Unbundling financial services: The case of brokerage and investment research

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Abstract

While brokers were formerly allowed to provide brokerage and financial research as a single package, unbundling rules now oblige them to charge separately for the two services. To analyze the effect of this regulation, we consider a duopoly between a broker, who offers a brokerage service and an investment research service, and an independent analyst, who offers a second financial research service. We show that when the broker is not allowed to bundle brokerage and investment research services, his profit is reduced. This effect is all the stronger when the cost he incurs to unbundle the two services is high. However, unbundling rules increase the profit of the independent analyst. They also increase the consumption of the brokerage service and that of the investment research service offered by the independent analyst, thus improving consumer surplus. Finally, we show that the lower the broker's unbundling cost is, the more effective unbundling rules are in improving welfare.

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

JEL Classification : G24, G28, L11, L13

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1 Introduction

Bundling or tying is a commercial practice that consists in selling several goods (or services) in a single package. The basic commodity is called "the tying good", and the other commodities or services are called "the tied goods". The tourism, computer and food industries are often used as examples of industries that adopt bundling strategies. However, tying is also widely practiced in the financial sector. For example, in the banking market, payment cards are often tied to insurance or other banking services (Vaubourg 2006; Weinberg 2006). In financial markets, as emphasized 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 making forecasts of earnings per share (EPS) or offering investment advice such as "buy" or "sell" recommendations).

Such practices are particularly interesting due to 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 customers brokerage fees. These inaccuracies contribute to increased corporate agency costs and reduced informational efficiency in financial markets.

In the UK (in 2006)[1] and in France (in 2007), so-called rules governing Commission Sharing Agreements (CSAs) or "unbundling rules"[2] 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 with) 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 pay out the financial research portion to the independent financial analyst. The CSA policy is to be extended to the European level in 2018. Indeed, the unbundling 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

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

[2] Although bundling actually refers to offering a quantity discount for a given good (Shy, 1997), practitioners and regulators usually employ the term "unbundling rules" (rather than "untying rules") to refer to measures intended to charge separately for the two services. For this reason, in the remainder of the article, we will use the terms "bundling" and "bundle" to describe financial analysts simultaneously selling execution and research services.

[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), and Hovakimian and Saenyasiri (2010; 2014).

(RPA) to finance investment advice services.

Surveys have been conducted of fund managers in the UK and France to assess the success of CSAs. 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 increased significantly between 2007 (approximately 5% of French portfolio management companies) and 2011 (approximately 60%). The survey also indicates that according to 75% of surveyed portfolio management companies, CSAs allowed them to purchase independent financial analysis. Moreover, conducting 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 analysts' optimistic bias declined significantly after the imposition of CSA rules. However, very little attention has been devoted to the consequences of CSAs for the pricing policy and profitability of firms in the brokerage and research industry. 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 refer to the literature on bundling in a duopoly.[4] A first strand of this 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 the 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 et al., 1990, Whinston, 1990 and Martin, 1999).[5]

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 this paper, we also consider a duopoly (between a broker and an independent analyst). To account for the specificity of the execution and research service industry, we consider 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 analyzes them separately. We show that the leverage effect used by one of the two duopolists may

[4]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 et al. (1989).

[5]When a fraction of consumers only value the tied good while another fraction value 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).

be undermined by its rival. Moreover, we demonstrate that this reaction induces a differentiation effect. This differentiation effect is based on the idea that offering a separated component that is different from the tied service contained in the bundle increases the demand for this bundle, which in turn creates demand for the separated component.

The second contribution of our paper is to demonstrate that prohibiting bundling practices crucially affects the profitability of the broker and the independent research provider. We show that unbundling rules reduce the profit of the broker but increase the profit of the independent analyst. They also improve consumer surplus and global welfare. For these reasons, our paper provides some support for the implementation of unbundling rules in the brokerage and investment research industry.

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. Sections 5 and 6 investigate consumer surplus and social welfare, respectively. Section 7 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. The service denoted by X is a brokerage service that consists of placing buy or sell orders on stock exchanges on behalf of consumers (fund managers, for example). The services denoted by 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, others prefer dividend discount models. Similarly, regarding the earnings components used to forecast, some analysts exclude non-operating items, whereas 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 substantive analysis.

We assume, in line with the practices described by Hayes (1998), Jackson (2005) and Mehran and Stulz (2007), that A can practice "pure bundling", i.e., 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 is Y (or Z) the "tied good". He can also practice a "pure component" strategy and separately offer X and Y (or X and Z). In contrast, B does not provide any execution service and only offers a financial research service, Y or Z, alone.

X, Y and Z have reservation values 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 of X.[6] 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. Denoting by V_{xy} (resp. V_{xz}) the reservation value for X

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

and Y (resp. Z) when they are consumed simultaneously, we assume that $V_{xy} = V_x + V_y$ (resp. $V_{xz} = V_x + V_z$).

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 in financial markets often buy investment research from different sources, we also assume that Y and Z can be bought simultaneously.

Each service has zero marginal cost.[7] However, we assume that unbundling both services, i.e., offering and pricing them 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 single channel (for example, during the same phone call between the analyst and his customer). Hence, c accounts for the cost of implementing two different delivery channels and of calculating the true value of the investment research service, independently from that of the brokerage service and *vice versa*.[8]

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, XZ, Y and Z are denoted by P_x^*, P_{xy}^*, P_{xz}^*, P_y^* and P_z^* respectively.

$\Pi_{i/j}^{A*}$ (resp. $\Pi_{i/j}^{B*}$) 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), the subgames in which A offers XY (resp. XZ) while B offers Z (resp. 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.

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[7]For an experiment on the impact of low-cost online brokers on the brokerage industry, see Bakos et al. (2005).

[8]We could also assume that placing orders on financial markets may provide access to financial information that reduces the cost of producing forecasts or recommendations.

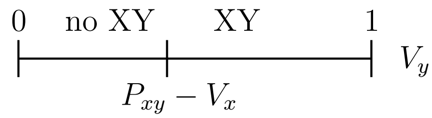

Figure 1: Consumers' demand in the subgame {XY, Y}

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

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

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

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

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 a choice among three possible actions: buying nothing, buying XY and buying both XY and Z.

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

They consume nothing if buying nothing is preferred to XY and 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.

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

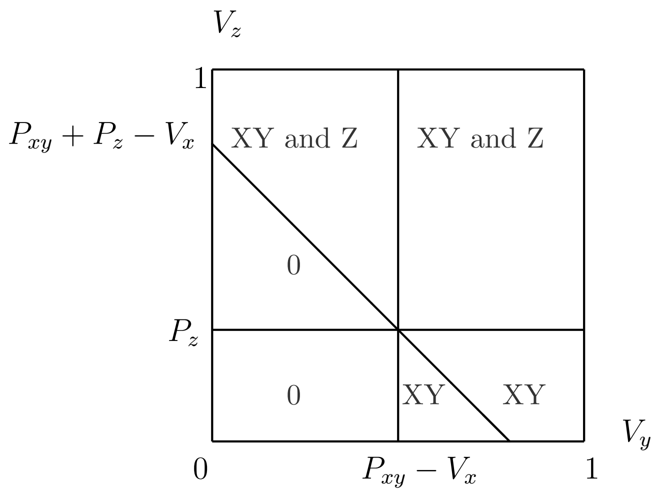

Figure 2: Consumers' demand in the subgame {XY, Z}

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 and 4, numerical simulations allow us to compute the values of P^*_{xy}, P^*_z, $\Pi^{A*}_{xy/z}$ and $\Pi^{B*}_{z/xy}$ for $V_x \in]1;3[$. Numerical simulations of the demand for XY and Z are represented in Figure A.1. in the Appendix.

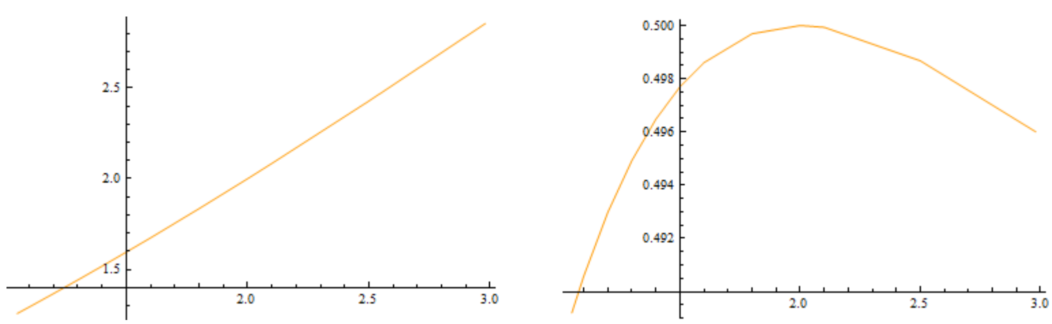

Figure 3: P^*_{xy} and P^*_z as functions of V_x

[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 even when Y and Z are not valued by consumers (i.e., when $V_y = V_z = 0$).

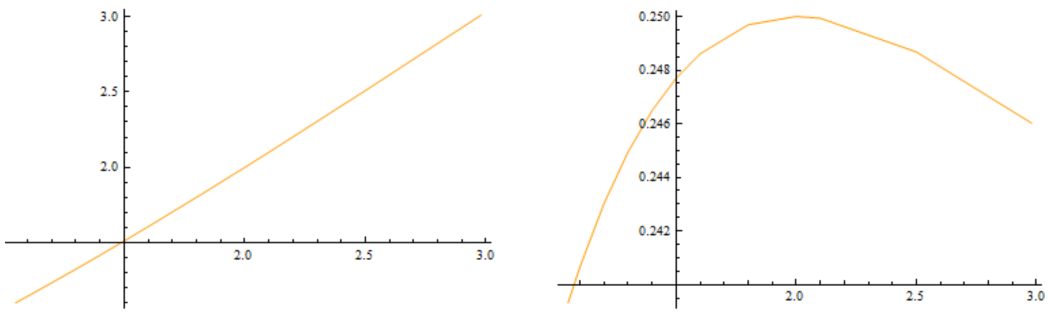

Figure 4: $\Pi^{A*}_{xy/z}$ and $\Pi^{B*}_{z/xy}$ as functions of V_x

Figures 3 and 4 indicate that P^*_{xy} and $\Pi^{A*}_{xy/z}$ increase with V_x. When consumers' valuation of 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, B's reaction functions can be written as

$$P^*_z \;=\; \frac{1}{2} - \frac{1}{4}(P^*_{xy} - V_x)^2.$$

Hence, we have

$$\frac{\partial P^*_z}{\partial P^*_{xy}} = \frac{1}{2}(V_x - P^*_{xy}).$$

Moreover, numerical values of P^*_{xy} 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] We thus obtain

$$\frac{\partial P^*_z}{\partial P^*_{xy}} > 0 \text{ if } P^*_{xy} < V_x, \text{ i.e., if } V_x < 2,$$
$$\frac{\partial P^*_z}{\partial P^*_{xy}} < 0 \text{ if } P^*_{xy} > V_x, \text{ i.e., if } V_x > 2.$$

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, P^*_z and P^*_{xy} are strategic complements for weak values of V_x and strategic substitutes for large values of V_x.

Lemma 2 reveals that in 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. 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.[12]

[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 $V_x < 2$.

[12] When one considers an increase in P^*_z, the mechanism is symmetric.

On the one hand, 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. On the other hand, when XY is not highly valued, 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.

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 of X, A can extract consumer surplus by setting $P_x^* = V_x$.

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

Finally, accounting for c, the cost incurred by the broker to unbundle the two 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*

$$P_y^* = 0, P_x^* = V_x, \Pi_{x\&y/y}^{A*} = V_x - c \text{ and } \Pi_{y/x\&y}^{B*} = 0$$

and

$$P_z^* = 0, P_x^* = V_x, \Pi_{x\&z/z}^{A*} = V_x - c \text{ and } \Pi_{z/x\&z}^{B*} = 0, \text{ respectively.}$$

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

Let us 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.[13]

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 $V_y - P_y > 0$, $V_y - V_z - P_y + P_z > 0$ 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 $V_y + V_z - P_y - P_z > 0$, $V_z - P_z > 0$ 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 5.

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

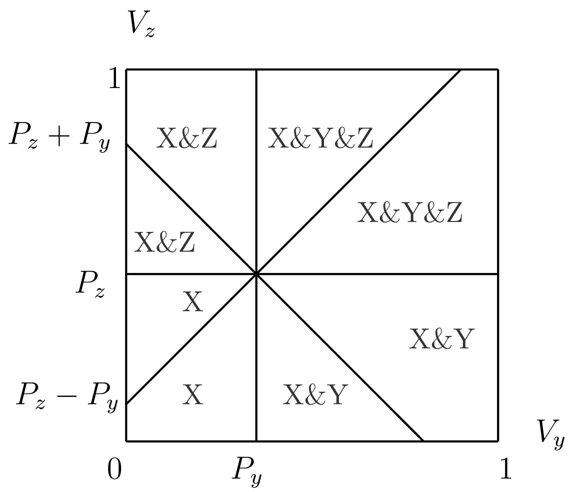

Figure 5: Consumers' demand in the subgame {X&Y, Z}

Following Figure 5, 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*

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

and

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

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 deduce that the full game has subgame-perfect equilibria if

(a) $\Pi_{xz/y}^{A*} > \frac{(1+V_x)^2}{4}$ and $\Pi_{xy/z}^{A*} > \frac{(1+V_x)^2}{4}$ and

(b) $\Pi_{xz/y}^{A*} > V_x + \frac{1}{4} - c$ and $\Pi_{xy/z}^{A*} > V_x + \frac{1}{4} - c$.

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

Table 1: The first-stage game

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), i.e., on the comparison between $\Pi^{A*}_{xz/y}$ and $\frac{(1+V_x)^2}{4}$. Figure 6 compares $\Pi^{A*}_{xz/y}$ and $\frac{(1+V_x)^2}{4}$ for $V_x \in]1;3[$. Note that we would obtain the same figure for the comparison between $\Pi^{A*}_{xy/z}$ and $\frac{(1+V_x)^2}{4}$.

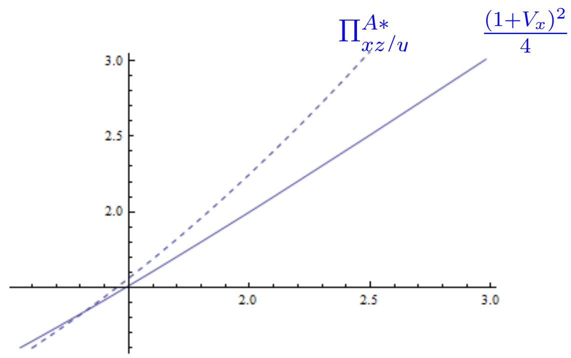

Figure 6: Full Game: $\Pi^{A*}_{xz/y}$ and $\frac{(1+V_x)^2}{4}$ as functions of V_x

From Figure 6, we observe that

$$\Pi^{A*}_{xz/y} > \frac{(1+V_x)^2}{4} \text{ for } V_x < V_x^*,$$

$$\Pi^{A*}_{xz/y} < \frac{(1+V_x)^2}{4} \text{ for } V_x > V_x^*.$$

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:*[14]

(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.

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

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.

For example, in accordance with the literature on the optimistic bias among sell-side analysts (Hayes 1998; Jackson 2005; Mehran and Stulz 2007), the equilibria described in Proposition 1 can be interpreted as accounting for market configurations in which the broker offers a brokerage service associated with optimistic investment advice and the independent analyst provides a less-biased investment research service.

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 behavior 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 deviation leads to a situation in which A offers XZ and B offers Z. However, this configuration is not an equilibrium. Indeed, B has an incentive to deviate 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. By contrast, if X is weakly valued by consumers, A's ability to benefit from the large valuation of 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, becomes an equilibrium. Hence, by suggesting that the full-game equilibrium may not exist, Proposition 1 provides some rationale for the difficulty of achieving 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.[15]. 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, the differentiation effect exhibited by Proposition 1 differs from those addressed by previous contributions. The specificity of our model is that Z cannot be consumed without X but is offered alone. This assumption, which captures the situation of the brokerage and investment research industry, implies that Z cannot be consumed without the bundle XY. Hence, the equilibrium in which one firm offers XY and the other offers Z is based on a differentiation

[15]For Posner (1976) and Weinberg (1996), selling a bundle XY in 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 $V_y < P_{xy} - V_x$.

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, the existence of Z partly guarantees the sale of XY, which is not valued by all consumers because some of them have an insufficient valuation of Y.

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 A is now prohibited from bundling 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 2, 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	$V_x - c$; 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 and one financial research service and B offers the other financial research service. In these equilibria, A and B earn positive profits.

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 no longer depends on the valuation of Y. 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 of Y consume Y, those who have a large valuation of Z consume Z, and those who have a large valuation of both Y and Z consume Y and Z.

Moreover, comparing the equilibria described in Proposition 2 to those defined in Proposition 1 indicates that unbundling rules increase the demand addressed to B. Indeed, as shown by Figure A.1. in the Appendix, the demand for Z (resp. Y) is weaker than $\frac{1}{2}$. By contrast, in Proposition 2, it equals $\frac{1}{2}$. When bundling is prohibited, 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). Let us remind that Proposition 1 can be interpreted as accounting for market configurations in which the independent analyst provides a non-biased investment research service and the broker offers a brokerage service associated with optimistic investment advice. Hence, the goal of unbundling rules, which is to develop independent and less-biased 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. 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 A.1. Because X and Y (resp. X and Z) are now unbundled, having a low valuation of Y (resp. Z) does not prevent agents from purchasing X and Y (resp. X and Z).

Note also that, according to Figure 4, $\Pi^{B*}_{z/xy} < \frac{1}{4}$ and $\Pi^{B*}_{y/xz} < \frac{1}{4}$. These observations indicate that unbundling rules increase B's profit. 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, unbundling rules decrease A's profit. The rationale for these results 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 improves the attractiveness of Z. By contrast, in Proposition 2, because X and Z are sold separately, equilibrium prices P^*_x and P^*_y (resp. P^*_z) obtained from (1) and (2) do not depend on P^*_z (resp. P^*_y). For this reason, consuming Y is not necessary to guarantee the consumption of Z and *vice-versa*. Hence, unbundling rules soften the interdependence and competition between A and B and restore their market power. However, for the broker, this favorable effect is undermined by the cost he incurs when bundling brokerage and investment research services is prohibited, such that unbundling rules eventually reduce A's profit.

5 Consumers' surplus

In this section, we investigate the impact of unbundling rules on consumers' surplus.

We denote by S^{b*} and S^{u*} the consumer surplus when bundling is allowed and when it is prohibited, respectively.

To determine the consumers' surplus when bundling is allowed, let us concentrate on equilibrium {XY, Z}. Consumer surplus S^{b*} is the sum of the surplus of consumers who buy XY, denoted by S^{b*}_{xy}, and the surplus of consumers who buy Z, denoted by S^{b*}_z.

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

$$S^{b*}_{xy} = \int_0^{P^*_{xy}-V_x}\int_{P^*_{xy}+P^*_z-V_x}^1 (V_x+V_y-P^*_{xy})dV_z dV_y + \int_{P^*_{xy}-V_x}^1\int_0^1 (V_x+V_y-P^*_{xy})dV_z dV_y. \quad (3)$$

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

$$S^{b*}_z = \int_0^{P^*_{xy}-V_x}\int_{P^*_{xy}+P^*_z-V_x}^1 (V_z-P^*_z)dV_z dV_y + \int_{P^*_{xy}-V_x}^1\int_{P^*_z}^1 (V_z-P^*_z)dV_z dV_y. \quad (4)$$

Summing (3) and (4), we obtain global consumer surplus when bundling is allowed:

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

To investigate the case in which bundling is prohibited, let us consider the equilibrium {X&Y, Z}. Consumer surplus S^{u*} is the sum of the surplus of consumers who buy X, denoted by S_x^{u*}, the surplus of consumers who buy XY, denoted by S_y^{u*}, and the surplus of those who buy Z, denoted by S_z^{u*}.

Because A extracts all the consumer surplus on X by setting $P_x^* = V_x$, we have $S_x^{u*} = 0$. Moreover, using Figure 5, we have

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

Using the fact that $P_y^* = \frac{1}{2}$ yields

$$S_y^{u*} = \int_{\frac{1}{2}}^1 \int_0^1 (V_y - \frac{1}{2}) dV_z dV_y = \frac{1}{8}.$$

Similarly, we have

$$S_z^{u*} = \frac{1}{8}.$$

Finally, we obtain

$$S^{u*} = \frac{1}{4}. \tag{6}$$

Comparing the expressions for S^{b*} and S^{u*} given by (5) and (6), respectively, it is straightforward to show the following proposition.

Proposition 3. *Unbundling rules increase consumer surplus.*

Proposition 3 indicates that consumer surplus is improved when bundling is prohibited. To understand the intuition behind this result, let us consider the equilibrium {XY, Z}. When bundling is allowed, there is under-consumption of X because some consumers do not value Y (or Z) enough to buy XY (or XY *and* Z). Similarly, there is also under-consumption of Z because some consumers do not value Y enough to buy XY *and* Z. This situation of under-consumption is represented by the square and the triangle at the bottom-left of Figure 2. By contrast, when unbundling rules are applied, as illustrated by Figure 5, all consumers buy at least X. They can also buy Z independent of their valuation of Y. Taken together, these effects globally increase consumer surplus.

6 Welfare

We now turn to the welfare analysis of unbundling rules.

Welfare is the sum of A's and B's equilibrium profits and global consumer equilibrium surplus. We denote by W^{b*} and W^{u*} social welfare when bundling is allowed and when it is prohibited, respectively.

When bundling is allowed, for example at equilibrium {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 in Figure 4, and S^{b*} is given by (5). We thus have

$$\begin{aligned} W^{b*} &= \Pi^{A*}_{xy/z} + \Pi^{B*}_{z/xy} + \frac{1}{6}(6 + {P^*_{xy}}^3 + 3P^{*2}_z + 3{P^*_{xy}}^2(P^*_z - V_x) + 6V_x - {V_x}^3) \\ &+ 3P^*_z({V_x}^2 - 2 + P^*_{xy}(-6 - 6P^*_z V_x + 3{V_x}^2)) \end{aligned} \quad (7)$$

When bundling is not allowed, for example at equilibrium {X&Y, Z}, 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

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

Hence, we obtain

$$W^{u*} = V_x + \frac{3}{4} - c. \quad (8)$$

Finally, numerical values for (7) and (8) when $c = 0$ and $c = 0.03$ are depicted in Figures 7 and 8.

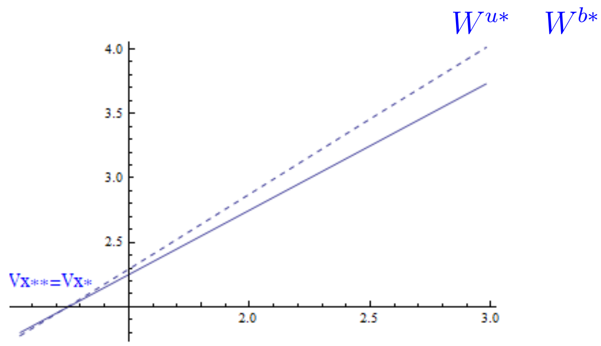

Figure 7: W^{b*} and W^{u*} as functions of V_x when $c = 0$

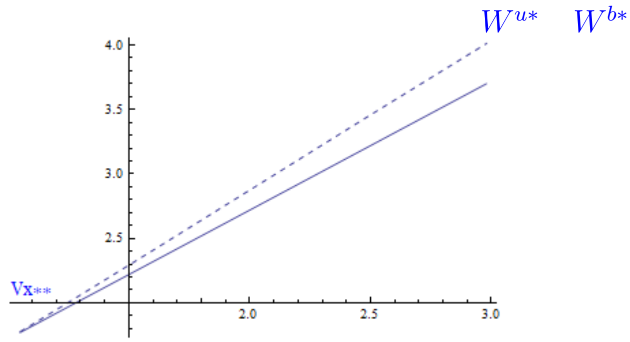

Figure 8: W_b* and W_u* as functions of V_x when $c = 0.03$

Figures 7 and 8 indicate that for values of V_x that are to the left of the intersection of the two curves, denoted by V_x^{**}, welfare is higher with unbundling rules than without unbundling rules; symmetrically, for $V_x > V_x^{**}$, welfare is lower with unbundling rules than without unbundling rules.[16] Figure 7, which corresponds to the limit case in which $c = 0$, shows that $V_x^{**} = V_x^*$. For $c > 0$ (for example, as in Figure 8), V_x^{**} is lower than V_x^*, such that, for all values of $V_x < V_x^{**}$, the existence of equilibria {XY, Z} and {XZ, Y} is always ensured.

We derive the following proposition:

Proposition 4.

(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^{**} decreases with c.*

Figures 7 and 8 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, as underlined in Proposition 3, unbundling rules also increase consumers' surplus.[17] 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, as mentioned in Section 3, 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 and the smaller the threshold V_x^{**}, the less welfare-increasing unbundling rules are.

Finally, this section shows that although unbundling brokerage and financial analysis improves the independent analyst's profit and the consumers' surplus, it decreases the broker's profit, such that the impact on social surplus is all the more favorable for social welfare as c is weak. This result advocates for the implementation of unbundling rules, combined with a reduction in the unbundling cost incurred by the broker.

[16] 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 consumption decisions for X, Y and Z are made more independent of one another.

[17] Note, however, that the increase in consumers' surplus that is due to higher consumption of X is totally extracted by the broker. Hence, this effect is neutral with respect to social surplus.

7 Conclusion

Our aim in this paper was to address the unbundling rules that have been implemented in many countries to promote independent research. While brokers were formerly allowed to 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 CSA policy 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, CSAs may have improved the efficiency of these financial markets. In this paper, we analyze the effect of this regulation on the pricing policy and profitability of firms in the brokerage and financial research industry.

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. Focusing 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 (for example a brokerage service associated with optimistic investment advice) while the independent analyst provides the other research service alone (for example a less-biased investment research service). This equilibrium is based 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 the two services, thus globally decreasing its profit. Our paper also shows that unbundling rules allow more consumers to consume the brokerage and the investment research service offered by the independent analyst, thus increasing their surplus. Finally, the impact of unbundling rules on social welfare crucially depends on the broker's unbundling cost: the lower the cost, the more effective the unbundling device is in improving welfare.

The results obtained in this paper have at least two normative implications. First, because brokers have no interest in unbundling the two services, this must be done through regulation. This provides some rationale for the implementation of unbundling rules, such as those that will be extended throughout Europe under MiFID2. Second, to be effective, this regulation has to be "bundled" with accompanying measures designed 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.

Appendix

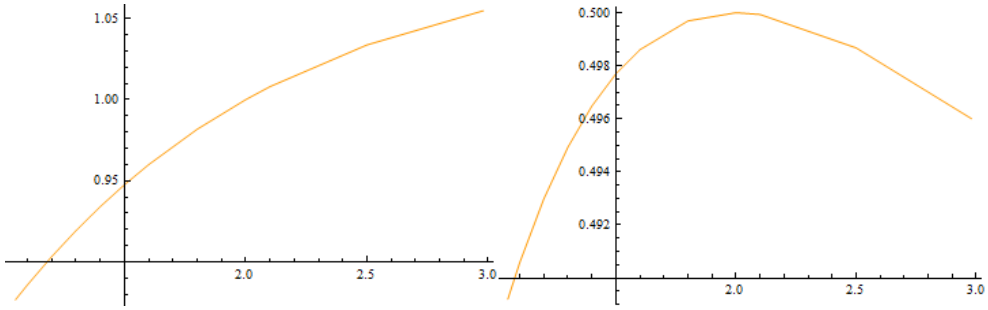

Figure A.1. Equilibrium demands for XY and for Z in subgame {XY, Z}

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