INSIDER TRADING:
REGULATION, SECURITIES MARKETS, AND WELFARE UNDER RISK NEUTRALITY

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Abstract: I evaluate in this paper the impact of insider trading regulation (ITR) on a securities market and on social welfare. I show that ITR has both beneficial and detrimental effects on a securities markets. In terms of welfare, I show that ITR has a purely redistributive effect; that is, it generates trading gains and trading losses that cancel out at the aggregate level. However, the goods and services that could have been produced with the resources allocated to enforce such a wealth redistribution are a net social cost of restricting insider trading. Finally, although I establish two conditions under which ITR is beneficial, I argue that neither condition provides sufficient support to the imposition of such a regulation.

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I- INTRODUCTION

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.

The literature on speculative trading under asymmetric information has focussed its attention on the analysis of market liquidity and informational efficiency,[1] but has paid relatively little attention to the issue of insider trading and its regulation.[2] Those studies that do consider insider trading, on the other hand, have usually omitted welfare analyses. To the best of my knowledge, only Ausubel (1990) and Leland (1992) have addressed the critical question: *Does insider trading regulation (ITR) make society better off or worse off?* Note that this question does not focus on the effects of ITR on liquidity, informational efficiency or other characteristics of a securities market. Rather, it focusses on the impact of ITR on social welfare.

Ausubel (1990) considers the impact of ITR on social welfare within the framework of a competitive market and concludes that society is better off when insider trading is restricted. However, his analysis neglects a fact that has become widely accepted: if expectations are rational, a trader with private information is never small.[3] Hence, price-taking behavior is not the adequate framework to analyze issues of informed trading. Leland (1992), on the other hand, also considering the impact of ITR on social welfare, arrives at an ambiguous result: if production is not responsive to securities prices, then ITR is beneficial; otherwise, it is harmful.

Although Ausubel (1990) and Leland (1992), unlike others, address the right question, they both ignore an important factor: the cost of ITR. When society allocates resources to regulate a market, it forgoes the goods and services that could have been produced with those resources. Thus, the utility that these goods and services would have generated to society is a measure of the cost of regulating the market. Put differently, since ITR diverts resources from production to regulation, it not only affects securities markets but also affects the real sector of the economy.

I consider in this paper an economy under two policy regimes: one in which insider trading is restricted (the regulated market), and one in which it is not (the unregulated market). After deriving an equilibrium for each regime, I evaluate the impact of ITR on a securities market and on social welfare. Due to the lack of research on the relationship between ITR and social welfare, I pay special attention to the welfare issue.

The model features three types of traders (insiders, outsiders, and liquidity traders) interacting with a market maker in a market for a risky asset. Insiders and outsiders possess private information about the future price of the risky asset; hence, their trading is informationally motivated. Liquidity traders, on the other hand, are uninformed and trade for exogenous reasons. Besides trading in the risky asset, all traders engage in the production

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[1] See, for example, Kyle (1989), Subrahmanyam (1991) and Spiegel and Subrahmanyam (1992).

[2] However, legal scholars have paid a great deal of attention to insider trading. An impressive amount of work, mostly published in law journals, followed the pioneering work by Manne (1966). See, for example, Scott (1980), Easterbrook (1981), Carlton and Fischel (1983), Easterbrook (1985), Haddock and Macey (1987), Manne (1987) and Macey (1991).

[3] Bhattacharya and Spiegel (1991) formally prove this result, although it can be traced back to Milgrom and Stokey (1982).

of a commodity. Therefore, the model can be used to analyze the impact of ITR not only on a securities market but also on the real sector of the economy.

Besides insiders, outsiders, liquidity traders, and a market maker, the model features a group of agents that do not participate in speculative activities. These individuals, referred to as workers, invest all their wealth in a risk-free asset and engage in production of the commodity. Further, if insider trading is restricted, some of these workers are diverted to perform the task of enforcing ITR; that is, they act as regulators.

The informational structure of the model reflects the fact that not only the insiders of a firm have access to nonpublic information that affects the future price of that firm's securities. Outsiders whose activities are related to the activities of the firm under consideration also possess such information. Thus, the model considers a framework in which informed traders acquire information about the future price of a risky asset as a byproduct of their activities. That is, information is costlessly acquired.

An example might help. Let the risky asset under consideration be IBM stock. The price of this stock is affected by factors that affect IBM itself; for example, by the invention of a new mainframe created by IBM researchers. I refer to this type of information, when known by only a few traders related to IBM, as inside information. Further, I refer to those few traders that observe this (private) information as insiders. The price of IBM stock is also affected by factors that affect firms related to IBM; for example, by the invention of a new computer chip created by Intel researchers. I refer to this type of information, when known by only a few traders related to Intel, as outside information. Further, I refer to those few traders that observe this (private) information as outsiders.

It is assumed below that all traders (and workers) are risk neutral. This assumption is useful to derive a simple, unique, closed-form Nash equilibrium in quantities (market orders). This equilibrium, in turn, provides a tractable framework to analyze the impact of ITR on a securities market and on social welfare.[4]

I show in this paper that ITR has both positive and negative effects on a securities market. In particular, I show that ITR has a positive impact on market liquidity and current-price volatility, and a negative impact on future-price volatility, informational efficiency, and price predictability. In terms of welfare, I show that ITR has a purely redistributive effect; that is, it generates trading gains and trading losses that cancel out at the aggregate level. However, the goods and services that could have been produced with the resources allocated to enforce such a wealth redistribution become the net social cost of restricting insider trading. Finally, although I establish two conditions under which ITR is socially beneficial, I argue that neither of them provides sufficient support to the imposition of such a regulation.

The rest of the paper is organized as follows. In part II, I introduce the model and derive two equilibria (one for the unregulated market and the other for the regulated one). In part III, I consider the impact of ITR on several characteristics of a securities market. In part IV, I evaluate the impact of ITR on social welfare. In part V, I consider two extensions of the basic model. And, finally, in part VI, I summarize the most important conclusions of the analysis.

II- THE MODEL

1.- Market microstructure

[4] The implications of relaxing the assumption of risk neutrality and replacing it by one of risk aversion are analyzed in detail in Estrada (1993a).

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). There are two investment opportunities in this economy: a risk-free asset (F) that yields a certain return (ρ), and a risky asset (x); the analysis is focussed on the latter. Three types of traders interact in the market for the 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 an unregulated market (indexed by U) or in a regulated market (indexed by R); that is, a market that restricts insider trading. Finally, there is a group of agents that do not participate in speculative activities. These agents, referred to as workers (indexed by K), simply invest their wealth in the risk-free asset.[5]

Insiders, outsiders, liquidity traders, and workers are endowed with (certain) initial wealth, w_i^0 which they can use to purchase a portfolio containing the risk-free asset and the risky asset. Yet, if insider trading is restricted, all these agents will be forced to forgo a proportion t_j ($0 \leq t_j \leq 1$) of their initial wealth to bear the cost of ITR. Thus, let t_R be the rate at which traders and workers are taxed in the regulated market, and t_U=0; that is, no taxes are paid in the unregulated market. Thus, the budget constraint of traders and workers is given by:

$$\left(1-t_j\right)w_i^0 = F_{ij} + \tilde{p}_{0j}\tilde{x}_{ij} \qquad i=N,T,Q,K \qquad j=U,R \tag{1}$$

where F_{ij} is agent i's demand for the risk-free asset in the jth market, $\tilde{p}_{0j}$ is the price of the risky asset in the jth market at the beginning of the period, and $\tilde{x}_{ij}$ is agent i's demand for the risky asset in the jth market. Since workers do not trade in the risky asset, then x_{Kj}=0.

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, $Y_{iU}=Y_{iR}$, 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 assumed that, if the market is regulated, (some) workers will perform this task. Hence, workers' production of the commodity will be larger when insider trading is not restricted; that is, $Y_{KU}>Y_{KR}$.

At the end of the period, when both trading and production are finished, traders and workers possess (random) terminal wealth given by:

$$\tilde{w}_{ij}^1 = \left(1+\rho\right)F_{ij} + Y_{ij} + \tilde{p}_1\tilde{x}_{ij} \qquad i=N,T,Q,K \qquad j=U,R \tag{2}$$

where $\tilde{w}_{ij}^1$ is agent i's terminal wealth in the jth market, and $\tilde{p}_1$ is the price of the risky asset at the end of the period. This terminal price, which is exogenously determined, is given by:

$$\tilde{p}_1 = \bar{p}_1 + \tilde{\varepsilon} + \tilde{\eta} \tag{3}$$

where $\bar{p}_1$ is the expected price of the risky asset given all publicly available information, 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.[6]

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

[6] Note that the future price of the risky asset does not depend on the type of market in which this asset is traded.

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 unregulated) in which liquidity traders trade. 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.

Unlike liquidity traders, insiders and outsiders trade for informational reasons. All traders observe all publicly available information about the future price of the risky asset, summarized in the parameter $\bar{p}_1$. Further, insiders privately (and costlessly) observe a realization of the random variable $\tilde{\varepsilon}$ (ε_1), and outsiders privately (and also costlessly) observe a realization of the random variable $\tilde{\eta}$ (η_1).[7] The first random shock ($\tilde{\varepsilon}$) arises in 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.

Insiders, outsiders, and liquidity traders are assumed to be risk neutral. 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.[8] Finally, workers are also assumed to be risk neutral. It follows from the risk-neutrality assumption that, without loss of generality, the utility function of insiders, outsiders, liquidity traders, and workers can be normalized to their (terminal) wealth. Thus, let $V_i = \tilde{w}_{ij}$, $i=N,T,Q,K$, where V_i is agent i's utility function.

Solving (1) for F_{ij} and substituting into (2) yields:

$$\tilde{w}_{ij}^1 = (1+\rho)(1-t_j)w_i^0 + Y_{ij} + \left[\tilde{p}_1 - (1+\rho)\tilde{p}_{0j}\right]\tilde{x}_{ij} \qquad i = N, T, Q, K \qquad j = U, R \tag{4}$$

It is the expected value of this terminal wealth, conditional on their private information, that insiders and outsiders (but not liquidity traders and workers) are assumed to maximize.[9] This is due to the fact that, under risk neutrality, maximizing the expected utility of a trader's wealth is equivalent to maximizing the trader's expected wealth, in the sense that both approaches generate the same demand functions.

2.- Strategies and equilibria

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

$$i) \quad x_{ij}^* = \arg\max_{x_{ij}} E\left(\tilde{w}_{ij}^1 \middle| \tilde{\omega}_i = \omega_i\right) \qquad i = N, T \qquad j = U, R$$

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

However, Leland (1992) shows that securities prices would be, on average, higher when insider trading is allowed, thus encouraging corporate investment. This beneficial effect of insider trading does not arise in the model considered in this paper.

[7] A model in which outsiders acquire information at a (fixed) cost is analyzed by Fishman and Hagerty (1992).

[8] Hence, his welfare is not analyzed.

[9] For simplicity, and without loss of generality, the return of the risk-free asset *(ρ)* is normalized to 0 in what follows.

That is, an equilibrium is a (current) price of the risky asset that: first, arises from demands that maximize the wealth (hence, 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 is revealed, and demands are submitted to the market maker, who sets the price that clears the market for the risky asset. At the end of the period, all uncertainty is resolved, the payoffs of the portfolios are realized, and the production of the commodity is finished. Trading, in particular, is structured in two steps: First, insiders and outsiders observe a realization of $\tilde{\varepsilon}$ and $\tilde{\eta}$, respectively, and submit their demand for the risky asset conditional on such a realization. At the same time, liquidity traders submit their demand for the risky asset. Second, the market maker determines the price that clears the market for this asset. It is assumed that, when so doing, he sets this price efficiently, thus making zero profits. That is, the market maker sets the current 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:

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

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

When selecting their portfolio, insiders and outsiders take this pricing function (but not the price of the risky asset) as given. That is, insiders and outsiders behave strategically in the sense that they take into account the effect of their demand on the (current) price of the risky asset, and they do so by incorporating into their maximization problem the market maker's pricing function. Note that this implies that neither insiders nor outsiders observe the (current) price at which they will trade. However, they both have a rational expectation of what this price will be. A rational expectations equilibrium exists when these expectations become self-fulfilling.

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 two 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]

[10] Note that $\tilde{\omega}_N = \tilde{\varepsilon}$, $\tilde{\omega}_T = \tilde{\eta}$, $\omega_N = \varepsilon_1$, 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 is correlated to the future price of the risky asset.

[12] As will be seen below, these conjectures are confirmed in equilibrium. That is, linear strategies are not an assumption but a result. The plausibility of this type of 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.

In this framework, the market maker selects the parameter that determines the liquidity of the market, and insiders and outsiders choose the parameter that determines their demand. That is, the market maker selects α_j, insiders select β_j, and outsiders select γ_j.

This concludes the analytical framework in an unregulated market; that is, in a market where insider trading is allowed. In such a framework, the following theorem holds:

Theorem 1: *When all traders are risk neutral and insider trading is allowed, there exists a unique equilibrium characterized by the parameters*:

$$\alpha_U = (1/2)\sqrt{\frac{\sigma_\varepsilon^2 + \sigma_\eta^2}{\sigma_Q^2}} \tag{6}$$

$$\beta_U = \gamma_U = \sqrt{\frac{\sigma_Q^2}{\sigma_\varepsilon^2 + \sigma_\eta^2}} \tag{7}$$

Proof: Using (3), (4), (5), and conjecture 2, a representative insider's problem can be written as:

$$\underset{x_{NU}}{Max}\ E\left(\tilde{w}_{NU}^1 \middle| \tilde{\varepsilon} = \varepsilon_1\right) = E\left[w_N^0 + Y_{NU} + \left(\tilde{\varepsilon} + \tilde{\eta} - \alpha_U x_{NU} - \alpha_U \gamma_U \tilde{\eta} - \alpha_U \tilde{x}_Q\right) x_{NU} \middle| \tilde{\varepsilon} = \varepsilon_1 \right] \tag{8}$$

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

$$x_{NU}^* = \left(\frac{1}{2\alpha_U}\right)\varepsilon_1 = \beta_U \varepsilon_1 \tag{9}$$

Similarly, using (3), (4), (5), and conjecture 1, a representative outsider's problem can be written as:

$$\underset{x_{TU}}{Max}\ E\left(\tilde{w}_{TU}^1 \middle| \tilde{\eta} = \eta_1\right) = E\left[w_T^0 + Y_{TU} + \left(\tilde{\varepsilon} + \tilde{\eta} - \alpha_U \beta_U \tilde{\varepsilon} - \alpha_U x_{TU} - \alpha_U \tilde{x}_Q\right) x_{TU} \middle| \tilde{\eta} = \eta_1 \right] \tag{10}$$

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

$$x_{TU}^* = \left(\frac{1}{2\alpha_U}\right)\eta_1 = \gamma_U \eta_1 \tag{11}$$

Equations (9) and (11) form a system in β_U and γ_U whose solution yields the unique equilibrium of the model. This equilibrium, however, must satisfy the restriction that the market maker sets prices efficiently. This implies that:

$$p_{0U} = E\left(\tilde{p}_1 \middle| \tilde{x}_{NU} + \tilde{x}_{TU} + \tilde{x}_Q = x_{NU}^* + x_{TU}^* + x_Q\right) = \bar{p}_1 + \alpha_U\left(x_{NU}^* + x_{TU}^* + x_Q\right) \tag{12}$$

Since all the random variables in the model are normally distributed, application of the projection theorem on (12) yields:

$$\alpha_U = \frac{Cov\left(\tilde{p}_1, \tilde{x}_{NU} + \tilde{x}_{TU} + \tilde{x}_Q\right)}{Var\left(\tilde{x}_{NU} + \tilde{x}_{TU} + \tilde{x}_Q\right)} = \frac{\beta_U \sigma_\varepsilon^2 + \gamma_U \sigma_\eta^2}{\beta_U^2 \sigma_\varepsilon^2 + \gamma_U^2 \sigma_\eta^2 + \sigma_Q^2} \tag{13}$$

Substituting (13) into (9) and (11) yields a quadratic equation in β_U ($=\gamma_U$) whose solution is given by (7). Finally, substituting (7) back into (13) yields (6). ■

Therefore, when insider trading is allowed, there exists a unique equilibrium in which informed traders' demands for the risky asset are a linear function of their private information. It is important to note that, if there were no liquidity traders in the market, the market maker, being bound to lose to informed traders, would not trade. In other words, without liquidity trading the equilibrium breaks down.[13]

Consider now a regulated market; that is, a market that restricts insider trading. It is assumed that ITR is effective in the sense that it fully prevents insiders from trading; that is, under ITR, $x_{NR}=\beta_R=0$.[14] Thus, in a regulated market, the following theorem holds:[15]

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

$$\alpha_R = (1/2)\sqrt{\frac{\sigma_\eta^2}{\sigma_Q^2}} \tag{14}$$

$$\gamma_R = \sqrt{\frac{\sigma_Q^2}{\sigma_\eta^2}} \tag{15}$$

Proof: Using (3), (4), and (5), a representative outsider's problem can be written as:

$$Max_{\ x_{TR}}\ E\left(\tilde{w}_{TR}^1 \middle| \tilde{\eta}=\eta_1\right) = E\left[(1-t_R)w_T^0 + Y_{TR} + \left(\tilde{\varepsilon}+\tilde{\eta}-\alpha_R x_{TR}-\alpha_R\tilde{x}_Q\right)x_{TR} \middle| \tilde{\eta}=\eta_1\right] \tag{16}$$

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

$$x_{TR}^* = \left(\frac{1}{2\alpha_R}\right)\eta_1 = \gamma_R\eta_1 \tag{17}$$

The equilibrium must satisfy the restriction that the market maker sets prices efficiently. When insider trading is regulated, this restriction implies that:

$$p_{0R} = E\left(\tilde{p}_1 \middle| \tilde{x}_{TR}+\tilde{x}_Q = x_{TR}^* + x_Q\right) = \bar{p}_1 + \alpha_R\left(x_{TR}^* + x_Q\right) \tag{18}$$

Since all the random variables in the model are normally distributed, application of the projection theorem on (18) yields:

$$\alpha_R = \frac{Cov\left(\tilde{p}_1, \tilde{x}_{TR}+\tilde{x}_Q\right)}{Var\left(\tilde{x}_{TR}+\tilde{x}_Q\right)} = \frac{\gamma_R\sigma_\eta^2}{\beta_R^2\sigma_\eta^2+\sigma_Q^2} \tag{19}$$

Substituting (19) into (17) yields a quadratic equation in γ_R whose solution is given by (15). Finally, substituting (15) back into (19) yields (14). ■

Therefore, when insider trading is restricted, there still exists a unique equilibrium in which the outsiders' demand for the risky asset is a linear function of their private information. Further, as was the case in the unregulated market, without liquidity traders in the market the (regulated) equilibrium breaks down.

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[13] Bhattacharya and Spiegel (1991) analyze a model in which an equilibrium exists even if prices perfectly reveal information. This is due to the fact that, in their model, insiders have an additional reason to trade, namely, the need to hedge a nontraded asset correlated to the price of the risky asset.

[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.

[15] This theorem is similar to Theorem 1 in Kyle (1985).

III.- INSIDER TRADING REGULATION AND SECURITIES MARKETS

The decision of whether or not to restrict insider trading has important implications for several characteristics of a securities market. I evaluate in this part, using the equilibria derived in the previous part, the impact of ITR on market liquidity, price volatility, informational efficiency, and price predictability.[16] I perform below an *ex-ante* analysis; that is, an analysis of the impact of ITR on a securities market before the realization of the random variables of the model.

Liquidity. The liquidity of the market (which is inversely related to the change in price that follows the arrival of an order) can be measured by the inverse of the parameter α_j of the market maker's pricing function. It follows directly from (6) and (14) that the liquidity of the unregulated market (L_U) and that of the regulated market (L_R) are given by:

$$L_U = 2\sqrt{\frac{\sigma_Q^2}{\sigma_\varepsilon^2 + \sigma_\eta^2}} \qquad L_R = 2\sqrt{\frac{\sigma_Q^2}{\sigma_\eta^2}} \tag{20}$$

Therefore, the market is *more* liquid when insider trading is restricted. This is explained by the fact that the lower variability of informed trading in the regulated market makes the market maker less likely to lose to informed traders. Hence, the market maker moderates the change in price with which he responds to any given change in demand. Note that this argument also explains why, in both equilibria, the liquidity of the market is increasing in the variability of liquidity trading and decreasing in the variability of informed trading.

Volatility of current prices. This characteristic of the market can be measured by the (unconditional) variance of $\tilde{p}_{0j}$; that is:

$$Var\left(\tilde{p}_{0j}\right) = \alpha_j^2\left(\beta_j^2\sigma_\varepsilon^2 + \gamma_j^2\sigma_\eta^2 + \sigma_Q^2\right) \qquad j = U, R \tag{21}$$

Using (6), (7), (14), and (15), it can be established that the volatility of current prices in the unregulated market (CV_U) and that in the regulated market (CV_R) are given by:

$$CV_U = (1/2)\left(\sigma_\varepsilon^2 + \sigma_\eta^2\right) \qquad CV_R = (1/2)\sigma_\eta^2 \tag{22}$$

Therefore, current prices are *less* volatile when insider trading is restricted. Although this result may be interpreted as a point in favor of ITR, note that it follows directly from the fact that, in the regulated market, current prices do not reflect inside information. Note, further, that in neither market the volatility of current prices depends on the variability of liquidity trading. This is explained as follows. Recall that an increase in the variability of liquidity trading induces the market maker to increase the liquidity of the market, which, as shown by (21), reduces the volatility of current prices. What equations (22) show is that an increase in the variability of liquidity trading and the market maker's subsequent increase in market liquidity exactly offset each other, thus leaving the volatility of current prices unchanged.

Volatility of future prices. This characteristic of the market can be measured by the variance of $\tilde{p}_1$, conditional on the equilibrium value of $\tilde{p}_{0j}$; that is:

[16] These characteristics are also considered, in a different model, by Leland (1992). From a qualitative point of view, my results confirm his results.

$$Var\left(\tilde{p}_1 \middle| \tilde{p}_{0j}\right) = \sigma_\varepsilon^2 + \sigma_\eta^2 - \frac{\left(\beta_j \sigma_\varepsilon^2 + \gamma_j \sigma_\eta^2\right)^2}{\beta_j \sigma_\varepsilon^2 + \gamma_j^2 \sigma_\eta^2 + \sigma_Q^2} \qquad j = U, R \tag{23}$$

Using (6), (7), (14), and (15), it can be established that the volatility of future prices in the unregulated market (FV_U) and that in the regulated market (FV_R) are given by:

$$FV_U = (1/2)\left(\sigma_\varepsilon^2 + \sigma_\eta^2\right) \qquad FV_R = \sigma_\varepsilon^2 + (1/2)\sigma_\eta^2 \tag{24}$$

Therefore, future prices are *more* volatile when insider trading is restricted. This follows directly from the fact that, in the unregulated market, inside information affects current (rather than future) prices. Put differently, ITR delays the moment in which inside information becomes reflected in securities prices.[17] Note, further, that in both markets the volatility of future prices is independent from the variability of liquidity trading. This is due to the fact that the former depends on the latter only through the volatility of current prices (that is, only through the variance of $\tilde{p}_{0j}$), which, as seen above, is independent from the variability of liquidity trading.

Informational efficiency. This characteristic of the market reflects the amount of information revealed by securities prices and can be measured by the inverse of the volatility of future prices. Thus, it follows directly from equations (24) that the informational efficiency of the unregulated market (IE_U) and that of the regulated market (IE_R) are given by:

$$IE_U = \frac{2}{\sigma_\varepsilon^2 + \sigma_\eta^2} \qquad IE_R = \frac{2}{2\sigma_\varepsilon^2 + \sigma_\eta^2} \tag{25}$$

Therefore, the market is informationally *less* efficient when insider trading is restricted. This result follows directly from the fact that prices in the unregulated (but not in the regulated) market reflect inside information.[18] Note, further, that the informational efficiency of both markets is increasing in the precision of the private information observed by insiders and outsiders. This result is obvious and needs no explanation. Note, further, that the informational efficiency of both markets is independent from the variability of liquidity trading. This is explained by the fact that an increase in the variability of liquidity trading induces the market maker to increase the liquidity of the market, which, in turn, induces insiders and outsiders to trade more aggressively. Thus, what equations (25) show is that the higher noise of liquidity trading is exactly offset by the subsequent increase in informed trading.

Price predictability. This characteristic of the market can be measured by the correlation coefficient between $\tilde{p}_{0j}$ and $\tilde{p}_1(r)$; that is:

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

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[17] After comparing the volatility of current and future prices in both a regulated and an unregulated market, and, after obtaining similar qualitative results to those obtained above, Leland (1992) concludes that insider trading accelerates the resolution of uncertainty from the terminal period to the current period.

[18] Fishman and Hagerty (1992) build a model in which, if insider trading is *allowed*, prices may become less efficient. In their model, this happens when insider trading deters a sufficiently large number of market analysts, who withdraw from the market thus ceasing to acquire (costly) information.

Using (6), (7), (14), and (15), it can be established that the correlation between current and future prices in the unregulated market (r_U) and that in the regulated market (r_R) are given by:

$$r_U = .7071 \qquad\qquad r_R = (.7071)\sqrt{\frac{\sigma_\eta^2}{\sigma_\varepsilon^2 + \sigma_\eta^2}} \tag{27}$$

Therefore, the correlation between current and future prices is *lower* when insider trading is restricted. This is due to the fact that the inside information reflected in current prices in an unregulated market increases the ability of these prices to predict future prices. Note, further, that current prices in the unregulated market predict 50% of the behavior of future prices, whereas current prices in the regulated market predict less than 50% of such a behavior.[19] Put differently, current prices in an unregulated market reflect half of the private information possessed by insiders and outsiders, whereas current prices in a regulated market reflect only half of the private information possessed by outsiders.[20]

IV- INSIDER TRADING REGULATION AND SOCIAL WELFARE

The market characteristics analyzed above, although highly relevant, should not become ends in themselves. As argued above, the ultimate concern of policy makers should be to maximize social welfare. Put differently, since the main issue about ITR is its impact on social welfare, it then follows that the ultimate question is whether ITR makes society better off or worse off.

To explore this issue, let social welfare in the jth market (SW_j) be defined as the joint expected utility of insiders, outsiders, liquidity traders, and workers in that market. That is, $SW_j=E(V_{Nj}+V_{Tj}+V_{Qj}+V_{Kj})$, where V_{ij} is agent *i*'s utility in the *j*th market. The analysis below is performed in terms of a representative agent of each type and, as in the previous part, is performed *ex-ante* (that is, before the realization of the random variables of the model). Hence, all the expectations taken below are *unconditional* expectations.

It follows from (3)-(7) and conjectures 1-2 that, when insider trading is allowed, an insider's expected terminal wealth is given by:

$$E\left(\tilde{w}_{NU}^1\right) = w_N^0 + Y_{NU} + (1/2)\sqrt{\frac{\sigma_Q^2}{\sigma_\varepsilon^2 + \sigma_\eta^2}}\,\sigma_\varepsilon^2 \tag{28}$$

Note that an insider's expected wealth is increasing in the variability of liquidity trading and in the variability of the information he observes. The first result follows from the fact that, as seen above, an increase in the variability of liquidity trading induces the market maker to increase the liquidity of the market. This increase in liquidity, in turn, allows an insider to place his order causing a smaller impact on current prices, thus increasing his expected trading profits.[21] The second result, on the other hand, follows from the fact that an insider's potential to profit from his private information is increasing in the variability of this information.[22]

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[19] This can be seen by computing the coefficient of determination between $\tilde{p}_{0j}$ and $\tilde{p}_1$, which is obtained by squaring equations (27).

[20] Note that both results imply that securities prices *partially* reveal information.

[21] Kyle (1985) refers to this as a "camouflage" that liquidity traders provide to insiders.

[22] Recall that insiders are assumed to be risk neutral. Hence, an increase in price volatility does not have a negative

When insider trading is restricted, on the other hand, insiders do not trade but they partially bear the cost of ITR. Hence, an insider's (certain) terminal wealth is given by the sum of his initial wealth, net of the tax imposed on him, and the value of his production; that is:

$$E\left(w_{NR}^{1} \right) = \left(1 - t_R\right) w_N^0 + Y_{NR} \tag{29}$$

It thus follows from (28) and (29) that ITR makes an insider *worse off* by the sum of his foregone expected profits from insider trading and the tax imposed on his initial wealth; that is, by the amount:

$$E\left(\tilde{w}_{NU}^{1} - w_{NR}^{1} \right) = t_R w_N^0 + \left(1/2\right)\sqrt{\frac{\sigma_Q^2}{\sigma_\varepsilon^2 + \sigma_\eta^2}}\,\sigma_\varepsilon^2 = t_R w_N^0 + \left(1/2\right)\Delta\pi_N \tag{30}$$

where $.5\Delta\pi_N$ denotes the expected profits from insider trading lost by an insider due to the imposition of ITR.

It follows from (3)-(7) and conjectures 1-2 that, when insider trading is allowed, an outsider's expected terminal wealth is given by:

$$E\left(\tilde{w}_{TU}^{1} \right) = w_T^0 + Y_{TU} + \left(1/2\right)\sqrt{\frac{\sigma_Q^2}{\sigma_\varepsilon^2 + \sigma_\eta^2}}\,\sigma_\eta^2 \tag{31}$$

Note that an outsider's expected wealth is increasing in the variability of liquidity trading and in the variability of outside information. These results are analogous to those derived above for an insider. When insider trading is restricted, on the other hand, it follows from (3), (4), (5), (14), (15), and conjectures 1-2, that an outsider's expected terminal wealth is given by:

$$E\left(\tilde{w}_{TR}^{1} \right) = \left(1 - t_R\right) w_T^0 + Y_{TR} + \left(1/2\right)\sqrt{\sigma_\eta^2 \sigma_Q^2} \tag{32}$$

Note that an outsider's expected trading profits are higher in the regulated market. This is mainly due to the higher liquidity of this market. Note, further, that it follows from (31) and (32) that the impact of ITR on an outsider's expected terminal wealth is given by:

$$E\left(\tilde{w}_{TU}^{1} - \tilde{w}_{TR}^{1} \right) = t_R w_T^0 - \left(1/2\right)\left\{ \sqrt{\sigma_\eta^2 \sigma_Q^2} - \sqrt{\frac{\sigma_Q^2}{\sigma_\varepsilon^2 + \sigma_\eta^2}}\,\sigma_\eta^2 \right\} = t_R w_T^0 - \left(1/2\right)\Delta\pi_T \tag{33}$$

whose sign depends on whether the increase in an outsider's expected trading profits ($.5\Delta\pi_N$) is higher or lower than the proportion of wealth he forgoes to partially bear the cost of this regulation.[23] In other words, ITR has an *ambiguous* effect on outsiders. This result contradicts the traditional argument that this regulation makes outsiders unambiguously better off.[24]

It follows from (3)-(6) and conjectures 1-2 that, when insider trading is allowed, a liquidity trader's expected terminal wealth is given by:

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impact on their utility.

[23] Note that $.5\Delta\pi_N$ denotes the expected trading profits gained by an outsider due to the imposition of ITR.

[24] It is true, however, that from an empirical point of view, equation (33) implies that ITR is likely to make outsiders better off.

$$E\left(\tilde{w}_{QU}^{1}\right)=w_{Q}^{0}+Y_{QU}-\left(1/2\right)\sqrt{\sigma_{\varepsilon}^{2}\sigma_{Q}^{2}+\sigma_{\eta}^{2}\sigma_{Q}^{2}} \tag{34}$$

Note that a liquidity trader always loses in an unregulated market. This follows directly from the fact that he trades with the market maker, who has superior information. When insider trading is restricted, on the other hand, it follows from (3), (4), (5), (14), and conjectures 1-2 that a liquidity trader's expected terminal wealth is given by:

$$E\left(\tilde{w}_{QR}^{1}\right)=\left(1-t_{R}\right)w_{Q}^{0}+Y_{QR}-\left(1/2\right)\sqrt{\sigma_{\eta}^{2}\sigma_{Q}^{2}} \tag{35}$$

Note that, as was the case in the unregulated market, a liquidity trader always loses in the regulated market. This is explained exactly as before. Note, however, that his expected trading loss is lower in the regulated market. This is mainly due to the higher liquidity of this market. Note, finally, that it follows from (34) and (35) that the impact of ITR on a liquidity trader's expected terminal is given by:

$$E\left(\tilde{w}_{QU}^{1}-\tilde{w}_{QR}^{1}\right)=t_{R}w_{Q}^{0}-\left(1/2\right)\left\{\sqrt{\sigma_{\varepsilon}^{2}\sigma_{Q}^{2}+\sigma_{\eta}^{2}\sigma_{Q}^{2}}-\sqrt{\sigma_{\eta}^{2}\sigma_{Q}^{2}}\right\}=t_{R}w_{Q}^{0}-\left(1/2\right)\Delta\pi_{Q} \tag{36}$$

whose sign depends on whether the decrease in a liquidity trader's expected trading loss ($.5\Delta\pi_{Q}$) is higher or lower than the proportion of wealth he forgoes to partially bear the cost of this regulation.[25] In other words, ITR has an *ambiguous* effect on liquidity traders. This result contradicts the traditional argument that this regulation makes liquidity traders unambiguously better off.[26]

Finally, it follows from (4) that, when insider trading is allowed, a worker's (certain) terminal wealth is given by:

$$E\left(w_{KU}^{1}\right)=w_{K}^{0}+Y_{KU} \tag{37}$$

When insider trading is restricted, on the other hand, some workers are diverted to enforce ITR, thus foregoing production of the commodity. Hence, as argued above, workers produce a lower amount of this commodity in a 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, by Y_{KU}-Y_{KR} = ($w_{N}^{0}+w_{T}^{0}+w_{Q}^{0}+w_{K}^{0}$)$t_R$. This formalizes the idea that ITR is costly in the sense that it diverts resources from the production of goods and services to the enforcement of this regulation. Thus, when insider trading is restricted, it follows from (4) and the arguments just outlined that a worker's (certain) terminal wealth is given by:

$$E\left(w_{KR}^{1}\right)=\left(1-t_{R}\right)w_{K}^{0}+Y_{KR}+\left(Y_{KU}-Y_{KR}\right)=\left(1-t_{R}\right)w_{K}^{0}+Y_{KR}+\sum_{i=N,T,Q,K}t_{R}w_{i}^{0} \tag{38}$$

Therefore, it follows from (37) and (38) that the impact of ITR on a worker's (certain) terminal wealth is given by:

$$E\left(w_{KU}^{1}-w_{KR}^{1}\right)=t_{R}w_{K}^{0} \tag{39}$$

[25] Note that $.5\Delta\pi_{Q}$ denotes the decrease in a liquidity trader's expected trading loss due to the imposition of ITR.

[26] However, equation (36) shows that, from an empirical point of view, ITR is likely to make liquidity traders better off.

which is unambiguously positive. That is, ITR makes workers unambiguously *worse off* by the proportion of wealth they forgo to partially bear the cost of this regulation.

In sum, ITR affects the utility of insiders, outsiders, liquidity traders, and workers as follows. It makes insiders worse off by the sum of their foregone expected profits from insider trading and their tax cost of regulation. It makes outsiders better off or worse off depending on whether the increase in their expected trading profits is higher or lower than their tax cost of regulation. It makes liquidity traders better off or worse off depending on whether the decrease in their expected trading loss is higher or lower than their tax cost of regulation. And, finally, it makes workers worse off by their tax cost of regulation. Therefore, the impact of ITR on social welfare is given by the sum of the gains and losses that this regulation imposes on the representative agents. Thus, it follows from (30), (33), (36), and (39) that ITR imposes a *net cost* on society given by:

$$\sum_{i=N,T,Q,K} E\left(\tilde{w}_{iU}^{1} - w_{iR}^{1}\right) = \sum_{i=N,T,Q,K} t_R w_i^0 = Y_{KU} - Y_{KR} \tag{40}$$

that is, a cost equal to the amount of the commodity that could have been produced by the workers diverted to enforce ITR.

This result is explained as follows. When ITR is imposed, insiders are prevented from trading, and their expected profits from insider trading are reallocated to outsiders and liquidity traders. This reallocation of wealth is considered by many to be beneficial because the insiders' "unfair" informational advantage is removed. Yet, from an efficiency point of view, that is not an argument at all. At the aggregate level, the gain obtained by outsiders and liquidity traders is exactly offset by the loss imposed on insiders; hence, society as a whole is made neither better off nor worse off by the imposition of ITR.[27] In other words, (a costless) ITR has a purely redistributive effect.[28]

Enter now the cost of ITR. When the market is regulated, some workers give up their role as producers in order to play the role of regulators. As a consequence, society forgoes the goods and services that would have been produced by those workers. As discussed above, this foregone production is the cost of ITR and is born by traders and workers through the tax system. When the expected gains and losses that result from the imposition of ITR are aggregated, the expected trading profits gained by outsiders and liquidity traders cancel out with the expected trading profits foregone by insiders. However, the cost of enforcing this redistribution does not vanish. Rather, it becomes a *net* social cost. Put differently, *regulating insider trading amounts to allocate resources to a scheme that merely redistributes wealth*. Therefore, it is clear that society could be made better off by allocating those resources to the *creation* of wealth.

Finally, note that in some circumstances ITR could make *everybody* worse off. It was established before that this regulation always makes insiders and workers worse off; thus, a case has to be established in which it also makes outsiders and liquidity traders worse off. This may occur when the cost of regulating the market is (sufficiently) high and the expected profits from insider trading are (sufficiently) low. Under these conditions, the

[27] This argument implicitly assumes that all traders have the same marginal utility of wealth. The implications of relaxing this assumption are analyzed below.

[28] A costless ITR has a purely redistributive effect only when all traders are risk neutral. If traders are risk averse, even a costless ITR has detrimental effects. Estrada (1993a) analyzes the impact of ITR on a securities market and on social welfare under the assumption of risk aversion in detail, and shows that a costless ITR has two perverse effects: First, it increases price volatility, thus making a securities market more risky; and, second, it worsens the risk sharing among traders.

cost of ITR borne by outsiders and liquidity traders through the tax system would outweigh the increase in expected trading profits generated for the former and the decrease in the expected trading loss generated for the latter. In this case, ITR would make everybody worse off, and, therefore, it would be Pareto dominated by the alternative of no regulation.

V- TWO EXTENSIONS OF THE MODEL

I briefly consider in this part two extensions of the model analyzed above. The first extension relaxes the assumption of equal marginal utility of wealth across traders, and the second deals with securities markets in developing economies. In spite of the results derived above, both extensions suggest that, under some conditions, ITR may actually be beneficial.

1.- Differential marginal utility of wealth

Implicit in the welfare analysis performed above was the assumption that all traders have the same marginal utility of wealth. This, of course, does not necessarily have to be the case. If, for example, both outsiders and liquidity traders had a marginal utility of wealth higher than that of insiders, the wealth redistribution would generate an increase in utility. If, in addition, this increase in utility outweighed the social cost of ITR, then the net effect of this regulation would be positive. That is, ITR would make society better off.

Formally, this issue can be analyzed by replacing the normalized utility function ($V_i = \tilde{w}_i^1$) by a utility function that displays risk neutrality but allows for differences in the marginal utility of wealth. Hence, let $V_i = \theta_i \tilde{w}_i^1$, i=N,T,Q,K, where θ_i is agent i's marginal utility of wealth. Note that, in this new specification, it is no longer the case that $E(V_i) = E(\tilde{w}_i^1)$. Rather, it is the case that $E(V_i) = \theta_i E(\tilde{w}_i^1)$.

The effect of ITR on the welfare of insiders, outsiders, liquidity traders, and workers, which was given by (28)-(40), has now to be reconsidered in terms of the modified utility functions. Once this is done and the gains and losses that ITR imposes on the representative agents are aggregated, it can be shown that the net effect of ITR on society is given by:

$$\sum_{i=N,T,Q,K} \theta_i E(\tilde{w}_{iU}^1 - \tilde{w}_{iR}^1) = \sum_{i=N,T,Q,K} \theta_i t_R w_i^0 + (1/2)\left\{\theta_N \Delta\pi_N - \theta_T \Delta\pi_T - \theta_Q \Delta\pi_Q\right\} \tag{41}$$

It follows from (41) that if θ_N, θ_T, and θ_Q are such that the second term of the right-hand side is negative, then the wealth redistribution would generate an increase in utility.[29] If, in addition, the absolute value of this second term is larger than the absolute value of the first term, then ITR would have a positive impact on social welfare. Intuitively, if the utility generated by the wealth redistribution is larger than the cost of regulating the market, then ITR would make society better off.

However, this argument can hardly be used to support ITR without some empirical evidence supporting the argument itself. Put differently, the argument above calls for ITR *only if* it can be empirically determined that: first, the difference in the marginal utility of wealth across traders is such that the wealth redistribution would generate an increase in utility; *and*, second, that this increase in utility would outweigh the cost of ITR. Such an empirical investigation may prove to be extremely difficult (if not impossible) but, without *some* empirical evidence in this direction, the argument cannot be pushed beyond the ground of a theoretical claim.

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[29] Note that if θ_N=θ_T=θ_Q, then the bracket reduces to 0 and the result obtained in the previous part holds.

2.- Securities markets in developing economies

The second extension is related to securities markets in developing economies.[30] In general, foreign investors do not have confidence in developing markets and are willing to invest in them only if they perceive that they would be treated fairly. Therefore, a set of clear rules on trading, ITR among them, may help these economies to attract foreign capital.[31] This capital, in turn, may help to activate the unused resources of these generally unemployed economies. Thus, if the creation of goods and services generated by the inflow of foreign capital outweighs the goods and services foregone due to the diversion of resources from production to regulation, then ITR would have a positive impact on the economy.[32]

Formally, this issue can be analyzed by replacing Y_{iR} for ΦY_{iR} (Φ>1). Recall that in the basic model it was the case that $Y_{iU}=Y_{iR}$, for $i=N,T,Q$; that is, insiders, outsiders, and liquidity traders produce the same amount of the commodity regardless of the type of market in which they trade. In the framework considered in this section, when foreign capital flows into the economy, insiders, outsiders, and liquidity traders become more productive, thus producing more in the regulated market; that is, $\Phi Y_{iR}>Y_{iU}$.

Further, recall that in the basic model it was the case that $Y_{KU}>Y_{KR}$; that is, workers produce more in the unregulated market. In the framework considered in this section, when foreign capital flows into the economy as a result of the imposition of ITR, workers produce ΦY_{KR} ($>Y_{KR}$), which may be larger or lower than Y_{KU}. Put differently, the imposition of ITR has an ambiguous effect on the amount of the commodity produced by workers. This ambiguity is the result of two opposite effects: first, the diversion of workers from production to regulation; and, second, the increase in the productivity of the workers not diverted to regulatory activities.

The effect of ITR on the welfare of insiders, outsiders, liquidity traders, and workers, which was given by (28)-(40), has now to be reconsidered in order to allow for the increase in productivity that stems from an inflow of foreign capital. Once this is done and the gains and losses that ITR imposes on the representative agents are aggregated, it can be shown that the net effect of ITR on society is given by:

$$\sum_{i=N,T,Q,K} E(\tilde{w}^{1}_{iU} - \tilde{w}^{1}_{iR}) = \sum_{i=N,T,Q,K} t_R\, w^0_i + \left\{ \sum_{i=N,T,Q,K} Y_{iU} - \Phi \sum_{i=N,T,Q,K} Y_{iR} \right\} \qquad (42)$$

It follows from (42) that, if Φ, Y_{iU}, and Y_{iR} are such that the second term of the right-hand side (the bracket) is negative, then ITR would generate an increase in the production of the commodity beyond the amount that would be obtained in the unregulated market. If, in addition, the absolute value of this second term is larger than the absolute value of the first term, then ITR would have a positive impact on the economy. Intuitively, if the increase in the production of goods and services generated by the increase in productivity (which is generated by the inflow of

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[30] The argument, in fact, applies to any securities market perceived as unreliable by foreign investors.

[31] I am not considering the rationality of this argument. Rather, I am considering an empirical issue. A commissioner of Argentina's Securities and Exchange Commission recently argued in a seminar on ITR that several japanese investors considering to invest in the Argentinean stock market inquired about the existence of clear rules on trading. In fact, these investors did inquire about the existence of ITR and the extent to which it is enforced.

[32] This argument and the analysis that follows assumes equal marginal utility of wealth across traders. Thus, as was the case in the basic model, $V_i = \tilde{w}^1_i$, for $i=N,T,Q,K$.

foreign capital, which, in turn, is generated by the imposition of ITR) is larger than the cost of regulating the market, then ITR would make society better off.

However, it is very unlikely that ITR by itself could induce an inflow of foreign capital. Such an inflow of capital may possibly be attracted by a complete set of clear rules on trading, not by the sole imposition of ITR. Put differently, the argument considered above may help to justify ITR *only* when such a regulation is a part of a broader plan aimed to increase the reliability of an otherwise unreliable securities market.

VI- CONCLUSIONS

I have evaluated in this paper the impact of ITR on a securities market and on social welfare under the assumption that all agents are risk neutral. The general policy implication that follows from the analysis is that society should not waste resources in imposing a scheme (ITR) to redistribute wealth. Rather, it should allocate those resources to the creation of wealth.[33]

ITR was shown to have both beneficial and detrimental effects on a securities market. In particular, it was established that this regulation increases market liquidity and future-price volatility, and decreases current-price volatility, informational efficiency, and price predictability. In terms of welfare, ITR was shown to make insiders and workers unambiguously worse off; its effect on outsiders and liquidity traders, on the other hand, is ambiguous and depends on the expected amount of insider trading profits to be redistributed, and on the cost of regulating the market. In addition, ITR was shown to have a purely redistributive effect. That is, it generates trading gains and trading losses that cancel out at the aggregate level. However, the cost of enforcing this wealth redistribution does not vanish. Rather, it becomes the net social cost of regulating insider trading.

In spite of this general result, there may be circumstances in which ITR is actually beneficial; two of these circumstances were considered above. First, when the difference in the marginal utility of wealth across traders is such that the wealth redistribution achieved by ITR generates an increase in utility that outweighs the cost of regulating the market. And, second, when ITR induces an inflow of foreign capital that generates an increase in the production of goods and services that outweighs the cost of this regulation. However, as suggested above, it is arguable that either argument provides sufficient support to the imposition of ITR.

[33] It is acknowledged that, due to the lack of popularity of insider trading, there may be no government willing to deregulate this activity completely, at least in the short run. An intermediate step in the process of deregulating insider trading may be to allow this activity and to impose a tax on insider trading profits. The impact of such a change in policy on a securities market and on social welfare is analyzed in detail in Estrada (1993b).

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