Bookshop, blockbusters and readers' tastes: a new appraisal of the fixed book price

Perona, Mathieu

Paris School of Economics, Sciences-Po Paris

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Bookshops and blockbusters: a model of the book market*

Mathieu Perona†

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Abstract

This paper models the book retail market as a dual market. Consumers choose between competitively retailed, well-identified blockbusters, and going to a monopoly bookshop to find the best match for their tastes. I show that uncertainty about the status on a given title (will it be a blockbuster or not?) places publishers in front of a trade-off between low prices (valuable if they get a blockbuster) and high prices (in the other case). The main effect of this trade-off is a decrease of wholesale prices compared with the case of full information, thus enabling the bookshop to compete with lower-priced blockbusters. Uncertainty thus increases both industry profits and consumer surplus. A fixed book price further increases consumer surplus and profits of non-blockbuster publishers, at the expense of those who get a blockbuster.

Keywords: books, fixed book price

JEL: L11, L42, Z11

1 Introduction

A Fixed Book Price agreement (FBP) amounts to no more than a resale price management of books prices by publishers. However, the FBP has been endowed with such cultural merits that, as Canoy, van der Ploeg, and van Ours (2006) put it, its alleged importance "have reached almost mythical proportions"[1], and is part to any debate in Europe about the cultural properties of books.

The main rationale for FBP is that retailers need fairly large retail margins in order to stock a great number of titles, many of whom will make few or no sales. With blockbusters making up a disproportionately large part of sales, price competition on successful titles eats up retailers profits, and make them unable to bear the cost of a large inventory. This, the argument goes,

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†PhD candidate, Paris School of Economics and Sciences-Po Paris, mathieu.perona@pse.ens.fr.

[1]Canoy, van der Ploeg, and van Ours (2006), p. 743.

would lead bookshops to close down, thus dramatically reducing publishing diversity to the sole blockbusters. By maintaining a dense network of well-stocked bookshops, the FBP is said to preserve a wide array of available titles, without which potential readers would turn away form reading. This policy tool has gained a wide acceptance in the book industry in most countries it concerns (see Rouet (2007)), and even the cartel-wary European Commission allows it as long as it does not cross borders of members States. From a politician point of view, the FBP also has the tremendous advantage of incurring no direct public spending, thus seemingly costless.

Opponents of the FBP argue that in countries without FBP, the book market functions well enough, both in terms of publishing diversity and of reading behaviours. Thus, without a clear market failure, public intervention in the book market is unwarranted, except in funding the production of high-brown titles of exceptional cultural value but few readers. As any RPM device, the FBP is suspected to entail a higher price for books, which means poorer readers may be excluded and on average represents a regressive subsidy from average blockbuster readers towards arguably richer high-brown, low-sales readers. International comparisons[2] show that the FBP does not appear to have a large impact on the average price of books. It does, however, increase the price of blockbusters and decrease that of all other books.

Surprisingly enough, both sides have made little use of the theoretical literature about RPM. The most common reference is to Telser (1960) and its tangible presale services notion: information about a book being a public good, discounters could free-ride on information provided by regular bookshop, who could not recoup the cost of acquiring this information. This insight is more fully developed by Perry and Porter (1990) in a setup of monopolistic competition, and provides some solid ground for the FBP if the informational externality is large enough. More support can also be found on Deneckere, Marvel, and Peck (1996) and Deneckere, Marvel, and Peck (1997), who demonstrate that a RPM, by mitigating price competition, increases equilibrium inventories of goods whose demands is learnt after inventory decisions have been made.

On the other side of the arguments, critic of the FBP point to the already high number of available books, which hints to the possibility of excessive diversity, as described by Dixit and Stiglitz (1977). Rey and Tirole (1986) also demonstrated that as a tool to align retailer and producer incentives, RPM was dominated by other, more accepted by competition authorities, forms of vertical restraints.

While all those contributions help shed some light on the effect of the RPM, the relative weight to give to each insight is unclear. Few papers have tried to delineate how each effect interacts with the specificities of the book market: great product diversity but monopolistic competition, product and consumer uncertainty, are only the most prominent points. To this day, the main contribution of this kind is van der Ploeg (2004), which deals with the optimal number of varieties problem.[3] In his paper, Ploeg compares a perfectly competitive equilibrium,

[2] See Fishwick (2005) and Ringstad (2004) for such reviews.

[3] The essential features of the model are also presented in Canoy, van der Ploeg, and van Ours (2006).

where all titles are priced at marginal cost, to a monopolistically competitive equilibrium (allowed by FBP), where each publisher monopoly power is characterised by the price and substitutions elasticities of demand for his title. In this setup, the FBP increases publishing profitability, and hence the number of books that are profitable enough to be published. However, the FBP also entails a net welfare loss due to higher prices and inframarginal books (low-demand books) being published, at a fixed cost. This loss is greater when elasticities of substitution between books are low and price elasticity is low. The former are in general quite high, except for blockbusters (see Bittlingmayer (1992)). The latter is not empirically known with precision (evaluations range from -0.6 to -1.4[4]), but Ploeg argues that list price is only a small fraction of the actual price of reading a book, which includes the opportunity cost of the time spent reading. Since this opportunity cost does not vary with the introduction of a FBP, the list price elasticity will be small, and the welfare loss large. This paper does not, however, model the strategic interaction between publishers and book retailers since it assumes a integrated book suppliers.

The present papers aims to show how diversity considerations interact with product uncertainty. Because books are pure experience goods, subjective valuation of a given title is learnt only with the act of reading it, and information about the match between individual tastes and a given book is hard to come by. Symmetrically, many titles have the ability to cater to a very large audience, but only a few end up doing so.[5] The reader thus needs knowledgeable advice in order to find a book that suits her tastes, and the publishers need someone to provide that intermediation service. Because they are supposed to know the books they sell, traditional booksellers are able to do that match between any given reader and the book that will suit her tastes. On the other hand, discount bookstores, department stores and so on, who only put books on shelves, do not provide much in the way of useful information. For some books, the blockbusters, press excerpts and word-of-mouth allow to overcome the uncertainty problems.

When considering the FBP, the uncertainty from the publisher's point of view becomes crucial. The FBP is supposed to curb price competition on blockbusters and allow bookshops to make a profitable margin on them. This could work only of there is an incentive for a blockbuster publisher to leave a substantial margin to the bookshop. If there is such thing as a sure blockbuster, such incentive is weak. The publisher of a sure blockbuster knows that he can set his optimal oligopoly price, and let competition take care of the double marginalization problem (a result of Rey and Tirole (1986)). Cross-subsidization can thus work only if the accession to the blockbuster status cannot be accurately predicted, forcing publishers to account for the need to convince bookshops to carry their titles.

To address this situation, I model the retail book market as a dual, horizontally differentiated one. From retailers' and consumers' point of view, the book market is broken down into two interdependent markets, represented as two Salop circles. On the first one stand the blockbusters,

[4] see Ecalle (1988), de Grauwe and Gielens (1993), van Ours (1990), Appelman and van der Broek (2002), Hjorth-Andersen (2000) and Ringstad and Løyland (2006)

[5] Caves (2002) uses the phrase "Nobody knows" to label this property, which is common to most cultural goods.

whose location is knows, and on the other one all other titles at locations unknown to consumers. Consistently with the argument above, blockbusters are sold by competitive retailers (department stores, newsagents,...) that carry books as one among many commodities, pick only well-known books, and cannot provide any reliable information about their conformity to anyone tastes. Non-blockbuster books are sold by monopoly bookshop, which is able to match a consumer with the closest book. In order to stay as close as possible to the argument above, I assume that the bookshop does not try to cheat consumers away from their best match. From the publishers' point of view, the picture is rather different. Upon publishing a books, a publisher does not know if it will end on the blockbuster or on the non-blockbuster market (again, see Caves (2002)) and must set his wholesale price before this uncertainty is resolved.

This setup leads to three main findings. Firstly, proponents of the FBP underline the fear that the prominent share of blockbuster and blockbuster-oriented pricing strategy (e. g. pricing titles betting on the idea they will be blockbusters) will squeeze bookshop profit margin to the point of driving it out of business. Exit from the blockbuster would lead to an average bad matching between titles and tastes, and to a dramatic reduction of the number of titles actually read. We show that even the combination of a large price advantage and perfect information about blockbusters do not lead to foreclose the bookshop except for very low utilities of reading. The key idea behind this result is that as long as the same wholesale price is charged to all retailers, the bookshop can always cut his price to attract consumers further away from the blockbuster and earn positive profits.

Secondly, I show that the core trade-off for the publisher is between setting a low price in order to capture more demand when a blockbuster and setting a high price, since demand for non-blockbuster do not respond much to individual price variations. Comparative statics show that an increase of the number of blockbuster gives a stronger incentive for publishers to reduce wholesale pricing. Such reduction benefits the publishers who end up with a blockbuster, the bookshop (who gets a larger margin) and consumers closer to the blockbusters. At some point, all publishers gain from the phenomenon, through lower bookshop prices, while the bookshop and consumers loose some of the previous benefits. When the number of blockbusters is large enough however, competition between publishers drive prices down and consumer surplus up. When both the total number of titles and the number of blockbuster is large, consumers get all available surplus. Here again, the *ex ante* ignorance of the final status of their title leads the publishers to this trade off between the two (full-information) pricing policies, balancing towards lower prices when the odds of getting a blockbuster get higher. Variation of profits and surplus are driven by the fact that when blockbusters are few, the odds of getting one are low, and the optimal pricing policy for the publishers and the bookshop is to price up to consumers' reserve price. Lower wholesale prices and competition from blockbuster progressively nudge the bookshop away from this high price, leading to an higher consumer surplus.

Thirdly, a fixed book price do not significantly change market outcomes. Its overall effect is

to slow down (but not stop) the general price decrease as the number of blockbuster grows. The FBP leads to the documented increase of blockbuster prices and decrease of non-blockbusters, while the bookshop margins are reduced to zero. In terms of profits and surplus, the FBP lowers consumer surplus and increases publishers profits, but when the number of titles and of blockbusters is large, consumers still get all available surplus. On the bottom line, this model hints that the FBP can be a good transitional response to fears of destabilisation of the retail book market by blockbusters. In the long run, assuming that the number of titles and the number of blockbuster increase, the effects of the FBP become less interesting. Therefore, the FBP may not be worth any more its prominent place in the debate around cultural policy of the book market.

2 The general model

The market for books is a dual one. On one side, some titles stand out. Everyone knows at least their title and has some idea of how well they fit one's tastes. On the other side stand a vast number of titles on which precious little information can be found. I model this dualism by two circles of unit circumference, which represent consumers' tastes (see Figure 1 for an illustration). The first one is the "blockbuster" circle. On this circle stand m well-known titles, uniformly distributed, whose location is common knowledge. On the other circle stand $n - m$ titles, also uniformly distributed, whose location is unknown. Titles are published by n different publishers, at a cost normalised to zero (each publisher thus publishes one title).

The two markets also correspond to two types of retailers. Blockbusters are competitively retailed, while the other books can only be found in a monopoly bookshop.

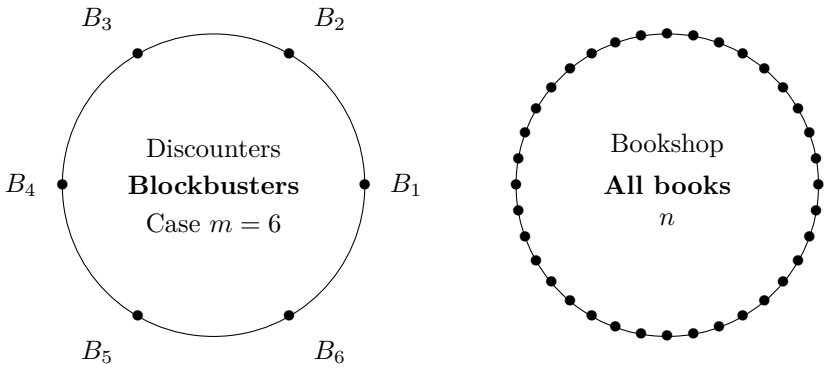

Figure 1: The two markets for books

Explanations of the blockbuster phenomenon[6] usually involves a mix of vertical differentiation

[6]Blockbusters are to books what stars are to movie players and the literature stemming from Rosen (1981) applies.

(where "quality" is the capacity if a title to attract many readers) and of informational cascades. In this setup, I abstract from "quality" issues to focus on how availability of information about one or several titles interact with market structure to skew sales in favour of exposed titles. In what follows, "blockbuster" is used as a shorthand to speak of titles which, for some exogenous reason, got media (radio, television, Internet,...) exposure, and about which enough information is available. This information allows the prospective reader to know of far each of those titles lie from her personal taste.

Readers There is a unit mass of risk-neutral readers represented by a common utility u from reading a book, and by a couple of by a taste (location) parameter (x_1, x_2), denoting their location on each circle. These two parameters are assumed to be independent and uniformly distributed. This hypothesis hinges on the idea that the blockbuster do not cover all genres and sub-genres of books. Assume that a reader likes history books and Latin American literature. Her favourite book on the blockbuster circle may be an essay on history, while there may be a Latin American book in an historical setting perfectly suiting her tastes on the second circle. Arguably, demands for the two books are not directly correlated in general and this trade-off is idiosyncratic.

Readers' utility is linear with the price charged, and subject to linear transportation cost from their tastes to the location of the book they buy on the circle. Hence, the utility of reader x eventually buying book i located at x_i for a price p is :

$$u(x, x_i, p) = u - p - t|x - x_i| \tag{2.1}$$

Readers have a unit demand, that is they buy at most one book. It should be noted that I do not restrict to the case where u is large enough to ensure full consumer participation. I assume, however, that u is such that one title is not enough to cover the whole market at any price, which leads to the restriction of the parameter space $u \in \left[\frac{t}{4n}, \frac{t}{2}\right]$.

Consumers also face an information problem. While they know their location on each circle, they have no information about the location of non-blockbuster circle, and are at a loss when it comes to evaluate the distance between a given title and their tastes.

Books A publisher produces only one book. All books are *ex ante* identical. By a process over which the publisher has no control, $m \ll n$ books get elevated to a "blockbuster" status. Their location becomes common knowledge, and they are stocked by competitive retailers. Other books are uniformly distributed on the other circle. Until late in the game, the publisher ignores which book will be the blockbuster and where any given title will lie. The publisher thus has little information when he sets his wholesale price w. I thereby model what Caves (2002) calls

the *nobody knows* property of cultural goods[7]. The main consequence of this property in this model is to rule out complex pricing strategies where the publisher needs to know precisely which book is neighbour to which one.

Outlets Books are sold by two types of retailers. The first type is the regular, brick-and-mortar, local bookshop. It carries a wide array of books, has a knowledgeable staff and enjoys a (local) monopoly position. The second, which I label "discounters" are non-specialised retailers. Unlike the regular bookshops, they have no territorial advantage, and hence compete in price with each other.

The bookshop The first type of retailer is represented by a single, monopoly bookshop. This bookshop chooses which books go to his shelves and the final price for each book. He has access to a technology that allows to match any given reader to the book closest to his or her tastes. Access to this matching technology entails no marginal cost. Notice that this technology does not allow to know the exact distance between a reader and her closest match: the bookseller only know in which half of a $\left[\frac{i}{n}, \frac{i+1}{n}\right]$ interval the reader is (that is, he learns i and in which half the reader is). Thus, the bookshop cannot use this information to price-discriminate between readers of a same title. Books being an experience good, the reader will hence know the exact distance between her tastes and the book only after purchasing and reading the book. I assume that the bookshop to always truthfully reveal the information he has about the location of any reader and title.

Since I will be interested in the condition for the bookshop to operate on its market, I further assume that there is a fixed cost K for the bookshop to be active. In order to keep contracts simple, I assume that cost is bargained between the bookshop and publishers: as long as publishers' and bookshop's profits are higher than K, the bookshop will be active.

Discounters Discounters are stores for which selling book is only a marginal part of their activity. Supermarkets, department stores and newsagents spring to mind. Those stores provide only a handful of titles, often those which have been subject to significant media exposure, easy-selling books by well-known writers. They cannot provide the prospective reader with more than what is already common knowledge about those titles. On the price side however, it has been observed that those retailers commonly use books as advertisement goods or loss-leaders in order to attract customers who will buy other products at the same time. Although I abstract from this behaviour, I assume that those discounters are price *à la Bertrand* over the titles they carry.

[7]Namely, the success (in terms if sales) of a given book is very difficult to forecast before the book is printed and effectively hits the shelves, and being the author or the publisher does not help much to relieve this uncertainty. This goes much further than a simple experience good property, since the publisher himself must act under this uncertainty, and has no informational advantage over the prospective reader.

Equilibrium definition Due the intristic symmetry of the model, I focus on symmetric equilibria. An equilibrium is then given by a uniform wholesale price w, the number of titles carried by the bookshop l and a uniform final price p.

Market organisation and timing The precise market organization and timing depend on the presence of blockbusters and on uncertainty. Generically, I assume that publishers first choose simultaneously their wholesale prices $w_1, \ldots, w_n$. Nature then picks up m titles uniformly distributed to be "blockbusters", the identity and location of those titles becoming common knowledge. With this information, the bookshop chooses which title he takes and sets the final price of each of these titles. Consumers then choose either to buy a book or not, and the outlet they will go to.

Since this models combines two effects, market duality and uncertainty, I will include each at a time. The next section deals with the case where there are no blockbusters (and hence no uncertainty either), and the following case deals with a dual market without uncertainty. Section 5 then combines the two elements.

3 A Bookshop Business

First assume that there are no blockbusters and no discounters are active. All books are then sold by a monopoly bookshop. In this situation, the only symmetric equilibrium saturates reader's participation constraint and allows publishers to extract all available surplus. The intuition behind that result is that for the bookshop, shelving an additional title increases overall consumer participation, that is the price it can charge on all consumers. Knowing that, publishers know that they can marginally increase the wholesale price of their title without the bookshop retaliating by excluding it from its shelves, nor reducing their market share (because of the imperfect information of readers' location and truthful matching). The incentive for such an upwards deviation exists as long as the bookshop can increase its price or reduce its profits. The limit it reached when the wholesale price hits consumers' participation constraint.

Proposition 3.1 (Bookshop business)**.** *When there are no blockbusters, the only symmetric equilibrium is:*

$$p = w = u - \frac{t}{4n}$$

Proof. This proof follows three steps. First I show that the bookshop is willing to take all n titles. Then I show that the bookshop will not exclude a publisher who sets his price slightly above that of the other publishers. The possibility of this upwards price deviation drives all prices up to consumers' participation constraint.

Assume that the bookshop takes $l \leqslant n$ titles. Since all consumers are *ex ante* identical, their participation decisions are of an all-or-nothing kind. They either all go buy a book, if

$u-p-\frac{t}{4l} \geqslant 0$) or all abstain. Hence, a bookshop featuring l titles maximises his profit by setting a price $p = u - \frac{t}{4l}$ saturating consumers' participation constraint. Thus, the price he can charge is increasing in the number of books, providing him with an incentive to take all available books.

Now, consider a unilateral deviation w_i of publisher i from a uniform wholesale price w. As long as $w \leqslant u - \frac{t}{4(n-1)}$, the bookshop finds profitable to stock all titles priced w. Because of the truthful matching assumption, market share are identical for all titles. A change in w_i thus does not impact i's market share as long as he does not get excluded by the bookshop: i has no incentive to lower his price, but can try to set an higher price than other publishers. More specifically i can set w_i high enough that he captures the marginal benefit for the bookshop to take his title, that is $\frac{t}{4(n-1)}$.

Each publisher can thus safely increase slightly his price as long as the bookshop benefits from having one more title. This benefit exists as long as $w < u - \frac{t}{4n}$, since the bookshop either makes some profit by taking i, or cannot profitably face positive demand. Consumers' participation constraint gives a bound to the possible price increase and leads to the only symmetric equilibrium. □

In this situation, the bookshop is unable to make any use of its market power and consumers have zero surplus. Let us now introduce a market with blockbusters and competitive retailers.

4 A Book market without uncertainty

In order to better understand the role that uncertainty about the market prospects of a given title plays, I first show how this market structure would operate if the destiny of each title were known. The timing of the game is thus modified as follows:

1. Nature pick out m titles to be blockbusters
2. Publishers of blockbusters and regular titles choose simultaneously their wholesale prices w_b and w respectively
3. The bookshop chooses the number of titles it will carry and its retail price p
4. Consumer choose whether or not they will buy a book and the market they will go to.

The existence of two markets and the possibility for the bookshop to carry blockbusters (it will do so at equilibrium, as we will see) calls for an additional behavioural assumption on the consumers: what happens when a consumer goes to the bookshop and is advised a blockbuster? Consistently with the descriptive literature on that score, I will assume that once its optimal match known, the consumer will by it at the lowest possible price (that is, the wholesale price charged by competitive

discounters). This implies that the bookshop cannot price the blockbusters it carries higher than their wholesale price.[8]

Using comparative statics on that market, I show in what follows that the introduction of a competitive blockbuster market alongside the traditional intermediated market entails some reaction from the publishers active on the former market. That reaction is however insufficient to prevent a large share of the demand to go to the blockbuster market. Thus, the market share of the bookshop quickly becomes insignificant as the number of blockbusters increase, and if there is a nontrivial cost for the bookshop to be active, the intermediated market may disappear completely. This result will be demonstrated along the following steps. First, I show how the existence of a dual market affects pricing and acceptation strategies of the publishers and the bookshop. This provides me with three possible price regimes according to the value of the utility of reading u and the number of blockbusters m. This allows then to do comparative statics on m and the computation of the corresponding market shares.

4.1 Consumers' choice

Let me first delineate the core trade-off of consumers' choice of market. Because of the symmetry of the problem, equilibrium strategies will be symmetric for a given homogeneous set of players, that is all blockbuster publishers will set the same wholesale price w_b and all other publishers the same wholesale w. Assume further that the bookshop sells all m blockbusters (I will later show that this is the case at equilibrium) and all $n-m$ other books. Consider a consumer who thinks he is located at distance $x \in \left[0, \frac{t}{2m}\right]$ of the nearest blockbuster. His utility from buying the blockbuster is:

$$u_{bb} = u - w_b - tx \tag{4.1}$$

If he goes to the bookshop, his expected distance from the nearest title is $\frac{1}{4n}$. With probability $\frac{n-m}{n}$, that title is a regular title sold at price p, and with probability $\frac{m}{n}$, it is a blockbuster sold at w_b. This consumer's utility from going to the bookshop is thus:

$$u_{bs} = u - \frac{n-m}{n}p - \frac{m}{n}w_b - \frac{t}{4n} \tag{4.2}$$

This consumer therefore goes to the bookshop if and only if u_{bs} is larger than u_{bb}, that is:

$$x \geqslant \frac{n-m}{n}\frac{p-w_b}{t} + \frac{1}{4n} \tag{4.3}$$

[8] At first blush, such behavior could seem at odds with the initial market choice: why would a consumer close to a blockbuster go to the bookshop? Remember, however, that the information available on a given blockbuster comes from advertising and word-of-mouth, and thus may not accurately reflect the characteristics of the book that a given consumer would be deem important. Better matching between tastes and prices, as provided by the bookshop, may make such a consumer revise his opinion on a book.

Let $x(p, w_b) = \frac{n-m}{n}\frac{p-w_b}{t} + \frac{1}{4n}$ denote the value of x such that the consumer is indifferent between buying the nearest blockbuster and going to the bookshop. Each of the m blockbuster attracts all consumers located at a distance lower that $x(p, w_b)$ on either side, that is a demand equal to $2x(p, w_b)$. Let then $d(p, w_b) = 1 - 2mx(p, w_b)$ denote the demand accruing to the bookshop.

4.2 Price regimes

Lemma 4.1 (Price regimes without uncertainty)**.** *The outcome of the pricing game features two classes of symmetric equilibria, parametrized by the values of u and m. For every value of m, there exists $\underline{u}$ and $\overline{u}$, decreasing in m such that:*

- *If $u \leqslant \underline{u}$, the equilibrium wholesale price on the intermediated market leads to a final price that saturates consumers' participation constraint in that market.*
- *If $u \geqslant \overline{u}$, the equilibrium wholesale price is an interior one.*

Proof. See Appendix A.1 □

The proof of this lemma is fairly long, since it implies to construct the two classes of equilibria. It underlines however two interesting features. The first is that in all cases, the bookshop finds optimal to carry the blockbuster, even if it makes no profit on them. The externality of having one more title is thus always larger than the opportunity to direct consumers to a non-blockbuster further away on which the bookshop would make some profit. The second and more interesting feature is that the wholesale price charged by non-blockbusters at equilibrium is always higher than the price that would maximize the sum of profits on the intermediated market. The fact that they do not internalize fully the impact of their pricing decisions on the overall size of that market leads them to set too high a price relative to what a monopoly publishing all $n - m$ non-blockbusters would do. This latter effect is instrumental in the evolution of the bookshop's market share as m increases.

The rather convoluted analytical form of the threshold $\underline{u}$ and $\overline{u}$ makes it difficult to apprehend at first glance. I therefor provide here two graphs illustrating the behaviour of those thresholds in specific cases. In figure 4, I show how the two boundaries evolve in the (u, m) plane when n becomes large (t acts only as a scale parameter and does not affect the curves otherwise). In the bottom zone, the constrained equilibrium prevails, while the unconstrained one occurs in the top zone. The intermediate zone between $\underline{u}$ and $\overline{u}$ is significant only for low values of m. If one reads the graph along a constant level of u, this graph means that the nature of the equilibrium is not immediately affected by the existence of a blockbuster market with few titles. However, the existence of this market forces, for larger values of m, non-blockbusters to acknowledge the competition and set wholesale prices low enough to allow the bookshop a positive market share.

As I argued before, a market with thousands of new titles seems to vindicate the approximation of large n. Figure 5 warrants that this is indeed the case. In that figure, I plot the same

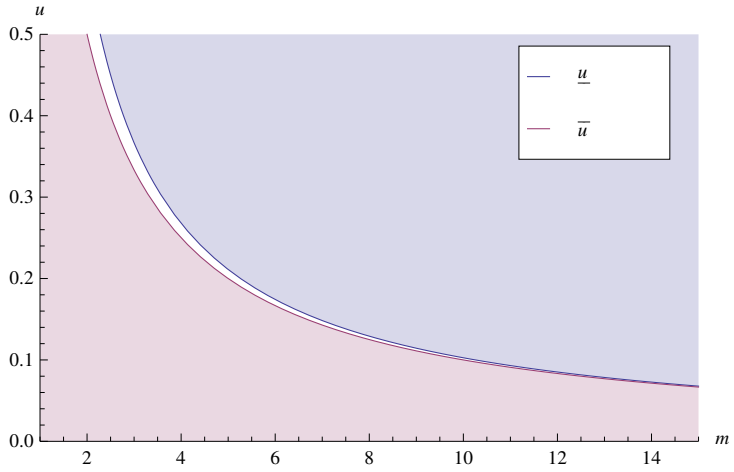

Figure 2: Thresholds $\underline{u}$ and $\overline{u}$ for $t = 1$ and $n \to +\infty$

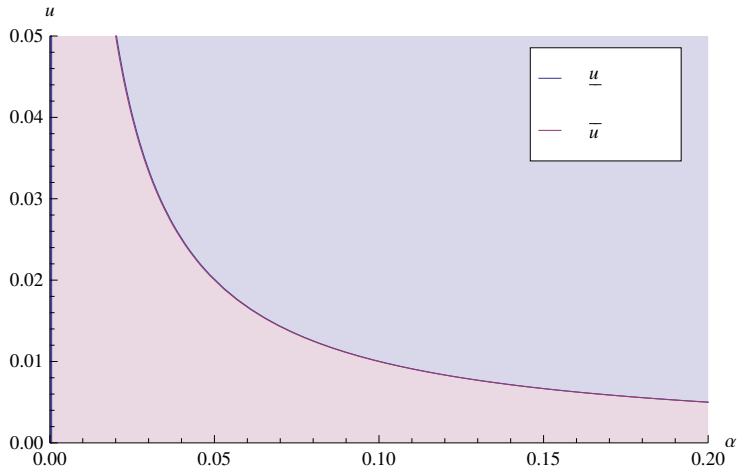

Figure 3: Thresholds $\underline{u}$ and $\overline{u}$ for $t = 1$ and $n = 1000$

thresholds for $n = 1000$ (much fewer titles than what a typical bookstore carries) and express the number of blockbusters as a share of the total number of titles: $m = \alpha n$. The overall aspect is the same as in figure 4, with t here acting as a shifting parameter along towards the right of the plane (higher transportation costs reduce the strength of blockbusters' price advantage).

These figures show that the introduction of blockbusters initially (for few blockbusters, low values of u or high values of t) little affect the equilibrium pricing of non-blockbuster publishers. The next question is then to see what is the interplay of this lack of reaction and consumers' choice between the two market.

4.3 Market shares and profits

The lack of reaction of non-blockbuster publishers, stemming from the coordination problem underlined in the proof, has in fact a dramatic effect of the bookshop's market share.

Proposition 4.1 (Market share without uncertainty)**.** *At an interior (unconstrained) equilibrium and for n large, the market share of the bookshop is decreasing in n and increasing in α. That market share is or the order of $\frac{1}{n}$.*

Proof. This proposition is a simple computational corollary of the proof of lemma 4.1. With the equilibrium values computed there, the bookshop captures a market share equal to, with $\alpha = m/n$ denoting the share of blockbusters,

$$M_l = \frac{2n\alpha(4-3\alpha) - \alpha^3 + 4\alpha^2 - 3\alpha - 2}{4\left(2n^2\alpha(1-\alpha) - n(1-3\alpha) - \alpha(2-\alpha) - 1\right)}$$

With n large enough, the terms in n dominate and the market share is of the order of $\frac{1}{n}$. □

This breakdown of the bookshop market share is the catastrophe scenario that proponents of the FBP pushed: the introduction of blockbusters would reduce other books to a tiny part of the market, leading to considerable reduction in diversity. If there is a non-trivial cost for the bookshop to operate, it may simply close down, depriving non-blockbusters of an access to customers. Consequently, profits for non-blockbuster become also trivial.

The overall picture is thus that the introduction of a competitive, horizontally differentiated market with good information will lead to a quick collapse of the intermediated market. This result, however, hinges on the idea that the publishers of blockbusters know beforehand that their title will be a success and are able to price accordingly. This idea is at odds with the well-documented finding that uncertainty of commercial prospects for a book is the exception. The next section shows that this uncertainty significantly affect the pricing strategies and the overall impact of the dual-market structure.

5 Blockbusters and uncertainty

Now assume that the m blockbusters are picked at random among the available titles. Each publisher has thus a chance m/n of getting a blockbuster status for his title. The gist of the change is that blockbusters are chosen after publishers set their wholesale prices. Compared with the case without uncertainty, this introduce a new trade-off. In the event a publisher gets a non-blockbuster, he wants to set a high price for the same reasons as before. In the event he gets a blockbuster, he wants to make use of the price to capture a larger market, which pushes towards lower prices. The equilibrium price will reflect the strength of these two effects.

Consumer choice Consumers' choice is made along exactly the same lines as in section 4.1. A consumer located at distance x from the nearest blockbuster will buy it rather than go to the bookshop if:

$$x \leqslant \frac{n-m}{n}\frac{p-w_b}{t} + \frac{1}{4n} \tag{5.1}$$

As before, $x(p, w_b) = \frac{n-m}{n}\frac{p-w_b}{t} + \frac{1}{4n}$ denotes the value of x such that the consumer is indifferent between buying the nearest blockbuster and going to the bookshop and $d(p, w_b) = 1-2mx(p, w_b)$ denotes the demand accruing to the bookshop.

5.1 Price regimes

The features of the model that led to the presence of two price regimes in the full information case are still present in the imperfect information one. The precise boundaries of the different regimes change, but the overall structure remains the same.

Lemma 5.1 (Price regimes with uncertainty)**.** *With uncertainty, the outcome of the pricing game features two classes of equilibria, parametrized by u and m. For every value of m, there exists $\underline{u}$, decreasing in m such that:*

- *If $u \leqslant \underline{u}$, the equilibrium wholesale price on the intermediated market leads to a final price that saturates consumers' participation constraint in that market.*
- *If $u \geqslant \underline{u}$, the equilibrium wholesale price is an interior one.*

Proof. See Appendix A.2 □

Contrary to the certain case, all equilibria are pure-strategy ones. For ready comparison with the certain case, figures 4 and 5 describe the distribution of the price regime in the (u, m) and (u, α) planes respectively, the former when n is large, and with α standing for the share of blockbusters in the latter. The white area between the two zones corresponds to a set of parameters where the symmetric wholesale equilibrium is such that the bookshop optimally prices exactly on the participation constraint of consumers.

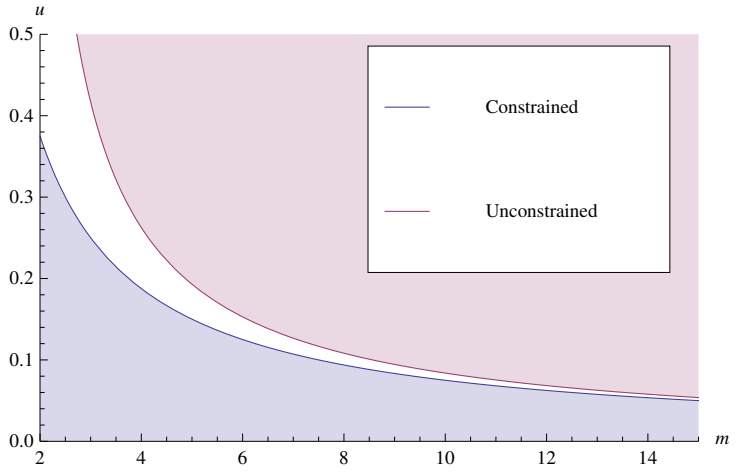

Figure 4: Thresholds $\underline{u}$ and $\overline{u}$ for $t = 1$ and $n \to +\infty$

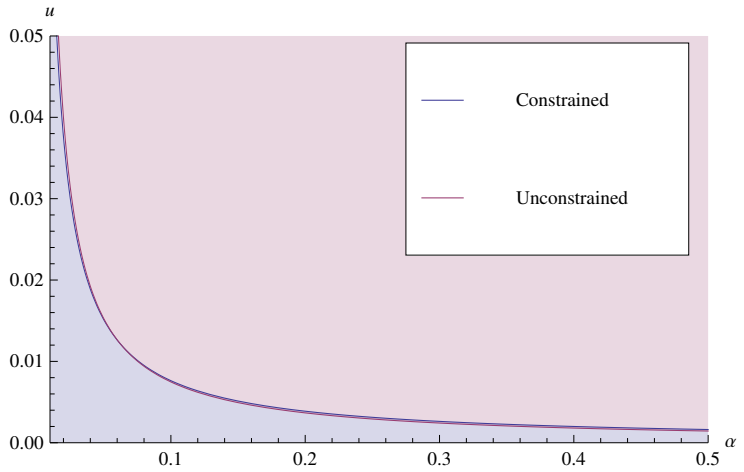

Figure 5: Thresholds $\underline{u}$ and $\overline{u}$ for $t = 1$ and $n = 1000$

The behaviour of the price regimes is similar with and without uncertainty. The main difference is that face with uncertain prospects, publishers are more ready to reduce their wholesale price, hoping to get a blockbuster. This reduces the set of parameters such that the equilibrium price is a constrained one. This situations however opens up the possibility that the equilibrium pricing strategy may be too high for the bookshop to operate. in the next section, I show that this occurs for low values of reading.

5.2 Can publishers profitably exclude bookshops ?

As I said before, one of the main motivations for the fixed book price was the fear that the presence of blockbusters would automatically exclude the bookshop. This would be true if pricing strategies remained identical to the $m = 0$ case, that is if the bookshop does not lower his price when blockbusters are introduced. Here, I show that complete bookshop exclusion occurs only for low values of reading.

Proposition 5.1 (Bookshop exclusion)**.** *Bookshop foreclosure occurs at equilibrium only if* $u < \frac{t}{2n}$*. When the bookshop is excluded, only a fraction of the market is served.*

Proof. As long as w is lower than consumers' participation constraint, the bookshop can sell his titles at the same price as the blockbusters. At such price levels, bookshop foreclosure is impossible, consumers further away from the blockbuster being better off going to the bookshop because of transportation costs. Hence, $w > u - \frac{t}{4n}$ is a necessary condition for bookshop foreclosure.

When $w > u - \frac{t}{4n}$, two scenarios can occur, depending on the value of u. When u is low, demands for blockbuster may not meet each other, making each blockbuster publisher a local monopoly. When u is large enough, demands will meet each other at the equilibrium price, leading to a usual symmetric Salop competition.

In the first case, all publisher set the local monopoly price $w = \frac{u}{2}$. That price is consistent with separate demands and bookshop exclusion when $u \leqslant \frac{t}{2n}$.

In the second case, blockbusters capture the whole demand. Consider $(n-1)$ publishers setting price w and publisher i setting w_i. The latter best response to w is given by:

$$\max_{w_i} \left\{ w_i \frac{m}{n} \left(\frac{1}{t}(w - w_i) + \frac{1}{m} \right) \right\}$$

which leads to an equilibrium symmetric price $w = t/m$. This price forecloses the bookshop if $u \leqslant \frac{t}{m} + \frac{t}{2(n-m)}$ and is consistent with market coverage if $u \geqslant \frac{3t}{2m}$. These two conditions can never be simultaneously satisfied for $n \geqslant m$. □

The rationale of the proof is fairly simple: in order to extract more profit from a blockbuster position, a publisher would like to decrease his price relative to the non-blockbuster situation,

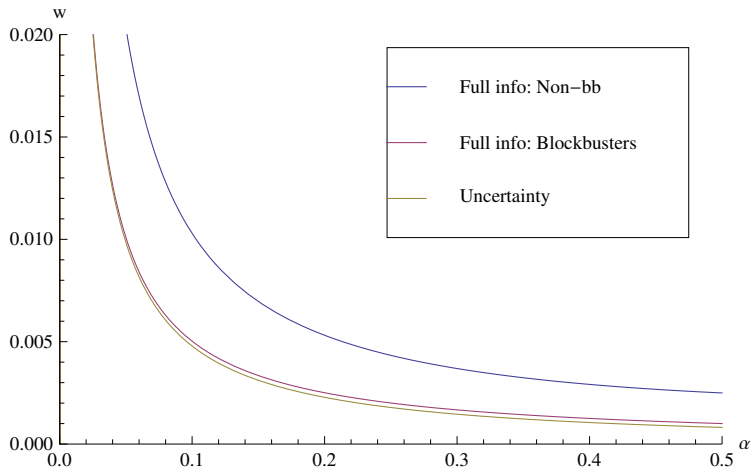

Figure 6: Wholesale prices in the two information regimes $t = 1$ and $n = 1000$

since he can thus expand his market share. By doing so however, he relaxes the constraint set upon the bookshop price, enabling the latter to cut his own price enough to capture some of the demand farther away from the blockbusters. The following paragraphs demonstrate how this leads very strict conditions for such an equilibrium to exist.

Proposition 5.1 shows that for $u \geqslant \frac{t}{2n}$, the publishers will never find profitable to set a wholesale price higher than consumers' participation constraint. As a result, the bookshop can always set a price such that he faces a positive demand. This bound is larger than the core constraint $u\frac{t}{4n}$ at which the bookshop can never be active. However, it should be noted that the interval $\left[\frac{t}{4n}, \frac{t}{2n}\right]$ is decreasing in length with n. When n becomes large, then, the case of bookshop foreclosure becomes almost identical to that of the complete collapse of the market for lack of interest for reading (u too small).

5.3 Market shares and profits

The effect of uncertainty on market prospects is vividly illustrated by the evolution of the bookshop's market share. While the introduction of blockbusters immediately cuts the bookshop market share to one half, further increase in the proportion of blockbuster only sightly decrease that market share, towards its long-term value of $\frac{2-\alpha}{4}$, where α is the share of blockbusters. The key behind this result is that under uncertainty, the profits to be made in the event a publisher gets a blockbuster dwarf those of a non-blockbuster to such and extent that the equilibrium wholesale price under uncertainty is close to the price charged for blockbusters in the case of perfect information (actually, it is even slightly lower). Figure 6 illustrate that feature. As a result, the coordination problem on the non-blockbuster side of the wholesale market lessens, and the bookshop is able to compete in prices with blockbusters to a much larger extent, thus

retaining a significant part of its market share.

Another sizable difference with the case without uncertainty is the level of profits in the industry. Overall, aggregate profits (that is, the sum of profits of publishers and the bookshop) are higher under uncertainty for a share of blockbuster under a threshold $\overline{\alpha}$. This threshold cannot be characterized in all generality, but for reasonable values of the parameters, is stands near 0.4, a situation where a very large number of titles are blockbusters in the sense of the present model. Split up between the different market participants, more significant differences appear.

Of course, the fact that the bookshop retains a significant market share, coupled with lower wholesale prices, allows it to make some profits ($\pi_l = t\frac{(2n-m)^2}{32m(n-m)^2}$) under uncertainty, while its profits without uncertainty are trivial. For the same reason of market share, the aggregate profits of non-blockbuster publishers are also significant, of the same order of magnitude than the aggregate profits of blockbuster publishers. These last profits are lower under uncertainty, since blockbuster publisher benefit from the information and price advantage, but the exists a wedge between the price under uncertainty and the price with full information. Since blockbuster publishers are much fewer than non-blockbuster publisher, this still means that getting a blockbuster means a much larger profit at the individual level. The odds of getting a non-blockbuster being large, the expected profit of publishers is larger under uncertainty, except for high values of α. the increase of blockbuster publishers profits, *via* an increase of the odds of getting a blockbuster, is the driving force behind the existence of the threshold $\overline{\alpha}$.

The effect of uncertainty is thus qualitatively twofold. On the one hand, uncertainty protects the activity of the bookshop by inducing lower wholesale prices on the non-blockbuster market. On the other hand, the same effects leads to prices that are too high (relative to the case without uncertainty) in the blockbuster market.

6 Welfare and policy

Until then, this paper has considered the effect of the information regimes only through the point of view of publisher and retailers of books. I will now consider the effects of the information regime on consumer welfare and the implications of the most common policy of the book market, the Fixed book price.

6.1 Welfare

In this framework the presence of uncertainty has two opposite effects. With respect to price, uncertainty makes books unambiguously cheaper, since blockbusters are (slightly) cheaper and non-blockbusters significantly. However, since nearly one-half of consumers now buy more expen-

sive non-blockbusters (while with full information, nearly all consumers buy blockbusters), the average price paid for a book is larger under uncertainty. This means a reduction in consumer welfare. On the other hand, consumers are always matched to books closer to their optimal taste, which increase welfare.

With my specification, the mismatch effect on consumer welfare always dominates the price effect , and consumers are better off with uncertainty,all the more with high transportation costs (*i.e.* when they are more sensitive to a mismatch). Total welfare (sum of all profits and consumer surplus) is thus higher under uncertainty.

6.2 Policy: the Fixed book price

It has been argued that the fixed book price, by eliminating price competition between discounters and bookshop over blockbusters, enabled the latter to survive to the blockbuster phenomenon. The framework of this paper allows to gauge that argument in two possible world: one where blockbusters are sure things (the book market without uncertainty) and one where *nobody knows* (the book market with uncertainty. This section deals with the two cases in turn.

6.2.1 FPB without uncertainty

Without uncertainty, the effect of a fixed book price is practically non-existent. One the one hand, the ability to fix the final price is of no consequence for blockbuster publishers, since competition already allowed them to make the most they could on the blockbuster market. On the other hand, the FBP allow non-blockbuster publishers to close the wedge between the wholesale and final price, but do not help solving the coordination problem: the impact of each publisher pricing decision on the demand accruing to the bookshop is still very weak, eliciting inefficiently (from their point of view) high prices. More precisely, let M_l denote the market share of the bookshop at some symmetric prices (p_b, p) for blockbusters and non-blockbusters respectively. A non-blockbuster publisher thus has a market share of M_l/n. Now, consider a deviating non-blockbuster publisher setting a price p_i. Conditionally on being accepted by the bookshop, the impact of a marginal change of price is:

$$\frac{\partial M_l}{p_i} = -\frac{2m}{nt}$$

If we consider that blockbuster are a proportion α of all titles, the effect of a price cut from a publisher on its market share is of the order of $\frac{\alpha}{n}$, that is insignificant for reasonably large values of n.

As a result, a FBP fails to have a significant effect on the market without uncertainty: difference between prices with and without FBP are second-order, and market outcomes are qualitatively the same. Thus, if there is such things as sure blockbusters in large enough numbers,

a FBP will prevent a collapse of the market intermediated by the bookshop.

6.2.2 FBP with uncertainty and an active bookshop

In the presence of uncertainty, the FBP affects the market outcome. Since prices are chosen before blockbuster status are known, the FBP completely cancels the price advantage of blockbusters: the wholesale and final price of all books is the same at:

$$p = w = \frac{nt}{2m(n-1)}$$

This means that blockbusters enjoy a market share that is approximately one and a half times that of a non-blockbusters, down from a much larger discrepancy without the FBP. As a consequence, the market share of the bookshop (and consequently of non-blockbusters) is almost twice that without the FBP.

Overall, prices with the FBP are slightly lower than without, close to the profits without uncertainty. In the detail, non-blockbuster publishers benefit from the FBP, while blockbuster publishers and the bookshop see their profits decrease. For the former, the decrease works through reduced market share, while for the latter, the FBP allows publishers to leave it no positive margin. Since, again, non-blockbuster publishers are more numerous, expected profits with the FBP are higher than without.

At the consumer level, the price under the FBP is close, and slightly higher, to the wholesale price without FBP. Consumers thus face marginally higher blockbusters and significantly lower non-blockbusters. Even if a large share of consumers are driven from blockbusters (which they would have read without the FBP) to more expensive non-blockbusters, the better matching dominates the price effect, except for very low values of t. As a result, consumer surplus and welfare are higher with a FBP.

The argument for the FBP, however, is that the market equilibrium with uncertainty can still not be sufficient for the bookshop to operate profitably. Therefore, I consider that case in the next section.

6.2.3 Market without bookshop

Let us for this section take at face value the argument of proponents of the FBP, that publishers of non-blockbusters will fail to coordinate to allow a sufficient profit margin to the bookshop without a FBP, for want of a sufficient profit, while they will be able to do so with a FBP (indeed, the profit of non-blockbuster publishers under the FBP is higher than the sum of non-blockbuster publishers and the bookshop without). In such case, the bookshop may fail to operate, leaving only the market for blockbusters.

In this case, the market equilibrium in the one delineated in section 5.2: publishers bet on

getting a publisher, and set a price

$$w = \frac{t}{m}$$

each getting a share $\frac{1}{m}$ of the market. In terms of price, this means that books are unambiguously more expensive than with uncertainty, with or without the FBP (even non-blockbusters in these cases are less expensive). Higher prices and a larger market share (the market is not shared with a bookshop) means that profits of blockbuster publishers are higher. As a result, the comparison of expected profits depend crucially of the odds of getting a blockbuster, that is the number of blockbusters. More precisely, expected profits in the case without a bookshop are $\frac{t}{n}$, and do not depend on the number of blockbusters, while expected profits under uncertainty decrease with the number of blockbuster. As a result, expected profits without a bookshop, initially lower than in the other two cases, overtake first the expected profits under uncertainty without FBP, than expected profits with uncertainty and a FBP. Unambiguously also, total profits in the sector are higher without a bookshop. These last two features are important when assessing the effect of the FBP: if the number of blockbusters is high enough, the market without a bookshop, barring credit constraints, can sustain as many publishers than the market with a bookshop. This means that published diversity may be the same, even if consumed diversity is much lower. Consumer surplus, however, is at its lowest when no bookshop is present.

7 Conclusion and further research

The main contribution of this paper is to show the effects of the interplay between the dual nature of the book market (competitively retailed blockbusters, monopolistically intermediated non-blockbusters) and the uncertainty of the commercial prospects of any given title. Without uncertainty, aggressive price strategies from blockbuster publishers, coupled with a coordination failure of non-blockbuster publishers practically drives the bookshop (and thus non-blockbusters) out of the market. Uncertainty however entails a lower wholesale price for all titles, thus enabling the bookshop to compete for a significant market share. Consumers thus face a better matching between their tastes and the book they buy, for a slight price difference. While a Fixed book price has no impact without uncertainty, a FBP imposed on a market with uncertainty further increases the quality of the match, and decreases prices of most book, thus improving profits, consumer surplus and welfare.

This model rather vindicates proponents of the FBP, by showing how it does have the price-increasing effect expected by a RPM in this framework of monopolistic competition. It also draws attention to the fact that more than competition at the retail level of the blockbuster phenomenon *per se*, it is the existence of "sure" blockbuster that is able to threatens the existence of a market where a large number of books are read (as opposed to produced, expected profits not being necessarily lower without an active bookshop). The descriptive literature documents the

fact that such "sure" blockbusters are few, and some title designated as such do fail miserably. More quantitative research (currently limited by poor date availability on those topics) is however needed to evaluate the statistical laws governing the success of books and the relationship between advertising expenses and commercial success in this sector.

For further research, I suggest that going beyond the assumption of perfect matching by the bookshop may be worthwhile to understand the current evolutions of the sector. By taking at face value the argument that the bookshop acts as a benevolent matchmaker between titles and tastes, I followed the descriptive literature, but assumed away a wealth of strategical relations between publishers and the bookshops. While the argument of systematic truthful matching was rather convincing with a large number of small publishers dealing with many bookshops, concentration in both layers of the market begs the question of a more thorough analysis of this particular issue.

Finally, neither the dual nature of the market nor the product uncertainty that drive the results of this model are unique to the book market. Other experience goods features the same properties, recorded music and movies (big theatre chain *versus* small screens) standing out as large examples. The main insights about the role of knowledgeable intermediaries and their ability to face the concentration of consumption on a handful of varieties should thus carry on to those markets.

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A Appendix

A.1 Price regimes without uncertainty

The symmetric equilibrium of the pricing game is a triplet (w_b, w, p) giving the wholesale prices charged by publishers of blockbusters and non-blockbusters respectively, and the price charged

by the bookshop for non-blockbusters. Throughout this proof, I will assume that the bookshop carries all blockbusters and sells them at price w_b, and show later that it is indeed the case (this makes exposure easier).

Since there is no assumption on u ensuring that consumers' participation constraint is always met, this constraint will be binding for some values of u. What I show here is that this constraint defines price regimes, and that the boundaries between these regimes depend crucially on m. I what follows, I first describe the three different price regimes and then compute the boundaries between them.

A.1.1 Interior equilibrium

Let us first assume that consumers' participation constraint is fulfilled, and let us start from a symmetric situation where all blockbuster publishers charge w_b and all non-blockbuster publishers charge w. The response of the bookshop from a deviation from that situation depends on the identity of the deviant: a deviation from a blockbuster publisher affects the bookshop's market share (through the trade-off between the two markets) while a deviation from a non-blockbuster publisher affects the bookshop's margin on that title, at constant market share.

Non-blockbuster publisher When the deviant is a non-blockbuster publisher, the bookshop market share is

$$d(p, w_b) = 1 - 2m\left(\frac{n-m}{n}\frac{p-w_b}{t} + \frac{1}{4n}\right)$$

using the results of section 4.1. Let i denote the deviating publisher, and w_i its wholesale price. The profit of the bookshop is then thus that is makes its usual margin $p - w$ on the $n - m - 1$ remaining non-blockbuster and $p - w_i$ on publisher i's title (recall that we are looking for a uniform p and that blockbusters are sold at wholesale price by the bookshop):

$$\pi_b = d(p, w_b)\left(\frac{1}{n}(p - w_i) + \frac{n-m-1}{n}(p - w)\right)$$

This profit is maximized for a price:

$$p_{inb} = \frac{1}{2}\left(w_b + \frac{1}{n-m}(w(n-m-1) + w_i) + t\frac{2n-m}{4m(n-m)}\right)$$

At that price, the deviating publisher makes a profit $w_i\frac{1}{n}d(p_{inb}, w_b)$. That profit is maximal for the following w_i, that defines non-blockbuster publishers' reaction function:

$$w_i = \frac{1}{2}\left(w_b(n-m) - w(n-m-1) + t\frac{2n-m}{4m}\right) \tag{A.1}$$

One can note that this w_i is indeed positive for any value of w_b enabling a positive market share for the blockbuster. This reaction function defines a unique symmetric wholesale pricing equilibrium for non-blockbuster publishers, which is:

$$w = \frac{1}{n-m+1}\left(w_b(n-m) + t\frac{2n-m}{4m}\right) \tag{A.2}$$

It should be noted here that a publisher that would publish all the $n-m$ non-blockbuster would set a price w', with

$$w' = \frac{w_b}{2} + t\frac{2n-m}{8m(n-m)}$$

that is lower that w. This result is a consequence from the truthful matching behaviour of the bookshop. An increase in the wholesale price of a non-blockbuster has only a second-order effect on the bookshop (and hence this publisher's) market share, but a first-order effect on this publisher's profits. Since, as in section 3, the bookshop keeps carrying a deviating publisher's title because of the effect the presence of one additional title has on overall consumers' expected utility and willingness to pay, this leads to an equilibrium wholesale price that is higher than what a cooperative equilibrium would yield.

Blockbuster publisher Now, let us consider the case of a deviating blockbuster publisher i, setting a price w_{bi}. This price alters consumers' choice in two ways: by altering the choice of those close to i's title on the blockbuster market, and through the odd of being advised i if they go to the bookshop. Consumers going to the bookshop now have the expected utility

$$u_{bs} = u - \frac{n-m}{n}p - \frac{m-1}{n}w_b - \frac{1}{n}w_{bi} - \frac{t}{4n} \tag{A.3}$$

while on the blockbuster market a consumer located at distance x from the nearest blockbuster can achieve $u - w_b - tx$, and $u - w_{bi} - tx$ if that consumer is close to i. The former will buy the blockbuster if

$$x \leqslant \frac{1}{t}\left(\frac{n-m}{n}(p-w_b) - \frac{1}{n}(w_b - w_{bi})\right) + \frac{1}{4n}$$

and the latter if

$$x \leqslant \frac{1}{t}\left((p-w_{bi}) - \frac{m}{n}(p-w_b) - \frac{1}{n}(w_b - w_{bi})\right) + \frac{1}{4n}$$

These two equations provide us with the market share of the bookshop. The bookshop then maximizes its profit for

$$p_{ibb} = \frac{1}{2}\left(w + w_b\frac{m-1}{m} + \frac{w_{bi}}{m} + t\frac{2n-m}{4m(n-m)}\right)$$

Given the bookshop reaction function p_{ibb}, the deviating blockbuster maximizes its profits simultaneously in both markets, since it captures the consumer close to its title on the blockbuster

market and a share $1/n$ of the market served by the bookshop. This allows to compute the optimal deviation w_{bi} and the corresponding symmetric wholesale price for blockbuster publishers w_b

$$w_b = \frac{4m(n-m)^2 w + t(2n^2 + 3mn - m^2)}{4(m(m+1)(m-2n) + (3m-1)n^2)} \tag{A.4}$$

Combining expressions for the wholesales on both markets (A.2) and (A.4) provides the unconstrained equilibrium wholesale pricing for the two types of publishers and for the bookshop:

$$w = \frac{t\left(n^3(8m-2) - 3n^2m(2m+1) + 4m^2n - m^3\right)}{4m\left(n^3(2m-1) - n^2(2m^2 - 2m + 1) + nm(m-2) + m^2\right)} \tag{A.5}$$

$$w_b = \frac{t\left(4n^3 - (4m-2)n^2 + 3mn - m^2\right)}{4\left(n^3(2m-1) - n^2(2m^2 - 2m + 1) + nm(m-2) + m^2\right)} \tag{A.6}$$

$$p = \frac{(-1 + 2m - 2n)\left(m^3 + m(3-8n)n^2 + 2n^3 + 2m^2n(-2+3n)\right)t}{8m(m-n)\left(n^2(1+n) + m^2(-1+n)(1+2n) - 2mn\left(-1+n+n^2\right)\right)} \tag{A.7}$$

With the assumption of the model, there is no guarantee that these prices are consistent with consumers' constraint. If u is low enough, consumers may have a negative expected utility of going to the bookshop, and therefore buying a blockbuster or abstaining from buying a book altogether. In such case, the consumer trade-off is substantially affected, defining a constrained equilibrium for the pricing game.

A.1.2 Constrained equilibrium

A constrained equilibrium occurs when the bookshop unconstrained price computed in the previous section would lead to a negative expected utility of going to the bookshop. Since the bookshop profit is single-peaked, its optimal choice in such case is to choose a price that exactly saturates consumer constraint, that is such that:

$$u - \frac{n-m}{n}p - \frac{m}{n}w_b - \frac{t}{4n} = 0 \tag{A.8}$$

The price solving this equation, labelled p_c, is the *constrained price* in what follows. If we move slightly back in the pricing game, it is easy to see that the bookshop may choose p_c if either w or w_b are too high. Let us consider the two populations of publishers in turn.

Non-blockbuster publishers Assume that (w, w_b) are such that the bookshop sets price p_c. Then, for the same reasons as in section 3, each non-blockbuster publisher has an incentive to raise its price since by doing so it increases its revenues without damaging its market share. Hence, the only symmetric equilibrium for non-blockbuster publishers is to set $w = p_c$.

Blockbuster publisher If we similarly assume that (w, w_b) are such that the bookshop sets price p_c and that blockbuster publisher i considers setting a price w_{bi} that keeps the constraint

binding. As in the previous section, the publisher cares for both the title it sells through the blockbuster market and the bookshop intermediated market:

$$\pi_{bbi} = w_{bi}\left(2\frac{u-w_{bi}}{t} + \left(1 - 2(m-1)\frac{u-w_b}{t} - 2\frac{u-w_{bi}}{t}\right)\right)$$

The maximization of this program according to w_{bi} allows to compute the profit-maximizing deviation and then the symmetric equilibrium wholesale price on the blockbuster market

$$w_b = u\frac{n-m}{2n-m-1} + \frac{t}{2(2n-m-1)} \tag{A.9}$$

Since the constrained price p_c fully absorbs, by definition, the effect of the wholesale w, the equilibrium w_b does not depend on what happens on the wholesale market for non-blockbusters. The constrained equilibrium is thus defined by:

$$w = p_c = u\left(\frac{n}{n-m} - \frac{m}{2n-m-1}\right) - t\frac{2n+m-1}{4(n-m)(2n-m-1)} \tag{A.10}$$

$$w_b = u\frac{n-m}{2n-m-1} + \frac{t}{2(2n-m-1)} \tag{A.11}$$

The question is now to pinpoint when this equilibrium occurs.

A.1.3 Boundaries between price regimes

The constrained situation occurs when the unconstrained price such that consumers have a negative expected surplus of going to the blockbuster. In such instance, the bookshop reverts to the constrained price. According to the values above, the unconstrained price leaves consumers with a positive expected surplus of going to the blockbuster if

$$u \geqslant t\frac{16m^2(n-1)n^2 + m^3(2n-1) + 2n^3(2n+1) - mn^2(4n(1+4n)-5)}{8mn\left(n^2(n+1) + m^2(n-1)(1+2n) - 2mn\left(n^2+n-1\right)\right)} = \overline{u} \tag{A.12}$$

To make things clearer, one can note that when n gets large (and I argued that this assumption is reasonable for the book market), $\overline{u}$ tends towards the limit value of $t\frac{4m-1}{2m(2m-1)}$.

Conversely, the belief from blockbuster publishers that the bookshop will set the constrained price is consistent only if their own price ensures that such price is indeed optimal for the bookshop. With the values above, this is true only as long as

$$u \leqslant t\frac{m^2 - 2n + 8n^3 + m\left(-1+6n-8n^2\right)}{4m\left(m^2 - 2mn^2 + n\left(-2+n+2n^2\right)\right)} = \underline{u} \tag{A.13}$$

For the same reasons as above, it should be noted that as n becomes large, $\underline{u}$ goes towards $\frac{t}{m}$.

The construction of the two equilibria ensures that for $u \leqslant \underline{u}$, the constrained equilibria is

consistent and that for $u \geqslant \overline{u}$, it is the unconstrained one. Between these two values, there is no pure-strategies equilibrium to the pricing game. When $u \in]\underline{u}, \overline{u}[$ and non-blockbuster publishers believe that the blockbuster publishers will set a price consistent with a constrained price, they maximize their profits by setting a price that makes the bookshop prefer the unconstrained price, and conversely.

A.1.4 Title selection by the bookshop

To finish this proof, I now need to show that the bookshop does indeed find optimal to carry all m bookshops. Since not carrying a blockbuster degrades the expected utility of consumer, shelving all blockbusters is weakly preferred by the bookshop whenever carrying it or not leads to a constrained equilibrium.

In the case of an unconstrained equilibrium, let us consider a bookshop facing prices (w, w_b) and choosing to carry $0 \leqslant m' \leqslant m$ blockbuster. The expected utility of a consumer going to the bookshop is then:

$$u - \left(p\left(\frac{n-m'}{n}\right) + \frac{m'}{n} w_b \right) - t\left(\left(1 - \frac{m'}{n}\right)\frac{1}{4n} + \frac{m'}{n}\frac{1}{2n} \right)$$

since that consumer faces the odds $\frac{m'}{n}$ to have its optimal title being one of the non-carried blockbusters and of being directed to the nearest non-blockbuster. The profit-maximization program of the blockbuster then features a corner solution: for the optimal value of $p(m')$, the profit-maximizing level of m' is m.

A.2 Price regimes with uncertainty

When uncertainty about the prospects of a title is not resolved before pricing decisions are made, publishers cannot set different wholesale prices for blockbusters and non-blockbusters any more. Thus, a symmetric equilibrium is now a couple (w, p) defining the equilibrium wholesale price and the equilibrium final price of the bookshop. As in section A.1, I will work through the two kinds of equilibrium regimes and then define the boundaries between them.

A.2.1 Interior equilibrium

As before, assume first that consumers' participation constraint is fulfilled. As before, the bookshop response to a deviation w_i from a symmetric wholesale price w depends on the *ex post* identity of the deviant, since deviation by a non-blockbuster affects directly only the bookshop margin, while deviation by a blockbuster publisher affects directly both margin and market share.

Bookshop reaction Since the structure of the market is the same, results from section A.1.1 apply, with the obvious simplification that $w_b = w$. The optimum price if the deviant is a

non-blockbuster is thus:

$$p_{inb} = \frac{1}{2(n-m)}\left(w(2n-2m-1) + w_i + t\frac{2n-m}{4m}\right) \tag{A.14}$$

And that for a blockbuster:

$$p_{ibb} = \frac{1}{2m}\left(w(2m-1) + w_i + t\frac{2n-m}{4(n-m)}\right) \tag{A.15}$$

Wholesale price equilibrium The wholesale price game now features only one type of publishers, who maximize their expected profits with respect to their wholesale price. Starting from a symmetric wholesale price w, let us consider a deviating publisher i using a wholesale w_i. If he does not get a blockbuster, his market share is impacted only through the bookshop reaction function, and he thus has a market of $1/n$ of the bookshop market share, that is

$$\frac{1}{n}\left(1 - 2m\left(\frac{1}{t}(p_{inb} - w) + \frac{1}{4n}\right)\right) \tag{A.16}$$

If that publisher gets a blockbuster, he captures around his blockbuster

$$\frac{2}{nt}((n-m)p + (m-1)w - (n-1)w_i) + \frac{1}{4n} \tag{A.17}$$

and a share $1/n$ of the bookshop market share,

$$\begin{aligned}&\frac{1}{n}\left(1 - \left(\frac{2}{nt}((n-m)p + (m-1)w - (n-1)w_i) + \frac{1}{4n}\right)\right.\\ &\left.-(m-1)\left(\frac{2}{nt}((n-m)p - (n-m+1)w + w_i) + \frac{1}{4n}\right)\right)\end{aligned} \tag{A.18}$$

The deviating publisher thus maximizes the sum $\frac{n}{m}A.16 + \frac{n-m}{n}(A.17 + A.18)$ over w_i, providing the unconstrained equilibrium wholesale price:

$$w_{nc} = t\frac{3n^2 + (n-m)^2}{4(n^2(2m-1) - nm + m^2)} \tag{A.19}$$

As in the certain case, nothing ensures that this wholesale will be low enough for the profit-maximizing price of the bookshop to respect consumers' participation constraint. I thus now describe the equilibrium assuming that the bookshop has to price according to that constraint.

A.2.2 Constrained equilibrium

The general setup is similar to that of section A.2.1, but with prices

$$p_{cinb} = \frac{1}{n-m}\left(nu - mw - \frac{t}{4}\right) \tag{A.20}$$

when i does not get a blockbuster and

$$p_{cibb} = \frac{1}{n-m}\left(nu - (m-1)w - \frac{n}{m}w_i - \frac{t}{4}\right) \tag{A.21}$$

otherwise.

The market shares of a deviating publishers are

$$\begin{array}{ll} \frac{1}{n}\left(1 - 2m\frac{u-w}{t}\right) & \text{if not a blockbuster} \\ \frac{1}{n}\left(1 - 2\left((m-1)\frac{u-w}{t} + \frac{u-w_i}{t}\right)\right) + 2\frac{u-w_i}{t} & \text{otherwise} \end{array}$$

This allows to compute a symmetric wholesale price equilibrium:

$$w_c = t\frac{n}{2m(n-1)} \tag{A.22}$$

A.2.3 Boundaries

It is now possible to compute the boundaries between the different price regimes. It is straightforward that w_c is decreasing in m. An increase in m thus relaxes the constraint on the price, and that constraint ceases to be biting at

$$u = t\frac{m(n-1) + 2n(3n-1)}{8mn(n-1)} \tag{A.23}$$

Conversely, the unconstrained price does not respect consumers' participation constraint when u is lower than:

$$u = t\frac{\left(m^3 - m^2(2m+1)n + m(2m-3)n^2 + 6(2m-1)n^3\right)}{8mn\left(m^2 + 3n^2 - mn(2n+3)\right)} \tag{A.24}$$

To get a feeling of what happens, notice that when n becomes large, the former boundary converges to $\frac{3t}{4m}$ and the latter to $t\frac{3(2m-1)}{4m(2m-3)}$.

Between these two boundaries however, there also exists an equilibrium defined by

$$\overline{w} = u - t\frac{2n+m}{8mn} \tag{A.25}$$

That value $\overline{w}$ is the limit value of a symmetric wholesale price such that the unconstrained profit-maximizing price of the blockbuster exactly saturates consumers' participation constraint. The

price regime thus depends on the ranking between w_{nc}, w_c and $\overline{w}$. For all $m > 1$, $w_c < w_{nc}$. The constrained equilibrium corresponds to the situation where $\overline{w} < w_c < w_{nc}$: for any $w < \overline{w}$, there exists a profitable upwards deviation. When $\overline{w}$ is reached, the bookshop becomes constrained in his pricing decision, by the profitable deviation still exists, until w_c is reached. Conversely, when $w_c < w_{nc} < \overline{w}$, for any $w > w_{nc}$, there exists a profitable downwards deviation, and an upwards one for $w < w_{nc}$. The case at hand is when $w_c < \overline{w} < w_{nc}$. For any $w > \overline{w}$, the bookshop is price-constrained, and the profitable deviation is downwards, towards w_c. Symmetrically, for any $w < \overline{w}$, the bookshop is not price constrained, and the deviation is upwards. Only at $w = \overline{w}$ do these two effects cancel out, thus delineating and equilibrium.

Titles selection For the same reasons as in the certain case, the bookshop always carries all blockbusters.