DEPARTEMENT BEDRIJFSECONOMIE

VOLUNTARY DISCLOSURE OF TURNOVER FOR SME'S

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WORKING PAPER
97-253
August 1997

D/1997/2263/10

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22 July 1997

Abstract

This paper is the first to analyze the desirability of voluntary disclosure of turnover of Small and Medium sized Enterprises (SME's) in the European Union. The fourth directive allows SME's to publish their financial statements in an abridged format. In contrast to large firms, the disclosure of turnover is left to the discretion of the SME.
In this paper we use a simple game theoretic model to study the disclosure behaviour of an incumbent firm faced with potential entry on the one hand and a customers-effect of disclosure on the other hand. Our findings suggest that the voluntary disclosure of turnover is always in the interest of the incumbent firm. However, it need not be in the general interest. We find conditions under which mandatory disclosure can be preferred from a welfare economic point of view.

JEL-codes: M41, K29
Key words: Voluntary disclosure, SME, turnover, entry game

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We thank Carl Reyns, Mark De Ceuster, An Jorissen and Patrick Vanhoudt for comments on an earlier version. Hylke Vandenbussche is grateful for the financial support provided by the Belgian Fund for Scientific Research (FWO). The usual disclaimer applies.

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I. Introduction

Small and Medium sized Entities (SME's)[1] in the European Union are allowed to publish their financial statements in an abridged format rather than a full format that applies to large firms. In the abridged format of the profit and loss account, the disclosure of turnover is left to the discretion of the SME.

The purpose of this paper is to analyze the voluntary disclosure decision of turnover in a simple game theoretic model in order to gain more insight into the incentives of a firm to disclose or not when it is faced with potential entry on the one hand and a customers-effect of disclosure on the other hand. Our findings suggest that voluntary disclosure, although in the interest of the SME already in the market, is not always in the general interest. We find conditions under which mandatory disclosure can even be preferred from a welfare economic point of view.

The model we present is well embedded in the existing literature on voluntary disclosure although the applications in the literature were not in first instance in the accounting environment (Grossman (1981), Verrecchia (1983), Darrough & Stoughton (1990) and Wagenhofer (1990)).

Grossman (1981) constructed a model of a buyer-seller situation where the seller has private information about the true quality of a product. Disclosure is free of costs and the buyer has the possibility, after purchasing the good, to verify the quality without incurring any costs. Under these assumptions, Grossman (1980) shows that full disclosure of the true quality of the product is always in the interest of the seller.

Verrecchia (1983) dropped the assumption that disclosure has zero costs and introduced the concept of *'proprietary cost of disclosure'*. This is not the direct cost of collecting, presenting and disclosing information (which is still considered to be

[1] According to the 4th European Directive an SME is a firm that does not exceed more than one of the following criteria: 250 employees, 20 MIO ECU turnover, 10 MIO ECU total assets. Individual

zero), but *the future loss of earnings or cash flows due to the release of private information*. The example he gives concerns a holder of a risky asset who has private information about the liquidating value of this asset. Disclosure of this information to the capital market causes a proprietary cost in the form of reactions by competitors, bankers etc. Hence, Verrecchia (1983) shows that full disclosure need no longer be optimal.

Another interpretation of the proprietary cost is given by Darrough & Stoughton (1990). They consider an entry game in which a monopolist firm quoted on the stock market has private information about its profits. Disclosure of 'good news' in the form of high profits can lead to an adverse effect on monopoly profits through entry of a potential entrant in the market but can also lead to a positive reaction of the capital market. The opposite reactions occurs with disclosure of low profits. Darrough & Stoughton (1990) show that depending on entry versus capital market reactions, profits may be disclosed or not.
Wagenhofer's (1990) model differs slightly from that of Darrough & Stoughton (1990) but he also finds that the disclosure decision depends on the trade off caused by proprietary costs.

The model we develop is most closely related to the ones of Darrough & Stoughton (1990) and Wagenhofer (1990). However, we consider SME's which are not quoted on the stock market and hence we abstract from capital market reactions. The specific context of SME's is their exemption of mandatory disclosure of accounting information in the abridged format of the profit and loss account. The most important variable for which the voluntary disclosure applies is 'turnover'[2]. In what follows we will discuss the voluntary disclosure of turnover in the presence of a potential entrant and additional demand effects in the form of a customers-effect of disclosure.

The remainder of the paper is organized as follows. In the next section, we further elaborate on the specific assumptions that are effective in our model. In a third

European member states, that have implemented this directive into their national legislation are allowed to adopt lower thresholds.
[2] The other variable is 'raw materials, consumables, goods for resale and other external charges'.

section, we introduce the model and solve it algebraically. Then we define the equilibrium strategies for the incumbent and potential entrant. Section four presents simulation results and discusses the desirability of voluntary disclosure. In a final section we sum up the main conclusions of our analysis.

II. Assumptions

As stated in the introduction, the prevailing literature on disclosure is constructed around mainly three assumptions: *endowment of information* , *true revelation* and *cost of disclosure*. The model we present here starts off with these same three assumptions whereby we relax the assumption that disclosure is free of costs and follow Darrough and Stoughton (1990) and Wagenhofer (1990) in assuming a proprietary cost of disclosure caused by the threat of a new entry in the market.

Endowment of information

The model which will be outlined in the next section assumes that an incumbent SME in the market has private information regarding the evolution of demand for its product. Two states of the world can occur. Either, the sector faces a boom, or a recession which results in an upward or a downward demand shift respectively. A potential entrant in the sector offering a homogeneous product does not know what state of the world has materialized but holds beliefs over the probability of a boom versus a recession. The state of the world will affect the turnover of the incumbent in a positive or a negative sense. The decision the incumbent faces is whether or not to disclose its turnover. While the potential entrant has to decide on entering the market or staying out.

Cost of disclosure

As first introduced by Verrecchia (1983), we drop the assumption that disclosure incurs no costs. Whenever the incumbent decides to disclose turnover, we assume this to give rise to a proprietary cost in the form of possible future loss of earnings, caused by a new entry in the market. When disclosed turnover is high, entry will occur, but when disclosed turnover is low, the potential entrant will stay out. Apart from

potential entry we assume disclosure of turnover to have an additional effect which we call a *customers-effect*. Since turnover reflects the state of the economy, consumers may use this information to form their expectations about future income, job security, etc. Hence, it is not unreasonable to assume that the disclosure of turnover results in an additional shift of the demand curve. To put it differently, a high turnover which reflects a boom, will give consumers confidence in the future. This will induce them to spend more than they would if the high turnover had not been revealed by the incumbent. The opposite applies when a low turnover is disclosed in the event of a recession. When the incumbent reveals the state of the world to be unfavorable, consumers will loose faith in the future which will result in reduced spending. In this case, disclosure of turnover will result in a downward shift in demand thereby reinforcing the strength of the recession. Since this customers-effect of disclosure is assumed to shift the demand curve, both firms will be affected by it in case of entry.

It is easy to understand that this customers-effect puts the incumbent before a dilemma. In the event of a boom, the incumbent will want to reveal this information in order to benefit from a positive customers-effect which adds to the boom and which will increase its profits. However, disclosure of high turnover will also result in entry which will break the incumbent's monopoly position and which will lower its profitability. This trade-off also exists in times of recession. In that case the incumbent does not want to reveal turnover in order not to shake consumers' confidence which has a negative effect on demand, additional to the recession. On the other hand, disclosure of turnover could prove useful to deter entry. In the simulations in section IV we assume that the customers-effect can never exceed the size of boom/recession, but it always works in the same direction as boom/recession, provided turnover is disclosed.

When the customer is another firm, instead of a final consumer, the customers-effect becomes even more easy to explain. Disclosure of high turnover is a signal that the incumbent firm is doing well. Especially when the customer firm depends on only a few suppliers, it is reassuring to know that your supplier is performing well. This will enhance the probability of continued survival for a firm in a later phase of the production chain. To summarize, by the *customers' effect* of disclosure of turnover we

mean that well performing firms are more likely to attract more customers or to get more business from existing customers, while the opposite holds for badly performing firms.

The direct cost of publication of turnover in the profit and loss account is assumed to be negligeable.

True revelation

Whenever disclosure has been decided upon, it is assumed that the incumbent reveals the *true* turnover. Or, in other words, we assume that the turnover published in the profit and loss account is the same as the one that arises from the general ledger, based on regular accounting procedures. There is no possibility for the incumbent to signal any other than its true type. To avoid incentives for the firm to register a higher or lower turnover than the one it actually faces, we disregard corporate and other taxes. This takes away the incentives for the incumbent to cheat or to manipulate its sales figure for tax purposes.

In the event of turnover disclosure, the entry decision of the potential entrant becomes easy because the potential entrant can decide under perfect information. However, when turnover is not disclosed by the incumbent, the potential entrant has to decide on entry in the uncertainty regarding the state of the world and its future profits after entry. Similar to Darrough & Stoughton (1990) we assume that when entry occurs, the entrant becomes informed and demand is known to both firms. In the absence of entry, the incumbent is a monopolist in the market and sets its output and price accordingly, while in the event of entry, a duopoly arises where both firms compete in output[3]. Since both firms operate in the same sector we assume wages to be identical. In order to produce, a fixed cost of capital is required for both the incumbent and the entrant. Apart from this fixed cost, the entrant faces an additional entry cost upon entry which can be thought of as a disadvantage versus the incumbent.

[3] Competition in prices (Bertrand) will never allow entry since in an industry with homogeneous products and fixed costs, the market is only viable for one firm.

In order to make the disclosure decision and the entry decision interesting to analyze, we want to make sure that the effects in boom versus recession are sufficiently different. Therefore we assume that in a recession, the market is not viable for two firms. In case of entry both firms in the market suffer losses. Only when the low turnover is not disclosed and entry does not take place, can the incumbent break even. In a boom we expect both firms to make positive profits.

III. The Model

In this section we introduce a simple model for the purpose of studying the equilibrium actions of the incumbent and potential entrant under the assumptions outlined above and their desirability from a policymaker's point of view. The incumbent has to decide between one of the following two actions {disclosure (D), non disclosure (ND)} while the entrant has to decide between {entry (E), no entry (NE)}. We first outline demand and cost conditions before we solve the game for pure strategies.

Demand and cost conditions

In the absence of entry, the inverse demand the incumbent faces prior to the recession (L) or boom (H), is given by

$$P(X) = a - X \tag{1}$$

where X is the output sold by the incumbent.

In case of entry, the inverse demand is a function of both the incumbent (X) and the entrant's output (Y):

$$P(X,Y) = a - (X+Y) \tag{2}$$

When a boom/recession materializes, the industry faces a positive/negative demand shift indicated by parameter γ. The inverse demand then becomes:

$$P(X) = a \pm \gamma - X \qquad \text{monopoly} \qquad (3)$$

$$P(X,Y) = a \pm \gamma - (X+Y) \qquad \text{duopoly} \qquad (3')$$

When the state of the world is revealed by disclosure of turnover, a positive/negative customers-effect in the event of a boom/recession further affects the position of the demand curve, which is indicated by parameter g. The demand is given by

$$P(X) = a \pm \gamma \pm g - (X) \qquad \text{monopoly} \qquad (4)$$

$$P(X,Y) = a \pm \gamma \pm g - (X+Y) \qquad \text{duopoly} \qquad (4')$$

As stated earlier the customers-effect is assumed to be 'pro-cyclical' meaning that it further reduces demand in the event of a recession, while it enhances demand in the event of a boom.

It already becomes clear that in a recession both disclosure and entry have a negative effect on the price prevailing in the market and hence on the incumbent's profits, while in a boom, disclosure has a positive customers-effect while entry has a negative effect on the price and on the incumbent's profits. This trade off between the effects of disclosure on the one hand and of entry on the other hand can also be found elsewhere in the literature be it in a different context. Darrough & Stoughton (1990) e.g. study large firms, for which there is a trade off between the possibility of entry and the reaction of the capital market.

The profit of the incumbent under monopoly is calculated as follows:

$$\pi^I \text{ (monopoly)} = P(X).\ X - w.\ X - K \qquad (5)$$

Here we implicitly assume output to be a proxy for employment whereby one unit of output (X or Y) is produced by one unit of labor[4] costing the firm an amount of w, which represents the unit wage. K refers to the fixed capital cost.

[4] This implies that we assume the underlying production function to be a Constant returns to Scale production function consisting of labor only (X=L).

The profit functions of incumbent (I) and entrant (E) under duopoly are given by :

$$\pi^{I}(\text{duopoly}) = P(X,Y).\ X - w.\ X - K \tag{6}$$

$$\pi^{E}(\text{duopoly}) = P(X,Y).\ Y - w.\ Y - K - k \tag{7}$$

where k is an additional entry cost for the entrant which could take the form of any costs that are involved with starting up a new firm, e.g. costs of registration. Since both firms operate in the same industry, the assumption of equal wage costs (w) is a realistic one.

Outline and Solutions of the game

In figure 1 we outline the timing of the entry game which consists of three stages. In *stage 1*, Nature decides what state of the world occurs, a boom or a recession. This is perfectly observed by the incumbent while the potential entrant only knows the probabilities with which boom and recession can occur. The prior belief that a boom materializes is $p \in [0,1]$. Consequently, the prior belief that a recession occurs is (1-p). A boom, which means an outward shift of the demand curve, results in a high turnover (X_H) for the incumbent while a recession results in a low turnover (X_L). In *stage 2*, the incumbent has to decide whether or not to disclose the turnover that has been attained. When it is decided that disclosing is optimal, the incumbent shares the private information regarding the state of the world with the potential entrant. The entrant holds beliefs about this disclosure decision made by the incumbent. The entrant's belief that a low turnover is disclosed is q, while his/her belief that a high turnover is disclosed is r. In *stage 3*, the latter can then decide whether or not to enter. When turnover is disclosed, the entry decision is easy. The entrant knows what node is arrived at in the tree. In a recession, the potential entrant stays out of the market while in a boom entry will surely follow after disclosure. This is indicated in figure 1 by the dashed lines leading to node 2 in a recession and node 7 in a boom. When the

incumbent decides no to reveal its turnover, the entry decision of the potential entrant becomes more difficult. In this case it is not clear what node in the game applies and what the payoff of entry will be. This is illustrated in figure 1 by the information set indicated by the dashed line.

Figure 1 : Timing of the game

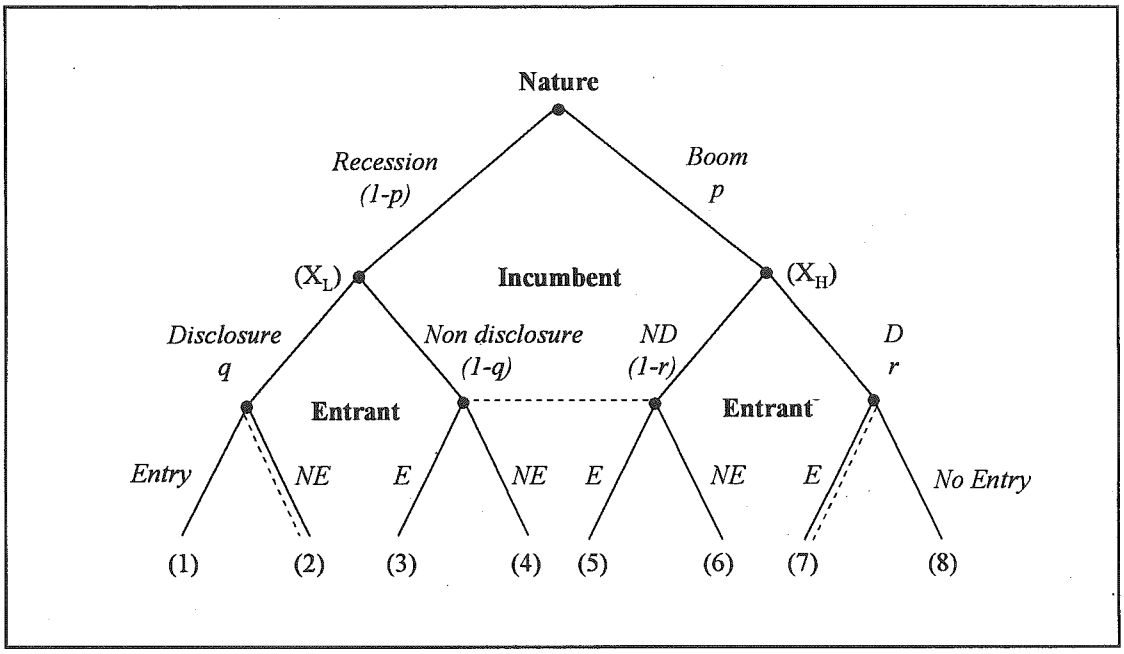


Table 1 presents an overview of the payoffs in the final nodes of the game for both players. The profit for the entrant (superscript E) in case of *no entry* is zero. Upon entry the entrant's payoff depends on which demand function applies. As stated earlier a boom/recession results in a positive/negative shift in demand (γ), which is even stronger if the incumbent has disclosed the state of the world (g).

$$\pi^E = \frac{(a \pm \gamma \pm g - w)^2}{9} - K - k$$

For the incumbent (superscript I), the profit under no entry is the monopoly profit which is, again determined by the state of the world and the disclosure decision.

$$\pi^I = \frac{(a \pm \gamma \pm g - w)^2}{4} - K$$

In the duopoly situation the incumbent's profit is

$$\pi^I = \frac{(a \pm \gamma \pm g - w)^2}{9} - K$$

The extensive form of the game is shown in figure 1 and will be solved by backwards induction. In games of imperfect information the subgame perfect Nash equilibrium is not sufficient to eliminate inconsistent equilibria. This is why we turn to a more stringent equilibrium concept. We closely follow Darrough and Stoughton (1990)[5] and use the concept of 'sequential equilibrium' which was first developed by Kreps and Wilson (1982)[6].

The entrant's strategy

When the incumbent discloses turnover, the entrant is perfectly informed about the state of the world. This means that the payoffs for the entrant are known. In the event of a recession, the entrant will stay out of the market and the game ends in node 2 (indicated by a dashed line in figure 1). If not, he would suffer a loss $\pi^E_{L,D,E}$ (the subscript L indicates a recession). When a boom applies, entry occurs because then the entrant makes a profit $\pi^E_{H,D,E}$ (the subscript H indicates a boom). The outcome of the game in this case is node 7 (again indicated by a dashed line in figure 1).

Under *non disclosure*, the potential entrant will calculate its expected payoff of *entry* and of *no entry* in order to decide what action yields the highest expected payoff. The expected profit under entry (E) is determined by the payoffs in nodes 3 and 5 and the

[5] Darrough and Stoughton (1990) used the sequential equilibrium approach to study the disclosure decision of large frims faced with potential entry on the one hand and the reaction of the capital markets on the other hand.

[6] A sequential equilibrium is by and large equivalent to a Perfect Bayesian Equilibrium (Gibbons, 1992).

beliefs of the entrant about the state of the world and the disclosure decision by the incumbent. It is given by

$$\text{Exp}(\pi^E/E) = (1-\theta).\ \pi^E_{L,ND,E} + \theta.\ \pi^E_{H,ND,E} \tag{8}$$

The expected profit under no entry (NE) is determined by the payoffs in nodes 4 and 6

$$\text{Exp}(\pi^E/NE) = (1-\theta).\ \pi^E_{L,ND,NE} + \theta.\ \pi^E_{H,ND,NE} = 0 \tag{9}$$

In expressions (8) and (9) θ is the belief of the entrant that a boom applies, given the observation of a non disclosure signal sent by the incumbent. In games of this sort this belief is called the posterior belief that a boom applies (θ), while $(1-\theta)$ refers to the posterior belief that a recession applies :

$$\theta = P(X_H|ND) = \frac{p(1-r)}{p(1-r)+(1-p)(1-q)} \tag{10}$$

By not entering the potential entrant has zero profits. This implies that expression (9) is equal to zero. The decision of entry than depends on (8) being *greater* or *smaller* than zero which results in *entry* or *no entry* respectively.

What determines the expected payoff for the potential entrant in the event of *non disclosure* ? Following from expression (8) $\text{Exp}(\pi^E/E) > 0$ if and only if [7]:

$$\theta > \frac{-\pi^E_{L,ND,E}}{\pi^E_{H,ND,E} - \pi^E_{L,ND,E}} \tag{11}$$

The right hand side of expression (11) is a *critical value* that lies between 0 and 1. If expression (11) holds, entry will occur for certain when the entrant observes non disclosure. In the opposite case where $\theta <$ 'critical value' the entrant will stay out of the market.

[7] We assume that in a recession the market is not viable for two firms, which implies that the payoff ($\pi^E_{L,ND,E}$) is negative.

Table 1 : Payoffs in the final nodes of the game

	(1) X_L, D,E	(2) X_L, D, NE	(3) X_L, ND, E	(4) X_L, ND, NE	(5) X_H, ND, E	(6) X_H, ND, NE	(7) X_H, D, E	(8) X_H, D, NE
X^*	$(a -\gamma -g -w)/3$	$(a -\gamma -g -w)/2$	$(a -\gamma -w)/3$	$(a -\gamma -w)/2$	$(a +\gamma -w)/3$	$(a +\gamma -w)/2$	$(a + \gamma + g -w)/3$	$(a + \gamma + g -w)/2$
Y^*	$(a -\gamma -g -w)/3$	0	$(a -\gamma -w)/3$	0	$(a +\gamma -w)/3$	0	$(a + \gamma + g -w)/3$	0
π^I	$[(a -\gamma -g -w)^2/9] - K$	$[(a -\gamma -g -w)^2/4] - K$	$[(a -\gamma -w)^2/9] - K$	$[(a -\gamma -w)^2/4] - K$	$[(a +\gamma -w)^2/9] - K$	$[(a +\gamma -w)^2/4] - K$	$[(a +\gamma+g-w)^2/9] - K$	$[(a +\gamma+g-w)^2/4] - K$
π^E	$[(a -\gamma -g -w)^2/9] - K-k$	0	$[(a -\gamma -w)^2/9] - K-k$	0	$[(a +\gamma-w)^2/9]- K-k$	0	$[(a+\gamma+g-w)^2/9]- K-k$	0

If θ equals the right hand side of expression (11), the entrant is indifferent between entry and no entry. In Darrough & Stoughton (1990) it is shown that such a case where θ = 'critical value' results in a mixed strategy by the entrant. However in this paper we limit our attention to the discussion of pure strategies. Let e be the probability of entry under non disclosure, then we can summarize the entrant's strategy as follows :

$$\theta > \frac{-\pi^{E}_{L,ND,E}}{\pi^{E}_{H,ND,E} - \pi^{E}_{L,ND,E}} \quad \Rightarrow \quad e = 1$$

$$\theta < \frac{-\pi^{E}_{L,ND,E}}{\pi^{E}_{H,ND,E} - \pi^{E}_{L,ND,E}} \quad \Rightarrow \quad e = 0$$

The incumbent's strategy

The incumbent firm wants to maximize its payoff which depends on the state of the world, his disclosure decision and the entrant's strategy. When the incumbent discloses turnover, the outcome of the game is easy. Disclosure of low turnover deters entry, which results in the monopoly profit for the incumbent $\pi^{I}_{L,D,NE}$. Disclosure of high turnover induces entry, leaving the incumbent with $\pi^{I}_{H,D,E}$. When the incumbent does not disclose, the result is not straightforward. Since the entrant's strategy depends on the posterior (θ), the incumbent's strategy must be analyzed for each posterior.

If a boom occurs and θ > 'critical value' the entrant will enter (e=1) upon non disclosure, which gives the incumbent $\pi^{I}_{H,ND,E}$. However, when θ < 'critical value' the entrant stays out of the market (e=0) and the incumbent gets a profit $\pi^{I}_{H,ND,NE}$. Comparing these payoffs to disclosure, it is clear that when e=1 the incumbent is better of disclosing high turnover :

$$\pi^{I}_{H,D,E} = \frac{(a+\gamma+g-w)^2}{9} - K \quad > \quad \pi^{I}_{H,ND,E} = \frac{(a+\gamma-w)^2}{9} - K$$

When e=1, non disclosure cannot deter entry. Hence the incumbent might as well disclose, thereby partly compensating the negative effect of entry with the positive shift in demand that follows from the customers-effect of disclosure.

When e=0 the optimal disclosure decision depends on the relative magnitude of the entry-effect versus the disclosure-effect:

$$\pi^{I}_{H,ND,NE} = \frac{(a+\gamma-w)^2}{4} - K \quad \gtrless \quad \pi^{I}_{H,D,E} = \frac{(a+\gamma+g-w)^2}{9} - K \quad \Leftrightarrow$$

$$\text{Entry effect} \gtrless \text{Disclosure effect}$$

If $\pi^{I}_{H,ND,NE} > \pi^{I}_{H,D,E}$ then the (negative) effect of entry is bigger than the (positive) effect of disclosure. Therefore the incumbent chooses non disclosure. If $\pi^{I}_{H,ND,NE} < \pi^{I}_{H,D,E}$ then the (positive) effect of disclosure outweighs the (negative) effect of entry and the incumbent chooses disclosure.

A similar story applies in the event of a recession. When θ > 'critical value' non disclosure induces entry (e=1), leaving the incumbent with a loss $\pi^{I}_{L,ND,E}$. Whether this payoff is bigger or smaller than $\pi^{I}_{L,D,NE}$, again depends on the entry-effect versus the disclosure-effect. In a recession both effects decrease the incumbent's payoff. Disclosure of low turnover avoids entry, while non disclosure avoids the downward shift in demand g.

$$\pi^{I}_{L,ND,E} = \frac{(a-\gamma-w)^2}{9} - K \quad \gtrless\gtrless \quad \pi^{I}_{L,D,NE} = \frac{(a-\gamma-g-w)^2}{4} - K \quad \Leftrightarrow$$

$$\text{Entry effect} \gtrless \text{Disclosure effect}$$

When the (negative) entry-effect is worse than the (negative) disclosure-effect, $\pi^{I}_{L,ND,E} < \pi^{I}_{L,D,NE}$, it is optimal for the incumbent to disclose low turnover. Vice versa, when

$\pi^{I}_{L,ND,E} > \pi^{I}_{L,D,NE}$, the incumbent will not disclose because the disclosure-effect is worse than the entry-effect.

When e=0, non disclosure deters entry. In that case it is clearly optimal for the incumbent not to disclose, because that way both negative effects can be avoided.

We can summarize the incumbent's strategy as a function of the entrant's response function as follows :

Boom

For e=1.....	➔	disclosure	➔ entry	node 7
For e=0 disclosure-effect > entry-effect	➔	disclosure	➔ entry	node 7
entry-effect > disclosure-effect	➔	non disclosure	➔ no entry	node 6

Recession

For e=1 disclosure-effect > entry-effect	➔	non disclosure	➔ entry	node 3
entry-effect > disclosure-effect	➔	disclosure	➔ no entry	node 2
For e=0.....	➔	non disclosure	➔ no entry	node 4

The entrant's strategy revised

The solution of the game by backwards induction leaves us with 6 equilibrium strategies. However, assuming that both players are rational, after receiving the non disclosure signal the entrant firm can update its beliefs about which state of the world applies. In other words, the disclosure decision of the incumbent, which is observed by the entrant, can contain additional information about what state of the world applies. When e=1, which we assume is common knowledge, it can be seen from the summary above that only a recession leads to non disclosure. This implies that upon observing non disclosure, the entrant *knows* a recession applies. In this case, after updating its

beliefs, the entrant firm wants to stay out of the market. Hence node 3 (L,ND,E) can not be a consistent equilibrium of the game. Non disclosure of turnover will be followed by no entry and the game ends in node 4 (L,ND,NE) rather than node 3. The entrant's revised strategy then becomes:

Recession

For e=1 disclosure-effect > entry-effect ➔ non disclosure ➔ no entry node 4

The incumbent's strategy revised

The incumbent can also anticipate the updating of the entrant's beliefs. He/she knows that when e=1 a non disclosure signal will be interpreted as a recession and deter entry. The only motive for disclosure in a recession is to avoid entry because the effect of disclosure on demand in negative. This means that the incumbent no longer has an incentive for disclosure given the negative customers-effect in a recession. Hence the incumbent will never disclose in a recession. His/her revised strategy becomes:

Recession

For e=1 entry-effect > disclosure-effect ➔ non disclosure ➔ no entry node 4

This implies the game ends in node 4 rather than node 2.

Table 2 lists the final equilibrium paths of the game, depending on the relative size of the disclosure-effect versus the entry-effect and the probability of entry under non disclosure.

Table 2 : Equilibrium paths

entry-effect > disclosure-effect		
e=1	*boom*	(disclosure, entry)
	recession	(non disclosure, no entry)
e=0	*boom*	(non disclosure, no entry)
	recession	(non disclosure, no entry)
disclosure-effect > entry-effect		
e=1	*boom*	(disclosure, entry)
	recession	(non disclosure, no entry)
e=0	*boom*	(disclosure, entry)
	recession	(non disclosure, no entry)

IV. Simulation Results

In the previous section we solved the game algebraically. In this section we use simulations to gain more insight into the incentives for incumbents to disclose their turnover. The purpose is by means of examples to reveal conditions under which turnover will be disclosed and conditions under which the incumbent finds it more profitable not to disclose and how this affects firms' profits and consumer welfare. In order to limit the number of parameters in the simulations and to present results in two-dimensional graphs, a number of simplifying but realistic assumptions are imposed. *First*, we assume the size of boom/recession given by parameter γ, does not exceed

total market size, indicated by parameter a. We restrict the size of the shock to half the initial market size ($0 < \gamma < 0.5a$). *Second*, as discussed earlier the customers-effect is 'pro-cyclical' and adds to the boom/recession. In the simulations we assume this additional demand effect to be smaller than the size of boom/recession. For simplicity we set it equal to half the size of boom/recession ($g=0.5\gamma$). *Third*, because the market is not viable for two firms in the event of a recession, both incumbent and entrant's payoffs will be negative or zero in the first four final nodes of the game. Only when turnover is not disclosed and no entry follows, the incumbent can break even. This assumption which was introduced earlier implies that we impose the value of the fixed cost K to be such that the profit of the incumbent in node 4 is equal to zero or $K= [(a - \gamma - w)]^2/4$. The purpose of this assumption is to guarantee that the payoff of the entrant in a recession is negative[8]. *Fourth*, for the simulations we also assume that the additional entry cost k carried by the entrant upon entry is one tenth of the fixed cost K ($k = 0.1$ K).

As a result of these simplifications, simulation results can be presented as a function of parameter θ, the entrant's posterior belief of a boom given non disclosure, and parameter γ, indicating the size of boom/recession.

Results

A first step in our analysis is illustrated in figure 2. There we show for what values[9] of θ and γ, the expected payoff of the entrant under non disclosure of turnover is positive and where it is negative. It turns out that the expected payoff is always negative in the bottom left area of the (θ,γ)-space, while the expected payoff of the entrant is always positive in the top right area. This suggests that when the incumbent does not disclose and the size of a boom is very small, the entrant's belief that a boom applies given the non disclosure signal, has to be very high in order for the expected pay-off to be

[8] If the payoff of the entrant in a recession would be positive, the disclosure problem would be less interesting to analyze since the entrant would always enter even under no disclosure.

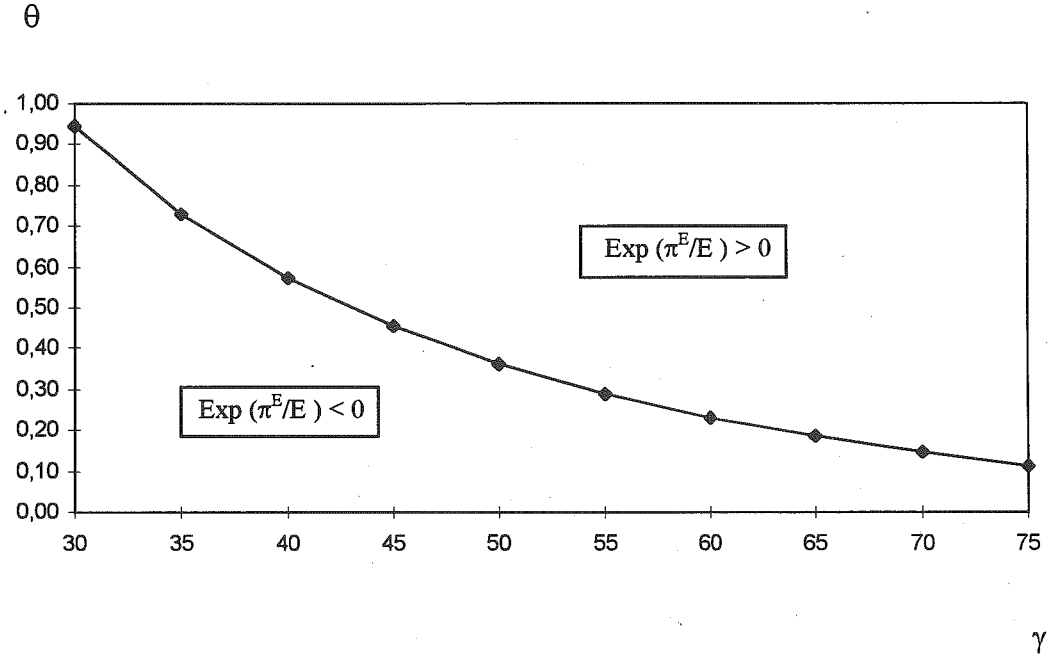
[9] For values of γ below 30, positive profits for both firms in a boom are not guaranteed. In general the condition that needs to be satisfied in order for X_H to yield positive profits for both firms is $26.\gamma.(a - w) \geq 5.((a - w)^2 + \gamma^2)$

positive. However, when the size of a boom is very high, a small belief in a boom under non disclosure suffices to induce a positive expected payoff.

***Result 1**: The higher the size of the boom (γ), the lower the requirement on the entrant's belief that a boom applies (θ) has to be in order to get a positive expected payoff for the potential entrant.*

We will see that the sign of the entrant's expected payoff is very important for the optimal actions of both firms, in a recession as well as in a boom.

Figure 2 : Critical level of θ for the entrant, determined by γ



a=150;w=20;30<γ<0.5a

Figure 3 illustrates the strategies for the incumbent and the entrant in a **recession**. The optimal decision for the incumbent depends on what state of the world materializes, a boom or a recession, the relative strength of the entry-effect versus the disclosure-effect and the probability that entry occurs when a non disclosure signal is released.

Hence, for a market size of a=150 and a wage of w=20, a minimum size of γ=30 is required to make X_L and X_H sufficiently different and to have positive profits for all combinations of (θ,γ) in a boom.

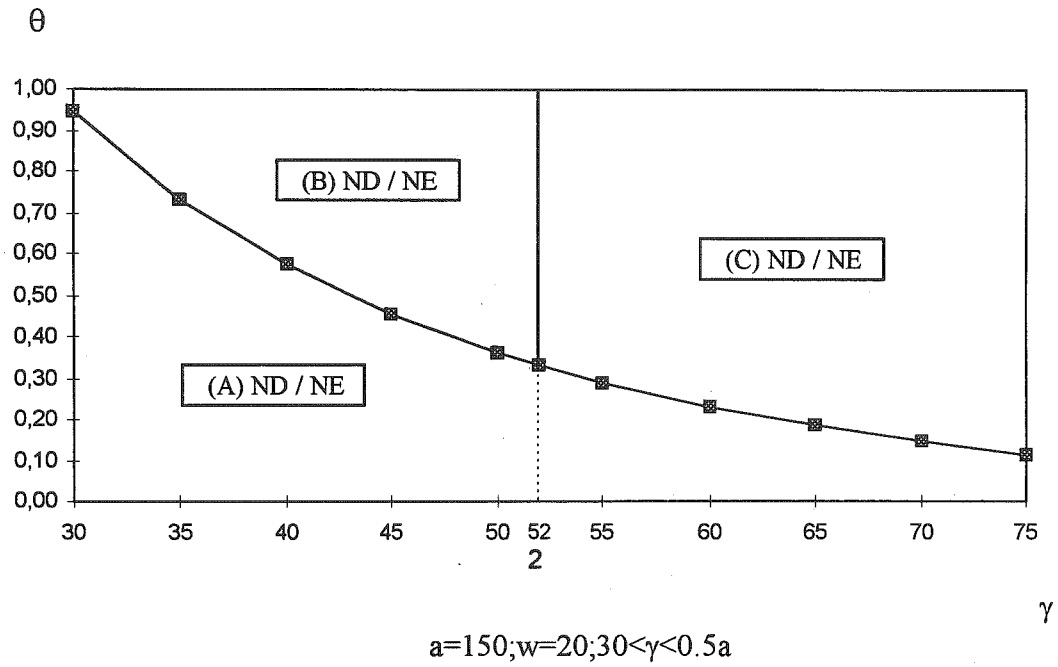
The critical level of θ derived in figure 2 is also shown in figure 3. When the posterior θ is below the critical level (bottom area A in figure 3) the entrant stays out of the market under non disclosure. It is therefore optimal for the incumbent not to disclose the low turnover as a result of the recession in order to avoid the negative customers-effect. When the posterior is higher than the critical level (top areas B and C), we have to consider the relative strength of the disclosure- and the entry-effect, which further divides the top area of figure 3.

In case of a recession which involves a relatively strong downward shift in demand (in this example $\gamma \geq 52$), the customers-effect is worse than the entry-effect under non disclosure. According to the equilibrium paths outlined in Table 2, the optimal strategy for the incumbent is then not to disclose low turnover (area C in Figure 3).

After observing the non disclosure, the entrant stays out of the market because the non disclosure is correctly interpreted as a sign of recession. In case of a recession with a relatively small decline in demand ($\gamma<52$), the negative effect of entry is worse than the negative effect of disclosure on demand. As we stated earlier, the incumbent does not have to disclose low turnover to deter entry. And by choosing non disclosure, the incumbent can avoid the (small) downward shift in demand (area B).

Result 2 : *It is never optimal for the incumbent to disclose in a recession*

Figure 3 : Strategies for the incumbent (before slash) and the entrant (after slash) in a *recession*

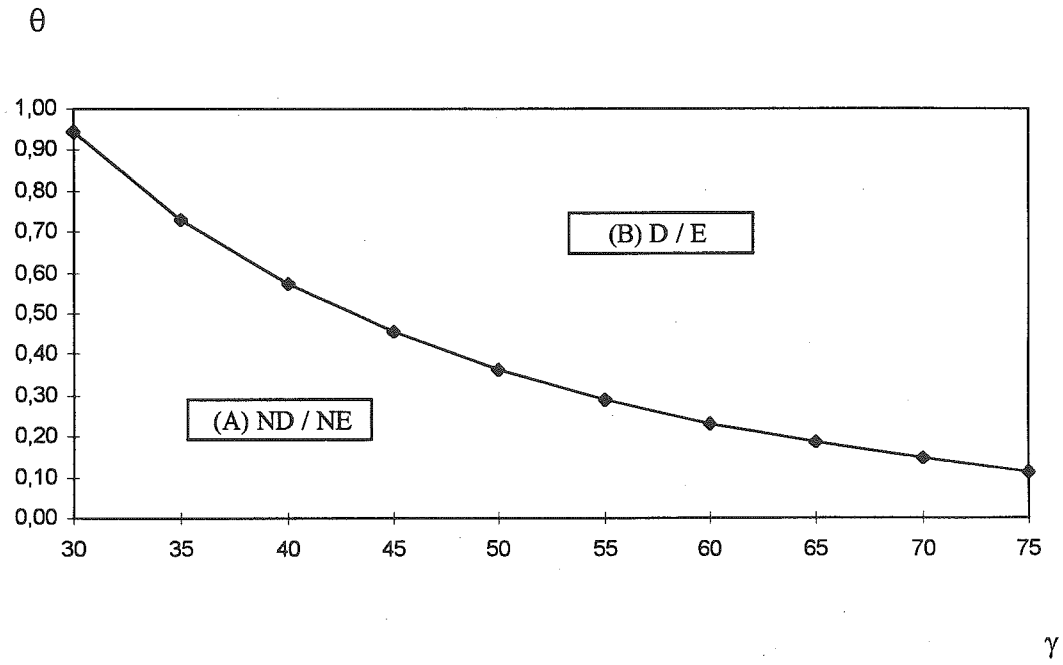


a=150;w=20;30<γ<0.5a

Figure 4 shows the strategies for the incumbent and the entrant in the event of a boom. The restriction we imposed on parameter g, the (positive) shift in demand, does not allow us to get a positive disclosure effect which outweighs the negative impact of entry.[10] Hence the only scenario occuring is where the negative entry effect is worse than the positive disclosure effect. Therefore figure 4 only shows two areas, divided by the critical level of the posterior θ. In area A non disclosure deters entry because the expected payoff for the entrant under non disclosure is negative. Given that the negative effect of entry is bigger than the positive effect of disclosure, it is optimal for the incumbent not to disclose. However, when the expected payoff for the entrant is positive (area B), non disclosure leads to entry. In that case it is optimal for the incumbent to choose disclosure to partly compensate the negative effect of entry with the positive shift in demand.

[10] To get at this result we would have to work with a demand shift caused by disclosure which is much stronger than the boom itself. This would not be realistic.

Figure 4 : Strategies for the incumbent (before slash) and the entrant (after slash) in a *boom*



a=150;w=20;30<γ<0.5a

***Result 3** : In a boom it is optimal for the incumbent to disclose only if the expected payoff for the entrant is positive (θ > critical level)*

Discussion of results

Comparing figures 3 and 4 we can summarize a number of conclusions. First,when the posterior is low and/or the size of the boom/recession is low there is a non disclosure equilibrium, regardless of the state of the world. This is also found by Darrough & Stoughton (1990), be it in a different context where there is a trade off for large firms between the possibility of entry and the valuation by the capital market. They state that when entry deterrence is primordial, pessimistic beliefs and high entry costs for the

entrant lead to a non disclosure equilibrium, irrespective of the incumbent's type (high versus low profits).

Second, when the posterior is high and/or the size of the boom/recession is high, in a recession it is optimal not to disclose, while in a boom it is optimal to disclose. Again this result is compatible with the conclusions by Darrough & Stougthon (1990). In fact Darrough and Stoughton (1990) mainly analyze the scenarion where the entry effect outweighs the disclosure effect. In this case the incumbent always has an incentive to disclose turnover when e=1, irrespective of the state of the world.

However, once the possibility that the disclosure-effect is stronger than the entry-effect is allowed for, the non disclosure signal is interpreted as a recession. Therefore the incumbent looses the incentive to disclose low turnover and prefers to prevent the negative customers' effect, knowing entry will not follow.

On the basis of our results we expect growing sectors to disclose turnover more than declining sectors, which is an issue that could be verified empirically. Our results also indicate that the decision of the incumbent whether or not to disclose turnover under a boom hinges on the probability the entrant attributes to the occurring of the boom when he observes non disclosure (posterior θ). When this belief is low, the incumbent prefers not to disclose high turnover. Only when the belief a boom occurs is high, the incumbent has an incentive to disclose high turnover, thereby signaling a market opportunity to the entrant. Hence, for potential entrants, accurate forecasts of demand are very important for their profit opportunities. This brings us to the welfare effects of the game.

Welfare Effects

The final outcome of the game, depending on the actions taken by the incumbent and the entrant, have implications for both firms and consumers. Although the equilibrium outcome is the optimal outcome for the players, considering that each player takes the action that is optimal given his/her beliefs and the other player's action, it is not necessarily optimal from a welfare economic point of view.

Let us first look at the case of a boom. For the consumers, the monopoly situation under non disclosure (node 6) cannot be preferred over the duopoly situation under non disclosure (node 5) because they would be faced with higher prices and a lower output. When we compare Cournot duopoly under disclosure and under non disclosure, it turns out that disclosure leads to a higher consumer surplus. Moreover, disclosure also maximizes total industry profits when the size of the boom is sufficiently high (γ>56). In sum under a boom, it can be argued that disclosure is in the general interest since consumers are better off, entrants make positive profits and the monopoly power of the incumbent is eroded. When we consider output a proxy for employment in the industry we can also state that disclosure and entry enhances employment compared to no disclosure. From the equilibrium paths outlined in table 2 we learn that when the entry-effect is stronger than the disclosure-effect and the posterior belief that a boom applies (θ) is below the critical level (e=0), the socially desirable outcome of disclosure and entry is not reached through voluntary disclosure. This leads to the following policy conclusion.

Result 4 *: In the event of a boom, mandatory disclosure would be in the general interest.*

In the event of a recession however, disclosure is not in the general interest. Consumers are better off under Cournot duopoly than under the monopoly situation which would be established by mandatory disclosure of low turnover. The price and output generated in node 3 maximize consumer surplus. For the incumbent, disclosure of low turnover always implies a loss. Non-disclosure of turnover is essential for the continuing survival of the firm already in the market. The entrant interprets non disclosure correctly as a recession and stays out of the market. This equilibrium outcome maximizes total industry profits and thus producers surplus.[11] Moreover, total welfare, which is calculated by simply adding consumers and producers surplus, is also maximized in equilibrium. However, for consumers this situation is only second

[11] Given the restriction imposed on parameter K, the monopoly case under non disclosure allows the incumbent to break even, which means producers surplus equals zero. In all other cases, it is negative.

best. They would prefer non disclosure to induce entry, leading to a lower price and a higher total output. On the other hand, this market structure could only hold in the short term. Although the multi-period game is beyond the scope of this paper, we can intuitively presume that the loss incurred by both firms would drive them out of the market, leaving the consumers with no supply. Depending on the nature of the good, this situation is not desirable. All things considered we come to the following conclusion :

Result 5 *: In the event of a recession, mandatory disclosure is not in the general interest. Total welfare is maximized when the entrant takes the 'right' action (stay out), under non disclosure.*

As we suggested earlier, accurate forecasts can be an important factor in determining the beliefs held by the entrant. Given the results of our welfare analysis, we find that in times of recession, accurate forecasts, which could be provided by the government, can lead to higher welfare than mandatory disclosure of actual turnover.

V. Conclusion

In this paper we have analyzed the voluntary disclosure decision of turnover in the abridged format of the profit and loss account, which applies to small and medium sized enterprises in the European Union. In a simple entry-game where an incumbent SME is faced with a potential entrant, we showed that the optimal disclosure decision depends on three factors. First, only high turnover, which indicates a boom, is sometimes voluntarily disclosed. Low turnover, which indicates a recession, is never disclosed. Second, the beliefs held by the entrant about the state of the world are important. Voluntary disclosure of high turnover does not take place when the entrant's posterior belief that a boom occurs is low. Third, the relative size of the entry-effect versus the disclosure-effect determines voluntary disclosure of high turnover. The incumbent will not disclose when the loss of profits due to entry exceeds the extra profit that would result from an upward shift in demand following disclosure.

Our paper shows that the option of voluntary disclosure of turnover is mainly in the interest of the firms already in the market but need not be in the general interest. In times of recession, the voluntary disclosure mechanism protects the incumbent firm from suffering losses. By not disclosing turnover, the negative customers' effect can be avoided. Non-disclosure will not lead to entry because the potential entrant correctly interprets this as evidence of a recession. In this case voluntary disclosure is justified because it prevents the incumbent firm from going out of business.

In a boom, however, an incumbent SME can (ab)use the voluntary disclosure option in the law as an entry deterrent. When the cost of entry is higher than than the benefit of disclosure of turnover and the entrant's expected payoff is negative, by not disclosing turnover, the incumbent can keep the second firm out of the market. Not disclosing turnover implies that the incumbent can continue to be a monopolist. It is clear that mandatory disclosure which would lead to entry would be in the general interest. In this case voluntary disclosure does not lead to an efficient outcome. Again the legislation offers an advantage to the firm already in the market at the expense of potential entrants and consumers.

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