INSIDER TRADING: REGULATION OR TAXATION?

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Abstract: I analyze in this paper the impact of a change of policy from insider trading regulation (ITR) to a regime that allows insider trading and taxes insider trading profits. I argue below that such a change of policy has a qualitative impact on securities markets and social welfare similar to that of a complete elimination of ITR; in particular, they both generate an increase in social welfare. The proposed regime combines the beneficial efficiency effects of deregulating insider trading with the explicit inclusion of a redistributive component; the latter is included in order to make the policy appealing to those lawmakers who base their decisions on fairness considerations.

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I- INTRODUCTION

There has been a significant amount of research on the benefits and costs generated by the imposition of insider trading regulation (ITR).[1] There has been very little research, on the other hand, on alternative policies to regulate insider trading. This may have been partly due to the extreme positions taken by many researchers with respect to whether insider trading is beneficial or detrimental; such extreme positions resulted in calls for an outright ban of insider trading or the elimination of all regulations against this practice. In any case, this paper attempts to fill the mentioned gap.

I have argued elsewhere (Estrada, 1995), based on a rather detailed welfare analysis, that the elimination of ITR would make society better off; I have further shown that this result is valid for a wide range of values of attitudes toward risk and volatility parameters. It thus follow from those arguments that ITR should be eliminated, or, at least, significantly relaxed. However, due to the (unfair?) lack of popularity of insider trading, there may be no government willing to make such a radical change of policy. In light of this problem, I consider in this paper an alternative policy that improves upon ITR, namely, allowing insider trading and taxing insider trading profits. Thus, I evaluate below the impact of a change in policy from ITR to a policy that allows insider trading and taxes insider trading profits.[2]

There is no doubt that liquidity and informational efficiency, among others, are important characteristics of a securities market. However, it is clear that these characteristics are not, or should not be, ends in themselves. There seems to be little doubt that, from a normative point of view, the ultimate goal (hence, the ultimate concern of policy makers) is, or should be, to maximize social welfare. Hence, although I do analyze below the impact of the proposed change of policy on securities markets, I place special emphasis on its impact on social welfare.

I argue in this paper that the impact of a change of policy from regulation to taxation would have an impact similar to that of a complete elimination of ITR. That is, either change of policy would decrease market liquidity, increase current-price volatility, decrease future-price volatility, increase the informational efficiency of the market, and increase price predictability. Further, in terms of welfare, either change of policy would make insiders and workers better off, outsiders and liquidity traders worse off, and society as a whole better off. In addition, I argue that a policy of allowing insider trading and taxing insider trading profits is politically more appealing than the complete elimination of ITR. This is due to the fact that the proposed regime incorporates a scheme (a tax on insider trading profits) to redistribute wealth from insiders to the rest of society. Thus, such a scheme should satisfy some fairness considerations usually sought to be satisfied through the imposition of ITR.

A more detailed introduction to the topic is omitted but can be found in Estrada (1995). The rest of the paper is organized as follows. In part II, I introduce the model and derive two equilibria (one for a market under ITR and another for a market under the proposed regime). In part III, I evaluate the impact of a change in policy from regulation to taxation on a securities markets and on social welfare. In part IV, I perform a sensitivity analysis

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[1] An impressive amount of work, mostly published in law journals by lawyer-economists, followed the pioneering work by Manne (1966). See, for example Scott (1980), Carlton and Fischel (1983), Easterbrook (1985), Haddock and Macey (1987), and Macey (1991). Economists, on the other hand, entered the debate more recently, following the pioneering work by Kyle (1985). See, for example, Ausubel (1990), Subrahmanyam (1991), Cornell and Sirri (1992), Leland (1992), and Meulbroek (1992).

[2] Throughout the analysis I will refer to a policy that restricts insider trading as “regulation,” and to a policy that allows insider trading and taxes insider trading profits as “taxation.”

in order to determine the generality of the results derived in part III. And, finally, in part V, I summarize the most important conclusions of the analysis. An appendix concludes the article.

II- THE MODEL

1.- Market microstructure

The analytical framework draws heavily from Estrada (1995). Consider a two-date (one-period) economy where 0 denotes the present (the beginning of the period) and 1 denotes the future (the end of the period). Three types of traders interact in the market for a risky asset: insiders (indexed by N), outsiders (indexed by T), and liquidity traders (indexed by Q). All these traders interact with a market maker either in a market that restricts insider trading (the regulated market, indexed by R) or in a market that allows insider trading and taxes insider trading profits (the alternative market, indexed by A).[3] Finally, there is a group of agents, referred to as workers (indexed by K), that do not participate in speculative activities.[4]

If ITR is to be effective, resources have to be allocated to monitor the behavior of insiders. Thus, in the regulated market, insiders, outsiders, liquidity traders, and workers are forced to forgo a proportion t_j ($0 \le t_j \le 1$) of their (certain) initial wealth (w_i^0) in order to bear this cost of ITR. Thus, let t_R be the rate at which the wealth of traders and workers is taxed in the regulated market, and $t_A=0$; that is, wealth is not taxed in the alternative market.[5] In the alternative market, on the other hand, wealth is not taxed but insider trading profits are. Thus, let λ_i ($0 \le \lambda_i \le 1$) be the rate at which the trading profits of the ith trader are taxed, such that λ_N is the rate imposed on insider trading profits, and $\lambda_T=\lambda_Q=0$; that is, the trading profits of outsiders and liquidity traders are not taxed.

The taxation of insider trading profits works as follows. At the beginning of the period, a risk-neutral party (government) exogenously selects the tax rate λ_N, and announces that the amount $\mu = \lambda_N E[(\tilde{p}_1 - \tilde{p}_{0A})\tilde{x}_{NA}]$ will be transferred to society, where $E(\pi_{NA})$ are the expected profits from insider trading in the alternative market. This transfer may be thought of as the governmental provision of a public good. At the end of the period, the government collects the amount $\lambda_N \pi_{NA}$ and provides the public good. Thus, let δ_i ($0 \le \delta_i \le 1$) be the proportion of this public good received by the ith agent.

Between the beginning and the end of the period, all traders and workers engage in the production of a commodity. Thus, let Y_{ij} be (the monetary value of) agent i's production of this commodity in the jth market. It is assumed that all traders produce the same amount of Y regardless of the type of market in which they trade; that is, $Y_{iA}=Y_{iR}$, for i=N,T,Q. However, this cannot be the case for everybody in the economy. For, if insider trading is restricted, someone has to perform the task of enforcing ITR, thus foregoing production of the commodity. It is

[3] Throughout the analysis, a market that restricts insider trading will be referred to as the "regulated" market, and a market that allows insider trading and taxes insider trading profits as the "alternative" market. Occasionally, a market that places no restriction on insider trading will be referred to as the "unregulated" market.

[4] In what follows, subscripts i will be used to index agents (i=N,T,Q,K) and subscripts j to index markets (j=A,R).

[5] The alternative system is assumed to be costless; that is, it is not costly to monitor whether insiders pay their taxes on insider trading profits. Admittedly, this is only a simplification. But it is not implausible to think that, if there exist economies of scale in enforcement (as is likely to be the case), the IRS could monitor whether insiders pay their taxes at a (marginal) cost lower than the cost of ITR. The assumption that the alternative regime is costless is simply an extreme version of the previous reasoning and its only purpose is to simplify the analysis.

assumed that, if the market is regulated, (some) workers will perform this task. Hence, workers' production of the commodity will be larger in the alternative market; that is, $Y_{KA}>Y_{KR}$.

All traders observe all publicly available information about the future price of the risky asset, summarized in a parameter $\bar{p}_1$. Further, insiders privately (and costlessly) observe a realization of a random variable $\tilde{\varepsilon}\ (\varepsilon_1)$, and outsiders privately (and also costlessly) observe a realization of a random variable $\tilde{\eta}\ (\eta_1)$. The first random shock $(\tilde{\varepsilon})$ stems from the firm that issues the risky asset under consideration; hence, it is observed only by insiders. The other random shock $(\tilde{\eta})$ may be thought of as arising somewhere else in the economy, perhaps in a firm whose activities are related to the activities of the firm under consideration; hence, it is observed only by outsiders. Following Fishman and Hagerty (1992), it is assumed that insiders have access to information of higher quality; that is, $\sigma_\varepsilon^2 < \sigma_\eta^2$, where σ_ε^2 and σ_η^2 are the variances of inside and outside information, respectively.

The behavior of liquidity traders is not explicitly modelled. They are assumed to demand a random quantity $\tilde{x}_Q$ of the risky asset, such that $\tilde{x}_Q \sim N(0, \sigma_Q^2)$. This demand is assumed to be independent from the type of market (regulated or alternative) in which they trade.[6] It is further assumed that $Cov(\tilde{\varepsilon}, \tilde{x}_Q) = Cov(\tilde{\eta}, \tilde{x}_Q) = 0$; that is, liquidity trading has no information content.

It follows from the above discussion that agent *i*'s terminal wealth in the *j*th market $(\tilde{w}_{ij}^1)$ is given by:

$$\tilde{w}_{ij}^1 = (1-t_j)w_i^0 + Y_{ij} + (1-\lambda_i)(\tilde{p}_1 - \tilde{p}_{0j})\tilde{x}_{ij} + \delta_i \mu \qquad i = N, T, Q, K \qquad j = A, R \tag{1}$$

where $\tilde{x}_{ij}$ is agent *i*'s demand for the risky asset in the *j*th market, $\tilde{p}_{0j}$ is the price of this asset in the *j*th market at the beginning of the period, and $\tilde{p}_1$ its price at the end of the period. This terminal price is given by $\tilde{p}_1 = \bar{p}_1 + \tilde{\varepsilon} + \tilde{\eta}$, where $\bar{p}_1$ is the expected price of the risky asset given all publicly available information, and and $\tilde{\varepsilon}$ and $\tilde{\eta}$ are two random variables such that $\tilde{\varepsilon} \sim N(0, \sigma_\varepsilon^2)$, $\tilde{\eta} \sim N(0, \sigma_\eta^2)$, and $Cov(\tilde{\varepsilon}, \tilde{\eta}) = 0$. That is, the future price of the risky asset is determined by all publicly available information and by two independent, normally-distributed random shocks.

The market maker is assumed to be risk neutral and constrained to make zero profits when selecting the price that clears the market for the risky asset (hence, his welfare is not analyzed). Insiders, outsiders, liquidity traders, and workers are assumed to be risk averse and to have a negative exponential utility function (*V*), thus displaying constant absolute risk aversion;[7] that is:

$$V_i(\tilde{w}_i^1) = 1 - e^{-a_i \tilde{w}_i} \qquad i = N, T, Q, K \tag{2}$$

[6] It could alternatively be assumed that the amount of liquidity trading depends on the type of market in which liquidity traders trade; however, an arbitrary difference in trading across markets would have to be assumed. The assumption of no differential trading is just as arbitrary as any other difference and simplifies the analysis considerably.

[7] Estrada (1994a), an extended previous version of this article, considers in detail the impact of a change in policy from regulation to taxation in a model in which all agents are risk neutral.

where a_i (a_i>0) is the absolute risk aversion parameter. Since is normally distributed conditional on each trader's private information set $(\tilde{\omega}_i)$ [8] then the expected value of V, conditional on $(\tilde{\omega}_i)$, is given by:

$$E\left[V_i\left(\tilde{w}_i^1 \mid \tilde{\omega}_i\right)\right] = 1 - e^{-a_i\left[E\left(\tilde{w}_i^1 \mid \tilde{\omega}_i\right) - (a_i/2)\,Var\left(\tilde{w}_i^1 \mid \tilde{\omega}_i\right)\right]} \qquad i = N, T, Q, K \tag{3}$$

Thus, insiders and outsiders (but not liquidity traders and workers) are assumed to select, conditional on their private information, the demand for the risky asset that maximizes (3).[9] However, it is clear that maximizing this expected utility function is equivalent to maximizing the (conditional) certainty equivalent of wealth (CE_i) which is given by:

$$CE_i = E\left(\tilde{w}_i^1 \mid \tilde{\omega}_i\right) - (a_i/2)\,Var\left(\tilde{w}_i^1 \mid \tilde{\omega}_i\right) \qquad i = N, T, Q, K \tag{4}$$

This follows from the fact that (3) is monotonically increasing in (4). Therefore, in what follows, insiders and outsiders will be assumed to select the demand for the risky asset that maximizes (4).

2.- Strategies and equilibria

Definition: An equilibrium is a realization of the random variable $\tilde{p}_{0j}$ such that the following two conditions hold:

i) $\quad x_{ij}^{*} = argmax_{\,x_{ij}} \quad E[V_i(\tilde{w}_{ij}^1) \mid \tilde{\omega}_i = \omega_i] \qquad i = N, T \qquad j = U, R$

ii) $\quad p_{0j} = E(\tilde{p}_1 \mid x_{Nj}^{*} + x_{Tj}^{*} + x_Q) \qquad j = U, R.$

That is, an equilibrium is a (current) price of the risky asset that: first, stems from demands that maximize the utility of insiders and outsiders, conditional on their private information $(\tilde{\omega}_i)$;[10] and, second, is efficient in the sense that it is equal to the expected (terminal) price of the risky asset, conditional on all the information available to the market maker.

The timing of the model is as follows. At the beginning of the period, endowments are distributed, information and liquidity trading are realized, and demands are submitted to the market maker, who sets the price that clears the market for the risky asset. In addition, the government announces the amount of the governmental transfer; that is, the amount of the public good to be provided. At the end of the period, all uncertainty is resolved, the payoffs of the portfolios are realized, the production of the commodity is finished, insiders pay their taxes on insider trading profits, and the government provides the public good. Trading, in particular, is structured in two steps: First, insiders and outsiders observe a realization of and , respectively, and submit their demand for the risky asset conditional on such a realization. Second, the market maker determines the price that clears the market for this asset. Following Kyle (1985), it is assumed that, when so doing, the market maker sets this price efficiently, thus making zero profits. That is, he sets the price of the risky asset by taking into account all publicly available information and the order flow.[11] This implies that the market maker sets the current price of the risky asset according to the expression:

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[8] Note that $\tilde{\omega}_N = \tilde{\varepsilon}$ and $\omega_T = \tilde{\eta}$.

[9] Recall that liquidity traders trade randomly and that workers do not trade.

[10] Note that $\omega_N = \varepsilon_1$ and $\omega_T = \eta_1$.

[11] The order flow provides the market maker with information beyond that which is publicly available. This is due to the fact that, as will be seen below, the demand of informed traders is based on their private information, which

$$\tilde{p}_{0j} = E\left(\tilde{p}_1 \middle| \tilde{x}_{Nj} + \tilde{x}_{Tj} + \tilde{x}_Q\right) = \bar{p}_1 + \alpha_j(\tilde{x}_{Nj} + \tilde{x}_{Tj} + \tilde{x}_Q) \qquad j = A, R \tag{5}$$

where α_j is a parameter whose reciprocal measures the liquidity of the jth market.

When selecting their portfolio, insiders and outsiders behave strategically in the sense that they take into account the impact of their demand on the price of the risky asset. That is, they maximize their expected utility by taking the market maker's pricing function (but not the price of the risky asset) as given. Further, when selecting their portfolio, insiders (outsiders) make a conjecture about what the outsiders' (insiders') demand for the risky asset will be. This yields the following conjectures:

Conjecture 1: An insider's demand for the risky asset is given by $\tilde{x}_{Nj} = \beta_j \tilde{\varepsilon}$, for a given parameter β_j. That is, an insider's demand is a linear function of his private information.

Conjecture 2: An outsider's demand for the risky asset is given by $\tilde{x}_{Tj} = \gamma_j \tilde{\eta}$, for a given parameter γ_j. That is, an outsider's demand is a linear function of his private information.[12]

Thus, the structure of the model is such that the market maker selects the parameter that determines the liquidity of the market, and insiders and outsiders select the parameter that determines their demand. That is, the market maker selects α_j, insiders select β_j, and outsiders select γ_j.

It follows from (5) and conjectures 1-2 that $\mu = \lambda_N E[(\tilde{p}_1 - \tilde{p}_{0j})\tilde{x}_{NA}] = \lambda_N(1-\alpha_A\beta_A)\beta_A\sigma_\varepsilon^2$; that is, the (unconditional) expected profits from insider trading are a function of known parameters. Note that this implies that there is no uncertainty about the value of the governmental transfer. In other words, the governmental transfer is a lump sum whose value follows from the parameters that determine the equilibrium of the model and the (unconditional) probability distribution of inside information.

This concludes the analytical structure of the model in the alternative market; that is, in a market in which insider trading is allowed and insider trading profits are taxed. In such a framework, the following theorem holds:

Theorem 1: *When all traders are risk averse, insider trading is allowed, and insider trading profits are taxed, there exists an equilibrium characterized by the parameters*:

$$\alpha_A = \frac{\beta_A\sigma_\varepsilon^2 + \gamma_A^2\sigma_\eta^2}{\beta_A^2\sigma_\varepsilon^2 + \gamma_A^2\sigma_\eta^2 + \sigma_Q^2} \tag{6}$$

$$\beta_A = \frac{1}{2\alpha_A + a_N(1-\lambda_N)\left[(1-\alpha_A\gamma_A)^2\sigma_\eta^2 + \alpha_A^2\sigma_Q^2\right]} \tag{7}$$

$$\gamma_A = \frac{1}{2\alpha_A + a_T\left[(1-\alpha_A\beta_A)^2\sigma_\varepsilon^2 + \alpha_A^2\sigma_Q^2\right]} \tag{8}$$

Proof: Using (1), (5), and conjectures 1-2, a representative insider's terminal wealth can be written as:

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is correlated to the future price of the risky asset.

[12] The plausibility of linear strategies has been strengthened by recent work: Bhattacharya and Spiegel (1991) analyze linear and nonlinear strategies and show that, if informed traders had to choose between them, they would choose the former over the latter.

$$\tilde{w}^{1}_{NA} = w^{0}_{N} + Y_{NA} + (1-\lambda_N)(\tilde{\varepsilon} + \tilde{\eta} - \alpha_A x_{NA} - \alpha_A \gamma_A \tilde{\eta} - \alpha_A \tilde{x}_Q) x_{NA} + \delta_N \mu \tag{9}$$

The expected value and variance of (9), both conditional on the insider's private information, are given, respectively, by:[13]

$$E\left(\tilde{w}^{1}_{NA} \middle| \tilde{\varepsilon} = \varepsilon_1 \right) = w^{0}_{N} + Y_{NA} + (1-\lambda_N)(\varepsilon_1 - \alpha_A x_{NA}) x_{NA} + \delta_N \mu \tag{10}$$

$$Var\left(\tilde{w}^{1}_{NU} \middle| \tilde{\varepsilon} = \varepsilon_1 \right) = (1-\lambda_N)^2 \left[(1-\alpha_A \gamma_A)^2 \sigma^2_{\eta} + \alpha^2_A \sigma^2_Q \right] x^2_{NA} \tag{11}$$

Thus, substituting (10) and (11) into (4), the insider's problem becomes:

$$Max_{x_{NA}} \left\{ w^{0}_{N} + Y_{NA} + (1-\lambda_N)(\varepsilon_1 - \alpha_A x_{NA}) x_{NA} + \delta_N \mu - (a_i / 2)(1-\lambda_N)^2 \left[(1-\alpha_A \gamma_A)^2 \sigma^2_{\eta} + \alpha^2_A \sigma^2_Q \right] x^2_{NA} \right\} \tag{12}$$

Taking derivatives and solving for the insider's demand yields:

$$x^{*}_{NA} = \frac{\varepsilon_1}{2\alpha_A + a_N (1-\lambda_N) \left[(1-\alpha_A \gamma_A)^2 \sigma^2_{\eta} + \alpha^2_A \sigma^2_Q \right]} = \beta_A \varepsilon_1 \tag{13}$$

from which (7) follows directly.

Similarly, using (1), (5), and conjectures 1-2, a representative outsider's terminal wealth can be written as:

$$\tilde{w}^{1}_{TA} = w^{0}_{T} + Y_{TA} + (\tilde{\varepsilon} + \tilde{\eta} - \alpha_A \beta_A \tilde{\varepsilon} - \alpha_A x_{TA} - \alpha_A \tilde{x}_Q) x_{TA} + \delta_T \mu \tag{14}$$

The expected value and variance of (14), both conditional on the outsider's private information, are given, respectively, by:

$$E\left(\tilde{w}^{1}_{TA} \middle| \tilde{\eta} = \eta_1 \right) = w^{T}_{0} + Y_{TA} + \left(\eta_1 - \alpha_A x_{TA} \right) x_{TA} + \delta_T \mu \tag{15}$$

$$Var\left(w^{1}_{TA} \middle| \tilde{\eta} = \eta_1 \right) = \left[(1-\alpha_A \beta_A)^2 \sigma^2_{\varepsilon} + \alpha^2_A \sigma^2_Q \right] x^2_{TA} \tag{16}$$

Thus, substituting (15) and (16) into (4), the outsider's problem becomes:

$$Max_{x_{TA}} \left\{ w^{T}_{0} + Y_{TA} + (\eta_1 - \alpha_A x_{TA}) x_{TA} + \delta_T \mu - (a_T / 2) \left[(1-\alpha_A \beta_A)^2 \sigma^2_{\varepsilon} + \alpha^2_A \sigma^2_Q \right] x^2_{TA} \right\} \tag{17}$$

Taking derivatives and solving for the outsider's demand yields:

$$x^{*}_{TA} = \frac{\eta_1}{2\alpha_{TA} + a_T \left[(1-\alpha_A \beta_A)^2 \ \sigma^2_{\varepsilon} + \alpha^2_A \sigma^2_Q \right]} = \gamma_A \eta_1 \tag{18}$$

from which (8) follows directly.

Equations (7) and (8) form a system in β_A and γ_A whose solution yields the equilibrium of the model. This equilibrium, however, must satisfy the restriction that the market maker sets prices efficiently. This implies that:

$$P_{0A} = E(\tilde{p}_1 | \tilde{x}_{NA} + \tilde{x}_{TA} + \tilde{x}_Q = x^{*}_{NA} + x^{*}_{TA} + x_Q) = \overline{p}_1 + \alpha_A (x^{*}_{NA} + x^{*}_{TA} + x_Q). \tag{19}$$

Finally, applying the projection theorem on (19) to solve for α_A yields (6). ■

In the regulated market, ITR is assumed to be fully effective in the sense that it prevents insiders from trading; that is, in a regulated market, $x_{NR}=\beta_R=0$.[14] Thus, in the regulated market, the following theorem holds:

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[13] It is important to recall at this point that, since the governmental transfer (μ) is a publicly-known lump sum, then there is no uncertainty about its value.

Theorem 2: *When all traders are risk averse and insider trading is restricted, there exists an equilibrium characterized by the parameters*:

$$\alpha_R = \frac{\gamma_R \sigma_\eta^2}{\gamma_R^2 \sigma_\eta^2 + \sigma_Q^2} \tag{20}$$

$$\gamma_R = \frac{1}{2\alpha_R + a_T(\sigma_\varepsilon^2 + \alpha_R^2 \sigma_Q^2)} \tag{21}$$

Proof: Similar to the proof of Theorem 1. ■

III- SIMULATION OF THE MODEL: BASE CASE

The complexity of the equilibria derived above precludes a tractable analysis in closed-form. Therefore, the impact of a change in policy from regulation to taxation on a securities market and on social welfare is evaluated below using numerical analysis. The impact of such a change in policy on a securities market is evaluated through its effect on market liquidity, price volatility, informational efficiency, and price predictability. Its impact on social welfare, on the other hand, is evaluated through its effect on the welfare of insiders, outsiders, liquidity traders, and workers. I perform below an *ex-ante* analysis; that is, an analysis of the impact of a change in policy from regulation to taxation before the realization of the random variables of the model.

1.- The expressions to be evaluated

The liquidity of the market (*L*), which is inversely related to the change in price that follows from the arrival of an order, can be measured by the inverse of the parameter α_j of the market maker's pricing function; that is:

$$L_j = \left(\alpha_j\right)^{-1} \qquad j = A, R \tag{22}$$

The volatility of current prices (*CV*) can be measured by the (unconditional) variance of $\tilde{p}_{0j}$; that is:

$$CV_j = \alpha_j^2 \left(\beta_j^2 \sigma_\varepsilon^2 + \gamma_j^2 \sigma_\eta^2 + \sigma_Q^2 \right) \qquad j = A, R \tag{23}$$

The volatility of future prices (*FV*), on the other hand, can be measured by the variance of $\tilde{p}_1$, conditional on the equilibrium value of $\tilde{p}_{0j}$; that is:

$$FV_j = \sigma_\varepsilon^2 + \sigma_\eta^2 - \frac{\left(\beta_j \sigma_\varepsilon^2 + \gamma_j \sigma_\eta^2\right)^2}{\beta_j \sigma_\varepsilon^2 + \gamma_j^2 \sigma_\eta^2 + \sigma_Q^2} \qquad j = A, R \tag{24}$$

The informational efficiency of the market (*IE*) reflects the amount of information revealed by securities prices, and can be measured by the inverse of the volatility of future prices; that is:

$$IE_j = \left(FV_j\right)^{-1} \qquad j = A, R \tag{25}$$

[14] This assumption is not crucial for the analysis (that is, its relaxation would not significantly change the results derived below) but it simplifies it substantially.

Finally, a measure of price predictability is given by the correlation coefficient between $\tilde{p}_{0j}$ and $\tilde{p}_1(r)$; that is:

$$r_j = \frac{\beta_j \sigma_\varepsilon^2 + \gamma_j \sigma_\eta^2}{\sqrt{\left(\sigma_\varepsilon^2 + \sigma_\eta^2\right)\left(\beta_j^2 \sigma_\varepsilon^2 + \gamma_j^2 \sigma_\eta^2 + \sigma_Q^2\right)}} \qquad j = A, R \tag{26}$$

As stated above, special emphasis is placed on the impact of a change in policy from regulation to taxation on social welfare. The welfare analysis is performed in terms of a representative agent of each type, and is performed *ex-ante*. Hence, the expectations taken below are unconditional expectations.

An insider's expected terminal utility in the alternative market and that in the regulated market are given, respectively, by:

$$E\left[V_N\left(\tilde{w}_{NA}^1\right)\right] = 1 - e^{-a_N\left\{w_N^0 + Y_{NA} + (1-\lambda_N)(1-\alpha_A\beta_A)\beta_A\sigma_\varepsilon^2 + \delta_N\mu - (a_N/2)(1-\lambda_N)^2\left[2(1-\alpha_A\beta_A)^2\beta_A^2(\sigma_\varepsilon^2)^2 + (1-\alpha_A\gamma_A)^2\beta_A^2\sigma_\varepsilon^2\sigma_\eta^2 + (\alpha_A\beta_A)^2\sigma_\varepsilon^2\sigma_Q^2\right]\right\}} \tag{27}$$

$$E\left[V_N\left(w_{NR}^1\right)\right] = 1 - e^{-a_N\left\{(1-t_R)w_N^0 + Y_{NR}\right\}} \tag{28}$$

An outsiders's expected terminal utility in the alternative market and that in the regulated market, on the other hand, are given, respectively, by:

$$E\left[V_T\left(\tilde{w}_{TA}^1\right)\right] = 1 - e^{-a_T\left\{w_T^0 + Y_{TA} + (1-\alpha_A\gamma_A)\gamma_A\sigma_\eta^2 + \delta_T\mu - (a_T/2)\left[(1-\alpha_A\beta_A)^2\gamma_A^2\sigma_\varepsilon^2\sigma_\eta^2 + 2(1-\alpha_A\gamma_A)^2\gamma_A^2(\sigma_\eta^2) + (\alpha_A\beta_A)^2\sigma_\eta^2\sigma_Q^2\right]\right\}} \tag{29}$$

$$E\left[V_T\left(\tilde{w}_{TR}^1\right)\right] = 1 - e^{-a_T\left\{(1-t_R)w_T^0 + Y_{TR} + (1-\alpha_R\gamma_R)\gamma_R\sigma_\eta^2 - (a_T/2)\left[\gamma_R^2\sigma_\varepsilon^2\sigma_\eta^2 + 2(1-\alpha_R\gamma_R)^2\gamma_R^2\left(\sigma_\eta^2\right)^2 + (\alpha_R\gamma_R)^2\sigma_\eta^2\sigma_Q^2\right]\right\}} \tag{30}$$

A liquidity trader's expected terminal utility in the alternative market and that in the regulated market are given, respectively, by:

$$E\left[V_Q\left(\tilde{w}_{QA}^1\right)\right] = 1 - e^{-a_Q\left\{w_Q^0 + Y_{QA} - \alpha_A\sigma_Q^2 + \delta_Q\mu - (a_Q/2)\left[(1-\alpha_A\beta_A)^2\sigma_\varepsilon^2\sigma_Q^2 + (1-\alpha_A\gamma_A)^2\sigma_\eta^2\sigma_Q^2 + 2\alpha_A^2(\sigma_Q^2)^2\right]\right\}} \tag{31}$$

$$E\left[V_Q\left(\tilde{w}_{QR}^1\right)\right] = 1 - e^{-a_Q\left\{(1-t_R)w_Q^0 + Y_{QR} - \alpha_R\sigma_Q^2 - (a_Q/2)\left[\sigma_\varepsilon^2\sigma_Q^2 + (1-\alpha_R\gamma_R)^2\sigma_\eta^2\sigma_Q^2 + 2\alpha_R^2(\sigma_Q^2)^2\right]\right\}} \tag{32}$$

A worker's (certain) terminal utility in the alternative market is given by:

$$E\left[V_K\left(w_{KA}^1\right)\right] = 1 - e^{-a_K\left\{w_K^0 + Y_{KA} + \delta_K\mu\right\}} \tag{33}$$

$$E\left[V_K\left(w_{KR}^1\right)\right] = 1 - e^{-a_K\left\{(1-t_R)w_K^0 + Y_{KA}\right\}} \tag{34}$$

When insider trading is restricted, on the other hand, some workers are diverted to perform the task of enforcing ITR, thus foregoing production of the commodity. Hence, as argued above, workers produce a lower amount of this commodity in the regulated market. Under competitive conditions, the compensation received by those workers diverted to enforce ITR must equal their opportunity cost. Hence, the cost of ITR, born by traders and workers through the tax system, is given by the value of the production workers forgo when they act as regulators; that is, $Y_{KA} - Y_{KR} = \left(w_N^0 + w_T^0 + w_Q^0 + w_K^0\right)t_R$. Therefore, a worker's (certain) terminal utility in the regulated market is given by:

This concludes the list of expressions to be evaluated. I turn now to consider the base case of the model with parameters that reflect average market data. These parameters will be used to find an explicit solution for both equilibria, which, in turn, will be used to evaluate the impact of a change in policy from regulation to taxation on a securities market and on social welfare.

2.- The base case

The values of the parameters for the base case are reported in Table 1. Volatility parameters and risk aversion coefficients were taken from Leland (1992).

TABLE 1: PARAMETERS FOR THE BASE CASE

σ_ε^2	σ_ε^2	σ_ε^2	t_R	a_i	$w_i^0 = Y_{iA}$	λ_N	δ_i
0.015	0.025	0.010	0.00002805	2	1	0.5	0.25

Although the volatility of $\tilde{p}_1\left(\sigma_\varepsilon^2 + \sigma_\eta^2 = .04\right)$ is taken from Leland (1992), the partition between $\sigma_\varepsilon^2\,(.015)$ and $\sigma_\eta^2\,(.025)$ is arbitrary. Note that this partition satisfies the restriction that the information observed by insiders is more precise than that observed by outsiders; that is, $\sigma_\varepsilon^2 < \sigma_\eta^2$. The variability of liquidity trading (σ_Q^2 =.010) and the risk-aversion parameters (a_i=2) are also taken from Leland (1992). The initial wealth of traders and workers (w_i^0) is normalized to 1, and so is their production of the commodity in the alternative market (Y_{iA}). The tax rate imposed on traders and workers in the regulated market (t_R) follows from the cost of ITR, which, in turn, follows from the production foregone by the imposition of this regulation. The foregone production in the model attempts to mirror the foregone production in the economy, thus implying a cost of ITR equal to .0001122.[15] Finally, insiders are assumed to keep half of their insider trading profits (λ_N=.5), and each representative trader is assumed to receive an equal amount of the governmental transfer (δ_i=.25).

The values reported in Table 1 can be used to compute an explicit solution for the model. The solution of the system for both the regulated and the alternative market is reported below in Table 2.[16] It is worthwhile to mention that the equilibria reported in this table are highly insensitive to the initial values needed to solve both systems numerically.

TABLE 2: EQUILIBRIUM VALUES FOR BEHAVIORAL PARAMETERS

α_A	β_A	γ_A	α_R	γ_R
0.999930	0.495963	0.493223	0.790298	0.616109

These equilibria can now be used to evaluate the impact of a change in policy from regulation to taxation on a securities market. Thus, market liquidity, current and future price volatility, informational efficiency, and price predictability in both the regulated and the alternative market are reported below in Table 3.[17]

[15] These calculations are shown in part I of the appendix of Estrada (1995).

[16] This table follows from equations (6)-(8), (20)-(21), and the values reported in Table 1.

[17] This table follows from equations (22)-(26) and the values reported in Tables 1-2.

TABLE 3: SECURITIES MARKETS

■	A	R	(A-R)
L	1.00007000	1.26534547	-0.2652754
CV	0.01976864	0.01217273	0.00759590
FV	0.02023137	0.02782725	-0.0075958
IE	49.4281837	35.9359974	13.4921862
r	0.70300475	0.55165092	0.15135383

Table 3 shows that a change in policy from regulation to taxation would have both beneficial and detrimental effects on a securities market. In particular, it would decrease market liquidity, increase current-price volatility, decrease future-price volatility, increase the informational efficiency of the market, and increase price predictability. From a qualitative point of view, *all* these results are the same as those that would be obtained from the complete deregulation of insider trading; that is, from the elimination of ITR.[18]

The equilibria reported in Table 2 can also be used to evaluate the impact of a change in policy from regulation to taxation on social welfare. To this purpose, let social welfare in the jth market (SW_j) be defined as the joint utility of insiders, outsiders, liquidity traders, and workers; that is, $SW_j=E(V_{Nj}+V_{Tj}+V_{Qj}+V_{Kj})$, where V_{ij} is agent i's utility in the jth market. The utility of each representative agent, as well as social welfare, in both the regulated and the alternative market are reported below in Table 4.[19]

TABLE 4: SOCIAL WELFARE

■	A	R	(A-R)
$E(V_N)$	0.98176920	0.98168333	0.00008587
$E(V_T)$	0.98192294	0.98195879	-0.0000358
$E(V_Q)$	0.98132060	0.98137883	-0.0000582
$E(V_K)$	0.98170152	0.98168333	0.00001819
SW	3.92671428	3.92670429	0.00000998

Table 4 shows that a change in policy from regulation to taxation would make insiders and workers better off, and outsiders and liquidity traders worse off. All these changes are explained by the changes in expected trading profits, in the taxation of wealth, and in the governmental transfer that stem from such a change in policy. In addition, Table 4 shows that a change in policy from regulation to taxation would make society better off.

Three reasons explain the result that the alternative regime yields a higher level of social welfare than the regulated regime; these three reasons are, in fact, the same three reasons that explain why an unregulated market improves upon a regulated one. First, it can be shown that the sum of the variances of the terminal wealth of all

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[18] Estrada (1995) analyzes in detail the impact of imposing ITR on a previously unregulated market, and finds that such a regulation increases market liquidity, decreases current-price volatility, increases future-price volatility, decreases informational efficiency, and decreases price predictability. The impact of eliminating ITR follows directly from those results, and, from a qualitative point of view, is the same as that shown by Table 3. An intuitive explanation of the impact of imposing ITR on a securities market is provided by Estrada (1994b).

[19] This table follows from equations (27)-(34) and the values reported in Tables 1-2.

agents in the regulated market is larger than such a sum in the alternative market.[20] This is explained by the fact that, when insiders are allowed to trade, the inside information they channel into securities prices corrects these prices in the right direction,[21] thus smoothing the price change that follows from the arrival of new information. Therefore, a change in policy from regulation to taxation would decrease the volatility of securities prices; that is, *the alternative market is less risky than the regulated market*.

Second, it is important to note that a change in policy from regulation to taxation would allow insiders not only to trade but also to bear risk. Thus, in the alternative market, the risk of the volatility of securities prices is spread across insiders, outsiders, and liquidity traders; in the regulated market, on the other hand, such risk is spread only across outsiders and liquidity traders. Put differently, *the risk sharing in the alternative market is superior to that in the regulated market*.

Finally, as long as monitoring whether insiders pay their taxes on insider trading profits is less costly than monitoring their behavior, a change in policy from regulation to taxation would reallocate resources to the productive sector of the economy. In other words, *the production of goods and services in the alternative market would be higher than that in the regulated market*.

In sum, a change in policy from regulation to taxation would decrease market liquidity, increase current-price volatility, decrease future-price volatility, increase the informational efficiency of the market, and increase price predictability. In terms of welfare, such a change of policy would force a reallocation of wealth and risk that would make insiders and workers better off, outsiders and liquidity traders worse off, and society as a whole better off. Three reasons explain this last result: First, a change in policy from regulation to taxation would decrease price volatility, thus making the market less risky; second, it would improve the risk sharing among traders; and, third, it would reallocate resources to the productive sector of the economy.

By comparing these results to those obtained by Estrada (1995) it can be established that, from a qualitative point of view, a change in policy from regulation to taxation would have the same impact on a securities market and on social welfare as that of a complete deregulation of insider trading. Hence, the policy proposed preserves the beneficial effects of allowing insider trading. In addition, the governmental transfer, which reallocates wealth from insiders to the rest of society, should satisfy some fairness considerations usually sought to be satisfied through the imposition of ITR. Therefore, the proposed policy combines the beneficial efficiency effects of eliminating ITR with the fairness considerations necessary to make the policy appealing to lawmakers.[22]

IV- SIMULATION OF THE MODEL: SENSITIVITY ANALYSIS

I explore in this part whether the results derived in the previous part hold for a wider range of values of the parameters of the model. As before, I divide this inquiry into results related to securities markets and results related to social welfare. I perform the sensitivity analysis with respect to changes in the variability of inside and

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[20] $Var\left(\tilde{p}_1 - \tilde{p}_{0A}\right) = .02023137 < Var\left(\tilde{p}_1 - \tilde{p}_{0R}\right) = .02782725.$

[21] Recent empirical research by Cornell and Sirri (1992) and Meulbroek (1992) provides support to the argument that insider trading corrects securities prices significantly and in the right direction.

[22] The optimal regulation of insider trading is addressed in more detail in Estrada (1994c).

outside information, the variability of liquidity trading, the risk aversion of all traders, and the tax rate on insider trading profits.[23]

1.- Securities markets

As shown in the previous part, a change in policy from regulation to taxation would have the same qualitative impact on a regulated securities market as that of a complete deregulation of insider trading. That is, it would decrease market liquidity, increase current-price volatility, decrease future-price volatility, increase informational efficiency, and increase price predictability.

The sensitivity analysis, summarized in Table A1, in part II of the appendix, shows that the previous results hold for a wide range of values of the parameters of the model. Table A1 shows that the superiority of regulation over taxation in terms of market liquidity and current-price volatility, and the superiority of taxation over regulation in terms of future-price volatility, informational efficiency, and price predictability hold for a wide range of values of the parameters of the model. I turn now to discuss the results of the sensitivity analysis on social welfare.[24]

2.- Social welfare

As shown in the previous part, a change in policy from regulation to taxation would have the same qualitative effect on traders and workers as that of a complete deregulation of insider trading. That is, it would make insiders and workers better off, outsiders and liquidity traders worse off, and society as a whole better off. The sensitivity analysis, summarized in table A2, in part II of the appendix, shows that, except in the specific cases to be considered below, these results hold for a wide range of values of the parameters of the model.

Throughout the sensitivity analysis, it is always the case that $E(V_{NA}-V_{NR})\geq 0$, $E(V_{TA}-V_{TR})\leq 0$, $E(V_{QA}-V_{QR})\leq 0$, and $E(V_{KA}-V_{KR})\geq 0$; that is, a change in policy from regulation to taxation never makes insiders and workers worse off, or outsiders and liquidity traders better off. Put differently, changes in the parameters of the model change the magnitude, but not the sign, of the individual gains and losses that result from such a change in policy.

The sensitivity analysis shows that an increase in the variability of inside or outside information, or in the variability of liquidity trading, increase the volatility of securities prices, thus increasing the risk to be born by society. Hence, both SW_A and SW_R decrease as $\sigma_\varepsilon^2, \sigma_\eta^2$ or σ_Q^2 increase. Further, since the risk sharing under taxation is superior to that under regulation, then SW_R decreases more rapidly than SW_A. Therefore, *the social gain of replacing ITR by a tax on insider trading profits is increasing in the variability of inside and outside information, as well as in the variability of liquidity trading*. This result is illustrated in Figures A1-A3, in part I of the appendix.

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[23] The range of variation of the parameters of the model in the sensitivity analysis is as follows: The variability of inside information (σ_ε^2) ranges from .002 to .024; the variability of outside information (σ_η^2) from .016 to .038; the variability of liquidity trading (σ_Q^2) from .002 to .024; the risk aversion of insiders (a_N), outsiders (a_T), and liquidity traders (a_Q) from .5 to 8; and, finally, the tax rate on insider trading profits from 0 to 1.

[24] Note that no sensitivity analysis was performed with respect to changes in the risk aversion of liquidity traders. This is due to the fact that liquidity traders trade randomly, and, therefore, their attitude towards risk has no impact on a securities market.

The sensitivity analysis also shows that the gain obtained by insiders as a result of a change in policy from regulation to taxation is decreasing in their risk aversion.[25] Further, the loss imposed on outsiders and liquidity traders, as well as the gain obtained by workers, are not significantly affected by changes in the risk aversion of insiders.[26] Finally, the social gain of replacing ITR by a tax on insider trading profits is decreasing in the risk aversion of insiders. Thus, somewhere between a_N=2 and a_N=2.5 the gain obtained by insiders and workers ceases to outweigh the loss imposed on liquidity traders and workers; that is, somewhere between a_N=2 and a_N=2.5 ITR becomes socially beneficial.

This result is explained as follows. A change in policy from regulation to taxation reallocates wealth from outsiders and liquidity traders to insiders and workers, and risk from outsiders and liquidity traders to insiders and the government. Note that, if insiders are more risk averse than outsiders and liquidity traders, then such a change in policy generates a reallocation of risk to traders (insiders) that bear that risk at a higher cost than outsiders and liquidity traders. Hence, as the risk aversion of insiders increases, the risk reallocation becomes more costly. Therefore, *if the risk aversion of insiders is high, ITR improves upon a tax on insider trading profits*. This result is illustrated in Figure A4, in part I of the appendix.

The sensitivity analysis also shows that the gain obtained by insiders and workers as a result of a change in policy from regulation to taxation, as well as the loss imposed on liquidity traders, are not significantly affected by changes in the risk aversion of outsiders.[27] The loss that such a change in policy imposes on outsiders, on the other hand, is decreasing in their risk aversion.[28] Finally, the social gain of replacing ITR by a tax on insider trading profits is increasing in the risk aversion of outsiders. Thus, somewhere between a_T=1.5 and a_T=2, the gain obtained by insiders and workers begins to outweigh the loss imposed on outsiders and liquidity traders. This is due to the fact that, as the risk aversion of outsiders increases, the risk reallocation becomes more beneficial. On the other hand, the opposite situation implies that, *if the risk aversion of outsiders is low, ITR improves upon a tax on insider trading profits*. This result is illustrated in Figure A5, in part I of the appendix.

The sensitivity analysis also shows that the gain obtained by insiders and workers as a result of a change in policy from regulation to taxation, as well as the loss imposed on outsiders, are not affected by changes in the risk aversion of liquidity traders.[29] The loss that such a change in policy imposes on liquidity traders, on the other hand, is decreasing in their risk aversion.[30] Finally, the social gain of replacing ITR by a tax on insider trading profits is increasing in the risk aversion of liquidity traders. Thus, somewhere between a_Q=1.5 and a_Q=2, the gain obtained by insiders and workers begins to outweigh the loss imposed on liquidity traders and workers. This is due to the fact that, as the risk aversion of liquidity traders increases, the risk reallocation becomes more beneficial. On

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[25] For a_N=.5, $E(V_{NA}-V_{NR})$=.00043501, whereas for $a_N \geq 7.5$, $E(V_{NA}-V_{NR})$=0.

[26] For $.5 \leq a_N \leq 8$, $(V_{TR}-V_{TA})$=.0000358, and $E(V_{QR}-V_{QA})$=.0000582. Further, for a_N=.5, $E(V_{KA}-V_{KR})$=.00001819, whereas for a_N=8, $E(V_{KA}-V_{KR})$=.00001817.

[27] For a_T=.5, $E(V_{NA}-V_{NR})$=.00008587, $E(V_{QR}-V_{QA})$=.0000581, and $E(V_{KA}-V_{KR})$=.00001818, whereas for a_T=8, $E(V_{NA}-V_{NR})$=.00008592, $E(V_{QR}-V_{QA})$=.0000590, and $E(V_{KA}-V_{KR})$=.00001820.

[28] For a_T=.5, $E(V_{TR}-V_{TA})$=.0002045, whereas for $a_T \geq 7$, $E(V_{TR}-V_{TA})$=0.

[29] For $.5 \leq a_Q \leq 8$, $E(V_{NA}-V_{NR})$=.00008587, $E(V_{TR}-V_{TA})$=.0000358, and $E(V_{KA}-V_{KR})$=.00001819.

[30] For a_Q=.5, $E(V_{QR}-V_{QA})$=.0002937, whereas for a_Q=8, $E(V_{QR}-V_{QA})$=0.

the other hand, the opposite situation implies that, *if the risk aversion of liquidity traders is low, ITR improves upon a tax on insider trading profits*. This result is illustrated in Figure A6, in part I of the appendix.

Note from Figures A4, A5, and A6 that a change in policy from regulation to taxation turns from beneficial to detrimental slightly beyond a_N=2, and from detrimental to beneficial slightly before a_T=2 and a_Q=2. This is due to the fact that, in the sensitivity analysis, the risk aversion of two representative traders is fixed at 2 and the risk aversion of the third representative trader is subject to changes. Hence, levels of risk aversion around 2 become a threshold. In other words, high and low levels of risk aversion should not be interpreted as higher or lower than 2, but as high and low with respect to the risk aversion of other traders. Therefore, the last three results derived above can be summarized as follows: *ITR improves upon a tax on insider trading profits only when insiders are more risk averse than outsiders or liquidity traders*.

Finally, the sensitivity analysis shows that the gain obtained by insiders as a result of a change in policy from regulation to taxation, as well as the loss imposed on outsiders and liquidity traders, are decreasing in the tax rate on insider trading profits.[31] The gain obtained by workers as a result of such a change in policy, on the other hand, is increasing in this tax rate.[32] At the aggregate level, the sensitivity analysis shows that *the social gain of replacing ITR by a tax on insider trading profits is increasing in the tax rate on insider trading profits*; this result is illustrated in Figure A7, in part I of the appendix. In fact, the sensitivity analysis shows that social welfare is maximized when λ_N=1.[33] This result follows from the assumption that the government collects an uncertain amount (a fraction λ_N of insider trading profits) but redistributes a certain amount (a fraction λ_N of the expected value of these profits). That is, under taxation, the government bears (a fraction λ_N of) risk that would be born by outsiders and liquidity traders under regulation. Further, since the government is assumed to be risk neutral, it can bear this risk at no cost. Therefore, it is always optimal to have the government bearing as much risk as possible, and, as a result, λ_N=1.

In sum, the sensitivity analysis establishes that regulation can improve over taxation *only* when insiders are more risk averse than outsiders or liquidity traders. In this case, the proposed change of policy reallocates risk to traders (insiders) that bear that risk at a higher cost than outsiders or liquidity traders. However, casual empiricism suggests that, in reality, the opposite pattern of risk aversion is observed; that is, insiders seem to be less risk averse than outsiders and liquidity traders.[34] In addition, it does not seem plausible to justify the imposition of ITR on the basis of differences in risk aversion across traders, when the latter is so difficult (if not impossible) to justify empirically. In other words, the conditions under which regulation improves upon taxation seem to be either inconsistent with casual empiricism or very difficult to justify from an empirical point of view.

3.- A digression

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[31] For λ_N=0, $E(V_{NA}$-$V_{NR})$=.00013466, $E(V_{TR}$-$V_{TA})$=.0000528, and $E(V_{QR}$-$V_{QA})$=.0000757, whereas for λ_N=1, $E(V_{NA}$-$V_{NR})$=.00003533, $E(V_{TR}$-$V_{TA})$=.0000188, and $E(V_{QR}$-$V_{QA})$=.0000407.

[32] For λ_N=0, $E(V_{KA}$-$V_{KR})$=.00000102, whereas for λ_N=1, $E(V_{KA}$-$V_{KR})$=.00003533.

[33] For this tax rate to be optimal it is necessary to assume that, even if the government collects all the insider trading profits, insiders would still trade.

[34] Some of the most notorious insiders have been arbitrageurs (like Ivan Boesky) or investment bankers (like Dennis Levine). It seems plausible to think that these traders, who frequently invest large sums of money in search for a quick profit, are inherently less risk averse that liquidity traders, who trade for liquidity reasons.

The assumption that, under taxation, the government collects an uncertain amount (a fraction λ_N of insider trading profits) and redistributes a certain amount (a fraction λ_N of the expected value of these profits) seems to be consistent with the way a government would act in such a regime. This is due to the fact that the amount of the public good to be provided would have to be stated in the government budget, but the insider trading profits would be collected in the following period. However, the assumption that the government is risk neutral, thus being able to bear risk at no cost, may be more controversial. I briefly consider in this section two variations of the basic model.

Consider first a situation in which the government is risk averse. Under this assumption, it becomes costly for the government to bear the risk of the variability in (a fraction λ_N of) insider trading profits. In order to simplify the analysis of this case, assume that all members of the government are workers; that is, individuals that do not participate in speculative activities.[35] In this framework, when ITR is replaced by a tax on insider trading profits, a fraction λ_N of the variability in securities prices is reallocated from outsiders and liquidity traders to insiders and the government; that is, to insiders and workers. Therefore, if all traders and workers are equally risk averse, a tax on insider trading profits would improve upon ITR even if the government does not costlessly bear this risk. This is due to the fact that the risk sharing in the alternative market (the risk of the variability in securities prices would be shared by all traders and workers) would be superior to the risk sharing in the regulated market (the risk would be born only by outsiders and liquidity traders).[36]

Consider now another variation, one in which the government does not bear the risk of the variability in insider trading profits. That is, a situation in which the government collects (a fraction λ_N of) insider trading profits and, at the end of the period, redistributes whatever amount it collected. Note that, in this case, the uncertainty about the value of the governmental transfer imposes a cost on traders and workers. In this framework, when ITR is replaced by a tax on insider trading profits, a fraction λ_N of the variability in securities prices is, as in the previous case, reallocated from outsiders and liquidity traders to insiders and the government. However, in this case, the government does not bear any risk. Rather, it spreads this risk across all members of society through an uncertain governmental transfer; that is, through an uncertain provision of a public good. Therefore, in this framework, if all traders and workers are equally risk averse, a tax on insider trading profits would improve upon ITR even if the government does not costlessly bear any risk. As in the previous case, this is due to the fact that the risk sharing in the alternative market (the risk of the variability in securities prices would be shared by traders and workers) would be superior to the risk sharing in the regulated market (the risk would be born only by outsiders and liquidity traders).

V- CONCLUSIONS

I have evaluated in this paper the impact of a change in policy from ITR to a regime that allows insider trading and taxes insider trading profits. I have shown that such a change in policy would have, from a qualitative point of view, an impact analogous to that of a complete deregulation of insider trading. That is, either change of policy would decrease market liquidity, increase current-price volatility, decrease future-price volatility, increase

[35] The sole purpose of this assumption is to capture the fact that the risk born by the government does not simply vanish from society; rather, it is borne by some of its members.

[36] Recall, in addition, that the alternative market is less risky than the regulated market.

the informational efficiency of the market, and increase price predictability. The sensitivity analysis validated these results for a wide range of values of the parameters of the model.

I have further shown that, in terms of welfare, a change in policy from regulation to taxation would also have, from a qualitative point of view, an impact analogous to that of a complete elimination of ITR. In particular, I have shown that the proposed change of policy would make insiders and workers better off, outsiders and liquidity traders worse off, and society as a whole better off. Three reasons explain this last result: First, taxation enables inside information to be channelled into securities prices, thus reducing price volatility; second, taxation enables insiders to participate in the process of risk sharing; and, third, taxation enables a reallocation of resources to the productive sector of the economy.

I have established specific conditions under which a change in policy from regulation to taxation would be socially detrimental. Such is the case when the risk aversion of insiders is high relative to that of outsiders or liquidity traders. Under these circumstances the proposed change in policy generates a reallocation of wealth and risk that lowers social welfare. However, I have argued that the conditions under which ITR improves upon the proposed regime seem to be either inconsistent with casual empiricism or very difficult to justify from an empirical point of view.

Finally, I have argued that the proposed policy combines the beneficial efficiency effects of eliminating ITR with the fairness component necessary to make the policy appealing to lawmakers. In sum, I have argued in this paper that, if there is no government willing to deregulate insider trading completely, the replacement of ITR by a policy that allows insider trading and taxes insider trading profits should be considered as a plausible alternative. Such a change in policy would ultimately result in the reallocation of resources to a more efficient use and in a subsequent increase in social welfare. And, as I have argued elsewhere, that is what economics is all about.

APPENDIX

I- SENSITIVITY ANALYSIS: SELECTED RESULTS

***Figure A1*: SOCIAL WELFARE AND INSIDE INFORMATION**

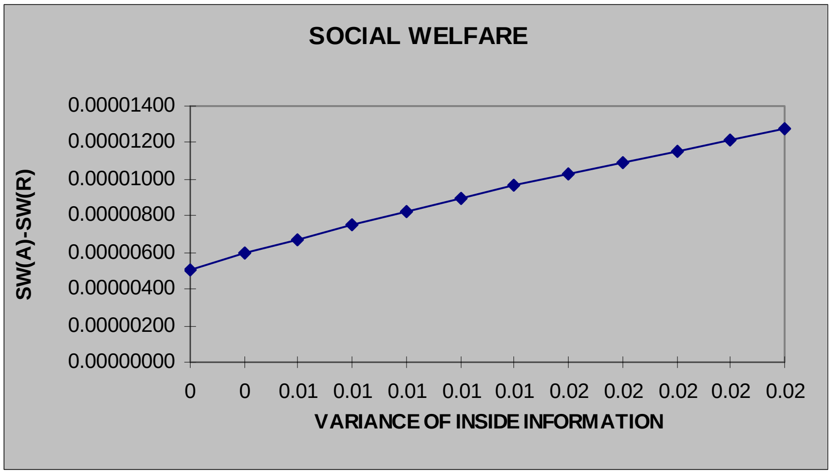


***Figure A2*: SOCIAL WELFARE AND OUTSIDE INFORMATION**

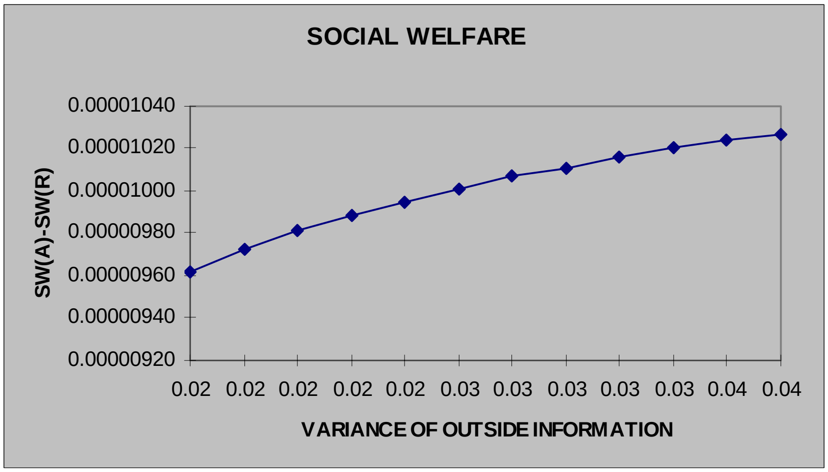


***Figure A3*: SOCIAL WELFARE AND LIQUIDITY TRADING**

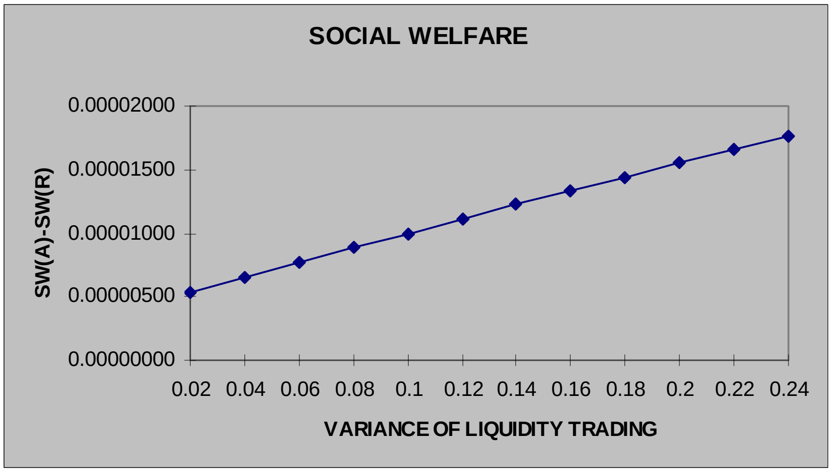


***Figure A4*: SOCIAL WELFARE AND INSIDERS' RISK AVERSION**

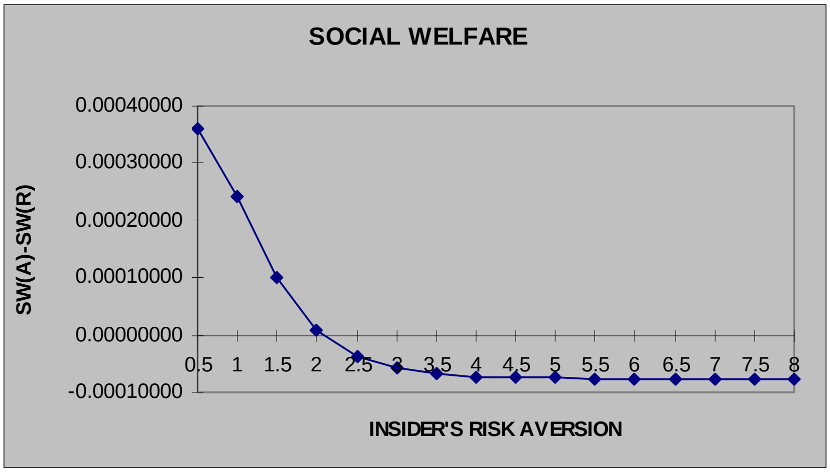


***Figure A5*: SOCIAL WELFARE AND OUTSIDERS' RISK AVERSION**

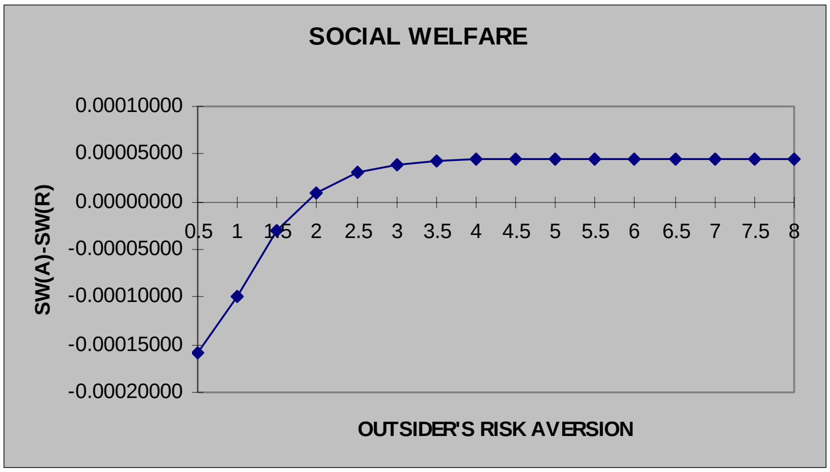


***Figure A6*: SOCIAL WELFARE AND LIQUIDITY TRADERS' RISK AVERSION**

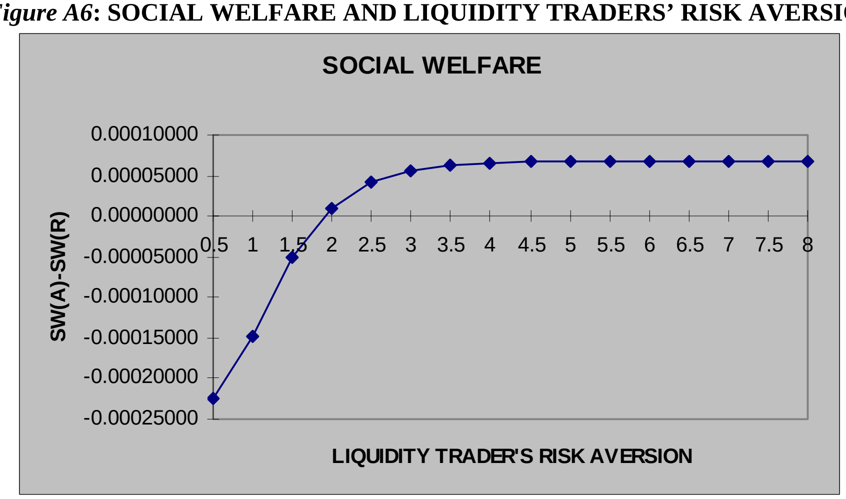
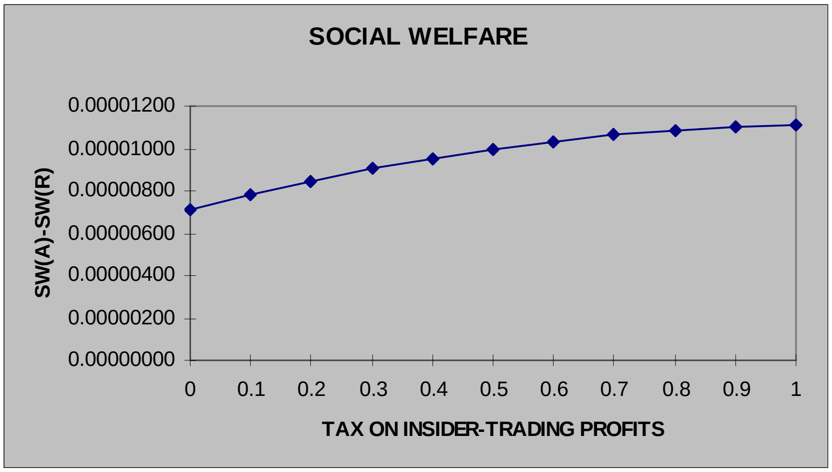


***Figure A7*: SOCIAL WELFARE AND TAX ON INSIDER-TRADING PROFITS**



II- SENSITIVITY ANALYSIS: SUMMARY OF RESULTS

***Table A1*: Securities Markets**

	σ_{ε}^{2}	σ_{η}^{2}	σ_{Q}^{2}	a_N	a_T	a_Q	λ_N
L_A	↓	↓	↑	↑	↑	-	↓
L_R	↑	↓	↑	-	↑	-	-
L_R-L_A	↑	↓	↑	↓	↑	-	↑
CV_A	↑	↑	↓	↓	↓	-	↑
CV_R	↓	↑	↓	-	↓	-	-
CV_A-CV_R	↑	↑	↑	↓	↑	-	↑
FV_A	↑	↑	↑	↑	↑	-	↓
FV_R	↑	↑	↑	-	↑	-	-
FV_R-FV_A	↑	↑	↑	↓	↑	-	↑
IE_A	↓	↓	↓	↓	↓	-	↑
IE_R	↓	↓	↓	-	↓	-	-
IE_A-IE_R	↑/↓[a]	↓	↓	↓	↑/↓[b]	-	↑
r_A	↓	↓	↓	↓	↓	-	↑
r_R	↓	↑	↓	-	↓	-	-
r_A-r_R	↑	↓	↑	↓	↑	-	↑

Table A1 shows whether a given market characteristic (row) increases (↑) or decreases (↓) as a result of an increase in a given parameter (column). More than one arrow in a box indicates a reversion in the direction of the change.

[a] The reversion occurs between $\sigma_{\varepsilon}^{2}=.018$ and $\sigma_{\varepsilon}^{2}=.020$.

[b] The reversion occurs between a_T=2 and a_T=2.5.

***Table A2*: Social Welfare**

	σ^2_ε	σ^2_η	σ^2_Q	a_N	a_T	a_Q	λ_N
$E(V_{NA})$	↑	↓	↑	↑	-	-	↓
$E(V_{NR})$	-	-	-	↑	-	-	-
$E(V_{NA}$-$V_{NR})$	↑	↓	↑	↓	-	-	↓
$E(V_{TA})$	↓	↑	↑	-	↑	-	↑
$E(V_{TR})$	↓	↑	↑	-	↑	-	-
$E(V_{TR}$-$V_{TA})$	↑	↓	↑	-	↓	-	↓
$E(V_{QA})$	↓	↓	↓	-	-	↑	↑
$E(V_{QR})$	↓	↓	↓	-	-	↑	-
$E(V_{QR}$-$V_{QA})$	↑	↓	↑	-	-	↓	↓
$E(V_{KA})$	↑	↓	↑	-	-	-	↑
$E(V_{KR})$	-	-	-	-	-	-	-
$E(V_{KA}$-$V_{KR})$	↑	↓	↑	-	-	-	↑
SW_A	↓	↓	↓	↑	↑	↑	↑
SW_R	↓	↓	↓	↑	↑	↑	-
SW_A-SW_R	↑	↑	↑	↓[a]	↑/↓[b,c]	↑[d]	↑

Table A2 shows whether an agent's (or society's) welfare (row) increases (↑) or decreases (↓) as a result of an increase in a given parameter (column). More than one arrow in a box indicates a reversion in the direction of the change.

[a] ITR turns from harmful to beneficial between a_N=2 and a_N=2.5.

[b] The reversion occurs between a_T=5.5 and a_T=6.

[c] ITR turns from beneficial to harmful between a_T=1.5 and a_T=2.

[d] ITR turns from beneficial to harmful between a_Q=1.5 and a_Q=2.

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