Occasional Paper Series ◆ 40

Regulating platform charges

Roman Inderst, University of Frankfurt,
Imperial College London and CEPR

Tommaso Valetti, Imperial College London,
University of Rome II and CEPR

FSA®
Financial Services Authority

November 2010

FSA OCCASIONAL PAPERS IN FINANCIAL REGULATION

Foreword

We are committed to encouraging debate among academics, practitioners and policy-makers in all aspects of financial regulation. To facilitate this, we are publishing a series of occasional papers in financial regulation, extending across economics and other disciplines.

These papers cover topics such as the rationale for regulation, the costs and benefits of various aspects of regulation, and the structure and development of the financial services industry. Since their main purpose is to stimulate interest and debate, we welcome the opportunity to publish controversial and challenging material including papers that may have been presented or published elsewhere.

The main factor in accepting papers, which will be independently refereed, is that they should make substantial contributions to knowledge and understanding in the area of financial regulation. We encourage contributions from external authors as well as from within the FSA. In either case, the papers will express the views of the author and not necessarily those of the FSA.

If you want to contribute to this series, please contact Michael Straughan or Peter Andrews at:

The Financial Services Authority
25 The North Colonnade,
Canary Wharf, London, E14 5HS
Telephone: (0)20 7066 3194 or 5808

Email: michael.straughan@fsa.gov.uk or peter.andrews@fsa.gov.uk

FSA Occasional Papers are available on our website: www.fsa.gov.uk

We welcome comments on these papers; please address them to the contacts list above.

Regulating Platform Charges

Roman Inderst[1], Tommaso Valletti[2]
November 2010

Executive summary

This study uses formal economic analysis to study platform charges in the market for retail investment services. Its key aim is to obtain qualitative insights into how the regulation of charges may affect the market outcome and thereby efficiency and consumer welfare. Our analysis is very stylised and abstracts from many detailed aspects of the market and its participants. Still, the obtained high-level economic analysis generates the following insights.

The market is special in that, in principle, funds and platforms can set a wide range of different charges. In particular, in principle, consumers can be charged independently by platforms and funds, through both fixed and variable fees. The first insight of the analysis is that this may allow the same economic outcome to be obtained, in terms of both efficiency and profits, with even widely different charging structures, including those observed with fund supermarkets and wraps. Then, in this stylised benchmark scenario, regulating only one charge may have little impact, as it simply leads to other charges being readjusted. We illustrate this in detail for the case where regulation restricts only platform-fund charges or platform-consumer charges.

However, when regulation restricts various charges at the same time, this may impose sufficient constraints on firms to affect the economic outcome. The same holds when practical restrictions already limit the flexibility of charges. We illustrate this by considering in detail the case of insufficiently flexible fund-consumer (management) charges: In a given share class they may vary little or not at all when the fund is sold across different platforms or to different investor groups.

Therefore, when regulation effectively constrains the flexibility of charges, its first impact of this is a restriction of price discrimination, both across different consumer segments at a given platform and across consumers at different platforms. Generally, such a

[1]University of Frankfurt, Imperial College London and CEPR. E-mail: Roman.Inderst@hof.uni-frankfurt.de.

[2]Imperial College London, University of Rome II and CEPR. E-mail: t.valletti@imperial.ac.uk.

restriction in price discrimination benefits some but hurts other consumers. The welfare implications are also ambiguous, which is why economists are generally hesitant to suggest price regulation only for the purpose of limiting price discrimination.

When the flexibility of charges is constrained, this may also restrict competition, once again provided that no alternative and equally effective 'channel' is used by firms. We illustrate this by discussing restrictions to platform-consumer charges in the form of rebates when, at the same time, funds can not flexibly adjust their fees ('one share class'). Platforms are then constrained as they can not compete for customers on the basis of fund-specific charges or charge reductions. However, an overall analysis must take into account to what extent competition then shifts to other 'channels' and charges, even when they may not be much in use at present. Such a caveat also applies when a restriction of certain charges may prima facie suggest a distribution of profits ('rents') between firms, e.g., towards funds in case shelf fees were restricted. A further analysis of the impact of certain charges would therefore crucially depend on the specific assumptions that are made on how flexibly firms can adjust other charges

Organisation of the paper

1 Motivation and plan of analysis

This study uses formal economic analysis to study platform charges in the market for retail investment services.

Introduction to the market

Platforms are internet-based services used by intermediaries (and sometimes clients) to view and administer investments.[3] Platforms offer tools that allow advisors or even clients to directly choose products and to monitor investment portfolios. There are two different types of platforms in the market: wraps and supermarkets. As we will note below in more detail, for our present analysis we can abstract from any practical differences between these different types. (For instance, fund supermarkets presently tend to offer wide ranges of unit trusts and OEICs, while wraps often offer greater access to other products.) Our analysis will be concerned with the general nature of platform charges and their regulation.

Our analysis will also abstract from the role of the adviser. As discussed below in more detail, we will specify that consumers can make informed decisions between platforms and investment products, though in practice this may only be so through the intermediation of an adviser. We abstract from any conflict of interest between the adviser and the client. While this is done primarily to focus the subsequent analysis, this specification may also reflect changes in the current regulatory environment.

Precisely, once the rules on adviser charging developed in the Retail Distribution Review[4] are operational, advisers are remunerated directly by their clients. These new rules will require advisers to agree their remuneration with clients upfront, and such remuneration will not be allowed to vary with respect to the provider recommended. The advisers' remuneration does not depend on the fund they recommend but rather on the provided service. To the extent that this does not per se fully erode adviser bias, we assume that supervision of adviser charges is effective and fulfills this objective.

Objective

This study uses formal economic analysis to provide intuition on how the pricing mechanisms in the platform market may work and how, based on this understanding, regulation could have an impact on prices, efficiency and consumer welfare. To accomplish this, we

[3] Cf. FSA DP 2007/2 for details.
[4] RDR; cf. FSA 2007/01.

use different modelling tools from microeconomic theory and the theory of Industrial Organization. In terms of policy, we aim to analyse the impact of various policies directed at the different charges set by funds and platforms (i.e., fund supermarkets or wraps). In particular, we consider the impact of policies that would prohibit certain charges.

Our objective is **not** to provide an all-inclusive and detailed picture of the platform market. We also do not aim to develop a single formal model that would allow for a comprehensive analysis of all the feedback effects that could arise from any given policy. Nor does our analysis give rise to a quantification of different effects. Instead, our analysis provides different, partial insights rather than a broad picture of the platform market.

Approach and organisation

We organise our study as follows. Section 2 introduces the baseline scenario, where a single fund is sold through a single platform to a representative consumer. All charges are fully transparent to the consumer. The baseline analysis in Section 3 draws on the literature on vertical contracting in Industrial Organization. (The literature discussion is relegated to Section 4.)

In the baseline model in Section 3, we derive our first key benchmark results. According to these findings, various models of how consumers are charged, as practiced by fund supermarkets or wraps, are equivalent. Moreover, as a side result, regulation that was imposed on the platform-fund charges would have **no** effect. The same applies to regulation that was imposed on the platform-consumer charges (i.e., on the various rebates and how these are passed on), which is considered in Section 5. However, regulation that was imposed on **both** sides at the same time could have an effect, as it reduces the scope for price discrimination by the platform (we show this in Section 6).

A key assumption in the baseline case is that the set of charges is sufficiently 'rich'—that is, unless it is seriously restricted by regulation. More precisely, without regulation, we allow for individualised 'prices' among all three parties: funds, platforms and customers. We then analyse the relevance of this assumption in the subsequent sections. To be specific, in Section 7 we choose the case in which the funds' charges to consumers are not fully flexible, as they can not differentiate individual consumers in a given 'share class'. Given the limitations on fund-consumer charges, regulating **either** platform-fund charges **or** platform-consumer charges could have an effect. We analyse first how the restriction in price discrimination—i.e., among consumers in a given share class (whether on the same or different platforms)—affects demand and, possibly, consumer surplus as well as welfare. Furthermore, we show how, with competing platforms, restricting such rebates may dampen competition. (It should, however, be recalled that this analysis presumes that the total level of charges is always fully transparent to consumers.) But we also analyse the assumptions under which restrictions on certain charges may limit the pricing power of platforms.

Section 8 concludes.

2 Selling over a platform: baseline case

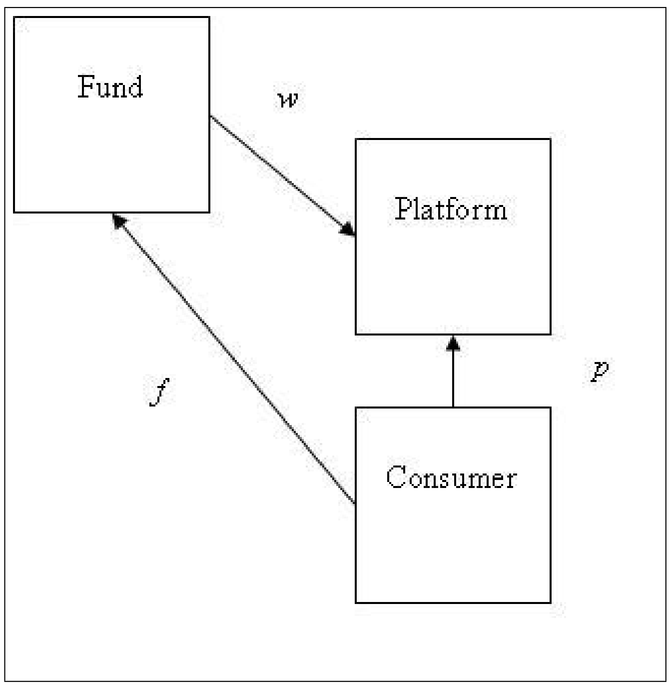
In this section, we introduce the simplest setup to study the interaction among funds, platforms and consumers. We ignore the role of advisers. This is thought to capture the notion that, once new regulation is in place, advisers act as consumers' agents, in their best interest. Furthermore, in our baseline scenario, we consider the highly stylised case where one fund is sold through a single platform. Presently, the fund also does not provide other services (we discuss this below). Hence, it acts simply as an intermediary. We further represent the demand for funds through a representative consumer. Before specifying this baseline scenario more formally, we should note that our key insight will hold rather generally — i.e., even when we introduce multiple funds, competition between platforms, or additional services that the platform provides.

Utility and cost

We specify by $v(q)$ the utility that the representative consumer obtains when he purchases q units of the fund (or invests the sum q). We stipulate that $v' > 0$ and $v'' < 0$ — i.e., that the marginal utility to the consumer is strictly decreasing. For instance, this may hold as the risk-averse consumer benefits from diversifying across different investments. For simplicity, we specify constant marginal costs — e.g., of handling — for the fund ($k_F \geq 0$) and for the platform ($k_P \geq 0$). Note also, that the case where consumer(s) can choose to turn instead to different funds and platforms is currently simply captured by the elasticity of the resulting (residual) demand function. When consumers can choose alternative channels and buy the fund at the same fund-consumer (management) fee f, then new issues arise. We discuss these below when considering the implied limited flexibility of the fund to practice price discrimination.

Charges

In the baseline case, we allow for the following linear prices between the fund, the platform and the consumer. We stipulate that the fund charges the per-unit fee f to the consumer and pays the platform the per-unit price w. We denote this by w, as it will play the role of a 'wholesale price', in line with more standard models of vertical contracting, although we will soon relate our notation to the pricing structure observed in the market. The platform can also charge the consumer a per-unit (transaction) fee that is given by a price p. Below, we allow also for non-linear prices that, for example, include a fixed membership fee. The following figure summarises the notation we have introduced in this section.



Baseline Case

With these prices, given some realised demand q, the profit of the platform and that of the fund are given by

$$\begin{aligned} \Pi_P &= (p + w - k_P)q(p + f), \\ \Pi_F &= (f - w - k_F)q(p + f), \end{aligned} \tag{1}$$

where, from $v(q)$, we can derive a strictly decreasing demand function $q(p + f)$. Note that this is a function of the total (per-unit) price that the investor pays: $p + f$. In what follows, we will mostly remain agnostic, to the extent that this is possible, about the precise sequence and form of negotiations through which the different charges are determined.

Illustration of charges

Next, we briefly relate the chosen structure of charges to those observed in practice, although our model is deliberately highly stylised. Funds may retain only a fraction of the management fee f and 'rebate' the rest to fund supermarkets (and, ultimately, also to adviser firms). Abstracting from adviser firms, this rebate would be given by w. Typically, no further payments are made to or from consumers. For instance, with a management fee of $f = 1.5\%$, there could be a rebate to the fund supermarket of $w = 0.75\%$, while $p = 0$.

With respect to wraps, a fraction of the management fee—say, one half—is typically rebated to consumers. This rebate then reduces the effective fee paid to the fund to $f = 0.75\%$. Some or all of this may then be used to compensate the wrap platform (plus, if we extended the model, the adviser). If all of the rebate is used in this way, $p = 0.75\%$. When the fund does not directly pay charges to the wrap, $w = 0$. (Note that we have chosen the parameters in both cases so that the consumer's profits and payments are the same.)

Note on notation

In what follows, we will consider different platforms and different funds, but also different consumers and consumer segments. Generally, to keep the analysis transparent, we will use the following notation. We will use superscripts for ('upstream') funds and refer to them by $n = 1, ..., N$. For 'downstream' platforms we will use subscripts and refer to them as $m = 1, ..., M$. Finally, we use subscripts also for consumer (groups), but denote them by $i = 1, ..., I$.

3 Irrelevance of platform-fund charges in the baseline case

Take some value for the platform-fund charge w as given. This may have been chosen either by the fund or by the platform through a 'take-it-or-leave-it' offer, though—as we noted—we can presently be agnostic about the precise process of how charges are determined.

Then, the first-order conditions of the fund and the platform, with respect to f and p, are given by

$$\frac{d\Pi_P}{dp} = (p + w - k_P)q' + q = 0, \qquad (2)$$
$$\frac{d\Pi_F}{df} = (f - w - k_F)q' + q = 0.$$

We use here that demand is a function of the **total** per-unit price: $f + p$. The fund and the platform both face a standard trade-off: a higher charge to the investor increases the respective margin, but it reduces volume.

When we add up the two first-order conditions, we obtain the requirement that

$$(p + f - k_F - k_P)q' + 2q = 0. \qquad (3)$$

When demand is well-behaved — e.g., strictly concave—then condition (3) pins down uniquely the total price $f + p$ that the consumer faces in equilibrium, together with the respective quantity q (number of units he buys). The first insight is that this is **independent** of the charge between the platform and the fund, w.[5] Moreover, once we substitute the equilibrium quantities back into the two first-order conditions (2), we obtain the two margins

$$p + w - k_P = f - w - k_F = -\frac{q}{q'}. \qquad (4)$$

Hence, in the baseline model, the payment w that flows between the fund and the platform does not affect margins, but only how they are 'earned': The higher is w, the lower is p, while f increases. In other words, a change in the fund-platform charge w would be passed on one-by-one through, for example, an increase in the management fee f.

We should note at this point that the fact that both firms obtain the same margins only holds because we presently abstract from competition at either the fund or the platform level. Competition is introduced below.

Note, also, that as w is indeterminate, regardless of what negotiation model we choose, **one** possible equilibrium outcome is that where $p = 0$ — i.e., consumers do not pay platforms. To make this more precise, denote by $p^* + f^*$ the total price that consumers

[5] The result that the quantity q depends only on the total margin of the platform $p + w - k_P$ is often equated, in the economics literature, to a 'one-sided market' (cf., also, our discussion below). Using the language of Rochet and Tirole (2006), a market for interactions between two sides (buyer and seller — i.e., customer and fund in our case) is one-sided if the volume of transactions realized on the platform depends only on the aggregate price level, while it is insensitive to reallocations of this total price between the buyer and the seller.

pay in equilibrium, which solves (3), together with the respective quantity $q^* = q(p^* + f^*)$. When we now set $p^* = 0$, we have from (4) that this price indeed arises in case $w^* = (f^* + k_P - k_F)/2$.

One implication of our result in the baseline model is immediate. Any regulation of the platform-fund charge w would have *no* real economic consequences. The intuition for this is ultimately simple: There is 'one price too many' in our model, as both the platform and the fund can charge consumers directly, through f and p. Thus, when we increase or reduce w, they optimally adjust their respective charges to consumers until their margins are again the same. In what follows, we show first how these insights hold rather generally. We will also illustrate the results with the example of linear demand.

3.1 Robustness when the platform provides services

So far, the platform is only an intermediary that does not provide services. While we still abstract from the adviser, we now extend the analysis by stipulating that the platform can provide services that enhance consumer utility and, consequently, demand. Conceptually, we can think of at least two different ways that such services can influence demand and how they can be charged for. We first consider the more immediate extension, where the platform can vary the level of these services and charge for the respective level of usage. In a second case, we suppose that the platform basically 'sinks' a given level of investment to create a fixed level of services that all consumers can enjoy equally.

Continuous service provision

Denote the level of services by s, as demanded by the representative consumer. The respective per-unit price is t. Denote the investor's utility by $v(q, s)$, which is now a function of both the purchased investment units q and the purchased service units s. As $p+f$ is the total price per unit of investment, we can derive the respective demand functions to obtain $q(p + f, t)$ and $s(t, p + f)$, which are downward-sloping in the respective 'own price'. While, generally, we may suppose that q and s are complements in the consumer's utility function and that the cross-price derivatives in the respective demand functions q and s are also negative, we do not need this for our core result: the robustness of our 'irrelevance result'.

It is now convenient to introduce $r = p + f$ for the total price that a consumer pays. Then, we denote the respective partial derivatives of demand by q_r and q_t, and by s_t and

s_r. Note, also, that now the platform's profits are given by

$$\Pi_P = (p + w - k_P)q(r,t) + (t - k_S)s(t,r),$$

where $k_S \geq 0$ denotes a constant marginal cost for providing the respective service to consumers.

Now, the equilibrium is characterised by three optimality conditions, as the platform chooses two prices: p and t. In addition to the adjusted first-order conditions in (2),

$$\begin{aligned} \frac{d\Pi_P}{dp} &= (p + w - k_P)q_r + q + (t - k_S)s_r = 0, \\ \frac{d\Pi_F}{df} &= (f - w - k_F)q_r + q = 0, \end{aligned}$$

we now have the requirement that

$$\frac{d\Pi_P}{dt} = (p + w - k_P)q_s + (t - k_S)s_t + s = 0.$$

Again, it is immediate to see why the choice of w, regardless of how it is determined, is irrelevant for the equilibrium level of the total price that consumers pay, $r = p + f$, as well as for the equilibrium service charge t and the profits that the platform and the fund realise. From the fund's first-order condition, we can use

$$w = f - k_F + \frac{q}{q_r},$$

and substitute it into the two first-order conditions for the platform: $\frac{d\Pi_P}{dp} = 0$ and $\frac{d\Pi_P}{dt} = 0$. In each case, w drops out, and the two first-order conditions can be solved for $r = p + f$ and t, irrespective of the choice of w. Then, if we were to change w, as previously, f and p would adjust one-to-one, while all choices related to the service would now be unaffected.

Service investment

The service the platform provides to consumers, be it directly or indirectly via the tools it provides to consumers' financial advisers, may represent a fixed investment. Once the tool is developed, it may cost little or nothing to provide it to an additional consumer or his adviser. Also, the respective service may not be easily scaled up or down, given a particular consumer's profile and willingness to pay. In this case, the provision of the service may be modeled more appropriately through a fixed, up-front investment. It is important to note that, again, the choice of w does not affect the provision of the service. This is now an immediate consequence of our previous observation that the platform's profits are independent of w.

3.2 Robustness to competition

We next show how the 'irrelevance' result survives when we introduce competition, at either the fund or platform level, or at both. Though the argument is always the same, it may be more insightful to proceed step-wise.

Fund competition

When there are N funds, the representative consumer's demand for each fund can be derived from his utility $v(\mathbf{q})$, where now $\mathbf{q} = (q^1, .., q^N)$ denotes the vector for the units of the respective investments. From this we obtain, when we denote the respective prices by $r^n = p^n + f^n$, the respective demand functions $q^n(\mathbf{r})$, where now $\mathbf{r} = (r^1, ..., r^N)$. Intuitively, the cross-price effects, $q^n_{n'} = dq^n/dr^{n'}$ with $n' \neq n$, should be positive. Consumers may seek to invest in different securities and funds to achieve greater diversification.

In contrast to the previous analysis, the platform's pricing now internalises these cross-price effects, as it maximises

$$\Pi_P = \sum_{n=1}^{N} (p^n + w^n - k^n_P) q^n.$$

Note that we allow for fund-specific (handling) costs for the platform, k^n_P. More importantly, we allow the platform-fund charge to be fund-specific, w^n, and the same applies to all prices set to consumers, f^n for the charge set by the fund and p^n for that set by the platform.

Our 'irrelevance' result follows immediately from the, by now, well-established procedure. From the first-order condition for each fund, now with respect to the respective fee f^n, we can obtain

$$f^n - w^n = k^n_F - \frac{q^n}{dq^n/dr^n},$$

so that, after substitution into the platform's profits Π_P, in equilibrium, only the total price paid by consumers for each fund r^n is determined, and it is independent on w^n. Again, for each fund, there is 'one price too many'. The regulation of any (or all) of the respective fund-platform charges w^n would be inconsequential.

Fund competition with free entry

In the preceding discussion, we essentially took the number of funds at a given platform as exogenously given. But results do not hinge on this. To see this, suppose that the number (or, more technically, the 'mass') N of funds on a platform were endogenous and determined by a zero-profit condition. Hence, to be specific, for given charges that are set by the platform, there could be a large universe of symmetric funds, each offering consumers access to more diversification, albeit with decreasing marginal return. (Funds could be thought of being 'symmetric' in offering, all else equal, the same diversification benefit and risk-adjusted return.) For given N and **symmetric** charge $r = p + f$, we may then write the demand per fund by $q(N; p + f)$,[6] such that in equilibrium,

$$\Pi_F = (f - w - k_F)q(N; p + f) = 0. \tag{5}$$

Now, for given N, the funds' symmetric charge f is determined by the first-order condition, which, using a short-hand notation for the derivative of per-fund demand, becomes

$$(f + w - k_F)q'(N; p + f) + q(N; p + f) = 0.$$

Again, only $r = p + f$ is then pinned down uniquely, for given N. Also, how the platform's total charge $w + p$ is distributed is irrelevant. But, as funds' profits do not depend on the structure of charges, this holds also for the equilibrium 'number' of funds that are active on the platform N. It is, in the present case, determined from a zero-profit condition, as given by (5).

Overall, when the number of funds on the platform is endogenous, regulation of w (in particular, imposition of $w = 0$) would not matter, at least not in the considered baseline case. (This may be different when regulation reduces the platform's scope to extract 'rent'; cf. below for a discussion of fixed 'shelf fees' and their regulation).

Platform (and fund) competition

The introduction of more than one platform raises, in principle, some modelling issues. One may first ask how platforms are differentiated, so that they can earn a positive margin in equilibrium. Likewise, when there are fixed costs, why is this not a natural monopoly, so that all business should, in equilibrium, be on one platform only? For the purpose of our present analysis, however, we abstract from these issues. Furthermore, we need not specify for our analysis whether, as may often be realistic, different consumers 'single-home' at one

[6] With symmetry, we can do without introducing a more general notation that would capture all cross-price effects (cf., also, the following discussion on platform *and* fund competition). When demand for different funds is heterogeneous, results hinge also on the extent to which charges are flexible and can, thus, price discriminate between different funds.

platform — i.e., they make all investments at one platform — or whether, in the model, a representative consumer 'mixes and matches' between investments at different platforms.

Presently, we need only that there is some demand function q_m^n for investment in fund $n = 1, ..., N$ through platform $m = 1, ..., M$, which depends on the respective total prices: $r_m^n = f_m^n + p_m^n$. Together with the fund-platform charges w_m^n, we still allow for full flexibility of **all** prices.

This general model, in terms of the presence of multiple platforms and multiple funds, can then be summarised by the respective profits for the N funds and the M platforms:

$$\begin{aligned} \Pi_{Pm} &= \sum_{n=1}^{N}(p_m^n + w_m^n - k_{Pm}^n)q_m^n, \\ \Pi_F^n &= \sum_{m=1}^{M}(f_m^n - w_m^n - k_{Fm}^n)q_m^n. \end{aligned}$$

Once again, the equilibrium, in terms of investments q_m^n, profits, and consumer surplus, is independent of any of the platform-access charges, w_m^n. Thus, regulation would have no impact even in this generalised setting. Formally, this can, once again, be seen by first solving for the first-order conditions for all n funds. (The $M \times N$ first-order conditions give rise to an $M \times N$ equation system that is linear in the respective terms $w_m^n - f_m^n$.) Substituting into the platform's first-order conditions, this can then be solved for the $M \times N$ total prices $r_m^n = p_m^n + f_m^n$ that consumers face when they purchase fund n through platform m. These are independent of the particular choices of all w_m^n.

3.3 Robustness to more complex pricing

So far, for the benchmark case, we have stipulated that all charges are linear, both those to consumers (p and f) and that between the fund and the platform (w). Generally, each charge could be some general function of the total number of investment units that one or all consumers buy through the respective platform. Such a function could, for instance, specify volume discounts. For our purpose, without loss of generality, we can restrict the analysis to charges that, together with a constant marginal price (p, f, or w), also specify some fixed, up-front payment, which we denote by P, F, or W, respectively. For instance, choosing a higher fixed fee F, while reducing the respective marginal fee f would represent a volume discount between the fund and investors.

Again, when we allow one or all of the three charges to take on such a more-general (contractual) form, our key result still holds. Quantities, consumer surplus and profits are independent of the choice of platform-fund charges, (W, w). This holds even though the respective quantities, surplus and profits are different from those derived previously, where charges had to be linear. Still, the same principle applies. There is still one 'price', now in terms of the more general contract (W, w), 'too many'. In particular, any regulation of the platform-fund charge — e.g., by requiring that one or both elements of (W, w) be zero — has no effect. For instance, now the prohibition of (only) 'shelf fees', so that $W = 0$, would have no implication.

To see this, suppose first that fees charged by funds are, in a given 'share class', required to be linear, so that $F = 0$. That is, the investor always pays only a percentage fee on his invested funds: $q \cdot f$. Suppose, instead, that the platform could charge investors a more complex fee — e.g., a fixed fee for managing the investor's account, P — in addition to a percentage fee p on his total investment. In our setting, where there is presently a single representative consumer, the platform would optimally choose the fixed part P so as to make the consumer just indifferent between 'participating' or not. That is, the consumer's 'participation constraint'

$$v(q) - q(p + f) - P \geq 0$$

would optimally just be binding. Thus, as the platform extracts the full consumer surplus, it optimally sets its marginal charge, p, equal to its own 'perceived cost':

$$p = k_P - w.$$

(Note the difference to the first-order condition (4), where without a fixed part P, the platform charges a mark-up equal to $-q/q'$.) This implies, again, that the fund passes on a change in w one-by-one into a change of its marginal charge p: $dp = -dw$. As the first-order condition (4) still applies to the fund, so that $df = dw$, altogether, we still have $dr = df + dp = 0$.

When the fund also can charge a fixed fee F, by the same argument, it will choose the marginal charge f equal to its 'perceived cost':

$$f = k_F + w,$$

implying, once again, that $df = dw$.

Note, finally, that a 'shelf fee' W (and any change dW to it) would, in our present model, not result in higher prices for investors. However, the difference to a change in w, which also leaves the distribution of profits between the platform and the fund unaffected, is that a higher 'shelf fee' would shift profits from the fund to the platform.

The fact that the size of the 'shelf fee' presently has no implications for prices or the availability of funds on the platform depends on our specifications. To see this, take the case where funds are different — e.g., in terms of costs. When the platform can charge only a single 'shelf fee' to all funds that could possibly register with the platform, from a standard 'double marginalisation' result in the vertical chain, a higher 'shelf fee' will lead to fewer choices for consumers. Also, such 'marginalisation' should be expected in equilibrium, as the platform (provided it has market power) extracts more profits. (Cf., also, the discussion at the end of Section 4.)

4 Discussion: charges in equilibrium

So far, we have restricted the discussion to highlighting the 'irrelevance result' — in terms of platform-fund charges — in the baseline model. We have remained agnostic about the way charges are determined. Put differently, we have mainly analysed the impact that platform-fund charges, w or w_m, have on the choice of f, as well as on p or p_m, and, therefore, on total prices for consumers. This may suggest that we have also assumed that the choice of platform-fund charges **precedes** that of charges to customers, and that all our previous results hinge on this. We now argue that this is not the case and hence results are, in fact, general.

For this purpose, suppose that the fund's fee f is chosen first before the charges (p, w) are chosen, say as 'rebates'. Precisely, suppose that the fund then offers w, before the platform finally chooses p (e.g., to what extent it passes on any 'rebates'). To see that the platform-fund charge is again 'irrelevant', note that for the fund's margin, only the difference $f - w$ matters. When the fund 'shifts' between f and w, so that $df = dw$, in equilibrium we still have that the platform optimally chooses a one-by-one pass-on: $dp = -dw$. The total price to customers remains unchanged, and the fund is then indifferent on how to choose, for a fixed value $f - w$, the respective charges f and w. We can also confirm our results when the 'sequencing' is different—i.e., when we let the platform choose its charges (p, w) before the fund chooses how much to charge consumers, f. The reasoning is exactly the same, although now with the platform and the fund having exchanged roles.

Relation to the literature

There are two different strands of the literature in Industrial Organization to which the preceding analysis connects. The first strand examines vertical contracting, while the second studies platforms and two-sided markets.

The key difference between the literature on vertical contracting and the present study is that, in our model, the fund and the platform can directly charge consumers, thus making the platform-fund charges irrelevant. Alternatively, when the platform cannot directly charge consumers, this corresponds to a vertical contracting model where the platform represents an essential 'input provider' that charges the fund a per-unit price w, while the fund then sets the single price that consumers pay, f. Of course, the choice of w would then matter.[7]

Next, a key feature of the literature on platforms and two-sided markets is that there are, in principle, three types of interactions: those between the platform and either side of the market (namely, the fund and consumers in our model) and that between the two platform participants (again the fund and the consumers). What is essential in our model is that an individual price can be specified for all three of these interactions. This is frequently not the case in the literature on two-sided markets, though in applications to markets for credit cards a similar 'neutrality' result for interchange fees has been obtained.[8]

Two-sidedness

A common notion in this literature is that of platforms representing **decentralised** markets — e.g., online platforms. Platforms typically generate revenues by charging its 'members', either by a fixed membership fee or on a per-transaction base. The utility of

[7] There is an abundance of literature on vertical contracting, and there is no 'seminal reference' to cite. Recently, in particular with relation to price discrimination and buyer power, various contractual models (e.g., with linear or more complex contracts; cf. above) have been analyzed and compared in Inderst and Valletti (2009a), Inderst and Shaffer (2009) and Inderst (2010).

[8] Armstrong (2006) and Rochet and Tirole (2006) develop canonical models of two-sided markets. See Rysman (2009) for a recent non-technical survey. In this literature, results are usually driven by the specific market application—e.g., media markets (Gabszewicz et al., 2004, Anderson and Coate, 2005, Anderson and Gabszewicz, 2006, Peitz and Valletti, 2008, Crampes et al., 2009); shopping malls (Nocke et al., 2007); telecommunications (Laffont et al., 1998). Empirical works include Rysman (2004, on yellow pages), Kaiser and Wright (2006, on magazines), Argentesi and Filistrucchi (2007, on newspapers), Genakos and Valletti (forthcoming, on mobile phones). On credit card markets and the 'neutrality' result see the generalisation in Gans and King (2003).

platform members on the various sides (gross of fees paid to the platform) is either defined exogenously or often derived from bargaining between the parties (e.g., a buyer and a seller who are 'matched' by the platform.)

A key difference is that in the market under consideration, funds set their prices/fees up-front. In the model, investors then decide essentially simultaneously whether or not to join a given platform and what funds to buy, depending on the aggregate fees they face. Arguably, this makes the standard frameworks in the 'two-sided' literature not directly applicable. In particular, in the benchmark case there is no 'pricing externality', e.g., from reducing of one of the charges, simply as other charges then adjust accordingly.

Furthermore, a key observation in the literature on two-sided markets is that the expected utility of consumers ('users') on one side is higher when there are more 'users' on the other side. Such externalities are often assumed exogenously. The question, then, is how, in the presence of such externalities, the platform should optimally set its charge on either side. The answer depends crucially on utilities and elasticities on either side, and it is no longer irrelevant how some total 'transaction fee' is split between, say, buyers and sellers. More formally, with positive cross-side network effects, demand curves shift outward in response to growth in the user base on the platform's other side. The platform should then subsidise the more price-sensitive side, and charge the side whose demand has increased more strongly in response to growth on the other side. Again, however, when charges are flexible and set up-front, the standard frameworks for two-sided markets and their results no longer apply.

Elastic demand and supply

The preceding remarks should, however, **not** suggest that there cannot be cases where the structure of prices matters, even though both platforms and funds can charge consumers directly. In fact, in the following section, we explore a case where there are contractual limitations to such charges, permitting only limited price discrimination.

Furthermore, our previous results pertain only to the linear platform-fund charge w. This holds, in particular, for the case where we made also the supply of funds elastic (and subject to a zero-profit condition). Suppose for a moment that a platform could set a 'shelf fee' W next to w and that there are many funds. We capture their difference by their **fixed** costs of operation K_{Fn}. (We could imagine that they have different 'costs' to generate a given return. Otherwise, we could think that fund prices are already adjusted to take into account differences in expected returns.) There is a mass N of funds on a given platform. While we need to characterise the choice of the pair (f_n, p_n) for each fund, given symmetry in demand and marginal cost, we ultimately need only a single pair of fees (f, p).

How is demand generated on the investors' side? For each investor, utility is $v(N; \mathbf{r}) - z$, where z is different to generate elastic demand also on the investor's side. Define the critical 'entrant' as z^*, where $v(N; \mathbf{r}) - z^* = 0$. Note that now there are both an 'intensive margin' (i.e., the number of units demanded by each participating investor) and an 'extensive margin' (i.e., the number $z \leq z^*$ of participating investors); both are affected by charges. Formally, we can derive for any investor and fund the demand function $q_n(N; \mathbf{r})$, while the aggregate demand is $q_n(N; \mathbf{r})G(z^*)$ for some distribution function $G(\cdot)$.

Although, given symmetry, we can apply our previous results to again obtain the irrelevance of w, this does not hold for the fixed fee W. There, the following observation is now immediate. As W is pushed up, fewer funds will participate. This will make each investor's demand for each fund less elastic. However, since for given prices, the reduction in choice reduces $v(\cdot)$ and, thus, tends to reduce z^*, and there is a countervailing effect on the equilibrium choice of $r_n = r$. Still, the increase in W should tend to lower consumer surplus. In this example, therefore, the 'structure' of prices matters. But this result should be put into perspective.

The key assumption that is made is that by requiring $W = 0$ the power of the platform to extract rents from funds could be restricted. This relies, however, on the assumption that platforms can not find other means to extract rents (e.g., through charging nonlinear prices; see also next). In fact, if these other channels are less efficient to transfer profits from funds to platforms, then contractual restrictions that are imposed by regulators should reduce overall efficiency. After all, these restrictions would not change possible structural problems in the market such as limited competition. When competition prevails, also the specification that a platform monopolistically sets the contractual terms would no longer be valid. Even when platforms can unilaterally stipulate participation fees, when they do not sufficiently control access to investors, as these regard different platforms as close substitutes or even use several platforms simultaneously, then they also have very little scope to extract profits from funds.

'Shelf fees'

Recall that our analysis only allowed for two contractual components of platform-fund charges, W and w. In particular, any other 'non-linear' pricing schemes, such as quantity discounts, were not allowed. The presence of such schemes would clearly change results fundamentally as then a prohibition of 'shelf fees' ($W = 0$) would **not** alter platforms' ability to extract rent. In principle, the platform may also have other means at its disposal, e.g., to require payment for certain services. In this case the prohibition of certain charges may push up other charges, but possibly at a reduction of efficiency, as 'shifting rents' through other channels is less efficient.

These conclusions apply rather generally, and they are also encountered in academic and policy work on the regulation of wholesale-retail contractual arrangements (e.g., so as to curb 'buyer power'). Generally speaking, regulating the 'contractual form' may lead to a loss of efficiency, but it may not alter the 'balance of power' in the respective business relation. This conclusion holds in particular when, somewhat in contrast to the sketched model, contracts are determined bilaterally through negotiations, instead of being set unilaterally and inflexibly by one side. Our preceding sketch on the impact of regulating fixed (shelf) fees has also focused on a monopolistic platform.

Further, also competition between platforms would clearly reduce the scope to extract profits from funds. Importantly, the degree of competition should depend not only on the number of platforms that are in competition, but more importantly on the degree to which they can differentiate themselves and thereby attract customers or their advisers. In the literature on platforms and two-sided markets (cf. our discussion above), a common terminology that is used in this respect is that of 'single-homing' or 'multi-homing'. If customers were to hold assets across different platforms ('multi-homing'), competition for each new investment would be intensified. Instead, when there is 'single-homing' of customers, i.e., when a customer only purchases through a single platform, after joining a platform customers will rarely switch. While this turns a platform, to some extent, into a 'gatekeeper' with respect to particular customers, by itself this should not undermine competition, as long as customers (or their advisers) still make an informed choice before joining a platform. In particular, to the extent that this choice depends also on the availability of particular (low-fee) funds on a platform, such 'gatekeeping' may not by itself shift market power away from funds to platforms.

5 Irrelevance of platform-customer charges in the baseline case

The preceding discussion showed that, at least in the baseline model, regulating only the linear platform-fund charges, (i.e., w_m^n in the most general case) would have no economic impact. Our discussion immediately suggests that this holds equally when we consider regulation of platform-customer charges — e.g., by requiring that any or all p_m^n should take on a particular value (e.g., zero). The reasoning is once again the same. One of the three charges (w_m^n, p_m^n, f_m^n) is always superfluous. We illustrate this with the case of linear demand.

Illustration: one platform, one fund

We take the simplest case first and specify linear demand $q = 1 - r$, where $r = p + f$. We also choose a particular 'game form' of how charges are determined in equilibrium. Precisely, we first let the platform choose its two charges, p and w, while the fund sets its fee f. Hence, in the second and last stage, the fund maximises $\Pi_F = (f - w - k_F)q$, which yields the first-order condition

$$f = \frac{1 + k_F + w - p}{2}.$$

Note that, ceteris paribus, the fund's pass-through rate of a change in w will be one half. However, as we already noted and will now confirm, when the platform obtains a higher charge w, its own charge to consumers p will also optimally adjust. Overall, the pass-through will again be just one: $df = dw$.

To see this, in the first stage, the platform maximises, given linear demand,

$$\Pi_P = (p + w - k_P)q(r) = (1 - p - w - k_F)(p + w - k_P)/2,$$

from which we obtain

$$w + p = \frac{1 + k_P - k_F}{2}.$$

Hence, only the sum $w + p$ is uniquely pinned down.

Regulation by setting **either** $p = 0$ *or* $w = 0$ would, thus, not matter. For instance, starting from an equilibrium where $p > 0$ and $w > 0$, requiring that $p = 0$ would push up w by the same amount: $dw = dp$. It would also increase f by the same amount, albeit leaving consumers' total charge, $r = p + f$, unchanged. Consumers will now pay, in equilibrium,

$$f + p = \frac{3 + k_P + k_F}{4},$$

irrespective of regulation.

Extension of the illustration: competition between platforms

For further illustration, we briefly extend the linear example to the case where two platforms compete, with respective linear demand

$$\begin{aligned} q_1 &= 1 - r_1 + br_2, \\ q_2 &= a - r_2 + br_1. \end{aligned}$$

The parameter a allows us to model possible asymmetric demand, although this soon will not be relevant. The parameter $b < 1$ captures the degree of substitutability between platforms. Given how charges are determined in the chosen game, in the second stage, the fund maximises with respect to f_m its total profit $\Pi_F = \sum_{m=1,2} (f_m - w_m - k_F)\, q_m$, which from linear demand obtains

$$\begin{aligned} f_1 &= \frac{1 + ab + (1 - b^2)(k_F - p_1 + w_1)}{2(1 - b)}, \\ f_2 &= \frac{a + b + (1 - b^2)(k_F - p_1 + w_1)}{2(1 - b)}. \end{aligned}$$

(Note that the fund takes into account the 'cannibalisation' across the two platforms.) In the first stage, each platform maximises its profit. With linear demand, we obtain for platform $m = 1$ the profits

$$\begin{aligned} \Pi_{P1} &= (p_1 + w_1 - k_P)q_1 \\ &= [1 - p_1 - w_1 - k_F(1 - b) + b(p_2 + w_2)](p + w_1 - k_P)/2, \end{aligned}$$

where we substituted for f_1. We obtain a similar expression for Π_{P2} which is not reported for the sake of brevity. Solving first-order conditions for both platforms yields

$$\begin{aligned} w_1 + p_1 &= \frac{2 + ab + k_P(2 + b) - k_F(2 - b - b^2)}{4 - b^2}, \\ w_2 + p_2 &= \frac{2a + b + k_P(2 + b) - k_F(2 - b - b^2)}{4 - b^2}, \end{aligned}$$

which illustrates once more that for each platform, only the total charge that it raises, $w_m + p_m$ and not the different charges to funds and consumers—is pinned down uniquely.

Extension: non-linear charges

Recall that we previously introduced the possibility that firms can raise non-linear charges. For the platform, we allowed for a pair (p, P), where P could represent a fixed 'membership fee'. Regulation of one component — say, the per-unit charge p — may now affect the equilibrium membership fee. This is, however, not the case in our baseline model. Intuitively, this follows simply from the 'irrelevance' of p. When this is regulated, the platform flexibly adjusts w. Consequently, as a regulation of p alone does not affect profits and the consumer's total (per-unit) charge r, the (maximum) fixed fee P also remains unchanged. There is no 'waterbed effect' in the two components.

More formally, recall that with such a two-part tariff (p, P), we argued above that $p = k_P + w$ was set equal to the platform's opportunity cost, which includes the platform-fund charge w. Recall also that, at least in the model with a single platform and a representative consumer, P was obtained from the representative consumer's utility, which depends on r alone. (In fact, without platform competition, P was set to extract **all** of the representative consumer's utility.) Thus, while the requirement $p = 0$ may change w, the prevailing fund-consumer charge, r and, therefore, P are left unchanged. Finally, note that the same conclusion would prevail when p was left unregulated, while the platform-fund charge was regulated — e.g., to $w = 0$. There would again be no 'waterbed effect' on the fixed part P.

6 Regulating all platform charges simultaneously in the baseline model

Using the baseline model, the preceding sections looked at the cases where **either** the platform-fund charge **or** the platform-consumer charge was regulated. The key and robust message is that this should have no implications unless we introduce additional 'constraints' (which is done in the Section 7, where we consider contractual limits to price discrimination as one such constraint).

In this section, we consider, instead, regulation that would at the same time target *all* charges that the platform can raise. Intuitively, our 'irrelevance' result would generally no longer apply, as the flexibility of charges is too constrained. What, then, are the economic implications?

Precisely put, we require that a platform can charge 'per-unit' (of investment) charges to funds and consumers, but that this can not depend on the identity of funds (or consumers). In this case, negotiating individual rebates on a fund-by-fund basis and passing some of this on to consumers would not be feasible. Formally, in a world with a single platform and many funds, regulation would require that $w^n = w$ and $p^n = p$. (Recall again that we use superscripts to denote the 'upstream' funds.)

No regulation benchmark

It seems, at this stage, more instructive to use the illustration with linear demand. Consider one platform and two funds with the respective demands for funds

$$\begin{aligned} q^1 &= 1 - r^1 + br^2, \\ q^2 &= a - r^2 + br^1, \end{aligned}$$

with $b < 1$. Each fund maximises with respect to f^n its profit $\Pi_{Fn} = (f^n - w^n - k_F)q^n$, which obtains from the first-order conditions

$$\begin{aligned} f^1 &= \frac{2(1 + k_F - p^1 + w^1) + b(a + k_F + p^2 + w^2) + b^2 p^1}{4 - b^2}, \\ f^2 &= \frac{2(a + k_F - p^2 + w^2) + b(1 + k_F + p^1 + w^1) + b^2 p^2}{4 - b^2}. \end{aligned} \tag{6}$$

In the first stage, the platform maximises its total profit, which, without regulation, when we solve for values p^n, yields

$$\begin{aligned} p^1 + w^1 &= \frac{1 + ab}{2(1 - b)^2} + \frac{k_P - k_F}{2}, \\ p^2 + w^2 &= \frac{a + b}{2(1 - b)^2} + \frac{k_P - k_F}{2}. \end{aligned}$$

The total price for the consumer is, once again, independent of the respective choices of w^n and p^n, provided that the sum remains the same. Without regulation, we obtain finally, from substituting the obtained values into f^n, that

$$\begin{aligned} r^1 &= \frac{6 + 5ab - 3b^2 - 2ab^3}{2(1 - b^2)(4 - b^2)} + \frac{k_P + k_F}{2(2 - b)}, \\ r^2 &= \frac{6a + 5b - 3ab^2 - 2b^3}{2(1 - b^2)(4 - b^2)} + \frac{k_P + k_F}{2(2 - b)}. \end{aligned} \tag{7}$$

Notice that $r^2 > r^1$ if $a > 1$: Consumers pay a higher price overall for the fund when demand is less elastic.

Joint regulation of platform charges

Imagine now regulation constrains the platform to setting a single $p^n = p$ and a single $w^n = w$. With regulation, competition between the funds is as before. Thus, optimal fund-consumer charges are still given by (6), albeit with the restriction to $w^n = w$ and $p^n = p$, so that we obtain simplified expressions

$$\begin{aligned} f^1 &= \frac{2(1 + k_F - p + w) + b(a + k_F + p + w) + b^2 p}{4 - b^2}, \\ f^2 &= \frac{2(a + k_F - p + w) + b(1 + k_F + p + w) + b^2 p}{4 - b^2}. \end{aligned}$$

In the first stage, the platform maximises its total profit $\Pi_P = (p + w - k_P)(q^1 + q^2)$. Solving the first-order conditions with respect to p, taking into account that $df^1/dp = df^2/dp = -(2 - b)/(4 - b^2)$, we obtain

$$p + w = \frac{1 + a}{4(1 - b)} + \frac{k_P - k_F}{2}.$$

The total price for the consumer is, once again, independent from the level of w, i.e., only the sum $w + p$ is pinned down uniquely. Substituting for f, we also obtain the respective total charges

$$\begin{aligned} r^1 &= \frac{10 + 2a + 5ab - 7b - 4ab^2}{2(1 - b^2)(4 - b^2)} + \frac{k_P + k_F}{2(2 - b)}, \\ r^2 &= \frac{10a + 2 + 5b - 7ab - 4b^2}{2(1 - b^2)(4 - b^2)} + \frac{k_P + k_F}{2(2 - b)}. \end{aligned} \tag{8}$$

Notice that, when $a < 1$, the less-elastic demand for fund $n = 2$ is still charged a higher total price, as in the case without regulation.

We can now compare (7) with (8) to analyse the impact of regulation. When $a = 1$, as could be expected, regulation has no impact. When $a > 1$, however, regulation increases r^1 and reduces r^2.

Hence, the difference between the respective charges is dampened. The intuition for this is immediate. With homogeneous charges, $w^n = w$ and $p^n = p$, the platform can no longer 'price discriminate'. It is forced to earn the same margin on both funds, regardless of the respective demand elasticity. Though funds can still adjust charges, as seen by $f^2 > f^1$ with and without regulation, this does not compensate for the lack of flexibility of the platform's charges.

That regulation reduces the scope for price discrimination is a recurrent theme in our analysis and the focus of the next section. For now, we postpone a discussion of the implications for welfare and consumer surplus.

7 Limits to customer-specific price discrimination

In what follows, we consider the case where there are practical restrictions to the degree of price discrimination. Specifically, we take the case where the funds' fees can not perfectly practice (third-degree) price discrimination between different investor groups (e.g., by giving volume discounts): Charges are the same in a given 'share class'.

To establish this case, we have, again, a single platform and a single fund, but now there are different consumer groups. Suppose that these groups of consumers can be identified **and** that all charges are flexible. That is, when we consider only a single fund and a single platform, there are now three charges (w_i, f_i, p_i) for each consumer type $i = 1, ..., I$. (Note that by using subscripts to now denote consumer types, we somewhat abuse our previous notation.)

For each consumer type, we can, in general, derive its demand from some specific utility function. All that we need for our subsequent analysis is that this gives rise to individual demand functions $q_i(r_i)$ with $r_i = f_i + p_i$. Note, in particular, that in the presence of third-degree price discrimination, the demand for consumer group i does not depend on the prices set to other consumer groups. As is immediate from our previous observations, when there are no further restrictions on the charges (p_i, f_i), the choice of platform-fund charges w_i is irrelevant for the market outcome.

Throughout this section, we suppose, instead, that for the considered groups of consumers, the fund can not charge separate fees: $f_i = f$. Such a restriction could arise, for instance, due to the costs of having multiple 'share classes', so the fees $f_i = f$ have to be homogeneous for all consumers in some segment. When, at the same time, $p_i = p$ and $w_i = w$, then it is immediate that our previous results on the 'irrelevance' of the structure of charges fully hold. Formally, this can be seen when we simply aggregate total demand and apply our previous equations without change. In the following subsection, we stipulate that while the fund's charge (in one 'share class') can not be adjusted, the platform could be if practicing price discrimination were not prohibited by regulation (on rebates).

7.1 Price discrimination on a platform

In our main case, we allow the platform to charge consumer-specific charges p_i. However, we suppose that in a given share class, it is also not feasible to stipulate such 'individualised' (i.e., consumer specific!) platform-fund charges, so there is a single w when only one fund is present. (See the end of this section for the alternative case; and note that when different rebates are negotiated by different platforms, as in the following sections, then clearly the alternative is more relevant.)

From the platform's profits

$$\Pi_P = \sum_{i=1}^{I} (p_i + w - k_P) q_i(r_i),$$

we have for each platform-consumer price p_i, by the first-order condition

$$p_i + w - k_P = -\frac{q_i}{q_i'}, \tag{9}$$

which corresponds to condition (4) in our baseline analysis. In particular, if $r_i = p_i + f_i$ were to stay unchanged, there would be a one-by-one pass-through of the platform-fund charge: $dp_i = -dw$. However, the difference from the baseline analysis comes from the optimisation problem of the fund, which chooses the **single** fee f to maximise

$$\Pi_F = \sum_{i=1}^{I} (f - w - k_F) q_i(r_i).$$

The first-order condition for the fund becomes

$$\sum_{i=1}^{I} \left[(f - w - k_F) q_i' + q_i \right] = 0. \tag{10}$$

As we also use that $w_i = w$, this yields, without regulation,

$$f - w - k_F = -\frac{\sum_{i=1}^{I} q_i}{\sum_{i=1}^{I} q_i'}.$$

Regulating the platform-fund charge

Suppose that there were a restriction on the platform-fund charge — e.g., to $w = 0$. Again, this has no economic implications in the present scenario. The key observation behind this is that when r_i stays unchanged, there is, once again, a one-by-one pass-through: $df = dw$. Thus, even when fund charges can not discriminate between different consumers, $f_i = f$, the level of the single platform-fund charge is irrelevant. (In the Appendix (Section 9.1), we show, for completeness, that the same 'irrelevance' result would obtain when we allowed f_i to differ but when $p_i = p$ in addition to $w_i = w$.)

We now provide an illustration with linear demand and two consumer groups where $q_1 = 1 - r_1$ and $q_2 = a - r_2$. Recall, also, that to fully pin down equilibrium profits and charges, we consider a two-stage game where first the platform sets its charges.

Thus, in the last stage, the fund maximises $\Pi_F = \sum_{i=1}^{2}(f - w - k_F)q_i$, which obtains

$$f = \frac{1 + a + 2k_F + 2w - p_1 - p_2}{4}.$$

In the first stage, without regulation, the platform maximises its profits with respect to p_i and w

$$\begin{aligned} \Pi_P &= \sum_{i=1}^{2}(p_i + w - k_P)q_i \\ &= (3 - a - 3p_1 + p_2 - 2w - 2k_F)(p_1 + w - k_P)/4 \\ &\quad +(3a - 1 - 3p_2 + p_1 - 2w - 2k_F)(p_2 + w - k_P)/4, \end{aligned}$$

where we have already substituted for f. The outcome again pins down only the margins

$$\begin{aligned} w + p_1 &= \frac{1 + k_P - k_F}{2}, \\ w + p_2 &= \frac{a + k_P - k_F}{2}. \end{aligned}$$

Hence, regulation of the level of w, including $w = 0$, has no implications. Consumers always end up paying

$$\begin{aligned} f_1 + p_1 &= \frac{5 + a + 2k_P + 2k_F}{8} \\ f_2 + p_2 &= \frac{1 + 5a + 2k_P + 2k_F}{8} \end{aligned}$$

whether or not the platform-fund w was set to zero.

Regulating platform-consumer charges: limits to price-discrimination

Consider the case where regulation would require that $p_i = p$. That is, the platform would no longer be allowed to adjust its charge to consumers (or, likewise, to make different rebates to different consumers for the same fund and share class).

Taking, again, the case of linear demand, at the first stage, the platform now chooses p and w to maximise

$$\Pi_P = \sum_{i=1}^{2}(p+w-k_P)q_i = (1+a-2p-2w-2k_F)(p+w-k_P)/2.$$

(The last stage, where fees f_i are set, is the same as without regulation.) We obtain from the platform's first-order condition

$$p+w = \frac{1+a+2k_P-2k_F}{4}.$$

(Note that regulation of the level of w, including $w=0$, is once again irrelevant for the platform.) Consumers, when regulation allows only a single charge $p_i = p$, end up paying a total price that is independent from w[9]

$$f+p = \frac{3+3a+2k_P+2k_F}{8}.$$

Regulation now limits the possibility to practice (third-degree price discrimination). For the fund, this possibility was excluded by assumption ('one share class'); for the platform, this possibility is ruled out by regulation, which prescribes that $p_i = p$. When $a > 1$, so that demand of consumer group 2 is less elastic, these consumers gain from regulation, as it shields them from being charged higher prices. Consumers with more-elastic demand, however, have to pay a higher price.

Turning to welfare and consumer surplus, without regulation, we obtain for the consumer surplus CS_i of type $i = 1,2$

$$\begin{aligned} CS_1 &= \frac{(3-a-2k_P-2k_F)^2}{128}, \\ CS_2 &= \frac{(3a-1-2k_P-2k_F)^2}{128}, \end{aligned}$$

[9] Note that when $p=0$, the platform still has a price to set, namely w, to maximize $\Pi_P = \sum_{i=1}^{2}(w-k_P)q_i = (1+a-2w-2k_F)(w-k_P)/2$. We get the same total margin as before:

$$w = \frac{1+a+2k_P-2k_F}{4}.$$

And consumers still end up paying

$$f+p = f = \frac{3+3a+2k_P+2k_F}{8}.$$

while firms' profits are

$$\begin{aligned}\Pi_P &= \frac{(1-k_P-k_F)(3-a-2k_P-2k_F)}{16} + \frac{(a-k_P-k_F)(3a-1-2k_P-2k_F)}{16},\\ \Pi_F &= \frac{(1+a-2k_P-2k_F)^2}{32}.\end{aligned}$$

When we impose uniformity of fund-consumer charges $p_i = p$ (or, in particular, $p = 0$), we obtain

$$\begin{aligned}CS_1 &= \frac{(5-3a-2k_P-2k_F)^2}{128},\\ CS_2 &= \frac{(5a-3-2k_P-2k_F)^2}{128}\end{aligned}$$

and

$$\begin{aligned}\Pi_P &= \frac{(1+a-2k_P-2k_F)^2}{16},\\ \Pi_F &= \frac{(1+a-2k_P-2k_F)^2}{32}.\end{aligned}$$

Clearly, when $a > 1$, customer 2 gains from uniformity, and customer 1 loses. (Note that this is immediate from comparing the respective prices.) The platform loses as it now has restricted ability to set prices. Aggregate quantity does not change. The latter result is, however, a particular feature of linear demand and does not hold generally. Holding aggregate demand constant, imposing 'uniformity' $p_i = p$ has the benefit of a better 'reallocation' of quantities from the weak (more elastic) to the strong (less elastic) market, which results in an increase of welfare (the sum of all consumer surplus and all profits). Note, also, that with linear demand, as quantities do not change in aggregate, and margins also do not vary, the fund neither gains nor loses. As we already noted, however, these insights are specific to the case with linear demand.

Limits to third-degree price discrimination: general remarks

Much research has been devoted to analysing the implications of prohibiting discriminatory pricing.[10] Typically, a profit-maximising monopolist would want to charge the low-demand-elasticity customer group a higher price than the high-demand-elasticity group. If, instead, the monopolist has to charge a single uniform price, under standard conditions, this price would lie between the two discriminatory prices. In her seminal work, Robinson

[10] For authorative overviews, see Varian (1989) and, more recently, Armstrong (2007) and Stole (2007).

(1933) defines the market that is charged more (less) under price discrimination than under uniform pricing as 'strong' ('weak'). For instance, with a simple linear demand function, the 'strong' buyer would be the larger buyer with a higher vertical intercept. When all demand functions are linear and all markets are served at the non-discriminatory price, the welfare effect of discrimination is negative since total output remains at the nondiscrimination level, and the given output is inefficiently distributed between consumers because they face different relative prices. Varian (1985) shows that, generally, a necessary condition for welfare to rise with discrimination is that total output with discrimination exceeds the no-discrimination level.

These results apply when buyers cannot turn to alternative sellers — i.e., they have no 'outside options'. It is only then that the supplier can act as an unconstrained monopolist. In contrast, Inderst and Valletti (2009a, b) recognise the possibility of demand-side substitution: buyers facing a high price in their market may want to switch to an alternative supplier. Although the (incumbent) seller is no longer perfectly unconstrained, the prevailing price may still lie substantially above the seller's marginal costs. Therefore, price discrimination still has welfare effects. However, we find that the implications of imposing uniform pricing are different from those in the more standard model, in which the seller is an unconstrained monopolist.

We provide a short discussion of the effects in Inderst and Valletti (2009a, b) in the Appendix (Section 9.2). Taken together, the often ambiguous results in the 'standard' literature and the very different results that are obtained when one modifies assumptions suggest that the welfare implications of restricting price discrimination between customer groups on a given platform are hard to predict.

Discriminatory platform-fund fees $w_i \neq w_j$

Unlike in the previous analysis, to complete this section we now allow the platform-fund charges w_i to vary when unregulated, though still $f_i = f$. One difference from the previous analysis is that without regulation, (9) becomes

$$p_i + w_i - k_P = -\frac{q_i}{q_i'}.$$

However, this is inconsequential. The key difference is that (10) now becomes

$$\sum_{i=1}^{I} [(f - w_i - k_F)q_i' + q_i] = 0, \tag{11}$$

which can no longer be written as a pass-through formula.

As a consequence of this observation, requiring that the platform-fund charge be zero, $w_i = w$, and, thus, also homogeneous, would now **have** an economic impact. Specifically, going back to (11), when **any** charge w_i changes, then **all** prices, including total prices to customers $r_i = p_i + f$, change. Intuitively, this is the case, as the platform has more flexibility to pass-through this change, namely through the individual prices p_i, while the fund has only a single price f to pass this through. (In contrast, in our previous analysis, the change in the by-assumption homogeneous platform-fund charge $w_i = w$ affected all prices in the same way.)

We illustrate this case with linear calculations and, again, two consumer groups. Take $q_1 = 1 - p_1$ and $q_2 = a - p_2$, for which we obtain from the respective first-order conditions

$$\begin{aligned} r_1 &= p_1 + f = \frac{7 + a + 3(w_2 - w_1)}{12} + \frac{k_P + k_F}{3}, \\ r_2 &= p_2 + f = \frac{7a + 1 + 3(w_1 - w_2)}{12} + \frac{k_P + k_F}{3}, \end{aligned}$$

or, taking the difference:

$$r_1 - r_2 = \frac{1 - a}{2} - \frac{w_1 - w_2}{2}.$$

It can be seen from this that, leaving aside differences in prices arising from differences in the strength of demand as described by the parameter a, it is $r_1 > r_2$ when $w_1 < w_2$.[11]

Imagine, now, that in the first stage, the platform must set $p_i = p$. Then, $\Pi_P = \sum_{i=1}^{2}(p + w_i - k_P)q_i$. We get

$$p = \frac{1 + a + 2k_P - 2k_F}{4} - \frac{w_1 + w_2}{2}.$$

Hence, regulation of the level of w is irrelevant for the customers, as they always end up paying

$$f + p = \frac{3 + 3a + 2k_P + 2k_F}{8}$$

whether or not the platform-fund fees w_i are set at zero. However, notice again the effects of third-degree price discrimination, as discussed previously: Consumer 2 gains from uniformity when $a > 1$, and the opposite is true for consumer 1.

[11] Notice here the typical result that the "stronger" market is charged more under third-degree price discrimination (this can be seen from the first term when $a < 1$, in which case consumer type 1 is the stronger market and ends up paying relatively more than consumer type 2). This result is not realistic in some cases, as we get no volume discount for the stronger market—rather, the opposite. Cf., also, the discussion of Inderst and Valletti (2009) in Section 9.2 below.

7.2 Price discrimination across platforms

In this section, we analyse the possibility that **different** platforms may negotiate different charges with the **same** fund. For the sake of simplicity we only consider a single fund that is now, however, sold through different platforms.

Note that we still restrict consideration to a given investment (share class), requiring, again, that the fund's fee is the same, regardless of the platform through which it is bought. To emphasise that we now consider different platforms, use the subscript $m = 1, ..., M$, so that the platform's charges to customers are p_m, while their individually negotiated platform-fund charges are w_m. We have, instead, that $f_m = f$. (In other words, w_m and p_m capture the 'rebates' that different platforms negotiate, as well as how these are potentially passed on to consumers.) Demand at each platform is given by $q_m(\mathbf{r})$, whereas, previously, $\mathbf{r} = (r_1, ..., r_M)$ with $r_m = f + p_m$.

Relevance of platform-fund charges

We once again ask whether the market outcome is at all affected by the choice of w_m. Recall, also, that to answer this question, the issue of how the platforms and the fund 'pass-through' changes in w_m are key.

To determine the level of pass-through in the present case, where the fund's flexibility of charges is restricted, we have for each platform's first-order condition with respect to p_m the, by now, well-known expression

$$p_m + w_m - k_{Pm} = -\frac{q_m}{dq_m/dr_m}.$$

Instead, the fund, as it is sold through all platforms, sets f to maximise profits

$$\Pi_F = \sum_{m=1}^{M} (f - w_m - k_{Fm}) \, q_m,$$

so that the first-order condition becomes

$$\sum_{m=1}^{M} \left[(f - w_m - k_{Fm}) \left(\sum_{m'=1}^{M} \frac{dq_m}{dr_{m'}} \right) + q_m \right] = 0. \tag{12}$$

Note that this includes all cross-price effects — i.e., how demand at each platform m is affected as the price at all platforms changes by df.

Our first observation is that the level of platform-fund charges is again irrelevant. To see this, set $w_m = w$. If all total prices faced by consumers, r_m, stay unchanged when

$dw \neq 0$, as there is a one-by-one pass-through with $df = dw$ and $dr_m = -dw$, then from the platforms' first-order condition, this is, once again, immediately verified. Setting $w_m = w$ and, thus, $dw_m = dw$, we can also verify from (12) the fund's pass-through $df = dw$, as the first-order condition continues to hold. Hence, we have, once more, that the level of platform-fund charges is irrelevant. But, as also observed previously when considering price discrimination between customers on a given platform, the 'irrelevance result' no longer applies when **different** platform-fund charges can be set.

We illustrate this once again with $M = 2$ platforms and linear demand. We then provide some general intuition. Recall that we use the simple linear specification with $q_1 = 1 - r_1 + br_2$ and $q_2 = a - r_2 + br_1$, where $b < 1$ denotes a parameter of substitution between platforms. We simplify expressions by specifying symmetric costs, $k_{Pm} = k_P$ and $k_{Fm} = k_F$, so that the first-order conditions for both platforms become

$$\begin{aligned} p_1 + w_1 - k_P &= 1 - r_1 + br_2, \\ p_2 + w_2 - k_P &= a - r_2 + br_1, \end{aligned}$$

while that for the fund becomes

$$(f - w_1 - k_F)(b - 1) + (1 - r_1 + br_2) + (f - w_2 - k_F)(b - 1) + (a - r_2 + br_1) = 0.$$

Some straightforward algebra allows us to calculate, for given w_m, the respective equilibrium prices. For our purpose it is, however, sufficient to report how the customer's total price changes in w_m. We have

$$\begin{aligned} \frac{dr_m}{dw_m} &= -\frac{1}{2}\frac{1}{2+b}, \\ \frac{dr_m}{dw_{m'}} &= \frac{1}{2}\frac{1}{2+b}. \end{aligned}$$

The economic intuition for this is immediate. When only w_m increases, the platform will, all else constant, pass this through one-by-one, thereby lowering the respective price p_m by the same amount. (Of course, not all stays constant in equilibrium, particularly the total prices r_m.) However, the fund's pass-through is different, as the change in f affects demand at **all** platforms. (That is, when the fund wants to regain margins if one charge w_m increases, it would have to increase its fee to all customers in the given share class.) This dampens the pass-through of the fund, so that dw_m does **not** result, again ceteris paribus, in an equally strong increase of f.[12]

As a consequence, an increase in the platform-fund charge at platform w_m would **decrease** the total price that customers pay at this platform. (Note, however, that this hinges crucially on the fact that the platform can pass-through this advantage.)

The linear example allows us to go one step further. We obtain

$$\frac{dp_m}{dw_m} = -\frac{1}{2}\frac{3+b}{2+b},$$

while always $\frac{df}{dw_m} = \frac{1}{2}$. And for the other platform m', we obtain

$$\frac{dp_{m'}}{dw_m} = -\frac{1}{2}\frac{1+b}{2+b},$$

which is a response **both** to the change in f, which reduces demand, and to the change in p_m, which increases demand when $b > 0$.

Restricting platform-fund charges

Suppose now that there were regulation of platform-fund charges. Specifically, we set $w_m = w$ (and possibly $w = 0$) for all platforms. As we explore next, the insights are now analogous to those of banning platform-consumer price discrimination ($p_i = p$) in the previous case, with one platform but different consumer groups at a single platform.

It is more illustrative to make this case by taking a different game form than previously: Now, the fund starts by setting its single fund-consumer fee f, together with 'proposing' (in case of no regulation) specific fund-platform charges w_m.[13] Then, platforms react by setting p_m (i.e., what fraction of a possible 'rebate' to pass on).

Again, platforms differ in how elastic their demand is — e.g., as one platform has managed (possibly through its services to the respective advisers) to achieve a higher 'captive base' of investors. Without regulation, the fund pays a higher charge w_m to the platform that faces a more elastic demand, say $m = 1$. The respective platform then passes this through into a lower p_m, so that customers at a platform with more-elastic demand end up paying a lower overall charge for their investment: $f + p_1 < f + p_2$. We have already seen this pricing structure, which in the current setting is intuitive. We can now put it

[12] This mirrors, of course, our previous observations for the case of price discrimination between customers on a given platform.

[13] The setting where the fund chooses w_m in anticipation of the subsequent (pass-on) choices p_m by platforms resembles that used in the vertical-contracting literature, to which we briefly referred to above.

somewhat differently, in the language of the 'vertical contracting' literature. Anticipating platforms' own optimal choice of charges (or pass-through rates), for the fund, demand at each platform is 'derived'. Note that, at $m = 1$, this 'derived demand' is more elastic as final demand is more elastic. This makes it optimal for the fund to pay this platform a higher charge $w_1 > w_2$.

Now, consider regulation that would no longer allow platform-fund charges, so that necessarily, $w_m = w = 0$. This imposes homogeneity across charges and, thus, no longer allows the fund to price discriminate between platforms. Though this affects consumers at the two platforms only indirectly, namely through the pass-through of different w_m into different charges p_m, the general implications are the same as those discussed above, where we considered prohibiting price discrimination by a single platform ($p_m = p$). Regulation reduces the total charge paid by customers in the less-elastic market, but it increases the price in the more-elastic market — just as with prohibiting third-degree price discrimination across different customer groups. The implications for consumer surplus and welfare are again ambiguous in general.

With linear demand $q_1 = 1 - r_1 + br_2$ and $q_2 = a - r_2 + br_1$, as well as symmetric costs $k_{Pm} = k_P$ and $k_{Fm} = k_F$, we have now for the second stage the first-order conditions for p_m:

$$\begin{aligned} p_1 + w_1 - k_P &= 1 - r_1 + br_2, \\ p_2 + w_2 - k_P &= a - r_2 + br_1. \end{aligned} \tag{13}$$

For the case without regulation, we allow the fund to specify (f, w_1, w_2) so as to maximise

$$\Pi_F = \sum_{m=1,2} (f - w_m - k_F)\, q_m(r_m, r_{m'}).$$

We solve a two-stage game. In the last stage, the platforms choose their prices p_i by solving (13), and obtaining

$$\begin{aligned} p_1 &= \frac{2 + ab - (2 - b - b^2)f + (2 + b)k_P - 2w_1 - bw_2}{4 - b^2}, \\ p_2 &= \frac{2a + b - (2 - b - b^2)f + (2 + b)k_P - 2w_1 - bw_2}{4 - b^2}. \end{aligned}$$

These prices are substituted back into Π_F, which is then maximised with respect to w_1 and w_2 in the first stage. This maximisation gets to the following equilibrium margins for the fund

$$\begin{aligned} f - w_1 &= \frac{1+ab}{2(1-b^2)} + \frac{k_P - k_F}{2}, \\ f - w_2 &= \frac{a+b}{2(1-b^2)} + \frac{k_P - k_F}{2}, \end{aligned}$$

from which we have that

$$w_1 - w_2 = -\frac{1-a}{2(1+b)}.$$

That is, the fund pays relatively less to the larger platform ($a > 1$). (Note, also, that there is again one degree of freedom too much, as the equilibrium does not pin down a unique choice (f, w_1, w_2), but only the respective overall 'level', together with the difference in charges w_m.)

The total price paid by consumers is, respectively,

$$\begin{aligned} r_1 &= p_1 + f = \frac{6 + 5ab - 3b^2 - 2ab^3}{2(1-b^2)(4-b^2)} + \frac{k_P + k_F}{2(2-b)} \equiv r_1^{no}, \\ r_2 &= p_2 + f = \frac{6 + 5ab - 3ab^2 - 2b^3}{2(1-b^2)(4-b^2)} + \frac{k_P + k_F}{2(2-b)} \equiv r_2^{no}, \end{aligned} \tag{14}$$

and we have that $r_1 < r_2$ iff $a > 1$.

For the case with regulation, the last stage is unaffected. In the first stage, though, the fund is restricted to setting (f, w), and we get the following equilibrium margin for the fund

$$f - w = \frac{1+a}{4(1-b)} + \frac{k_P - k_F}{2}.$$

The total prices paid by consumers are, respectively,

$$\begin{aligned} r_1 &= p_1 + f = \frac{10 - 7b + 2a + ab(5-4b)}{4(1-b^2)(4-b^2)} \equiv r_1^{reg}, \\ r_2 &= p_2 + f = \frac{10a - 7ab + 2 + b(5-4b)}{2(1-b^2)(4-b^2)} \equiv r_2^{reg}, \end{aligned} \tag{15}$$

and we have again that $r_1^{reg} < r_2^{reg}$ iff $a > 1$.

What is of interest now is to compare the total prices without regulation given by (14) with those we have just obtained under regulation, given by (15). We have

$$\begin{aligned} r_1^{reg} - r_1^{no} &= \frac{a-1}{4(2+b)(1+b)}, \\ r_2^{reg} - r_2^{no} &= -\frac{a-1}{4(2+b)(1+b)}. \end{aligned}$$

This confirms with linear demand that, with $a > 1$, so that $m = 2$ is less elastic, $p_2 + f = r_2$ goes down under regulation, but the opposite holds for $m = 1$, as $p_1 + f = r_1$ goes up.

Relevance of platform-consumer charges

Consider now, the regulation of each platform's charge to consumers (or its rebate): $p_m = p$. Recall that we consider competition between platforms. And recall that we have, by assumption, ruled out that the fund can price discriminate between consumers on the two platforms: $f_m = f$ (one share class). In other words, the fund can not (continuously) affect, through its management fee, how demand shifts between the two platforms. Or, put differently, its only way to directly steer demand from one platform to the other would be to no longer be present on one platform. The fund could, however, indirectly affect how demand shifts from one platform to the other, namely by negotiating different platform-fund fees, w_m, thereby providing platforms with an incentive to pass on these changes to consumers, through adjusting p_m. But when such 'rebates' are no longer allowed, so that $p_m = p$ (or even $p = 0$), this channel is also closed. From this perspective, **given** the restriction $f_m = f$, prohibiting fund-customer price discrimination may weaken competition.

We can also look at the implications from restricting $p_m = p$ somewhat differently. When a single platform demands a higher platform-fund charge w_m, then given $f_m = f$, the fund can no longer pass this through only 'locally'. An increase in f also affects demand at the other platform and is, therefore, dampened. (In fact, the simultaneous increase of f at the other platform shields the first platform from a loss in demand **to** its competitor.) When p_m is flexible, the platform will, however, be more aggressive, as its margin has increased, and lower p_m. But this channel does not exist when $p_m = 0$ is no longer a strategic variable.

8 Concluding remarks

The preceding analysis considered a stylised model of the market for selling retail investment products over platforms. In our baseline case, we allowed charges between all three parties (platforms, funds, consumers) to vary flexibly. Practically speaking, this case should comprise two elements. First, in the absence of regulation, platforms can negotiate specific rebates and pass these on to consumers. Second, funds and platforms have the same scope to price discriminate between different investors — i.e., there are no specific restrictions such as those that we discussed in relation to the existence of different share classes.

In the most basic 'baseline scenario', we showed that regulating either platform-customer or platform-fund charges (i.e., the respective rebates) has no economic effect. (Note that consequently only one such restriction applies.) Intuitively, this is the case as in this flexible environment, one charge is always superfluous. (As a side result, without regulation, the same economic outcome, in terms of margins and the total price paid by consumers, can be obtained with different charge structures — e.g., with and without rebates to consumers).

This result stands in marked contrast to the presumptions and outcome in 'standard' two-sided (platform) Industrial Organization models, which have become prominent over the last decade. As we discussed, the pricing structure in these models with externalities is typically far less rich—e.g., as there is no charge between sellers (i.e., funds) and consumers that is set up-front. Our strong results obtained in the baseline analysis are, however, also due to specific assumptions that are made there. This is why we also analysed different scenarios where regulating platform charges would matter.

The first scenario considers the simultaneous regulation of **both** platform-fund and platform-consumer charges. In particular, regulation may require that charges do not vary between different funds sold over the same platform. We showed that this regulation restricts the scope for price discrimination, raising total charges for funds where demand is more elastic and reducing total charges for funds where demand is less elastic. In a second scenario, we considered the case where a fund's scope for price discrimination was restricted a priori — e.g., as charges in a share class could not be adjusted, while platform charges were more flexible. In this case, we showed that limiting the platform's scope to practice price discrimination also brings down charges for some consumers but increases charges for other consumers. We further argued that, with competition between platforms, if fund-consumer fees could not adjust flexibly, a regulation that restricts the flexibility of platform-consumer charges might reduce competition.

We also stressed that, when regulation reduces the scope for price discrimination, the implications for both consumer surplus and welfare generally are ambiguous. While for specific cases (cf. our illustrations with linear demand), results can be obtained, the implications usually do not depend on readily available data such as elasticities. (Instead, they are, for instance, related to the 'curvature' of demand functions.)

We also discussed when the regulation of charges may reduce the scope to extract 'rent', which could result in higher efficiency. For instance, prohibiting 'shelf fees' could reduce platforms' scope to extract a larger share of total profits. We argued, however, that any such conclusion relies heavily on the assumption that platforms (or, more generally, any party with assumed market power) do not find other means to extract rents and shift profits. In fact, if they find other means and charges, then it may be expected that these allow only for a less efficient transfer of profits, implying that the regulation of contracts would reduce efficiency. Regulating contracts, on the other side, does not change the market structure and, thereby, possible competitive problems.

As discussed in the introductory remarks, we did not separately consider the role of the adviser. In fact, when consumers make advised decisions, we stipulated in our models that advice is given to maximise consumers' utility. We also stipulated that consumers can readily identify their own total charge, irrespective of how it is composed. Otherwise–i.e., when particular charges are more transparent than others—there could be further effects from regulation. Note, however, that this refers only to charges that are directly paid for by consumers. To calculate their own bill, they need not know the size of funds' and platforms' margins and how profits are shared through platform-fund charges.

This would be different when it could be feared that platforms tend to select funds not based on efficiency and consumer benefit, but mainly or only on platform-fund charges. When consumers can calculate their overall benefits before joining a platform, such a strategy would not be in the platform's interest. (For example, when a platform makes it difficult or impossible to buy low-fee (passive) funds, retail investors may either not join or buy them elsewhere, provided that they are aware of these funds. But this would follow when advisers' interests are perfectly aligned with those of customers.) So, for example, an argument why platform-fund charges should be regulated or made more transparent, as they lead to a selection of funds that is not in the consumers' interest, would have to be more subtle. This work has not analysed such an argument.

Some guidance may, however, be taken from recent work. Inderst and Ottaviani (2009a, b) show how customers who rely on advice are exploited through particular contracts when they either simply ignore the presence of incentive conflicts that arise from commissions that are made to intermediary agents or when they naively follow advice. In this case, for instance, the market equilibrium both with and without competition may require retail investors to pay 'indirectly' for advice, namely through commissions that lead to higher fees, even though this then leads to biased advice – in contrast to the case where investors pay directly for advice.

9 Appendix: omitted material

9.1 Only discriminatory fund-customer charges: f_i while $p_i = p$

For completeness, we consider the case where it is now the platform that cannot charge separate fees to consumers, $p_i = p$, while the fund can set, in principle, different prices to different investors $f_i \neq f_j$ (e.g., across share classes). As we will show, this is the mirror case to that considered in Section 3.1.

From the optimisation problem of the fund, which chooses each fee f_i to maximise,

$$\Pi_F = \sum_{i=1}^{I} (f_i - w_i - k_F) q_i(r_i),$$

the first-order condition becomes

$$f_i - w_i - k_F = -\frac{q_i}{q_i'}.$$

Once again, when r_i stays unchanged, there is a one-by-one pass-through of the platform-fund charge: $df_i = dw_i$. From the platform's profits,

$$\Pi_P = \sum_{i=1}^{I} (p + w_i - k_P) q_i(r_i)$$

we now have the first-order condition

$$\sum_{i=1}^{I} [(p + w_i - k_P) q_i' + q_i] = 0.$$

Following exactly the same reasoning as in Section 3.1, if we use that $w_i = w$, this becomes

$$p + w - k_P = -\frac{\sum_{i=1}^{I} q_i}{\sum_{i=1}^{I} q_i'}.$$

Hence, there is once more a one-by-one pass-through: $dp = -dw$. We have the mirror result of fund-consumers' price discrimination: Even when platform charges cannot discriminate between different consumers, $p_i = p$, the platform-fund charge is irrelevant, **provided** also that this charge can not further discriminate: $w_i = w$.

9.2 Third-degree price discrimination: literature discussion

In Inderst and Valletti (2009b), under price discrimination, a stronger buyer receives a strictly lower price than a weaker buyer. This is opposite to those in the standard setting, where the seller can act as an unconstrained monopolist. As a consequence, the stronger buyer obtains quantity discounts in our model. Stronger buyers benefit as their outside option becomes (endogenously) more attractive. The results of Inderst and Valletti (2009a, b) apply to two different circumstances. In one possible application, a customer has to incur costs of locating an alternative seller to the incumbent monopolist. Such costs could be simply costs of search and information acquisition. Buyers locate the same alternative option after spending some fixed cost and find more attractive alternative options by expending more resources. In a second possible application, the outside option could arise from the threat of entry by alternative sellers. In order to serve customers, however, alternative sellers must also spend resources to set up a distribution network in the markets served by the monopolist, which comes at a fixed cost.

Both in terms of positive predictions on which buyer obtains a discount and in terms of welfare implications, the findings of Inderst and Valletti (2009a, b) with a constrained monopolist differ from those when the seller is an unconstrained monopolist. In our work, uniform pricing is beneficial to the weaker buyer, as it allows him to hide behind the stronger buyer. If the seller were unconstrained, as we anticipated above, it is well known that uniform pricing would lead to an 'average' price that lies strictly between the price of the strong and that of the weak buyer in the case of price discrimination. Hence, in the unconstrained case, the imposition of uniform pricing hurts the weak buyer, which is opposite to our findings. In contrast, in our model with outside options, there is no price 'bracketing', and the stronger buyer is not penalised by price discrimination.[14] In our model, uniform pricing unambiguously increases consumer surplus and welfare. Uniform pricing still has better properties than price discrimination, but this is achieved via a very different mechanism. In particular, with an unconstrained seller, the main welfare benefits from imposing uniform pricing are to shift purchases away from weaker buyers, which is, in fact, the opposite of what occurs in our model. A uniform price does not penalise

[14] At first, the intuition for why stronger buyers with larger demand can obtain a discount would seem to be simply that they can spread any fixed cost of switching sellers over a larger number of purchased units. There are "economies of scale" with the outside option, which puts a limit on the maximum per-unit price that the (incumbent) seller can charge. However, the mechanism at work is more subtle since a larger buyer also obtains, for any given price, a greater surplus from the incumbent seller. Inderst and Valletti (2009a, b) show that what matters is the difference between the surplus that can be obtained from the monopolist and the surplus that can be obtained from alternative sellers. Though they are both larger for the stronger than for the weaker buyer, the surplus realized with alternative sellers also ends up being *relatively* larger, which ultimately forces the incumbent seller to offer the strong buyer a discount.

the strong market, but allows the weak market to enjoy a cheaper price, which is strictly welfare-improving.

References

[1] Anderson, Simon and Steven Coate (2005), Market Provision of Broadcasting: A Welfare Analysis, Review of Economic Studies 72, 947-972.

[2] Anderson, Simon and Jean Gabszewicz (2006), The Media and Advertising: A Tale of Two-Sided Markets, in: Victor Ginsburgh and David Throsby (eds.), Handbook of the Economics of Art and Culture, Amsterdam: Elsevier Science.

[3] Argentesi, E. and L. Filistrucchi (2007), Estimating Market Power in a Two-Sided Market: The Case of Newspapers, Journal of Applied Econometrics 22, 1247-1266.

[4] Armstrong, Mark (2006), Competition in Two-Sided Markets, RAND Journal of Economics 37, 668-691.

[5] Armstrong, Mark (2007), Recent Developments in the Economics of Price Discrimination, in R. Blundell, W. Newey and T. Persson (eds), Advances in Economics and Econometrics: Theory and Applications: Ninth World Congress, Cambridge University Press, Cambridge.

[6] Crampes, Claude, Carole Haritchabalet and Bruno Jullien (2009), Advertising, Competition and Entry in Media Industries, Journal of Industrial Economics 57, 7-31.

[7] FSA (DP 2007/01), A Review of Retail Distribution.

[8] FSA (DP 2007/02), Platforms: The Role of Wraps and Fund Supermarkets.

[9] Gabszewicz, Jean, Didier Laussel and Nathalie Sonnac (2004), Programming and Advertising Competition in the Broadcasting Industry, Journal of Economics and Management Strategy 13, 657-669.

[10] Gans, Joshua and Stephen King (2003), The Neutrality of Interchange Fees in Payment Systems, Topics in Economic Analysis and Policy 3, Issue 1, Article 1.

[11] Genakos, Christos and Tommaso Valletti (forthcoming), Testing the 'Waterbed Effect' in Mobile Telephony, Journal of the European Economic Association.

[12] Inderst, Roman (2010), Models of Vertical Contracting, International Journal of Industrial Organization 28, 341-344.

[13] Inderst, Roman and Marco Ottaviani (2009a), How (Not) To Pay for Financial Advice, Mimeo.

[14] Inderst, Roman and Marco Ottaviani (2009b), Sales Talk, Cancellation Terms, and the Role of Consumer Protection, Mimeo.

[15] Inderst, Roman and Greg Shaffer (2009), Market Power, Price Discrimination, and Allocative Efficiency in Intermediate-Goods Markets, RAND Journal of Economics 40, 658-672.

[16] Inderst, Roman and Tommaso Valletti (2009a), Price Discrimination in Input Markets, RAND Journal of Economics, 40, 1-19.

[17] Inderst, Roman, and Tommaso Valletti (2009b), Third-Degree Price Discrimination with Buyer Power, The B.E. Journal of Economic Analysis & Policy, vol. 9, (Contributions), Article 6.

[18] Kaiser, Ulrich and Julian Wright (2006), Price Structure in Two-sided Markets: Evidence from the Magazine Industry, International Journal of Industrial Organization 24, 1-28.

[19] Laffont, J.-J., Rey, P. and Tirole, J. (1998), Network competition II: Price discrimination, RAND Journal of Economics, 29 38-56.

[20] Nocke, V., M. Peitz, and K. Stahl (2007), Platform Ownership, Journal of the European Economic Association 5, 1130-1160.

[21] Peitz, Martin and Tommaso Valletti (2008), Content and Advertising in the Media: Pay-Tv versus Free-to-Air, International Journal of Industrial Organization 26, 949-965.

[22] Robinson, Joan (1933), The Economics of Imperfect Competition, 1950 reprint, Macmillan, London.

[23] Rochet, Jean-Charles and Jean Tirole (2006), Two-Sided Markets: A Progress Report, RAND Journal of Economics 37, 645-667.

[24] Rysman, M. (2004), Competition Between Networks: A Study of the Market for Yellow Pages, Review of Economic Studies 71, 483-512.

[25] Rysman, M. (2009), The Economics of Two-Sided Markets, Journal of Economic Perspectives 23, 125-144.

[26] Stole, Lars (2007), Price Discrimination and Imperfect Competition, in M. Armstrong and R. Porter (eds), Handbook of Industrial Organization: Volume III, North-Holland, Amsterdam.

[27] Varian, Hal (1989), Price Discrimination, in R. Schmalensee and R. Willig (eds) Handbook of Industrial Organization: Volume I, North-Holland, Amsterdam.

The Financial Services Authority
25 The North Colonnade Canary Wharf London E14 5HS
Telephone: +44 (0)20 7066 1000 Fax: +44 (0)20 7066 1099
Website: http://www.fsa.gov.uk

Registered as a Limited Company in England and Wales No. 1920623.
Registered Office as above.