Unbundling financial services: The case of brokerage and investment research

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Abstract

While brokers could formerly provide brokerage and financial research as a single package, unbundling rules now oblige them to charge separately for the two services. To analyse the effect of this regulation, we consider a duopoly between a broker and an independent research provider and two types of services: a brokerage service and two different research services, which cannot be consumed without the brokerage service. Without unbundling rules, there exists an equilibrium in which the broker offers a bundle of brokerage and a research service while the independent analyst provides the other research service alone. This equilibrium is based on a differentiation effect, whereby the demand for the bundle boosts the demand for the separated component and *vice versa*. Under unbundling rules, another equilibrium emerges in which the broker offers the brokerage and one research service separately while the independent analyst offers the second research service. In this equilibrium, the market power of both protagonists and their profits are increased and welfare is improved.

Key words : financial analysts, independent analysts, unbundling rules, leverage effect, differentiation.

JEL Classification : G24, G28, L11, L13

1 Introduction

Tying is a commercial practice that consists in selling different goods (or services) in a single package. The the basic commodity is called "the tying good" and the other commodities or services "the tied goods". The tourism, computer and food industries are often taken as examples of industries that adopt bundling strategies. However, bundling is also widely practiced in the financial sector. For example, in the banking market, payment cards are often bundled with insurance or other banking services (Vaubourg, 2006, Weinberg, 2006). In financial markets, as emphasize by Raghunathan and Sarkar (2016), brokers also bundle brokerage services (which consist of executing exchange orders on behalf of clients) and financial research (which consists of forecasts of earnings per share (EPS) or investment advice such as "buy" or "sell" recommendations).[1]

Such tying practices are also more interesting considering the conflicts of interest that they may generate within brokerage and financial research (Hayes, 1998, Jackson, 2005, Mehran and Stulz, 2007). Indeed, financial analysts tend to produce optimistic forecasts or recommendations in the hope of generating buy orders and charging brokerage fees to customers. These inaccuracies contribute to increased corporate agency costs and reduced informational efficiency in financial markets.

In the UK (in 2006).[2] and in France (in 2007), so-called rules governing Commission Sharing Agreements (CSAs) or "unbundling rules" were introduced to reduce conflicts of interest between brokerage and financial research and promote independent research, i.e., financial analysis that is produced by an analyst who is not employed by or affiliated to a broker.[3] While brokerage and financial research were previously provided as a single package and charged globally, the new regulation requires firms to clearly divide the fees for the two types of services. Investors such as portfolio management companies must now clearly divide fees into the brokerage and investment research commission. When an investor purchases the brokerage service from an execution broker and the financial research service from a third party (for example, an independent research provider, i.e., a research provider that does not offer brokerage services), the investor and the broker can enter into a CSA. Under such an arrangement, the broker must divide its fees into two components and pays out the financial research portion to the independent financial analyst.[4]

The device for CSAs is to be extended to the European level in 2018. Indeed, the un-

[1] As mentioned by Oxera (2009), *"the terms on which these extra services were provided were not always explicitly agreed.*

[2] On this issue, see notably the consultation paper published by the Financial Conduct Authority (FCA) in 2013 (FCA, 2013).

[3] For reforms intended to mitigate conflicts of interest between research and investment banking, see Kadan et al., 2009, Clarke et al., 2011, Guang et al., 2012, Hovakimian and Saenyasiri, 2010, 2014.

[4] Although bundling actually refers to offering a quantity discount for a given good (Shy, 1997), we will employ the commonly used term "unbundling rules" (rather than "untying rules") to refer to measures intended to charge separately for the two services. By extension, we will interchangeably use the terms "bundling" and "bundle" to describe financial analysts' practices that consist in simultaneously selling execution and research services.

bundling of research and brokerage services is a key element of the revised Market in Financial Instruments Directive (MiFID 2), which also stipulates that asset managers must now define their research budget in advance and operate through a Research Payment Account (RPA) to finance investment advice services.

Some surveys have been conducted to assess the success of CSAs among fund managers in the UK and in France. According to Oxera (2009), the number of CSAs signed by fund managers in the UK increased from 50% to 70% between 2005 and 2007. The average number of non-execution services provided by third parties through CSAs increased from approximately 17 in 2005 to more than 40 in 2007. Similarly, Sagalink (2012) indicates that the number of French portfolio management companies that entered into CSA protocols significantly increased between 2007 (approximately 5 % of French portfolio management companies) and 2011 (approximately 60%). Moreover, according to 75% of surveyed portfolio management companies, CSAs allowed them to purchase independent financial analysis. Moreover, conduct panel data regressions on a sample of earnings per share forecasts for 58 French firms during the period from 1999 to 2011, Galanti and Vaubourg (2017) show that the analysts' optimistic bias declined significantly after CSA rules. However, very little attention has been devoted to the consequences of CSAs on the pricing policy and profitability of the brokerage and research industry's protagonists. The goal of this paper is to fill this gap.

One innovation of this paper is to refer to industrial economics to address the implications of a financial reform. Because we investigate the interactions between a broker and an independent research provider, we focus on bundling practices in a duopoly.[5]

A first strand of literature focuses on the situation in which a firm is a monopolist in the tying good market while the tied good market is competitive. This gives rise to a so-called leverage effect, whereby offering a bundle that contains this tying good and a second good (the tied good) enables the monopolist to exert its market power and to foreclose sales in the tied good market (Carbajo, DeMeza and Seidmann, 1990, Whinston, 1990 and Martin, 1999).[6]

Another series of contributions shows that tying enables firms to relax competition by strengthening differentiation when consumers have heterogeneous reservation prices. For instance, Shy (1996) and Chen (1997) consider a duopoly and show that there exist pure tying equilibria in which one firm offers the tying good alone and the other offers a bundle. Using a duopoly model with two bundles, Vaubourg (2006) shows that when firms are allowed to practice mixed tying, there exist equilibria in which one firm sells one bundle while the rival sells the second bundle and a separated component. These equilibria result from a combination of discrimination and differentiation effects. In Raghunathan and Sarkar (2016), because earnings forecasts and recommendations may be produced according to different data and methods such that consumers may buy two research services from two different sellers to eventually synthesize them. For this reason, research service from two different sellers may be considered as complements. In contrast, brokerage service from two different sellers are more likely to be similar, i.e., substitutes. The authors show that bundling a service that competes as a complement with

[5]For theoretical contributions on bundling in a monopoly, see Stigler (1963), Schmalensee (1982, 1984), Salinger (1995), Adams and Yellen (1996), Bakos and Brynjofsson (1999) and MacAfee, MacMillan and Whinston (1989).

[6]When a fraction of consumers only value the tied good while another fraction values both the tying and the tied good, tying may allow the monopolist in the tying good to collude in the tied good market (Spector, 2007).

another one that competes as a substitute enables the two firms to soften competition.

In this paper, we adopt a different approach to account for the situation in the execution and research service industry. Hence, we propose a duopoly model, in which there exists only one bundle (brokerage + research service) and a separated component (a second research service) that cannot be consumed without the brokerage service. For this reason, the second research service can never be bought outside the bundle. This theoretical framework enables us to contribute to the literature in two ways.

First, our paper renews the literature on bundling by proposing a comprehensive framework in which leverage and differentiation effects are combined, whereas the literature typically analyses them separately. We show that the leverage effect may be undermined by the monopolist's rival. Moreover, we demonstrate that in some cases, this reaction induces a differentiation effect. In contrast with earlier theoretical contributions, this differentiation effect is based on the idea that offering a separated component that is different from the tied service contained in the bundle enables the creation of demand for this bundle, which in turn creates demand for the separated component.

The second contribution of our paper is to demonstrate that unbundling rules crucially affect the pricing policy and the profitability of the broker and the independent research provider. We show that, as expected, unbundling rules increase the market share of the independent analysts. More interesting, our paper also reveals that unbundling rules improve the profitability of both the independent analyst and the broker, by restoring their market power, and improve global welfare.

The remainder of the article is organized as follows. The next section establishes the assumptions of the model. In Section 3, we study equilibria, while Section 4 considers unbundling rules. Section 5 concludes the article.

2 Assumptions

In this section, we present the assumptions of our model.

We consider a broker, denoted by A, and an independent research provider, denoted by B, in a duopoly. There exist three services. X is a brokerage service that consists of placing buy or sell orders on stock exchanges on behalf of consumers (fund managers, for example). Y are Z are investment research services, which consist of producing information about firms or issuing recommendations (for example, "buy" or "sell") and forecasts of stock prices or EPS. The existence of two different research services is in line with the idea that financial information may be produced from different data and according to different approaches. For example, while some analysts use Price/earnings models, some others prefer dividend discount models models. Similarly, as regards the components of GAAP earnings used to forecast earnings, some analysts exclude non-operating items whereas some others include them (Brown et al., 2015). Financial information produced by analysts can also take various forms, from a very standard document such as a morning letter to a more specific and more substantive analysis.

In line with the practices described by Hayes (1998), Jackson (2005) and Mehran and Stulz (2007), we assume that A practices pure bundling, i.e., it can offer the two services X and Y (or

X and Z) as a bundle, denoted by XY (or XZ), where X is the "tying good" and Y (or Z) the "tied good". In contrast, B, which does not provide any execution service, practices a "pure component" strategy, i.e., it can offer the other financial research services, Y or Z, alone.

X, Y and Z have a reservation value of V_x, V_y and V_z, respectively, with $V_x > 0$, $V_y > 0$ and $V_z > 0$. All consumers have the same valuation for X.[7]

However, consumers have heterogeneous preferences for Y and for Z. Hence, we assume that V_y and V_z are uniformly distributed between 0 and 1. V_y and V_z are independent.

Moreover, we assume that the sole use of the information produced by financial analysts is to execute buy or sell orders, such that Y and Z cannot be consumed without X. In line with Raghunathan and Sarkar (2016) who observe that agents on financial markets often buy investment research from different sources, we also consider that Y and Z can be bought simultaneously.

Each service has zero marginal cost. [8] However, we assume that unbundling both services, i.e., offering them services separately induces a fixed cost for the broker. This cost is denoted by c with $c \geq 0$. Indeed, as underlined by practitioners and observers, X and Y are traditionally delivered as a package by the same person using a unique channel (for example, during the same phone call between the analyst and his customer). Hence, c accounts for the cost for implementing two different delivery channels and for calculating the true value of the investment research service, independently from the one of the brokerage service and *vice versa*. Denoting by V_{xy} (resp. V_{xz}) the reservation value for X and Y (resp. Z) when they are consumed simultaneously, we assume that $V_{xy} = V_x + V_y$ (resp. $V_{xz} = V_x + V_z$).

We consider a two-stage game. In the first stage, each firm chooses which service(s) to offer. In the second stage, firms compete in prices. The prices of X, XY and XZ are denoted by P_x, P_{xy} and P_{xz}, respectively. $Pi^A_{i/j}$ (resp. $\Pi^B_{i/j}$) denotes A's (resp. B's) equilibrium profit when A (resp. B) chooses action i and B (resp. A) chooses j. All strategies are pure strategies. We are interested in subgame-perfect equilibria (i.e., Nash equilibria in each pricing subgame and in the full game).

3 Equilibria

We now solve the model. We first examine the second-stage subgames. We then consider the first-stage game.

3.1 The second-stage subgames

There exist four types of subgames: the subgames in which A offers XY (resp. XZ) while B offers Y (resp. Z) and the subgames in which A offers XY (resp. XZ) while B offers Z (resp.

[7] V_x can be interpreted in reference to the notion of "broker votes", by which the clients directly vote about their general satisfaction, including satisfaction about the sales and trading activity of the broker (Brown et al., 2015).

[8] For an experiment on the impact of low cost on-line brokers on the brokerage industry, see Bakos et al. (2005). Moreover, although placing orders on financial markets may provide an access to information that is useful for producing forecasts or recommendations, we do not consider scale economies as a rationale for bundling practices (for a paper based on this assumption, see Whinston (1990).

Y), the subgames in which A offers X and Y (resp. X and Z) while B offers Y (resp. Z), and the subgames in which A offers X and Y (resp. X and Z) while B offers Z (resp. Y).

3.1.1 The subgames {XY, Y} and {XZ, Z}

Let us consider the subgame {XY, Y}. Consumers buy XY if $V_x + V_y - P_{xy} > 0$, i.e., if $V_y > P_{xy} - V_x$. This is represented by Figure 1.

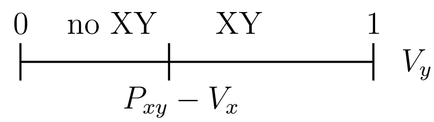

Figure 1: Consumers' demand in the subgame {XY, Y}

Following Figure 1, the demand for XY is $(1 - P_{xy} + V_x)$. Hence A sets $P_{xy}*$ as follows:

$$P_{xy}* = \text{ArgMax } P_{xy}(1 - P_{xy} + V_x).$$

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Moreover, because Y is already contained in bundle XY provided by A, the demand for Y alone is 0.

This yields the following lemma:

Lemma 1 *The subgames {XY, Y} and {XZ, Z} have a unique Nash equilibrium, defined by* [9]

$$P_{xy}* = \frac{1+V_x}{2},\ \Pi^A_{xy/y}* = \frac{(1+V_x)^2}{4},\ \Pi^B_{y/xy}* = 0$$

and

$$P_{xz}* = \frac{1+V_x}{2},\ \Pi^A_{xz/z}* = \frac{(1+V_x)^2}{4},\ \Pi^B_{z/xz}* = 0,\ \textit{respectively.}$$

3.1.2 The subgames {XY, Z} and {XZ, Y}

In subgame {XY, Z}, consumers have the choice between three possible actions: buying nothing, buying XY and buying both XY and Z.

They consume XY if XY is preferred to nothing and if XY is preferred to XY and Z, i.e., if $V_x + V_y - P_{xy} > 0$ and $V_z - P_z < 0$.

They consume XY and Z if buying XY and Z is preferred to nothing and buying XY and Z is preferred to Z, i.e., if $V_x + V_y + V_z - P_{xy} - P_z > 0$ and $V_z - P_z > 0$.

[9]We have checked that the second-order condition is satisfied (the trace of the Hessian matrix is negative, and its determinant is positive).

They consume nothing if buying nothing is preferred to XY and buying nothing is preferred to XY and Z, i.e., if $V_x + V_y - P_{xy} < 0$ and $V_x + V_y + V_z - P_{xy} - P_z < 0$.

This is represented by Figure 2.

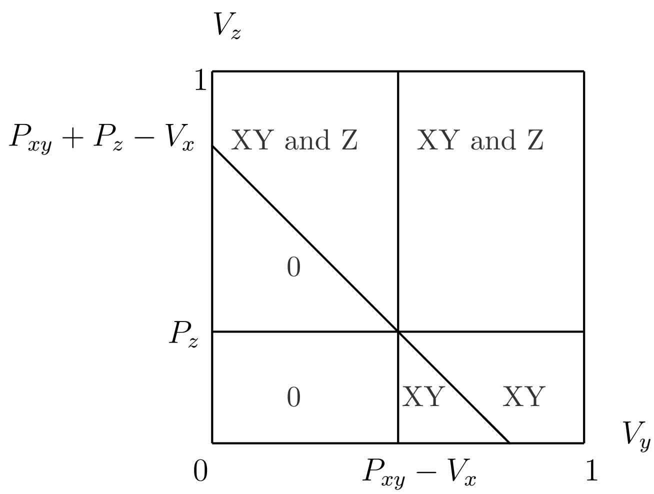

Figure 2: Consumers' demand in the subgame {XY, Z}

Following Figure 2, the demand for XY is $1 - P_z(P_{xy} - V_x) - \frac{1}{2}(P_{xy} - V_x)^2$, and the demand for Z is $1 - P_z - \frac{1}{2}(P_{xy} - V_x)^2$.

Hence, $P_{xy}*$ and P_z* are set as follows:

$$P_{xy}* = \text{ArgMax } P_{xy}(1 - P_z(P_{xy} - V_x) - \frac{1}{2}(P_{xy} - V_x)^2)$$

$$P_z* = \text{ArgMax } P_z(1 - P_z - \frac{1}{2}(P_{xy} - V_x)^2)$$

If $1 < V_x < 3$,[10] the maximization program has real solutions and the subgame {XY, Z} has a Nash equilibrium.

As shown in Figures 3, 4 and 5, numerical simulations allow us to compute the values of $P_{xy}*$, P_z*, $\Pi^A_{xy/z}*$, $\Pi^B_{z/xy}*$ and the demand addressed to A and B for $V_x \in [1; 3]$.

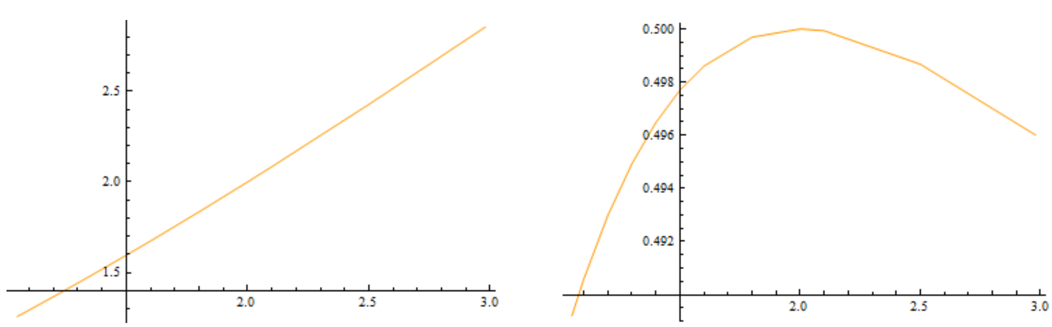

Figure 3: $P_{xy}*$ and P_z* as functions of V_x

[10] $V_x > 1$ ensures that when $P_x* > 0$, X is valued enough to be consumed, and $V_x < 3$ ensures that consuming XY and Z is not preferred to consuming nothing when Y and Z are not valued by consumers (i.e., when $V_y = V_z = 0$).

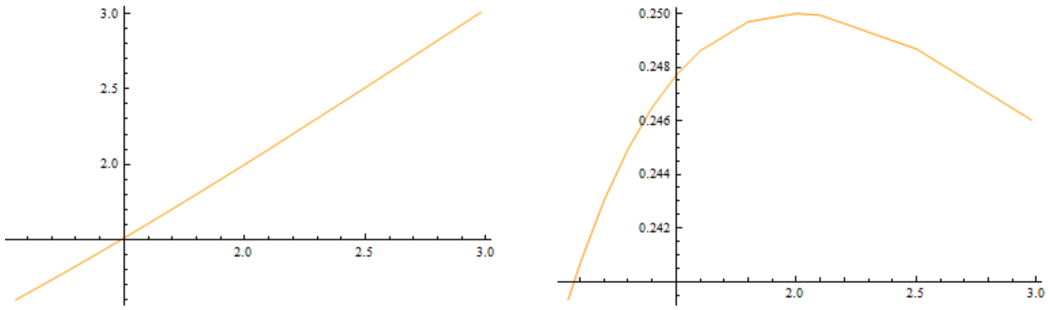

Figure 4: $\Pi^A_{xy/z}*$ and $\Pi^B_{z/xy}*$ as functions of V_x

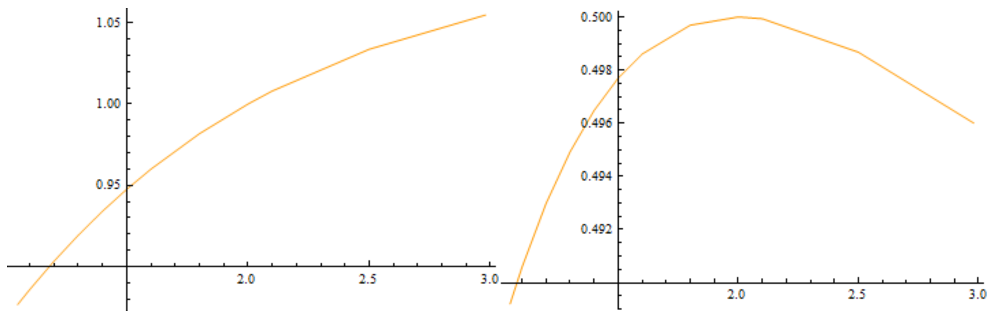

Figure 5: Demand for XY (resp. XZ) and demand for Z (resp. Y)

Figures 3 and 4 indicate that $P_{xy}*$ and $\Pi^A_{xy/z}*$ increase with V_x. When consumers' valuation for X increases, A can charge a higher price on bundle XY and earn a larger profit.

Figures 3 and 4 also suggest that P_z* increases with $P_{xy}*$ (and V_x) when $V_x < 2$ and P_z* decreases with $P_{xy}*$ (and V_x) when $V_x > 2$. Indeed, A's and B's reaction functions can be written as

$$\begin{aligned} P_z* &= \frac{1}{2} + \frac{1}{4}(P_{xy} * - V_x)^2, \\ P_{xy}* &= \frac{1}{3}(-2P_z + 2V_x + \sqrt{6 + 4P_z^2 - 2P_z V_x + V_x^2}), \end{aligned}$$

respectively.

The numerical values of $P_{xy}*$ and P_z* as functions of V_x indicate that $P_{xy}* < V_x$ when $V_x < 2$ and $P_{xy}* > V_x$ when $V_x > 2$.[11]

Concerning A's reaction function, we have

$$\frac{\partial P_z*}{\partial P_{xy}*} = \frac{1}{2}(V_x - P_{xy}*)$$

Hence,

$$\frac{\partial P_z*}{\partial P_{xy}*} < 0 \text{ if } P_{xy}* < V_x,$$

[11] Although Figure 3 suggests that $P_{xy}* = V_x$, precise numerical values show that $P_{xy}*$ is *slightly* weaker than V_x when $V_x < 2$ and $P_{xy}*$ is *slightly* larger than V_x when $V_x < 2$.

$$\frac{\partial P_z*}{\partial P_{xy}*} > 0 \text{ if } P_{xy}* > V_x.$$

Numerical values of $P_{xy}*$ and P_z* as functions of V_x indicate that $P_{xy}* < V_x$ when $V_x < 2$ and $P_{xy}* > V_x$ when $V_x > 2$.[12]

Concerning B's reaction function, we have

$$\frac{\partial P_{xy}*}{\partial P_z*} = -2 + \frac{8P_z - 2V_x}{2\sqrt{6 + 4P_z^2 - 2P_zV_x + V_x^2}}.$$

Similarly, numerical values indicate that $\frac{\partial P_{xy}*}{\partial P_z*}$ is negative when $V_x < 2$ and positive when $V_x > 2$.

The subgame {XZ, Y} can be solved in a similar way.

Finally, this leads to the following lemma

Lemma 2 *The subgames {XY, Z} and {XZ, Y} have a unique Nash equilibrium. In this equilibrium, reaction functions are characterized, respectively, by*[13]

$$\frac{\partial P_z*}{\partial P_{xy}*} < 0 \textit{ and } \frac{\partial P_{xy}*}{\partial P_z*} < 0 \textit{ if } V_x < 2,$$

$$\frac{\partial P_z*}{\partial P_{xy}*} > 0 \textit{ and } \frac{\partial P_{xy}*}{\partial P_z*} > 0 \textit{ if } V_x > 2.$$

and

$$\frac{\partial P_y*}{\partial P_{xz}*} < 0 \textit{and } \frac{\partial P_{xz}*}{\partial P_y*} < 0 \textit{ if } V_x < 2,$$

$$\frac{\partial P_y*}{\partial P_{xz}*} > 0 \textit{and } \frac{\partial P_{xz}*}{\partial P_y*} > 0 \textit{ if } V_x > 2.$$

To understand the intuition behind this result, let us focus on the subgame {XY, Z}. An increase in $P_{xy}*$ reduces the demand for XY and, consequently, the demand for Z.[14] When V_x is large (i.e., when $V_x > 2$), B can restore its profit by increasing the demand for Z, i.e., by decreasing P_z*. Because consumers buy Z only if they can also buy XY, this is possible only when XY is valued highly enough, i.e., for large values of V_x. In this case, $P_{xy}*$ and P_z* are strategic substitutes. When V_x is weak (i.e., when $V_x < 2$), XY is not valued highly enough to enable consumers to buy it. Hence, they do not buy Z either. Hence, B improves its profit by increasing P_z* rather than increasing the demand for Z. In this case, $P_{xy}*$ and P_z* are strategic complements.

Finally, Lemma 2 reveals that in the subgames {XY, Z} and {XZ, Y}, A and B are strongly interdependent. The nature of the strategic interactions between $P_{xy}*$ and P_z* is endogenous and crucially depends on V_x.

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[12] Although Figure 3 suggests that $P_{xy}* = V_x$, precise numerical values show that $P_{xy}*$ is *slightly* weaker than V_x when $V_x < 2$ and $P_{xy}*$ is *slightly* larger than V_x when $V_x < 2$.

[13] We have verified that the second-order condition is satisfied.

[14] When one considers an increase in P_z*, the mechanism is the same.

3.1.3 The subgames {X&Y, Y} and {X&Z, Z}

In subgame {X&Y, Y}, due to Bertrand competition on Y, we have $P_y* = 0$. Moreover, because A has a monopoly power in X and all consumers have the same valuation for X, A can extract their surplus by setting $P_x* = V_x$.

Subgame {X&Z, Z} can be solved in the same way.

Finally, accounting for the cost incurred by the broker to unbundle both services, we obtain the following lemma:

Lemma 3 *For $V_x > c$ (H1), the subgames {X&Y, Y} and {X&Z, Z} have a unique Nash equilibrium, defined by*

$$P_y* = 0, P_x* = V_x, \Pi^A_{x\&y/y}* = V_x - c \text{ and } \Pi^B_{y/x\&y}* = 0$$

and

$$P_z* = 0, P_x* = V_x, \Pi^A_{x\&z/z}* = V_x - c \text{ and } \Pi^B_{z/x\&z}* = 0, respectively.$$[15]

3.1.4 The subgames {X&Y, Z} and {X&Z, Y}

Let us for example focus on subgame {X&Y, Z}. As in the previous subgames, A extracts all the consumer surplus. We thus have $P_x* = V_x$. Then, consumers have a choice among three possible actions: buying X, buying X and Y, buying X and Z and buying X, Y and Z.[16]

Consumers buy X if X is preferred to buying X and Y, buying X and Z and buying X, Y and Z, i.e., if $V_y - P_y < 0$, $V_z - P_z < 0$ and $V_y + V_z - P_y - P_z < 0$.

They consume X and Y if buying X and Y is preferred to buying X alone, buying X and Z and buying X, Y and Z, i.e., if if $V_y - P_y > 0$, $V_y - V_z - P_y + P_z > 0$ and $V_z - P_z < 0$.

They consume X, Y and Z if buying X, Y and Z is preferred to buying X alone, buying X and Y and buying X and Z, i.e., if if $V_y + V_z - P_y - P_z > 0$, $V_z - P_z > 0$ and $V_y - P_y > 0$.

They consume X and Z if buying X and Z is preferred to buying X alone, buying X and Y and buying X, Y and Z, i.e., if $V_y - P_y > 0$, $V_y - V_z - P_y + P_z < 0$ and $V_z - P_z > 0$ and $V_y < P_y$.

These conditions are represented by Figure 7.

[15]The fact that A's equilibrium profit is larger in subgame {X&Y, Y} than in subgame {XY, Y} illustrates the critiques of leverage theory mentioned in Footnote 11.

[16]Buying nothing is not an option: because $V_x > 1$, X is also valued enough to be consumed alone.

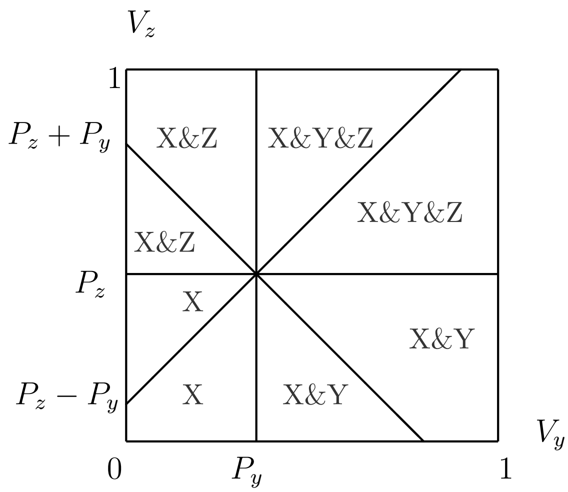

Figure 7: Consumers' demand in the subgame {X&Y, Z}

Following Figure 7, the demand for Y is $(1 - P_y)$, and the demand for Z is $(1 - P_z)$. As a result, A sets P_y* such that

$$P_y* = \text{ArgMax } P_y(1 - P_y) - c \tag{1}$$

and B determines P_z* as follows

$$P_z* = \text{ArgMax } P_z(1 - P_z). \tag{2}$$

This yields the following lemma:

Lemma 4 *The subgames {X&Y, Z} and {X&Z, Y} have a unique Nash equilibrium, characterized by*

$$P_x* = V_x,\ P_y* = P_z* = \frac{1}{2},\ \Pi^A_{x\&y/z}* = V_x + \frac{1}{4} - c \text{ and } \Pi^B_{z/x\&y}* = \frac{1}{4}$$

and

$$P_x* = V_x,\ P_z* = P_y* = \frac{1}{2},\ \Pi^A_{x\&z/y}* = V_x + \frac{1}{4} - c \text{ and } \Pi^B_{y/x\&z}* = \frac{1}{4}.$$

3.2 The first-stage game

The first-stage game is described in Table 1. The first entry in each cell corresponds to A's equilibrium profit, while the second entry corresponds to B's equilibrium profit.

From Table 1, we can deduce that the full game has subgame-perfect equilibria if:
(a) $\Pi^A_{xz/y}* > \frac{(1+V_x)^2}{4}$ (and $\Pi^A_{xy/z}* > \frac{(1+V_x)^2}{4}$) and
(b) $\Pi^A_{xz/y}* > V_x + \frac{1}{4} - c$ (and $\Pi^A_{xy/z}* > V_x + \frac{1}{4} - c$).

Under H1, $\frac{(1+V_x)^2}{4} > V_x + \frac{1}{4} - c$, such that if (a) is true, condition (b) is also verified. Hence, the existence of subgame-perfect equilibria only depends on (a). Figure 6 compares $\Pi^A_{xz/y}*$ and $\frac{(1+V_x)^2}{4}$ for $V_x \in [1; 3]$. We obtain the same figure for the comparison between $\Pi^A_{xy/z}*$ and $\frac{(1+V_x)^2}{4}$.

		B	
		Y	Z
	XY	$\frac{(1+V_x)^2}{4}$; 0	$\Pi^A_{xy/z}*$; $\Pi^B_{z/xy}*$
A	XZ	$\Pi^A_{xz/y}*$; $\Pi^B_{y/xz}*$	$\frac{(1+V_x)^2}{4}$; 0
A	X & Y	$V_x - c$; 0	$V_x + \frac{1}{4} - c$; $\frac{1}{4}$
A	X & Z	$V_x + \frac{1}{4} - c$; $\frac{1}{4}$	$V_x - c$; 0

Table 1: The first-stage game

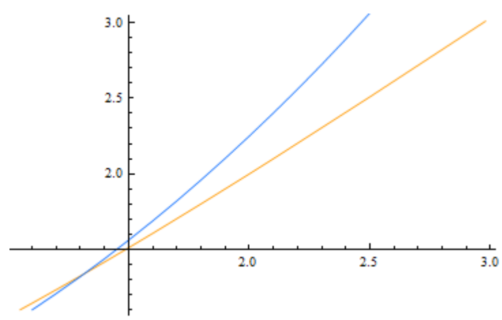

Figure 6: $\Pi^A_{xz/y}*$ and $\frac{(1+V_x)^2}{4}$ as functions of V_x

From Figure 6, we observe that

$$\Pi^A_{xz/y}* > \frac{(1+V_x)^2}{4} \text{ for weak values of } V_x,$$

$$\Pi^A_{xz/y}* < \frac{(1+V_x)^2}{4} \text{ for large values of } V_x.$$

We thus obtain the following proposition:

Proposition 1. *There exists a threshold $V_x* \in [1;3]$ such that if $V_x < V_x*$, the full game has two subgame-perfect equilibria:*[17]

(a) an equilibrium in which A offers XY and B offers Z and

(b) an equilibrium in which A offers XZ and A offers Y.

Proposition 1 indicates that the full-game equilibrium is characterized by a market configuration whereby A offers a bundle that contains the brokerage and a research service while B offers the second research service alone. The equilibrium accounts for market configuration where the broker offers a brokerage service associated with an optimistic investment advice and the independent analyst provide a less biased investment research service.

[17]Numerical simulations indicate that $V_x \simeq 1.315$.

The contribution of this result is twofold. First, Proposition 1 indicates that the existence of the equilibrium crucially depends on the value of V_x. To understand the mechanism behind this result, let us for example consider the situation in which A offers XY and B offers Z.

If V_x is large, the situation in which A offers XY and B offers Z is not a Nash equilibrium because A is tempted to deviate to benefit from the large valuation of X. To do so, A offers XZ and attracts all consumers, such that the demand for Z alone is null. This behaviour is in line with the so-called leverage effect described by Whinston (1990) and Martin (1999), by which bundling enables a monopolist in the tying service (here, A in the brokerage service market) to exert its market power in the (more competitive) tied service market (here, the investment research market). This leads to the situation in which A offers XZ and B offers Z. However, this configuration is not an equilibrium. Indeed, B deviates by differentiating his offer, i.e., by offering XY (rather than XZ). We thus reach the situation in which A offers XZ and B offers Y, which is not an equilibrium for the reason given above, and so forth.

If X is weakly valued by consumers, A's ability to benefit from the large valuation for X (and to extend its market power in the market for Z) is weak. Hence, he has a weak incentive to deviate from the situation in which A offers XY and B offers Z, which, consequently, is an equilibrium.

Hence, by suggesting that the full-game equilibrium may not exist, Proposition 1 provides some rational for the difficulty of obtaining co-existence between an independent researcher and a broker.

Second, Proposition 1 renews the literature on bundling in a duopoly. While the literature usually separately addresses leverage and differentiation effects, in our model, they emerge from a comprehensive and unique theoretical framework.

On the one hand, Proposition 1 stresses a limit of the leverage effect, which is different from that usually cited in the literature.[18]. This reveals that the use of the leverage effect by the monopolist on the tying service can be undermined by the reaction of its rival, which consists of restoring its market power by offering a tied service that is different from that contained in the bundle.

On the other hand, Proposition 1 exhibits a differentiation effect that differs from those addressed by previous contributions. Shy (1996) and Chen (1997) exhibit equilibria in which one firm offers the tying service (for example, X) alone and the other offers a bundle (for example, XY). In these equilibria, differentiation mitigates competition: consumers who have a low valuation for the tied service choose the tying service X alone, and those who have a high valuation for the tied service choose the bundle XY. Vaubourg (2006) introduces a second bundle (for example, XZ) and shows that there exist equilibria in which one firm offers the tying service (for example, X) and the first bundle (for example, XY) and the other offers the second bundle (for example, XZ). In these equilibria, mixed tying by one of the two firms makes discrimination possible without reducing differentiation since the two firms do not offer the same bundle. By

[18]For Posner (1976) and Weinberg (1996), selling a bundling XY with the hope of exerting market power in the tied service market does not induce more profit than selling X and Y separately. Indeed, although such a strategy allows for an increase in the price paid to the monopolist, it is undermined by the fact that while X alone is consumed by all consumers, XY (in the subgame {XY, Y}) is only consumed by those for which $V_y < P_{xy} - V_x$.

contrast, in this paper, Z cannot be consumed without X but is offered alone. This assumption, which accounts for the situation of the brokerage and investment research industry, implies that Z cannot be consumed without the bundle XY. Proposition 1 shows that the situation in which one firm offers XY and the other offers Z can be an equilibrium. This market configuration is based on a differentiation effect, by which each offer ensures the attractiveness of the other. Because, by definition, Z cannot be consumed without X, the bundle XY guarantees the sale of Z. Symmetrically, in contrast with X (recall that $V_x > 1$), the bundle XY is not valued by all consumers (because some of them have an insufficient valuation for Y). Hence, the existence of Z partly guarantees the sale of XY.

4 Unbundling rules

In this section, we address the effect of unbundling rules. We successively study the second-stage subgames and the first-stage game.

We assume that unbundling rules are implemented in the financial industry such that it is now prohibited for A to bundle X and Y (or X and Z). A is thus compelled to adopt a "pure component" strategy, which consists in separately offering X and Y (or X and Z). As in Section 3, B offers Y only (or Z only). In this case, the first-stage game with unbundling rules is described in Table 2.

		B: Y	B: Z
A	X & Y	V_{xc} ; 0	$V_x + \frac{1}{4} - c$; $\frac{1}{4}$
	X & Z	$V_x + \frac{1}{4} - c$; $\frac{1}{4}$	$V_x - c$; 0

Table 2: The first-stage game with unbundling rules

From Table 2, we obtain the following proposition.

Proposition 2. *Under H1, the full game has two subgame-perfect equilibria:*

(a) an equilibrium in which A offers X and Y and B offers Z and

(b) an equilibrium in which A offers X and Z and B offers Y.

Proposition 2 states that when unbundling rules are implemented, there exist two market outcomes, in which A offers the execution service (X) and one financial research service (Y or Z) and B offers the other financial research service (Z or Y). In these equilibria, A and B earn positive profit.

The rationale for these equilibria is different from that behind the equilibrium described in Proposition 1. Due to the unbundling of X and Y, the consumption of X does not depend on the valuation for bundle XY. The markets for the tying and the tied services are disconnected. In the tying market, A can now extract all the possible profit on X alone by setting $P_x* = V_x$. In the tied service market, A and B offer differentiated services: the consumers who have a large valuation for Y consume Y, those who have a large valuation for Z consume Z, and those who have a large valuation for both Y and Z consume Y and Z.

Proposition 2 also shows that unbundling rules increase the demand addressed to B. As shown by Figure 5, in the basic model the demand for Z (resp. Y) is weaker than $\frac{1}{2}$. By contrast, in Proposition 2, it equals $\frac{1}{2}$. This comes from the fact that with unbundling rules, the consumption of Z (resp. Y) is no longer conditioned by the consumption of Y (resp. Z), such that more consumers now buy Z (resp. Y). Hence, the goal of unbundling rules, which is to develop independent analysis, is achieved. This is in line with the results of the surveys conducted by Oxera (2009) and Sagalink (2012), which indicate that the number of services provided by independent research providers increased after the enforcement of unbundling rules in the UK and France.[19] It is noteworthy that these rules also improve the demand addressed to A. Indeed, with unbundling rules, it equals 1 (the demand for X) + $\frac{1}{2}$ (the demand for Y), which is larger than the demand for XY represented in Figure 5. Because X and Y (resp. X and Z) are now unbundled, there is no situation in which a low valuation for Y (resp. Z) prevents agents from purchasing XY (resp. XZ) or XY and Z (resp. XZ and Y).

Moreover, note that, according to Figure 4, $\Pi^B_{z/xy}* < \frac{1}{4}$ and $\Pi^B_{y/xz}* < \frac{1}{4}$. These observations indicate that the equilibria described in Proposition 2 are more profitable for B than the equilibrium highlighted by Proposition 1. By contrast, we know from Proposition 1 that $\Pi^A_{x\&y/z}* < \Pi^A_{xy/z}*$ and $\Pi^A_{x\&z/y}* < \Pi^A_{xz/y}*$. Hence, the equilibria exhibited in Proposition 2 are less profitable for A than the one described by Proposition 1. The rationale for this result is as follows. Recall that the equilibrium in Proposition 1 is based on the idea that the sale of Z ensures the attractiveness of bundle XY, which in turn ensures the attractiveness of Z. By contrast, in Proposition 2, because X and Z are sold separately, consuming Y is not necessary to guarantee the consumption of Z and *vice-versa*. While in Section 3 prices are strategic complements, the optimal prices P_x* and P_y* (resp. P_z*) obtained from (1) and (2) do not depend on P_z* (resp. P_y*). Hence, unbundling rules soften the interdependence and competition between A and B. They restore A's and B's market power. However, this favourable effect if undermined by the cost incurred by the broker due to the unbundling of brokerage and investment research services, such that unbundling rules eventually reduces A's profitability.

5 Welfare

We now turn to the welfare analysis of unbundling rules. We first focus on welfare when A practices bundling. We then address welfare under unbundling rules.

5.1 Welfare with bundling

Welfare, denoted by $W*$, is the sum of A's and B's equilibrium profits and global consumer equilibrium surplus, denoted by $S*$. We denote by S_b* and W_b* the consumer surplus and welfare, respectively, when A practices bundling (i.e., without unbundling rules).

[19]Concerning fees, French portfolio management companies pay between 4 and 20 pb for brokerage services (with an average of 6 bp and a median of 10 bp) and between 2 and 20 bp for research (with an average and a median of 10 bp) (Sagalink, 2012).

Concentrating on subgame {XY, Z}, we have

$$W_b* = \Pi^A_{xy/z} * + \Pi^B_{z/xy} * + S_b * .$$

Numerical values for $\Pi^A_{xy/z}*$ and $\Pi^B_{z/xy}*$ are depicted by Figure 4.

Let us now determine consumer surplus. The individual surplus of each consumer who buys XY is measured by $V_x + V_y - P_{xy}*$. Hence, the global surplus of all consumers who buy XY, denoted by $S_{xy}*$, can be written as follows:

$$S_{xy}* = \int_0^{P_{xy}*-V_x} \int_{P_{xy}*+P_z*-V_x}^1 (V_x + V_y - P_{xy}*) dV_z dV_y + \int_{P_{xy}*-V_x}^1 \int_0^1 (V_x + V_y - P_{xy}*) dV_z dV_y. \quad (3)$$

The individual surplus of each consumer who buys Z is measured by $V_z - P_z$. Hence, from Figure (2), the global surplus of all consumers who buy Z, denoted by S_z*, is

$$S_z* = \int_0^{P_{xy}*-V_x} \int_{P_{xy}*+P_z*-V_x}^1 (V_z - P_z*) dV_z dV_y + \int_{P_{xy}*-V_x}^1 \int_{P_z*}^1 (V_z - P_z*) dV_z dV_y. \quad (4)$$

Calculating and summing (3) and (4), we obtain the global consumer surplus:

$$\begin{aligned} S_b* &= \frac{1}{6}(6 + P_{xy}*^3 + 3P_z*^2 + 3P_{xy}*^2(P_z * - V_x) + 6V_x - V_x{}^3 + 3P_z * (V_x{}^2 - 2) & (5)\\ &+ P_{xy} * (-6 - 6P_z * V_x + 3V_x{}^2) & (6) \end{aligned}$$

5.2 Welfare with unbundling rules

We denote by S_u* and W_u* the consumer surplus welfare, respectively, under unbundling rules.

Let us concentrate on subgame {X&Y, Z}. In this case, we have

$$W_u* = \Pi^A_{x\&y/z} * + \Pi^B_{z/x\&y} * + S_u * .$$

Recall that, in accordance with Lemma 4, $\Pi^A_{x\&y/z}*$ and $\Pi^A_{x\&y/z}*$ are given by

$$\Pi^A_{x\&y/z}* = V_x + \frac{1}{4} - c \text{ and } \Pi^B_{z/x\&y}* = \frac{1}{4}.$$

Consumer surplus is the sum of the surplus of consumers who buy X, denoted by S_x*, the surplus of consumers who buy XY, denoted by S_y*, and the surplus of those who buy Z, denoted by S_z*.

Because A extracts all the consumer surplus on X by setting $P_x* = V_x$, we have $S_x* = 0$. Moreover, using Figure 7, we have

$$S_y* = \int_{P_y*}^1 \int_0^1 (V_y - P_y*) dV_z dV_y.$$

Using the fact that $P_y* = \frac{1}{2}$, we have

$$S_y* = \int_{\frac{1}{2}}^{1} \int_{0}^{1} (V_y - \frac{1}{2}) dV_z dV_y = \frac{1}{8}.$$

Similarly, we obtain $S_z* = \frac{1}{8}$ and $S_u* = \frac{1}{4}$. Hence, we have

$$W_u* = V_x + \frac{1}{4} - c + \frac{1}{4} + \frac{1}{4} = V_x + \frac{3}{4} - c. \tag{7}$$

Finally, numerical values for (6) and (7) when $c = 0$ and $c = 0.03$ are represented by Figures 8 and 9.

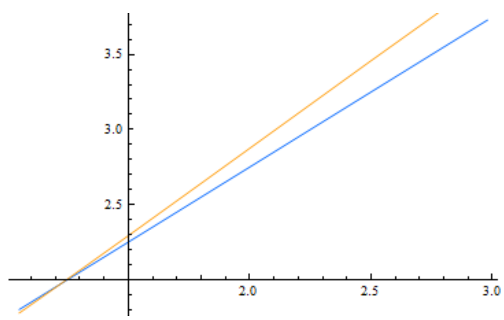

Figure 8: W_b* and W_u* as functions of V_x when $c = 0$

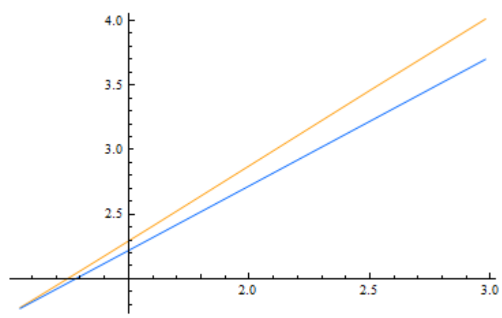

Figure 9: W_b* and W_u* as functions of V_x when $c = 0.03$

Figures 8 and 9 indicate that for values of V_x that are on the left of the intersection between the two curves, welfare with unbundling rules is larger than without unbundling rules ; symmetrically, for values of V_x that are on the right of the intersection between the two curves, welfare with unbundling rules is weaker than without unbundling rules.[20] Figure 8, which corresponds to the limit case $c = 0$ shows that the intersection of the two curves is the same as in Figure 5, denoted by V_x^*. Hence, for larger values of c (as for example, on Figure 9), the intersection of the two curves is weaker than V_x^*, such that the existence of the equilibrium with bundling is always ensured.

[20]This observation comes from the fact that the shape of W_b* is larger than the one of W_u*. Indeed, when bundling is allowed, a given increase in V_x induces more consumption of Y or/and Z. By contrast, when bundling is not allowed, this effect is weaker because consumptions of X, Y and Z are made more independent from each other.

We derive the following proposition:

Proposition 3.

(a) *There exists a threshold* $V_x^{**} < V_x^*$ *such that if* $V_x < V_x^{**}$*, unbundling rules increase social welfare.*

(b) *The threshold* V_x^{**} *increases with* c*.*

Figures 8 and 9 and Proposition 3 indicate that without any unbundling cost, unbundling rules increase welfare. The rationale behind this finding is as follows. First, as mentioned in Section 4, unbundling rules increase A's and B's market power, which is favorable to their profit. Moreover, unbundling rules also increase consumers' surplus. Second, without unbundling rules, some consumers do not consume Z because to do so, they have to buy X *and Y*, they not value enough. When unbundling rules are applied, they can buy Z independently from their valuation from Y, which increases their surplus.[21] When the unbundling cost for the broker is null ($c = 0$), both mechanisms have their full effects and unbundling rules globally increase social welfare. However, when $c > 0$, these effects are undermined by the existence of the unbundling cost, such that unbundling rules increase welfare only when $V_x < V_x^{**}$. Moreover, the larger c, the smaller the threshold V_x^{**}, the less welfare-increasing unbundling rules.

Finally, this section shows that although unbundling brokerage and financial analysis improves the independent analyst' profit and the consumers's surplus, it decreases the broker's profit. It also indicates that the impact on social surplus is all the more favorable for social welfare as c is weak.

6 Conclusion

The aim of this paper was to address the unbundling rules that have been implemented in many countries to promote independent research. While brokers could formerly provide brokerage and financial research as a single package and charge for them globally, unbundling rules oblige them to clearly divide the fees for the two services. Prior empirical investigations suggest that the device for CSAs that was introduced in France and in the UK a few years ago has reduced optimism in financial analysts' forecasts (Galanti and Vaubourg, 2017). In doing so, they may have improved efficiency in financial markets. In this paper, we analyse the effect of this regulation on the pricing policy and the profitability of the brokerage and financial research industry's protagonists.

To do so, we consider a duopoly between a broker and an independent analyst and assume that there exist two types of services: a brokerage (tying) service and two different (tied) financial analysis services, which cannot be consumed without the brokerage service. Focussing first on the situation before unbundling rules, we show that there exists an equilibrium in which the broker offers a bundle that contains the execution service and one research service while the independent analyst provides the other research service alone. This equilibrium is based

[21] Note also that when unbundling rules are applied, all consumers buy X while without unbundling rules, some of them do not consume it because they do not value Y or Z enough, with which X is bundled. But, because this increase in consumers' surplus is totally extracted by the broker, this effect neutral on social surplus.

on a differentiation effect, whereby offering the bundle boosts the demand for the separated component and *vice versa*.

When unbundling rules are applied, another equilibrium emerges in which the broker separately offers the brokerage service and one research service while the independent analyst offers the second research service alone. As expected, this increases the demand addressed to the independent analyst and its profit. Moreover, because the consumption of the bundle no longer depends on the consumption of the separated component and *vice versa*, the interdependence between the broker and the independent analyst is reduced, which increases their respective market power. However, this effect is undermined by the cost incurred by the broker to unbundle both services, thus globally decreasing its profit. Our paper also shows that unbundling rules allow consumers to consume more Z, thus increasing their surplus. Finally, the impact of unbundling rules on social welfare crucially depends on the broker's unbundling cost: the weaker the cost, the more effective the unbundling device in improving welfare.

The results obtained in this paper have at least two normative implications. First, because brokers have no interest to unbundle both services by themselves, this must be done through regulation. Second, to be effective, this regulation has to be combined with measures that aim to reduce the unbundling cost for the broker.

These findings could be completed or extended in various ways. First, we could account for the fact that brokers have a more important role than independent analysts in the investment research industry. Hence, our analysis could be refined by considering two (rather than one) brokers and investigating how CSA rules affect strategic interactions between the independent analyst and the two brokers. Second, and more ambitiously, it would also be interesting to collect precise information on brokers' pricing policies and financial situations to assess the impact of CSA rules on the profitability of European brokers and independent analysts.

References

Adams, W. and Yellen, J. (1976), "Commodity bundling and the burden of monopoly", *Quarterly Journal of Economics* 90, 475498.

Bakos, B. and Brynjofsson, E. (1999), "Bundling information goods: Pricing, profit and efficiency", *Management Science* 45, 16131630.

Bakos Y., Lucas H., Oh G., Simon W. Viswanathan V. and Weber B. (1999), "The impact of E-commerce on competition in the retail brokerage industry", *Information System Research* 16, 352371.

Brown, L., Call, A., Clement, M. and Sharp, N. (2015), "Inside the "'black box"' of sell-side financial analysts ", *Journal of Accounting Research* 53, 1-47.

Carbajo, J., de Meza, J. and Seidmann, D. (1990), "A strategic motivation for commodity bundling", *Journal of Industrial Economics* 38, 283298.

Chen, Y. (1997), "Equilibrium product bundling", *Journal of Business* 70, 85103.

Clarke, J., Khorana, A., Rau, R. and Patel, A. (2011), "Independents' day? Analyst behavior surrounding the Global Settlement", *Annals of Finance* 7, 529-547.

Cohen L., Malloy C. et Frazzini A. (2010), "Sell-side school ties", *Journal of Finance* 65, p. 1 409-1 437.

FCA (2013), Consultation on the use of dealing commission rules, Consultation Paper 13-17.

Guan Y., Lu H. and Wong M.H. (2012), "Conflict of interest reforms and investment bank analysts' research biases", *Journal of Accounting, Auditing and Finance* 27, 443-470.

Vaubourg, A.-G. and S. Galanti S., 2017, "Optimism bias in financial analysts' earnings forecasts: Do commission sharing agreements reduce conflicts of interest ?", *Economic Modelling*, forthcoming.

Hayes, R. (1998), "The impact of trading commission incentives on analysts' stock coverage decisions and earnings forecasts", *Journal of Accounting Research* 36, 299-320.

Hovakimian, A. and Saenyasiri, E. (2010), " Conflicts of interest and analyst behavior: Evidence from recent changes in regulation", *Financial Analysts Journal* 66.

Hovakimian, A. and Saenyasiri, E., 2014. US analyst regulation and the earnings forecast bias around the world, *European Financial Management* 20, 435-461.

Jackson, A. (2005), "Trade generation, reputation and sell-side analysis", *Journal of Finance* 60, 673-717.

Kadan, O., Madureira, L., Wang, R. and Zach, T. (2009), "Conflict of interest and stock recommendations: The effect of global settlement and related regulations", *Review of Financial Studies* 22, 4189-4217.

MacAfee, R., MacMillan, J. and Whinston, M. (1989), "Multiproduct monopoly, commodity bundling and correlation of values", *Quarterly Journal of Economics* 104, 371 383.

Martin, S. (1999), "Strategic and welfare implications of bundling", *Economics Letters* 62, 371 - 376.

Mehran, H. and Stulz, R. (2007), "The economics of conflicts of interest in financial institutions", *Journal of Financial Economics* 85, 267-296.

Oxera (2009), *The impact of the new regime for the use of dealing commissions: Post-implementation*, report for Financial Services Authority, available at: www.oxera.com.

Pozner, R. (1976), Antitrust law, University of Chicago Press.

Raghunathan S. and Sarkar S. (2016), "Competitive bundling in information markets: a seller-side analysis", *MIS Quarterly* 40, 111-131.

Sagalink Consulting (2012). *Commissions de courtage à facturation partagée : un état des lieux.*

Salinger, M. (1995), "A graphical analysis of bundling", *Journal of Business* 68, 8598.

Schmalensee, R. (1982), "commodity bundling by single products monopolies",*Journal of Law and Economics* 25, 62 - 72.

Schmalensee, R. (1984), "Gaussian demand and commodity bundling", *Journal of Law and Economics* 57, 211-230.

Shy, O. (1996), Industrial Organization: Theory and Applications, MIT Press, pp. 372-376.

Spector, D. (2007), "Bundling, tying, and collusion", *International Journal of Industrial Organization* 25, 575-581.

Stigler, G. (1963), "United states v. loew's inc: A note on block booking", *Supreme Court Review* 152, 152157.

Vaubourg, A.G. (2006), "Differentiation and discrimination in a duopoly with two bundles", *International Journal of Industrial Organization* 24, 753-762.

Weinberg, J. (1996), "Tie-in sales and banks", *Federal Reserve Bank of Richmond Economic Quarterly* 82/2, 1-19.

Whinston, M. (1990), "Tying, foreclosure and exclusion", *American Economic Review* 80, 837859.