \theta) = 0$ we obtain respectively indifferent consumers $\theta_{A0} = -1/t$; $\theta_{AB} = 1/2$; and $\theta_{B0} = 1 + 1/t$. From these we obtain demands, given by: $q_A = \theta_{AB} - \theta_{A0} = q_B = \theta_{B0} - \theta_{AB} = 1/2 + 1/t$. Consumers to the left of θ_{A0} and to the right of θ_{B0} will not use CSSs.

Consumer surplus in the market for CSS will be equal to (by using symmetry):

$$CS^B = 2\int_{1/2}^{1+1/t} (1 - t \mid \theta - 1 \mid)\, d\theta = 1 + \frac{1}{t} - \frac{t}{4}. \tag{1}$$

Profits in the CSS market will be given by:

$$\pi_A^b = \pi_B^b = \beta_S \cdot (\frac{1}{2} + \frac{1}{t}). \tag{2}$$

As for the other category of consumers, their overall surplus will be given by some CS_O (we do not need to specify more since it does not change across configurations), and in this market, the search engine will gain $\pi_O = \beta_O \cdot N$.

[20] Equivalently, one can think of the search engine having entered with a CSS subsidiary which is so inferior to the rivals' service that consumers would never use it. This would arguably correspond to the situation during the period in which Froogle was in the market.

Entry with the supply of the input (no bias in organic ranking) If the search engine platform enters with its CSS and continues to list without biases all the CSSs, all consumers interested in comparing products will choose among A, G_S and B, located respectively at 0, 1/2 and 1. One can check that the consumers indifferent between A and G_S and respectively G_S and B are those located at 1/4 and 3/4, from which (and from previously obtained indifferent consumers θ_{AO} and θ_{BO}) demands can be immediately established.

Consumer surplus in the market for CSS will be given by:

$$CS^{\emptyset} = 2\{\int_{-1/t}^{0}(1 - t \mid \theta \mid) d\theta + \int_{0}^{1/4}(1 - t \mid \theta \mid) d\theta + \int_{1/4}^{1/2}(1 - t \mid \theta - \frac{1}{2} \mid) d\theta\} = \frac{1}{t} + 1 - \frac{t}{8}, \quad (3)$$

and profits will be:

$$\pi_A^{\emptyset} = \pi_B^{\emptyset} = \beta_S \cdot (\frac{1}{4} + \frac{1}{t}); \ \pi_{G_S}^{\emptyset} = \beta_S \cdot \frac{1}{2}. \quad (4)$$

Note that although total demand is the same as in the case without entry ($Q^B = Q^{\emptyset} = 1 + 2/t$), consumer surplus is higher here, since G_S's entry gives consumers located between 1/4 and 3/4 a variety which is closer to them: the fact that the platform 'copies' other CSSs is good for consumers.

Entry and denial of supply (demotions of rivals from organic listing) If the search engine does not list rivals in its organic search results, rival CSSs can only reach the $(1 - \alpha)$ individuals who rely on alternative means to get to their websites. Consumer surplus and profits associated with these users will therefore be equal to the values found above, appropriately weighted, that is, $(1 - \alpha)CS^{\emptyset}$ and respectively $(1 - \alpha)\pi_A^{\emptyset}$ for rival CSSs and $(1 - \alpha)\pi_{G_S}^{\emptyset}$ for the search engine's CSS.

As for individuals who start their shopping process from the search engine, they will never see the rival CSSs and hence they can only visit the search engine's CSS, G_S. By finding the indifferent consumers (who will be located at $1/2 - 1/t$ and $1/2 + 1/t$) one can check that consumer surplus will be equal to $\alpha(1/t)$ and profits to $\alpha(2/t)\beta_S$. Overall, therefore, we have:

$$CS^d = (1 - \alpha)[\frac{1}{t} + 1 - \frac{t}{8}] + \alpha(1/t), \quad (5)$$

and profits will be:

$$\pi_A^d = \pi_B^d = (1 - \alpha)\beta_S \cdot (\frac{1}{4} + \frac{1}{t}); \ \pi_{G_S}^d = (1 - \alpha)\beta_S \cdot \frac{1}{2} + \alpha(2/t)\beta_S. \quad (6)$$

It is straightforward to check that the demotion strategy is profitable for the search engine platform and that it leads to lower consumer surplus, for any $\alpha > 0$. Given that demotion also reduces the overall demand for CSSs from $Q^{\emptyset} = 1 + 2/t$ to $Q^d = (1 - \alpha)(1 + 2/t) + \alpha \cdot 2/t$, producer surplus, which is equal to $\beta_S \cdot Q$ will also be lower. Therefore, the refusal to supply (or demotion) strategy, will reduce economic welfare too.

Discussion However simple, this model shows that in a situation in which a platform does not charge for its input (in this case, because it monetises through advertising) it might have the incentive to enter with its service and to deteriorate access to its rivals, to divert their demand to its service. Entry (or 'copying') by the platform is not anti-competitive: even in this model where it does not affect consumer prices (but it may reduce advertising fees for merchants, not modelled in this simple framework) entry in the 'downstream' market by the platform is beneficial because it offers some consumers a variety which is closer to their ideal one. But what is detrimental is the fact that once operating its comparison shopping services (the downstream market), the platform has the incentive to degrade access to the input for the rivals.

Note also that to reach the conclusion that this conduct is anti-competitive, we do not need to assume that the input is 'indispensable': in the model, there are also individuals who do not need to start their shopping from the search engine, so the input is truly indispensable only for a fraction α of consumers. Yet, for any $\alpha > 0$, the effects of foreclosing the input to rivals are negative.

3.1.3 Google Privacy Sandbox

In January 2020, Google announced that its web browser Chrome (which is the default browser on mobile devices using Android, and it is by far the leading internet browser overall) would no longer allow websites to use third-party cookies. As part of the new policy, Chrome would use algorithms to create a large number of 'cohorts', namely groups of people sharing certain features. A person's browsing history would be kept private, but the browser itself would look at the history and would assign each user to a certain cohort. When a user visits a website, Chrome will tell that website the cohort that individual belongs to.

This business policy makes it more difficult for advertisers to track users' activities on the web, and instead of having individualised and detailed information on users, they would only have aggregate information. This implies that platforms would not have the same ability to serve well-targeted ads, and advertisers' willingness to pay would decrease.[21]

In principle, one could argue that Google's proposed policy is pro-competitive since it improves users' privacy experience. However, there is also the risk that the Privacy Sandbox rules would not apply to Google itself, which may continue to have detailed information about users, and may therefore entrench Google's dominance in digital advertising. The UK's Competition and Markets Authority indeed saw potential anti-competitive concerns and it investigated the conduct at issue:[22]

> "[...] the CMA is concerned that [...] the Privacy Sandbox Proposals would allow Google to:

[21]Similar (and likely stricter) rules had already been introduced by Apple, which through its App Tracking Transparency (ATT) policy has given users more control over what happens to their data. Both Facebook and Snap, whose business models are based on advertising, were significantly harmed by Apple's ATT policy. Since Apple's advertising revenue is virtually insignificant in relative terms, unlike Google's, the possible anti-competitive concerns raised by Google's Privacy Sandbox policy, would likely not apply to Apple. However, the German Cartel Office did open an investigation, fearing that Apple's new tracking rules — which force third-party apps to ask users for permission before they track their behaviour to serve them personalised ads — do not apply to Apple itself. See Financial Times, "Apple faces German antitrust probe over app tracking rules", 14 June 2022. It has also been reported that following the ATT policy Apple's own advertising business (mostly, through ads served in its App Store) has benefited significantly. See Financial Times, "Apple's privacy changes create a windfall for its own advertising business", 17 October 2021.

[22]Competition and Markets Authority (2022a): page 23. Interestingly, the CMA also states that Google's *announcements* relative to its Privacy Sandbox Proposal are likely to constitute an abuse of its dominant position, since they harm competitors and create uncertainty in the market.

(a) distort competition in the market for the supply of ad inventory in the UK and the market for the supply of ad tech services in the UK, by restricting the functionality associated with user tracking for third parties while retaining this functionality for Google;

(b) self-preference its ad inventory and ad tech services by transferring key functionalities to Chrome, providing Google with the ability to affect digital advertising market outcomes through Chrome in a way that cannot be scrutinised by third parties, and leading to conflicts of interest; and

(c) exploit its apparent dominant position by denying Chrome web users substantial choice in terms of whether and how their personal data is used for the purpose of targeting and delivering advertising to them.

In February 2022, the CMA accepted Google's revised commitments, according to which Google would restrict data sharing within its ecosystem not to benefit itself when third-party cookies are removed, thereby eliminating the risk of self-preferencing for its advertising services.[23]

The CMA's concerns about a possible anti-competitive impact of Google's proposed policy might have a very similar rationale as in the Google Shopping case. Absent the Privacy Sandbox policy, third-party websites can continue to track individuals who browse the internet by using Chrome, even when they have left their sites. Effectively, those websites obtain information which they could later monetise via targeted advertising. But Google (Chrome) is not charging those third parties for such information, and it does compete with them in the digital advertising market. Therefore, if the Privacy Sandbox policy applied to its rivals but not to Google itself, it would bias competition. Think of Facebook, for instance: if Facebook, which does not pay Google when it tracks users, cannot have detailed information about them, will have less ability to sell targeted ads, and an advertiser might prefer to use Google to advertise its products because it would expect it to reach those individuals in which it is more interested. In turn, Google would have higher profits when foreclosing information.

Therefore, as in *Google Shopping*, it is the business model based on monetisation through advertising that reduces the ability of the platform to extract rents from third parties which make use of its inputs. In turn, the platform may have the incentive to foreclose them and increase sales with its own services instead. In the next section, we look at another instance in which the business model of a platform may reduce rent extraction, thus offering a possible rationale for foreclosure.

3.1.4 Apple Music

At the time of writing, the EC is investigating Apple for possible abuse of a dominant position in the market for the distribution of music streaming apps to owners of Apple devices.[24] The market structure is similar to that we have considered so far and illustrated in Figure 1, with Apple being

[23]Competition and Markets Authority (2022a). The Decision also imposes a Monitoring Trustee who will work alongside the CMA to ensure that Google complies with its obligations.

[24]See "Statement by Executive Vice-President Margrethe Vestager on the Statement of Objections sent to Apple on App Store rules for music streaming providers", Brussels, 30 April 2021.

the vertically integrated incumbent, since it is also active downstream with its Apple Music services, and Spotify being an independent downstream rival.

The case originates from a complaint by Spotify, which accuses Apple of anti-competitive conduct for, among other things:[25] setting a 30% fee for Spotify Premium on App Store; creating problems for the Spotify app upgrades, and frequently rejecting its app; changing arbitrarily App Store guidelines; rejecting the Spotify app for Apple Watch; preventing it from sending promotional push notifications (as Apple Music does) and from directly or indirectly targeting iOS users to use a purchasing method other than Apple's In-App Purchase (IAP) system.

Some of these allegations concern conduct before the launch of Apple Music. If not reflecting objective justifications (for instance, concerns about Spotify apps' quality), Apple may have adopted them to force Spotify to adopt its billing system, which would likely not make it a violation of competition law but rather a tool of pressure (I do not know whether legitimate or not from a commercial law point of view) in a negotiation between two contracting parties. But it is also possible that Apple had already decided to enter the online music distribution market, and that it planned to weaken rivals as a way to make its future downstream activities more successful.

When finally Spotify decided to sell Premium subscriptions directly in App Store, it raised its subscription price from EUR 9.99 to EUR 12.99, thus passing on to its consumers the entire 30% App Store fee. Interestingly, Apple Music entered the market selling its subscription at EUR 9.99, the same price originally set by Spotify. But of course, Apple Music does not pay this fee, which allows it to enjoy a competitive advantage.

Later, Spotify withdrew from AppStore, so to subscribe to Spotify Premium, iOS users need to get the Premium subscription on the Spotify website, where it is sold at EUR 9.99. Note however that this option (subscribe to Premium on the Spotify website and use the subscription in the 'normal' Spotify app on iPhones and iPads) cannot be advertised on Apple devices, which is another of the complaints made by Spotify.

The EC's Statement of Objection mentions two competition concerns. Firstly, Apple's obligation for any digital content app to use its In-App Purchase system, where it charges a 30% commission fee on all purchases. Secondly, Apple's 'anti-steering provisions', which prevent app developers from informing iOS users (in their apps or by e-mail to users who created an account in the app) that they could make their purchases elsewhere (e.g. on Spotify's website).

The EC argues that these practices would distort competition in the music-streaming market to the advantage of Apple Music, not only because rivals have to pay fees that Apple Music does not pay, but also because they reserve valuable information to Apple: rivals would not even be able to communicate with and have basic information about, their clients. Among other things, they would be unable to understand why they terminate the subscription, and to try retaining them.[26]

[25] For Spotify's allegations, see: https://www.timetoplayfair.com/timeline

[26] A similar concern has been investigated by the European Commission in the *Amazon Marketplace* case: third-party sellers have complained that they do not have access to data and information about customers, whereas Amazon, which is not only the platform owner but also a competitor, does. At the moment of writing, the EC has yet to decide whether to accept the commitments that Amazon offered to close the case. See the EC's Press Release on 14 July 2022, "Commission seeks feedback on commitments offered by Amazon concerning marketplace seller data and access to Buy

This is an interesting and challenging case. I see more competition concerns in Spotify's allegations (if correct and Apple's conduct is not objectively justified) that Apple made it difficult for its apps to be hosted and updated in the App Store than in the fact that Apple charges it the 30% fee on Premium subscriptions. After all, Apple imposes the same fee of 30% to all digital apps offering paid (subscription) services (only apps engaged in physical delivery, e.g. Deliveroo, Uber, etc., are excluded), so it is difficult to argue it is a strategy to favour Apple Music over its competitors, although of course, it does have that effect.

Therefore, if there is a concern that the fee is too high in general (for instance because Apple and similar dominant platforms may extract too high rents from third parties, thereby disincentivising innovation), this would likely be a concern for all markets, and probably the best solution should not be a competition policy intervention,[27] but (a legislative or regulatory) one which imposes caps on fees across markets.[28]

If the concern was that whenever a platform also offers its own services then the fee distorts competition,[29] there would be only two solutions available: either preventing the platform itself from offering the service as well or denying it the possibility of charging downstream rivals for access. Neither solution would seem acceptable to me, at least in general.

It remains the question of the possible degradation of access alleged by Spotify. To this purpose, in what follows I suggest a possible rationale for a platform copying *and* degrading interoperability to apps it hosts.

3.1.5 Copying and degradation of interoperability as a rent extraction device

Many platforms commit to non-discriminatory terms of access for 3rd parties. For instance, both Apple and Google set a uniform ad valorem fee of 30% (15% for sales below USD 1 million) that software developers will have to pay for apps sold in Apple's App Store and Google Play. Amazon Marketplace's fee structure is more articulated: it consists of a menu which includes a (small) fixed fee, an ad valorem 'referral' fee which may vary (roughly, between 8 and 30%) according to the sector the merchant's product belongs to and a fulfilment fee.[30] But even Amazon commits to those fees, which do not change according to the success of the merchant.

All things considered, even in the case of Amazon the 'access price' is remarkably uniform and quite far from the non-linear pricing (not to mention contingent offers) that we typically assume in the literature on vertical restraints, and which would allow maximising industry profits.

Box and Prime".

[27] To the extent this is a competition issue, it would not be exclusionary, but exploitative. Recall that exploitative abuses, of which excessive prices are the main example, are extremely rare even in jurisdictions, such as the EU, where competition law allows in principle to investigate them.

[28] I confess I have some sympathy for such an intervention. Apple claims the fee guarantees security and quality in the iOS environment, but is it necessary that each periodic subscription of each user carries the 30% fee? Why not one initial fee to guarantee that the app complies with whatever is the minimum standard required by Apple? Note also that in a Mac computer, as opposed to mobile devices, developers are not required to pay for users to download apps, and this does not appear to have negatively affected Macs' security.

[29] Vestager's statement, mentioned in a previous footnote, says: "We are concerned that Apple's rules negatively impact its rivals by raising their costs, reducing their profit margins as well as their attractiveness on the Apple platform."

[30] See https://sell.amazon.com/pricing.

One may wonder why access fees charged by many digital platforms such as Apple and Android's app stores have this simple uniform fee structure. I suspect that avoiding opportunistic behaviour is a primary reason for it: a software developer needs to make an important investment for its app to run on these operating systems and it might not want to do it if it feared that it may later be expropriated. Anticipating this possible problem, the platform commits to certain access fees in the first place.[31]

However, here I am not interested in the reasons why firms set uniform access fees, but in their effects. I will deal with such effects in the next technical Section 3.1.6, but for the readers who are not interested in that (very simple but) technical treatment, I summarise the analysis in what follows.

Consider a platform which faces many apps with different demands but it sets the same ad valorem fee, f, to host them. In general, we'll see in Section 3.1.6 that the larger the demand for an app the higher the fee that the platform would like to set. But if the platform can set a *uniform* fee, then rent extraction is limited, for two reasons: first, because there is a double marginalisation problem to start with; second, because the fee cannot be targeted to each app's demand. For some apps, the optimal fee may be higher and for others lower.

In particular, the platform may want to extract more rents from apps which are particularly successful.[32] How can it do that? Denial (or degradation) of interoperability does not help, since it would eliminate (or reduce) the platform's share of rents. Instead, launching its copycat version of the app may increase the platform's profits. Even if the 'me-too' app is of inferior quality (or equivalently, its marginal cost is higher) relative to the original, the fact it does not have to pay the ad valorem fee (a form of 'self-preferencing') may outweigh those disadvantages, allowing it to steal business from the original app. Provided that the fixed cost of developing the me-too app is not too high and that its quality is not too low relative to the original app, introducing the copycat version of the app may then be profitable for the platform. However, competition from the original app limits the profits that the me-too app can make. Any instrument that would make the former less desirable in the eyes of users would increase the latter's profits. One obvious instrument would be to deny or degrade interoperability between the platform and the original app.

In terms of the Apple Music case, having Spotify bypass the 30% fee or enjoy the same features as Apple Music (push notifications, etc.) would limit Apple's rent extraction. Hence, Apple might have the incentive to deteriorate Spotify for iOS users.

The welfare effects of the copying strategy, though, are a priori ambiguous. On the one hand, the platform's copying of a 3rd party app benefits consumers, since competition among the apps inevitably lowers prices and reduces the double marginalisation problem. On the other hand, copying might be wasteful for society in that it entails a fixed cost. There may also be a discouraging effect on innovation if rivals anticipate they are systematically copied whenever they have a successful app.

What is unambiguously bad, instead, is the degradation of interoperability: it weakens the com-

[31] It is also possible that a platform may fear a backlash if it tried to engage in discriminatory terms, given that most people dislike discrimination. However, I fear that the stronger the monopoly power the stronger the temptation to engage in price discrimination.

[32] Note that a priori, there may be demand uncertainty, and hence it is not clear which apps will be successful.

petitive constraint from the 3rd party app, and it increases the price charged by the copycat app, thereby harming consumers and overall welfare.

3.1.6 A simple model of copying and foreclosing when the platform commits to uniform fees*

Here I formalise the treatment of the model that I have briefly described in the previous paragraphs. (Readers uninterested in a formal treatment can safely skip this section and jump to Section 3.2.)

Consider a platform which hosts a product sold by firm E and whose (a priori uncertain) demand is given by $q = v - p$, where v is uniformly distributed in $[1, 1 + d]$. (We focus on *one* product for simplicity but the same logic applies a fortiori when there are many products hosted by the platform.) The marginal cost of selling this product is $c < 1$. One can think of firm E as a merchant which sells its products in the platform's marketplace, or as a software developer that sells an app which can be downloaded from the platform's app store.[33] Consider the following game which provides us with the benchmark and shows that a platform which commits to uniform fees is not able to do full rents extraction.

1. The incumbent platform I *commits* to an ad valorem fee $f < 1$ which it will collect from E if the latter wants to be hosted by the platform.[34]

2. Demand uncertainty is resolved.

3. The complement firm E decides whether to accept the offer and if so it will set the sales price p.

4. Consumers will buy the product and payments are made.

Perfect information To understand the main forces at work in the model, it is useful to consider the perfect information case. At stage 3, E will set its price p to maximise its profit $\pi_E = ((1 - f)\, p - c)\,(v - p)$. Solving the FOC gives:

$$p = \frac{1}{2}\left(v + \frac{c}{1 - f}\right). \tag{7}$$

At stage 1, I will set the ad valorem fee f to maximise its profit $\pi_I = (f p)\,(v - p)$, which after substituting for p gives us the FOC:

$$\frac{\partial \pi_I}{\partial f} = \frac{c^2}{4}\left(\frac{v^2}{c^2} - \frac{(1 + f)}{(1 - f)^3}\right) = 0 \tag{8}$$

[33] Positive incremental costs are more natural in the former case, but in some cases, they may exist also for digital apps. For instance, Spotify pays per-stream royalties.

[34] The game can be extended by assuming that consumers have value $v - p_I - p$ for the system composed of the platform and the complement, and then by studying the platform's optimal choice of both p_I, the price of access for individuals, and f, the fee for complementors. In such a model, it turns out that $p_I = 0$. For simplicity, here I do not consider the platform price. See Motta and Shelegia (2021) for such a model, with the only difference being that demand for the third-party product has constant elasticity.

Since the expression $\frac{(1+f)}{(1-f)^3}$ is increasing in f, as $\frac{v}{c}$ rises, so will the value of f which solves the FOC: there exists an increasing function $f^*(v)$ which for any v gives the optimal fee f^* that the incumbent platform would set. In other words, as demand (proxied here by its intercept v) increases, the platform would like to increase its fee.

Demand uncertainty In case there is demand uncertainty, the optimal fee at stage 1 will be decided anticipating that E will set the sales price according to $p(f) = \frac{1}{2}\left(v + \frac{c}{1-f}\right)$, so it will have to choose f as to maximise expected profits:

$$\pi_I^{exp} = \frac{1}{d}\int_1^{1+d} f p(f)\,(v - p(f))\; dv. \tag{9}$$

Taking the derivative and solving the FOC will give the optimal fee $\bar{f}$.

After uncertainty resolves: imperfect rents extraction Suppose now that we are at stage 3. At stage 1, the platform has set the fee $\bar{f}$ in the condition of uncertainty about demand, that is, $\bar{f}$ has been chosen to maximise *expected* profits. At stage 2, though, the state of demand, v, is revealed. We know there must be a value $\bar{v}$ for which $\bar{f} = f^*(\bar{v})$. For all values $v > \bar{v}$, then, the fee $\bar{f}$ is lower than the one the platform would have chosen had it known the state of demand v at the moment of setting the fee.[35] In other words, the platform is extracting lower rents than it would like from E because when it set the fee it could not anticipate the actual level of demand for the app. If it could renegotiate the fee it would raise it, but given it has committed to the fee, changing f would amount to a breach of contract.[36]

Of course, this adds to another source of imperfect rent extraction, which is due to double marginalisation. To the extent that a platform does not engage in non-linear pricing (and as we have discussed, Apple does not have fixed fees, and Amazon has very small ones) and that it suffers from uncertainty, therefore, there may exist significant rents which are left to third-party players.

In what follows, we consider the possibility that the incumbent engages in copying (and degrades interoperability) to increase its profits.

Copying and degradation of interoperability to extract more rents Suppose that after the incumbent platform I has *committed* to an ad valorem fee $\bar{f} < 1$ and demand uncertainty is resolved, the platform can introduce a perfect copy of the third-party product (and it may also possibly degrade the latter's interoperability with the platform, see below), and after that, E and I (if active) set prices p and p_i.

[35]For instance, if $d = 5$, so that v is uniformly distributed over $[1, 6]$, and $c = 1/2$, then $\bar{f} = .7$. This would be the optimal fee under certainty if $v = 3.8$. If the incumbent knew with certainty that demand $v > \bar{v} = 3.8$ then it would set $f^* > \bar{f}$.

[36]If $v < \bar{v}$, the incumbent would like to reduce the fee, and one could expect renegotiation could take place quite easily since E would accept a lower fee. But when I wants to increase the fee, E's interest is not aligned and could prevent the fee rise.

We assume that the incumbent's copycat version of E's product has a marginal cost $c_I \in \left(\frac{2c}{1-\bar{f}} - v, \frac{c}{1-\bar{f}}\right)$. If c_I was lower than the lower bound of this interval, then the copycat would be so efficient that it could set the monopoly price undisturbed;[37] if it was higher than the upper bound (which equals E's effective marginal cost, which takes into account the fee that E has to pay), then absent degradation of E's on the platform, I's copycat product would not sell anything.

Assume also that I needs to pay a fixed cost $K \geq 0$ to copy E's product.

If I introduced a copy, the two versions of the product would compete. At equilibrium $p_i = p = c/(1-f)$ and all demand goes to I's product. The fact that it is I which sells even if $c_i > c$ is due to E having to pay the fee: this can be seen as a market distortion created by self-preferencing.[38]

Under copying, the incumbent makes profits:

$$\pi_I^c = \left(v - \frac{c}{1-\bar{f}}\right)\left(\frac{c}{1-\bar{f}} - c_I\right) - K, \tag{10}$$

whereas if it does not copy it makes:

$$\pi_I^{nc} = \frac{\bar{f}\left(v^2\left(1-\bar{f}\right)^2 - c^2\right)}{4(1-\bar{f})^2}. \tag{11}$$

A necessary condition for the copying strategy to be profitable is that the fixed cost of K is not too high. Another necessary condition is that c_I is not too high. For instance, if $c_I \to c/(1-\bar{f})$, then the incumbent's copycat product sells but competition is so strong that its (gross) profits will tend to zero. The incumbent would be better off not copying and extracting rents from the more efficient firm E, even if K was very small or zero.

Since competition destroys profits, if the incumbent enters the market with its copycat product, then it would have the incentive to make its rival less competitive. To do so, it may want to reduce the rival's quality or raise its costs. In this homogeneous product model, the latter is more natural: introduce a 'deterioration factor', $g < 1$ that increases the rival's effective cost to $\frac{c}{g(1-\bar{f})}$. Since the maximum profits that the vertically integrated monopolist can achieve are obtained by setting $p_i = (v + c_I)/2$, if the incumbent deteriorates E's product by a factor $g = \frac{2}{(1-\bar{f})(v+c_I)}$, then it will obtain the monopoly profits, $\pi_I^{VI} = \frac{(v-c_I)^2}{4} - K$. Again, provided c_I and K are not too large, the strategy of copying plus denial of supply (or of interoperability) would be profitable.[39] [40]

[37] This restriction allows us just to eliminate a less interesting case from the analysis: the lower the cost of the copycat product the higher the incentive to introduce a copy.

[38] With differentiated products of course the third-party seller may sell. It may pass the fee through (partially or fully) to consumers. This is what Spotify did: when Apple Music marketed at USD 9.99, it decided to sell its premium subscription at USD 12.99.

[39] For instance, if $d = 5$ (so that $v \in [1, 6]$), $c = 1/2$, one can show that $\bar{f} = 0.69$. If $K = 1$ and $c_I = 0.6$, then $\pi_I^{VI} \geq \pi_I^{nc}$ for $v \geq 5.056$. In other words, when realised demand v is high enough, then the copy-and-degrade strategy becomes optimal for the incumbent.

[40] Note that I have reasoned as if the incumbent was not able to anticipate that — should the realised demand v be large enough — it could later use the copy-and-degrade strategy. But if it did, then the fee $\bar{f}$ would be lower. Intuitively, if it anticipates that for $v > \bar{v}$ it will always make the vertically integrated monopoly profits, its optimal choice of f will be driven by its expected profits over the demand range $1, \bar{v}$, rather than over $1, 1 + d$. Given the expected demand is lower, so will be $\bar{f}$.

Without entering into a full-blown calculation of welfare in the different scenarios, a few observations can be made. Firstly, note that the copying strategy taken by itself (that is, without considering possible degradation of interoperability) is not necessarily detrimental. In particular, consumers gain from the introduction of the copycat product, and they do also when $c_I > c$, that is, I's version of the product is more expensive because it creates competition and it leads to a price decrease. In other words, however 'unfair' and possibly distortive in the long run, the form of self-preferencing represented by the platform's copy not being subject to the payment of the fee benefits consumers in the short run.

Secondly, from a total surplus perspective, the copying strategy entails an additional fixed cost and if $c_I > c$ it would also cause an additional productive inefficiency. These inefficiencies may outweigh the consumer surplus benefit, even from a purely static point of view.

Thirdly, while the welfare effect of the copying strategy (by itself) is a priori ambiguous, if it was accompanied by degradation of interoperability it would necessarily be detrimental. By raising the cost (or lowering the quality) of the rival, consumer and total surplus will go down.

3.2 Dynamic foreclosure (exclusion of potential competitors)

In this Section, I will discuss two cases where the alleged abuse of a dominant position might be explained by a dynamic theory of harm, with the dominant firm engaging in foreclosure to protect its position from potential competitors. The first is the FTC's suit against Facebook (Section 3.2.1). The second concerns Apple's browser policy (Section 3.2.2). I will then informally describe a model which might rationalise the conducts at issue (Section 3.2.3) before studying it formally (Section 3.2.4*).

3.2.1 Facebook's interoperability: The FTC case

The Federal Trade Commission has sued Facebook for trying to preserve its dominant position in the market for personal social networking, (i) by acquiring potential competitors (notably, Instagram and WhatsApp); and (ii) through policies that prevented interoperability between Facebook Blue and other apps that it viewed as possible competitive threats.[41]

The FTC supported its allegations with a number of internal documents, where it emerges that Facebook was extremely worried about firms coming from some adjacent markets,[42] such as Instagram and WhatsApp, and that when it realised it could not compete with them on the merit, it decided to take them over.[43]

Given the scope of this paper, I will not dwell upon Facebook's acquisition but will focus on the FTC's allegation that Facebook implemented and enforced an interoperability policy which was meant to deter or hinder potential competitors.[44]

[41] Facebook Amended Complaint, 19 August 2021, Federal Trade Commission v. Facebook, Inc., FTC Matter/File Number 191 0134; US District Court Memorandum Opinion, 11 January 2022.

[42] In 2013, Facebook also bought Onavo, a user surveillance company, allegedly to identify potential competitors.

[43] See e.g., US D.C. (2022: 27-28).

[44] The Judge did not allow these allegations to move forward because "Facebook abandoned the policies in 2018, and

To have access to user data and communicate with the Facebook Platform, 3rd party apps need APIs (that is, Application Programming Interfaces), of which the 'Find Friends' and 'Open Graph' APIs appeared to be particularly valuable.

According to the FTC, Facebook made them available only on condition that 3rd parties refrain from competing with Facebook's core services and from connecting with other social networks, to deter the growth of potential competitors. The FTC maintains that these policies were effective:

> "These actions, individually and in the aggregate, have suppressed the ability and incentive of apps in the Facebook ecosystem to become competitive threats to Facebook — and its personal social networking monopoly — in at least two ways. First, the public announcement and enforcement of the policies changed the incentives of software developers, deterring them from developing features and functionalities that would present a competitive threat to Facebook, or from working with other platforms that compete with Facebook. Second, enforcement of the policies — i.e., the actual termination of API access for competitive threats that attracted Facebook's attention — hindered the ability of individual businesses to threaten Facebook's personal social networking monopoly." (FTC Complaint, para. 137.)

In terms of enforcement of such conditional access, the FTC reports a few examples, concerning apps with social functionalities and active in messaging, and as such considered suitable to move into the personal social network market. Firstly, Path, a personal social networking rival, had its access to Facebook terminated, which slowed it down considerably. Secondly, Circle, an app with local social functionalities and trying to build a 'local social network', had access to APIs withheld (Facebook pretended it did so because the app was 'spamming' users), with immediate consequences for Circle's growth. Similarly, Vine (an app which made short videos) was also cut off by Facebook. Thirdly, in 2013 Facebook blocked mobile messaging apps from using the most relevant APIs.

3.2.2 Apple's restrictions for browsers

In its Report on Mobile Ecosystems, the UK Competition and Markets Authority (CMA) found that Apple and Google have entrenched market power over their mobile ecosystems which allows them actual and potential rivals to compete with them.[45] In November 2022, the CMA opened a Market Investigation into the supply of web browsers and browser engines on mobile devices, and the distribution of cloud gaming services through app stores on mobile devices (for short, mobile browsers and cloud gaming).

The CMA appears to be particularly concerned about Apple's requiring other browsers on its iOS to use Apple's WebKit browser engine (which is the 'technology used to transform web page source code into content with which users can engage'). According to the CMA, "Apple's restrictions have effectively blocked cloud gaming services from its app store and hampered the development of web apps through its restrictions on browser engines." The reason why Apple may have the incentive to do so resides in the fact that Cloud gaming

its last alleged enforcement was even further in the past." According to the judges, "Section 13(b) allows the FTC to 'bring suit in a district court of the United States to enjoin' allegedly unlawful conduct only where it has 'reason to believe . . . that any person, partnership, or corporation is violating, or is about to violate, any provision of law enforced by the [FTC].' [..] Section 13(b) therefore contemplates only 'relief that is prospective, not retrospective.' " (US D.C. (2022), on pages 36-37.) The fact that the Judge dismissed the interoperability allegations for legal reasons, does not make it less interesting to discuss their economic rationale.

[45] See CMA (2022b).

"could pose a threat to its App Store business since it is an alternative way of discovering and distributing games, [and] also reduce the importance of top-end 'high-spec' phones like Apple's."

A similar reason for foreclosure may apply to web apps: these are like native apps, but they can be accessed via a browser, and need not be tailored to each OS. Therefore, they could allow users to access content without relying on app stores.

The CMA's concerns remind me very closely of the US DoJ's arguments when it investigated Microsoft's conduct in the browser market (see above, Section 2.2). In both cases, the dominant company is afraid that a 'middleware' (in the Microsoft case) or cloud apps, or web browsers may allow consumers to bypass their gatekeeping position (which may consist of their operating system or their app store). More concretely, in this case, Apple may be concerned that cloud gaming and web apps may over time displace other apps which are sold in the App Store and which pay fees to Apple through its IAP system.

3.2.3 Denying interoperability today to keep the monopoly tomorrow

The dynamic theories of foreclosure briefly described in Section 2.2 might offer a fitting rationale for the conduct of Facebook and Apple summarised in the previous two sections: by preventing the growth of a company in a complementary market, the dominant firm might be able to protect its monopolistic position in the primary market.

However, in the leverage tying model of Carlton and Waldman (2002) and in the dynamic vertical foreclosure model of Fumagalli and Motta (2020) the dominant firm is *integrated* and it operates both in the primary (or upstream) market and in the complementary (or respectively downstream) market. In the model, I propose in Section 3.2.4 below I show that even if the dominant incumbent is not integrated — and Facebook was not a competitor of the apps for which it conditioned interoperability — it may still have the incentive to exclude. Let me briefly summarise the model and its results.

Suppose that *today* there is an incumbent platform I_0 and $M + 1$ apps which offer complementary services and are hosted on the platform. The focus is on app E_1: if it is successful today, firm E may launch *tomorrow* an alternative platform E_0, which could attract not only the users of E_1 but also those of $X \leq M$ other apps. All users of E_1 and X would find platform E_0 — if available — to be sufficiently superior to the incumbent's to outweigh any cost of switching from one platform to the other.

In the model, demand is characterised by demand externalities, and 'success' for the app E_1 today consists of having a large enough number of users downloading the app. As the number of users in period 1 increases, the app will have more data and hence improved features tomorrow. If instead E_1 is not able to attract sufficient users today, it will not have sufficient customer data and hence will not attract sufficient users to the new platform tomorrow. Assume also that neither platforms nor apps charge prices to consumers and platforms do not charge apps for access. This is to reproduce a feature of the Facebook case, where monetisation occurs through advertising revenues. Users leave their data and attention to both the app and the platform where it is hosted, which will place ads obtaining advertising revenues in return.

In the model, I focus attention on the case where the incumbent platform has the *ability* to foreclose: If the incumbent denies interoperability to E_1, today's users cannot download the E_1 app on the only platform available today, I_0, and this will limit E_1's customer basis, thus preventing the potential entrant E from having a successful alternative platform, E_0.

As for the *incentive* to refuse interoperability, the model shows that it can arise only if (inter alia) X (the number of other apps whose users the new platform E_0 may attract) is high enough. Intuitively, refusing interoperability entails a cost for the incumbent, which will lose revenue from users of E_1 (in both periods, I assume that the interoperability decision is irreversible). If instead there is competition from the new platform, the incumbent will lose the future revenues from the users of X apps. Therefore, only if the latter cost is higher than the former, will the incumbent have the incentive to engage in foreclosure.

Note that the incentive to foreclose would be higher if the dominant incumbent was integrated, in the sense of being active in the market where E_1 operates, because in that case, the affiliate's revenue could compensate the cost of excluding E_1. Suppose for instance that the incumbent could introduce I_1, a copycat version of the app E_1. This would increase the incentive to exclude, given that even an inferior substitute to E_1 would contribute with its users to lower the loss from excluding E_1 today.[46]

Demand externalities through the volume of data are only one possible mechanism which may explain why 'success' today is a stepping stone for success tomorrow. In Carlton and Waldman (2002) and Fumagalli and Motta (2020) foreclosure may take place in two environments. First, if network effects exist (utility increases with the number of both period 1 and period 2 users). Secondly, in these papers' fixed cost versions, the entrant needs to enter both complementary markets (respectively both upstream and downstream), and entry occurs only if profits are high enough. Foreclosure in the first period of the game reduces the overall profits that the entrant makes, thereby preventing it from entering.

Another possible mechanism is that the incumbent's aggressive strategy may exclude if reducing the entrant's profits today lowers its assets and hence its chances to raise funds.

The following section analyses the model informally described here. The reader who is not interested in formal models can move directly to Section 3.3.

3.2.4 Denying interoperability to protect the core market: a model with data-driven externalities*

A firm I (*I*ncumbent) operates a platform, denoted by I_0, which consumers can use to access the platform's complementary apps. Consumers do not intrinsically value the platform and can use a complementary app only if they have access to the platform.

A firm E has just entered with a new complement app E_1. Two separate groups of consumers who have so far not used the platform and would not derive any utility from any other apps are considering downloading E_1. We shall denote with N_1 and N_2 the endogenously determined number of consumers who will download the app in respectively period 1 and period 2. (For simplicity, I assume that the N_1 consumers use the app only in period 1 and then disappear. This allows me not to worry about them behaving strategically.) Downloading the app has a positive but arbitrarily small cost, ϵ, which can be thought of as the cost of installation or due to storage space. (This is a cost incurred by consumers and not a transfer from them to the app's owner.)

The utility of one consumer (indirectly) increases with the number of all other individuals who currently use or have in the past used the app: $U_k = v - t \mid \theta - l_E \mid + \gamma(N_{k-1} + N_k)$, with $k = 1, 2$, N_k represents the number of users of the app E_1 at time k; $N_0 = 0$ because the app is available only from time 1, where v is the intrinsic (i.e., not affected by network externalities) utility of the app; $t > 2\gamma$ is a disutility parameter, θ is the favourite specification of the app for a generic consumer, $l_E = 0$ is the "location" (or product specification) of the app,

[46] Motta and Shelegia (2021) show that copying may also be an alternative tool of exclusion if it subtracts enough users to the complementary app E_1.

γ is a parameter which measures the relevance of network effects. We assume that consumer preferences θ are uniformly distributed on the real line, with unit density.

This conveys the idea that while using the app, individuals' attention and usage are converted into data which can improve the experience of current and future app users: think for instance of a searchable GIF app which can better predict which GIFs users prefer, or a navigation app which uses the movement of users to collect and elaborate information which helps offer quicker journeys or a digital map which tracks its users and can improve the map by seeing where they go. (Equivalently, one may also have traditional network effects where the utility of people increases directly with the number of other users, but this would require having period 1 users also use the app in period 2, which I assume away to avoid dealing with strategic behaviour by period 1 consumers.)

All firms monetise through advertising, so there are zero prices for both apps and platforms. I assume that consumers' attention benefits both an app itself and the platform on which it is hosted. More precisely, each user brings a total advertising revenue of 1 and the platform and the app gain respectively a proportion β and $1-\beta$ of this revenue.

I also assume that consumers within each cohort coordinate their decisions, to simplify the analysis and avoid possible cases of miscoordination.

Finally, in each period there also exist other M consumers (not interested in E_1) who use the incumbent's platform with other apps which have reached a sufficient customer base to give utility to their users. These M consumers may switch to another platform, if available.

At the beginning of period 2, E could enter the market with its platform, E_0, which would be considered (marginally) superior by the N_2 consumers who are also considering downloading the app E_1. E_0 may also attract $X < M$ users of other apps, who would otherwise rely on the incumbent's platform should E_0 not be available.

Developing E_0 costs F_0 and gives platform E_0 with probability one. Assume that:

$$\beta\left[X + \frac{2vt}{(t-2\gamma)^2}\right] \geq F_0 > \beta X + \frac{2v}{t-2\gamma} \qquad (A1)$$

This allows us to focus on the case where under interoperability there would be entry, whereas denial of interoperability *might* give rise to exclusion at equilibrium. (If this assumption did not hold, the incumbent's decisions on interoperability would not affect E's platform decision: either E_0 would never be developed, or it would always be. Note also that for (A1) to be satisfied, the share of profits captured by the platform must be large enough: $\beta > (t-2\gamma)/t$.)

Platforms and apps have zero costs for maintenance and operations. As mentioned above, they do not charge consumers for downloading and using. The game is as follows.

(t_0) Firm I decides whether to allow interoperability — and hence not to engage in any exclusionary conduct, ($\emptyset$) — between its platform I_0 and the app E_1, or deny it (D).

($t_{1.a}$) Period 1 consumers decide whether to download and use, or not, the app E_1, if available on platform I_0. M consumers use other apps on platform I_0. Advertisers pay platforms and apps the advertising revenue due to them for period 1 usage.

($t_{1.b}$) Firm E decides whether to spend F_0 to create the platform E_0, or not.

(t_2) Period 2 consumers decide whether to download the app E_1. If platform E_0 is available, they will use it on platform E_0, which gives them a slightly higher utility than I_0. $X < M$ consumers using other apps will also download E_0 and use their apps on it. If E_0 is not available, consumers interested in E_1 will decide whether to download the app from I_0. All M consumers use their apps on I_0. Advertisers pay platforms and apps period 2 advertising revenue.

Solution: full interoperability: ($\sigma_I = \emptyset$) Let us find the payoffs at t_2. If N_1 consumers had downloaded E_1 at t_1, then t_2 consumers utility would be $v+\gamma(N_1+N_2)-t\theta$. The indifferent consumers between downloading or not are those at distance $\bar{\theta}_2 = \frac{v+\gamma(N_1+N_2)}{t}$ from $l_E = 0$. So all consumers located in $[-\bar{\theta}_2, \bar{\theta}_2]$ will use E_1. This means that the number of users at t_2 will be:

$$N_2(N_1) = \frac{2(v + \gamma N_1)}{t - 2\gamma}. \tag{12}$$

If E_0 is not available, these N_2 consumers will download and use E_1 on I_0. Period 2 profits will be $(1-\beta)N_2$ for E and $\beta(N_2 + M)$ for the incumbent.

If instead E entered with E_0 then the N_2 consumers would also download E_0, since they consider it (slightly) superior. Period 2 profits would be $(1 - \beta)(N_2) + \beta(N_2 + X)$ for E and $\beta(M - X)$ for the incumbent.

At time $t_{1.b}$, E takes its platform entry decision. If N_1 consumers had downloaded E_1 and it enters, E would make $\pi_{E,2}(\emptyset, E_1 + E_0) = N_2(N_1) + \beta X - F_0$. If it stayed out, it would make $\pi_{E,2}(\emptyset, E1) = (1 - \beta)N_2$. Hence, E will choose to develop E_0 if:

$$\beta\left[X + \frac{2(v + \gamma N_1)}{t - 2\gamma}\right] \geq F_0. \tag{13}$$

Consider now the choice of the cohort of consumers deciding at period t_{1a}. Since they just use the app in this period, their choice is not affected by their expectations: neither the future use of the app nor the availability of a competing platform will impact upon their utility,[47] which is given by: $U = v + \gamma N_1 - t \mid \theta \mid$. Hence, all consumers located within a distance $\theta_1 = \frac{v+\gamma N_1}{t}$ from $l_E = 0$ will download and use the app. Solving $N_1 = 2\frac{v+\gamma N_1}{t}$ we obtain:

$$N_1^* = \frac{2v}{t - 2\gamma}, \tag{14}$$

and by replacement:

$$N_2^* = \frac{2vt}{(t - 2\gamma)^2}. \tag{15}$$

By replacing this value into the entry condition, we obtain that entry takes place if $\beta\left[X + \frac{2vt}{(t-2\gamma)^2}\right] \geq F_0$, which is satisfied by (A1). This leads us to the following:

Lemma 1. *(Equilibria under full interoperability: $\sigma_I = \emptyset$.) If the incumbent adopts full interoperability between its platform I_0 and the app E_1, then: $\frac{2v}{t-2\gamma}$ consumers download the app E_1 on I_0 at t_{1a}, the substitute*

[47] In a richer model where they use the app also in the following period, the analysis would be slightly more complex but qualitative results would not change much.

platform E_0 is developed at t_{1b}, and $\frac{2vt}{(t-2\gamma)^2} + X$ consumers will download and use their apps on E_0 at t_2. Profits are respectively: $\pi_E(\emptyset, E_0 + E_1) = \beta\frac{2v}{t-2\gamma} + \frac{2vt}{(t-2\gamma)^2} + \beta X - F_0$ and $\pi_I(\emptyset, E_1 + E_0) = \beta\left(\frac{2v}{t-2\gamma} + M - X\right)$.

Solution: denial of interoperability: ($\sigma_I = D$) If the incumbent commits to deny interoperability to E_1 on its platform, no consumer will use the app E_1 in t_{1a}.

If firm E did not enter with its platform, it would make zero profits also in the second period (given that E_1 does not function on platform I_0). If it did develop its own platform, $N_2(0) = \frac{2v}{t-2\gamma}$ consumers would download E_1 and use it on E_0, and it would also attract X consumers who will want to use other apps on E_0, so firm E would be make profits $\frac{2v}{t-2\gamma} + \beta X$.

At time $t_{1.b}$, E will not enter with its own platform because $F_0 > \frac{2v}{t-2\gamma} + \beta X$ by Assumption (A1).

At $t_{1.a}$ the N_1 consumers will not have the chance to download the app E_1 because it is not available on the platform I_0. Hence, we have the following result.

Lemma 2. *(Equilibria under denial of interoperability: $\sigma_I = D$.) If the incumbent denies interoperability between its platform I_0 and the app E_1, no consumer downloads the app E_1 on I_0 either at t_{1a}, or at t_2, the substitute platform E_0 is not developed at t_{1b}. Profits are respectively: $\pi_E(D, E_1) = 0$ and $\pi_I(D, E_1) = \beta M$.*

The incumbent's interoperability decision

Lemma 3. *(Condition for exclusion) The incumbent platform will engage in denial of interoperability, that is, $\sigma_I = D$, iff $X > \frac{2v}{t-2\gamma}$.*

Proof. Given Assumption (A1), E_0 will be developed if the incumbent gives full interoperability, but will not be developed otherwise. By choosing interoperability the incumbent will gain $\pi_I(\emptyset, E_1+E_0) = \beta\left(\frac{2v}{t-2\gamma} + M - X\right)$; by denying it, it will protect its platform monopoly and make $\pi_I(D, E_1) = \beta M$. Hence it will deny interoperability if and only if $X > \frac{2v}{t-2\gamma}$. □

Discussion Under assumption (A1), the incumbent has the *ability* to deter the substitute platform E_0. However, its *incentive* to exclude will depend on the trade-off between the additional current profits it makes under interoperability, $\beta N_1^* = \beta\frac{2v}{t-2\gamma}$, and the foregone future profits βX, due to those consumers who would prefer to use their apps on the entrant's platform if E_0 was available.

Note that v can be interpreted as the importance of app E_1 relative to other apps: the higher v, the higher the weight of the foregone profits from the foreclosure strategy, and hence the less likely to have foreclosure at equilibrium.

Note also the temporal dimension of the choice: the short-term loss from denial of interoperability is traded off with the long-term gain of keeping all the M consumers who use the other complementary apps.[48]

This consideration helps us understand what happens if Assumption (A1) did not hold. Denial of interoperability is costly in the short-run for the incumbent because it prevents it from making profits on the entrant's app E_1. Therefore, a necessary condition for denying interoperability is that it will achieve exclusion. When the cost of developing is either low enough or large enough, the incumbent has no reason to deny interoperability because it does not prevent the development of the competing platform or, respectively, the new platform will not be developed anyhow.

[48] If we discounted the profits made in the second period, this temporal dimension will appear even more clearly.

It is also worth noting that a necessary condition for the incumbent to engage in vertical foreclosure is that the potential entrant platform would steal consumers from apps other than the one to which interoperability is denied. This is because denying interoperability to a complementary product/app is costly, and it reduces users and profits in *both* periods. Therefore, it can be optimal to engage in such a strategy only if it allows to retain consumers of other apps.

In other models of exclusion in adjacent markets, for instance, Carlton and Waldman (2002) and Fumagalli and Motta (2020), exclusion would emerge at equilibrium even if there is no other complementary or vertically-related product than the one supplied by the potential entrant. But in those models, the incumbent is integrated and therefore if it denies interoperability, it will achieve some profits with its own substitute of the entrant's product. Here, instead, I have shown that even if the incumbent has no own offer in the adjacent market, it may have the incentive to exclude, provided that it protects the profits accruing from some other apps.

This discussion also points to the fact that the incumbent may want to introduce its version, albeit inferior, of the product in the adjacent market as a way to reduce the cost of denying interoperability.

3.3 Raising rivals' costs

3.3.1 The Italian Amazon Logistics case

In 2021, the Italian Competition Authority (ICA) fined Amazon over EUR 1.1 billion for having leveraged its dominant position in the market for intermediation services on e-commerce platforms to the market for logistics services for e-commerce. The former market included both hybrid platforms (that is, platforms which also operate as retailers, like Amazon) and traditional ones (like eBay).[49] Amazon was super-dominant in this market, and its position, also protected by high barriers to entry (network effects, stickiness of preferences, brand reputation), strengthened over time with respect to both users (around 80% in 2019) and third-party (3P) sellers, whereas rivals were marginalised (eBay went from 25-30% in 2016 to 10-15% in 2019).

The latter market included services such as order fulfilment, warehouse management, delivery, returns, and customer service, and the ICA found that there was a marked difference between B2C logistics for e-commerce and B2B logistics,[50] where established companies operate.

The conduct at issue consisted of 3P sellers being granted exclusive advantages on Amazon Marketplace only if they adopted the logistics services provided by Amazon ('Fulfilled By Amazon': FBA), thus putting 3P sellers relying on rival logistics services at a disadvantage. In other words, the ICA takes issue with the 'self-preferencing' of Amazon's logistic service over competing ones. The advantages that only FBA sellers would get consisted of: no enforcement of performance metrics (that is, 3P sellers using FBA would not be penalised by Amazon for certain negative performances), eligibility to the Prime label and access to Prime customers (over 7 million in Italy), higher likelihood of winning the BuyBox, and exclusive access to promotional events (such as Black Friday, Back to School, Prime Day).

The ICA rationalises this conduct as a 'raising rivals' costs' theory of harm. By tying these advantages

[49] Other retail channels, such as brick and mortar sales or merchant websites, and price comparison services were not considered good enough substitutes to e-commerce platforms.

[50] Among other things, B2B deals with bulks and pallets, B2C with small parcels; B2B's flow of business is steady and foreseeable, B2C's less predictable, continuous, and seasonal; B2B needs to ship to few, well-known, regular recipients, B2C to many more, unknown consumers; reverse logistics (when the recipient sends back what receives) is hardly relevant for B2B, whereas it is crucial and very complex for B2C.

with FBA, 3P sellers would be induced not to rely on rival logistics services, since this would imply losing access to the aforementioned advantages.

The ICA found this conduct led to important anti-competitive effects for actual and potential logistics rivals, whose market share decreased while FBA's increased.[51] Because of this, the conduct led to anti-competitive effects for 3P sellers (which could not freely choose among alternative logistics services), for consumers, and importantly for this theory of harm, for alternative e-commerce marketplaces: since logistics services are very important for the success of a platform, the conduct at issue, by reducing the scale of operation of alternative logistics suppliers, would not only harm such suppliers, making them less efficient, but it would also make alternative marketplaces less competitive. This in turn would have further negative effects on 3P retailers and consumers, who could not have good alternatives to Amazon marketplace for respectively selling their products and buying them.

At the moment of writing, the case is under appeal, and Amazon contests several ICA's conclusions, including the fact that the conduct had negative effects on logistics rivals,[52] and that the decision would be vitiated by an 'efficiency offence' argument. According to Amazon, it gave advantages only to FBA subscribers because its logistics services were superior and because it needed to guarantee the quality of the services offered in its Marketplace to avoid negative externalities that other logistics providers may ignore. (If a consumer receives the product she purchased later than expected or damaged, Amazon's reputation would suffer, and a logistic supplier would not internalise this externality.)

In its Decision, the ICA stresses that it is legitimate for Amazon to aim at guaranteeing high-quality logistics services, but it could do so by placing objective performance criteria on both its services and on third-party logistics operators.[53] It also argues that if Amazon did care about quality, offering more lenient treatment to FBA retailers (whose negative performance is not taken into account) would not be justified.

One may argue that it is more difficult for Amazon to rely on other suppliers' logistics services than its own, perhaps because of contract incompleteness, and difficulties in monitoring or in enforcing a certain quality of services. Interestingly, though, a few months before the ICA's decision, Amazon introduced the Seller Fulfilled Prime (SFP) programme, whereby it approved some logistics operators and qualified them for the same advantages as FBA should 3P retailers use their services.[54] This may well be interpreted as suggesting that other logistics operators are not so inefficient after all,[55] and that there may be a way to guarantee that their services are aligned with Amazon's quality standards.

[51]The conduct allegedly also further discouraged multi-homing, namely the possibility that the same 3P seller would rely on both FBA and rival logistics services, already unattractive because of the high cost of operating multiple warehouses.

[52]Some logistics suppliers in Italy have important scale, so no doubt the judge will have to decide whether their being active mostly in B2B services implies that e-commerce retailers not selling in Amazon Marketplace could rely on them or not for B2C services; Amazon also submitted that logistics rivals had continued to grow during the period of the conduct.

[53]The remedy adopted by the ICA requires Amazon to grant sales benefits and visibility on its platform to all 3P sellers which can comply with fair and non-discriminatory fulfilment standards, in line with the level of service that Amazon intends to guarantee to Prime consumers. Those standards must be made public.

[54]The SFP development seems to be in line with the remedy that the ICA later imposes, but the ICA considered it is still part of the abusive conduct, for two reasons. First, the SFP would target a particular class of 3P sellers with a low turnover rate, which the FBA finds it difficult to attract (high long-term storage tariffs and high standardisation of FBA services would discourage retailers which need some flexibility). Second, Amazon itself negotiated the contractual terms between approved logistics firms and SFP retailers, hence this programme would not allow the emergence of rivals which are truly independent of Amazon.

[55]The Decision also contains testimonies suggesting that some logistics operators were as efficient as Amazon, but some logistics operators admitted that they could not match Amazon's services.

4 Concluding remarks

Antitrust Authorities around the world have been investigating several abuse of dominance cases by large digital platforms. Here I have focused on some high-profile cases where the abuse might consist of self-preferencing or denial of interoperability or a similar practice which has the effect of excluding, marginalising, or deterring a rival operating in an adjacent market.

Some commentators have contested the possibility that there may be an incentive for exclusion, by for instance claiming that a platform would have all the interest in keeping complementary apps or services operating, as they represent their main source of profits; or claiming that even if there was exclusion, it would not be anti-competitive, e.g. when these markets are characterised by zero prices to consumers.

I have delineated, informally as well as with the aid of formal models, the rationale behind the dominant platforms' conduct in some of these cases. Broadly speaking, they belong to well-known and established categories of theories of harm (mostly from the recent literature on vertical foreclosure), albeit 'adapted' or 'modified' to fit the specificities of the digital sector.

In other words, sound and widely accepted rationales for foreclosure often exist for high-profile cases involving big technology companies. Of course, before concluding that the conduct at issue is abusive, it is also necessary to check whether the facts of the case are fully consistent with a certain theory of harm and whether there may exist efficiency defences, or objective justifications.

Finally, I should also warn against limiting ourselves to 'off-the-shelf' theories of harm. As markets and technologies evolve and we understand digital markets and business practices better, we shall discover new rationales for anti-competitive exclusion.

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