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**THE EVOLUTION OF  
SECURITIES MARKET ORGANISATION**

**JAN ALLEN KREGEL**

**No 189**

# THE EVOLUTION OF SECURITIES MARKET ORGANISATION

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An analysis of Walras' and Marshall's explanation of competitive price notes that both model actually existing, but different, forms of trading in stock markets, a call auction and a continuous auction respectively. Although Walras uses market organisation to ensure complete information, under simultaneous trading his analysis joins Marshall who assumes the existence of 'perfectly informed dealers'. The paper builds on the problems of market regulation in conditions of simultaneous and continuous trading to assess the evolution of the New York market from call to continuous trading and the institution of single capacity trading with fixed commissions on the London market.

## ***I. Introduction***<sup>1</sup>

Walras' tâtonnement explanation of the determination of general competitive equilibrium has been criticised as an unrealistic abstraction, while Marshall's analysis of price determination is considered to be grounded in his first-hand investigations of actual economic conditions. Yet, both economists clearly state that their account of the determination of prices in competitive markets is modelled on the same real world institution, the stock exchange.

Indeed, Walras is more explicit than Marshall in basing his theory on real world institutions: "... we must go to the market to study value in exchange. ... The markets which are best organised from the competitive standpoint are those in which purchases and sales are made by auction, through the instrumentality of stockbrokers, ... This is the way business is done on the stock exchange ... . Let us go into the stock exchange of a large investment centre ... . Let us take for example trading in 3 per cent French Rentes on the Paris Stock Exchange ..." (E., pp 83-4).

For Marshall, on the other hand, "The more nearly perfect a market is, the stronger is the tendency for the same price to be paid for the same thing at the same time in all parts of the market" .. "the markets for things which satisfy in an exceptional way these conditions ... are, as we have said, stock exchange securities and the more valuable metals" (P., pp. 325-6).

If both approaches reflect the same real-world institution, why are they evaluated differently? The simple-minded answer is that they replicate different real world institutional arrangements of price formation in securities markets. Walras' theory refers to one form of market organisation, a single price discrete auction market, while Marshall refers to a continuous open outcry auction market.

Walras points out, and Keynes confirmed (cf. Hicks, 1982, p. 296), that he was attempting to replicate the operation of the determination of prices on the Paris Bourse, while Marshall, although he makes no direct indication, was clearly referring to the institutional arrangements then prevailing on the London Stock Exchange. If Marshall's theory is considered more realistic, it is only because it relies on an institutional organisation for price determination that is more familiar to Anglo-Saxon readers!

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The existence of different institutions and market organisations at the basis of the two approaches raises two questions of interest to institutionalist and evolutionary economics. The first is whether the diverse institutional grounding leads to theoretical differences in the explanation of equilibrium prices. The second question is the explanation for the simultaneous existence of two different institutional structures for the same purpose, and for their recent disappearance, or more generally whether economics can provide any enlightenment concerning the process of evolution of institutional structures for price formation in securities markets. The rest of this paper seeks answers to these two questions in the theories presented by Marshall and Walras, and in historical examples of market evolution.

## II. *Marshall and Walras: Theory and Reality Competitive Market Price Formation*

### *Walras and Simultaneous Trading*

Walras promises a theory which will render "perfectly comprehensible" ... "the confused uproar and chaotic movement", the "clamour and bustle", that impresses any visitor to a stock exchange. In the type of market organisation that prevailed on the Paris Bourse when Walras was writing, brokers met once a day at the same time in the same place to trade stocks. Trading was organised by an employee of the exchange who started trading by calling the name of the first stock on the official "List". He began the price formation process by announcing an opening price, which was either the previous day's equilibrium price, or a price determined by canvassing the state of the orders arriving at the "charges" of the "agents de change" before the market opened (Cf. Roubaud, pp. 79-80). The assembled brokers indicate the size of the buy or sell orders that they have been given by their clients for at price. If the orders do not match, a new price is called, lower if offers predominate, and vice versa. The "auctioneer" continues this process of "groping" or "tâtonnement" until he reaches a price at which the market clears.<sup>2</sup> This becomes the "official" price, or the fix. All orders to buy or sell at this price are executed, as are orders to buy at a higher price or sell at a lower price. There is thus a "single price" which is the same for all bargains executed.

As Walras points out, what the *agent de change* carries with him in his carnet of

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<sup>2</sup> Orders may be given for a particular price, now called a limit order, or for the average price or for the fix, i.e. the equilibrium price. These latter orders give some flexibility in determining the price which will balance the largest number of orders. Cf. Vidal.

orders is the equivalent of his clients' demand and supply curves.<sup>3</sup> The process of tâtonnement carried out by the auctioneer makes this information public and allows its use to produce the market supply and demand functions which determine the equilibrium price. This is what is called the "price discovery" function of the market. Walras notes that while there may be discontinuities in the individual functions, "for all practical purposes [the aggregate or market demand and supply functions] can be considered continuous by virtue of the so-called *law of large numbers*. (E., p. 95) Thus the process of tâtonnement produces a single price for each stock called sequentially from the Exchange list. Once the price of the last stock is fixed the market is over and no further trading takes place until the following day. It is thus a market which trades at "discrete" intervals, with periodic trading "suspensions" during which new orders are collected on the basis of new information which reaches clients.

Note that price formation takes place in conditions of perfect information: all orders which exist at any price are presumed to be in the possession of the *agents de change* when they arrive at the market and they are publicly exhibited during the auction. This is not an assumption of Walras' model, it is the result of the regulations embodied in the French Commercial Code which restricted trading to officially designated Bourses via a given number of officially appointed *agents de change* who were officials of the Crown. In exchange for their monopoly over negotiation they were forbidden from placing orders for their own account during the auction process; they could not then intervene to influence market supply and demand.<sup>4</sup> Perfectly competitive prices require regulations creating a market with restricted access for traders and a perfect monopoly over trading.

There is little difference between a real world single price discrete auction "call" market, such as the Paris Bourse, and the mechanism that Walras sets out in the *Elements*.

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<sup>3</sup> "But if he were prevented from going to the market himself, or if, for one reason or another, he had to ... give his orders to a broker, he would have to anticipate all possible values of  $p_a$  [the price of stock a] from zero to infinity and determine accordingly all the corresponding values of  $d_a$  [the demand for stock a]" (p. 93).

<sup>4</sup> This is what I have called, following Braudel, a "public market" since all information is exposed simultaneously to all participants. See Kregel, 1990a. It is interesting to note that the discussion of Article 71 in the *Esprit du Code de Commerce*, pp. 310-1, lists four advantages of concentrating exchange in a regulated market. The first is facilitating the search of buyers and sellers, the second is to facilitate government surveillance to insure operation in the public interest and the last two to facilitate dissemination of information regarding prices and the financial positions of traders to the general public.

The most obvious difference is that in a real Call market prices are fixed sequentially, and thus in a temporal order, while Walras thought of the market fixing prices simultaneously on the level of "the whole world [which] may be looked upon as a vast general market made up of diverse special markets" (E., p. 84).

"Suppose now, that at the same time ... trading is going on in 3 per cent French Rentes, similar trading is taking place in the securities of other governments, English, Italian, Spanish, Turkish and Egyptian, and in stocks and bonds issued by railways, ports, canals, mines, gas works, other factories, banks, credit institutions, etc.; suppose that all trading proceeds by conventional shifts in price ...; and suppose that besides *cash* transactions there are *future* transactions, some *firm* and others *optional*, then the tumult of the stock market resolves itself into a veritable symphony in which each player plays his part" (p. 86) in determining the general equilibrium.<sup>5</sup>

If demand is a function of the prices of other stocks on the List, then convergence problems may arise which may prolong the time required to reach equilibrium since this may mean going back and reopening trading on stocks which have been called earlier. Many existing call markets (cf. Schwartz) have provisions for "call backs" which allow traders to ask for a stock to be "re-called" and the price renegotiated. Edgeworth suggested a similar process for reopening bidding called recontracting. This is not much different from the solution that Walras suggests in the quotation given above, for "call backs" or recontracting are forms of contingency contract, similar to futures and options which also existed in the Paris market. Thus, although the simultaneous determination of equilibrium prices assumed by Walras did not in fact take place, there were real world expedients which were capable of producing a close equivalent. The common criticism of tâtonnement and recontracting as allowing the flow of time to be reversed are misplaced.

Yet, there are clear limits to the ability of these expedients to replicate simultaneous price determination in conditions of perfect knowledge of all prices. For example, the client would have to specify to the broker not only his demands for the stock at different prices, but for all possible prices of all the other stocks on the List. In the case of contingent contracts, there would be additional Lists to be called, and prices to be fixed, for these additional contracts. In simple terms this is what Debreu furnished in his *Theory of Value*, the proof that

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<sup>5</sup> Compare Marshall: "The whole Western World may, in a sense, be regarded as one market for many kinds of stock exchange securities..." P., p. 325).

these expedients can replicate simultaneous trading. However, the completion of this process, as in the case of call backs, would require an inordinately long period of time and require inordinately able brokers to handle the amount of information required to complete the price determination process. It could never be accomplished in the hour (for some periods it was as high as two!) for which the authorities permitted the market to open. But, as the time required for "simultaneous" trading to be replicated increases, the probability that information will change and clients will want to change their orders increases. For such a system to be feasible, no new information presumed to change client orders can be permitted. But, this is equivalent to assuming not only perfect present information, but also complete knowledge of all future conditions. While monopoly trading and access regulations can produce conditions of perfect knowledge of existing supply and demand curves, there is no known set of regulations which can produce the same result for future information.

Here is the source of the criticism of lack of realism, for there are physical impediments of time and space which prevent real world market organisations from introducing the required expedients without assuming that each individual has the perfect knowledge, not only of the present, but of all possible future conditions. There are no government regulations which can prevent information from changing, or which can reveal all future contingencies to market participants.

Walras clearly recognised these difficulties in Lesson 35 where he deals with the problem of a "continuous" market, which introduces the possibility of changes in the information determining supply and demand functions. But here the reader is not given the analogy of the symphony, but the assurance that "the market is like a lake agitated by the wind, where the water is incessantly seeking its level without ever reaching it" (E., p. 380) so that the theory remains valid although reality may never correspond to it.<sup>6</sup>

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<sup>6</sup> Both authors issue caveats concerning the fact that "the use of money in trading has peculiarities of its own" (Walras, E., p. 86) and "the organization of markets is intimately connected both as cause and effect with money, credit, and foreign trade" (P., p. 324) a topic Marshall associates with industrial fluctuations. Walras continues the quote in the text: "For, just as a lake is, at times, stirred to its very depths by a storm, so also the market is sometimes thrown into violent confusion by *crises*, which are sudden and general disturbances of equilibrium" (E., p. 380-1), a use of metaphor similar to Marshall: "The commercial storm leaves its path strewn with ruin. When it is over there is a calm, but a very dull calm" (MCC, p. 250) which provoked Keynes' rebuke that "Economists set themselves too easy, too useless a task if in tempestuous seasons they can only tell us that when the storm is long past the



*Marshall and Continuous Trading Markets*

Continuous trading was a problem Marshall faced directly, taking as example a stock market organisation in which continuous, contemporaneous trading was the norm. As in Paris, the British client was represented by a broker who had exclusive access to the Stock Exchange, although not through government regulation, but as a member in what was a privately owned club. A client order received at any time during the trading day could be taken to the Exchange to seek out a counter party. This trading was usually done by consulting a number of brokers, known as "jobbers", who bought and sold for their own investment purposes in order to find the best available price. Other orders for the same stock might be negotiated at the same time by other brokers, or at other times during the day, and they could be executed at different prices, so that there was no guarantee of a "single" price for all buyers and sellers, nor was there any possibility of complete knowledge of either the trades or prices occurring during the market day. Reporting trades was voluntary.

Although he disavowed any attempt at realism in his representation of markets, Marshall's goal was "to contribute my mite towards that work of 'real'-ising the results of abstract quantitative reasoning in Economics" (letter to Jevons, quoted in Pigou, p. 372). Reference to the stock market as the archetypal example of the organised competitive market is present in all Marshall's major works because he thought it best illustrated that "great law, that the larger the market for a commodity the smaller are the fluctuations in its price, and the lower the percentage of turnover which dealers charge for doing business in it." (P, p. 328).

In his presentation of price formation Marshall chooses the concrete example of "the corn market in a country town" (P., p. 332). Actual prices vary over the day as individual buyers and sellers engage in a "continuous" open outcry auction market in which repeated bilateral "higgling and bargaining" takes place throughout the day. The same "calling out of prices" takes place, but it is now the buyers and sellers themselves who do the calling. In the London Stock Exchange this same "higgling and bargaining" process takes place, but it is the individual brokers (or the broker and the jobbers) who bargain until a price is agreed at which a individual exchange can take place.

There will thus be a series of exchanges throughout the day, each one the result of an

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ocean is flat again" (1971, p. 65).

individual auction process and producing different prices. The evolution of prices during the day will be determined by the arrival times of buyers and sellers in the market, the size of their bargains, and their ability to bargain. It is difficult to define a single "equilibrium" price in such conditions since each price is an equilibrium for a particular bilateral "auction". But this would contradict Marshall's proposition that a homogenous commodity such as corn traded in a competitive market should have a uniform price.

One solution to this problem would be to differentiate corn traded at "10 o'clock" from "5 o'clock" corn. Instead, Marshall proposes that the average of the prices observed during the day will be the same as the price determined by the demand and supplies of all traders had they traded at the same time, i.e. as if there had been a Walrasian auction to "fix" a single equilibrium price. Indeed, Marshall sets out aggregate market supply and demand functions and calculates the equilibrium (and average) price of corn directly from them (P., p. 333).

This is precisely the same information that the auctioneer discovers by means of the process of the tâtonnement, but it is the organisation of the discrete call market which requires all existing orders to be presented at the same time that produces perfect information concerning the market supply and demand curves and allows the auctioneer to calculate the equilibrium price. There seems to be no evident economic reason why the prices concluded in a continuous auction market should produce an average price which is equal to the equilibrium price "fix" of a discrete Call market.

One way of assuring the result would be to assume that the arrival times of buyers and sellers are random so that the distribution of prices around the notional "equilibrium" price is normal. This result could be achieved by means of the application of the "law of large numbers". A sufficiently large number of trades and traders will make the distribution of prices approach a normal curve around the "call" price. This would provide a basis for Marshall's "great law" concerning the influence of the size of the market on price. But, even this is not sufficient to assure that the average price will converge to the Call market price, for that would also require that the size of each individual exchange is uniform, or normally distributed across bargains over the day.

This stretches the "law of large numbers" beyond its limits and instead Marshall introduces "dealers" (who much resemble jobbers) with "perfect knowledge of the conditions

of the market". This produces what "has some claim to be called the true equilibrium price: because if it were fixed at the beginning, and adhered to throughout, it would exactly equate demand and supply...; and because every dealer who has perfect knowledge of the circumstances of the market expects that price to be established. If he sees the price differing much from [the equilibrium price] he expects that a change will come before long, and by anticipating it he helps it to come quickly" (P., p. 333-4). The continuous trading auction market thus reproduces the Call "equilibrium" price, but it is the arbitrage activity of the perfectly "well-informed dealer" who replaces the process by which the auctioneer produces perfect information by revealing the market supply and demand curves.

Independently of how the dealer might "discover" the equilibrium price, this description of the process by which prices converge to equilibrium creates another, more subtle problem. While both the auctioneer and the *agents de change* in Walras' tâtonnement are exogenous to the price fixing process because they do not trade for themselves and thus have no impact on supply and demand, this is not true of dealers whose livelihood depends on their trading activities.

If a dealer can carry a position during the day, buying cheaply in the morning and selling at a better price in the afternoon, he can also carry a position from day to day, or week to week. If he is to be able to sell at a high price in the morning in order to buy at a lower price in the afternoon, he must have carried over these stocks from a prior market. But, Marshall's assumption that the average of prices over the day converges to the Call equilibrium precludes dealers from being net buyers or sellers.<sup>7</sup> If a dealer carries an open position the quantities which farmers bring to the market no longer determines available supply which can no longer be considered as fixed for the market day. If quantity available may be influenced by dealer positions, then the equilibrium price may also be influenced by the existence of dealers' trading.<sup>8</sup>

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<sup>7</sup> This problem could be resolved by delaying settlement until the end of the day; this is equivalent to Walras' expedient of introducing a futures market. Marshall makes no indication that this is what he has in mind, and it would still require that the dealers are able to close all bargains, implying perfect foresight concerning the equilibrium price from the beginning of the day.

<sup>8</sup> Indeed, Marshall recognised the case in which the whole of the supply is in the market and the case in which supplies may be withdrawn or destroyed by suppliers rather than sold

Marshall denies that perfect knowledge for dealers is necessary for average prices to equal equilibrium prices even though, in the absence of perfect knowledge, it is virtually certain that dealers will be carrying open positions over time. It is interesting that rather than considering how dealers' imperfect knowledge might change effective supply, Marshall deals with the possibility that non-equilibrium prices produced by dealers imperfect knowledge might produce income effects which would change individuals' demand functions. To deal with this problem Marshall makes what he calls a "latent" assumption: the constancy of the marginal utility of money. This rules out "income effects" arising from the temporal path of prices, and also rules out self-reinforcing price trends. Marshall argues that "This assumption is justifiable with regard to most of the market dealings with which we are practically concerned. When a person buys anything for his own consumption, he generally spends on it a small part of his total resources; while when he buys it for purposes of trade, he looks to re-selling it, and therefore his potential resources are not diminished. In either case there is no appreciable change in his willingness to part with money. There may indeed be individuals of whom this is not true; but there are sure to be present some dealers with large stocks of money at their command; and their influence steadies the market" (P, p. 335). Now, if a professional dealer "can therefore make considerable purchases without depleting his stock of money or greatly altering its marginal value." (P, p. 336) there is another assumption "latent" in Marshall's analysis that there is no cost to the dealer of undertaking market arbitrage. This means either that there is no risk involved in such action, or that there is no cost in carrying stocks, so that the services of the dealer in assuring that the average of the day's prices converges on equilibrium are without either risk, or cost (just as the services of the auctioneer in Walras).<sup>9</sup> Again, this requires that each dealer finishes each market day without open positions and without loss, and can only occur if perfect knowledge is assumed.

In fact, Marshall's "latent assumption" is simply a device for eliminating "intra-day"

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in order to limit prices. In *Industry and Trade* (3rd ed) there is a note which refers to the concept of "elasticity of supply" in a dealer's market which recognises the possibility that "a given rise in price will cause an increase in the offers which sellers accept according ... as they have formed high or low estimates of the level of prices at the next market" (I&T. p. 187-8).

<sup>9</sup> This costless carry would be the case in conditions of delayed settlement or dealing for the "account" period.

time effects. The dealer has no cost of carry, and there is no impact on incomes of a dispersion of prices around equilibrium. This is, of course, tantamount to assuming a perfectly liquid market in which the commodity can be sold at any time at the equilibrium price.<sup>10</sup> In essence, it is little different from the assumption of simultaneous trading or full contingent markets which Walras introduced. But, just as fully specified contingent markets do not exist in the real world, perfectly well-informed traders with a constant marginal utility of money do not exist in the real world.

What is then the basic difference between Marshall and Walras?<sup>11</sup> Surprisingly it is Marshall who has to impose perfect knowledge in the form of perfectly well-informed dealers to produce equilibrium price in the case of continuous trading, while for Walras this a result of regulations of market trading. When price interaction effects are introduced, Marshall has to make his "latent" assumption of the constant marginal utility of money to prevent the prices of other goods impinging on each other. This is, of course, Marshall's partial equilibrium method; it is clearly questionable when he attempts to argue that it is a property applying to dealers in real markets. Walras has a similar problem when the prices of all other goods appear as arguments in the demand function. To resolve this problem requires either simultaneous trading or the existence of fully specified contingent markets, neither of which exist in the real world.

But, there is a more fundamental point for present purposes. The perfect knowledge that emerged from the institutional organisation of the monopoly Call market has to be imposed by assumption when simultaneous trading is introduced, which is exactly what Marshall was required to do to deal with a continuous trading market.

### ***III. The Evolution of Market Organisation: Simultaneous and Continuous Trading and Monopoly of Trading***

All organised securities markets, with the sole exception of London, start as single

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<sup>10</sup> This is what the "specialist" on the New York Stock Exchange is expected to provide. In MCC (p. 94) Marshall maintains that in an organised stock market the risk of capital loss is virtually eliminated because it is possible to sell for "almost the same price" as originally paid.

<sup>11</sup> There are other differences, e.g. Marshall rejected that the "method of curves" could be applied to the case of temporary equilibrium which is under discussion. Cf. Kregel, 1992c for a more complete discussion of price formation in Marshall's other "periods".

price discrete auction markets, i.e. as markets operated by the equivalent of Walrasian auctioneers. Yet, no major securities markets (although there are still some metals markets, such as the London gold fixing) which use this organisational form today.<sup>12</sup> The problems of real-world market organisation in handling simultaneous and continuous trading, and their impact on the monopoly position of the market, that emerged in Section II will be used to elucidate this evolution.

*The New York Stock Exchange: Simultaneous Trade Begets Continuous Trade*

Until the 1870s the New York Stock and Exchange Board used a Call system similar to the Paris Bourse. In the middle of the 19th century the official List had around 25 stocks, primarily government securities and bank shares. A Call to fix prices was held twice daily. The railway boom produced a large increase in new industrial issues. By 1869 the Regular List of securities had risen to 307 (145 stocks and 162 bonds). In addition there was also a Free list of variable size with shares traded on the simple request of a member.

The NYSE was a monopoly which restricted access and regulations which limited members to trading with each other. As the number of share issues increased this monopoly was threatened by competition from traders dealing outside the Exchange "on the curb". In 1864 these brokers formed the "Open Board of Stock Brokers". Around 1865 all brokers started to trade outside of the formal Calls in the "Long room" located on the ground floor of the new NYSE building (similar to the trading in the "coulisses", the hallways of the Paris Bourse) and let to a private firm. Entry to the Long room was unrestricted on payment of a simple entry fee, and soon members of the general public were trading there. The NYSE and Open Board brokers who also traded in the Long room objected to the admission of non-members and in 1868 grouped together to take over the lease. Thereafter it was operated for continuous trading from 8.30 to 5 and initiated the concentration of trading different stocks in specific floor locations. To further protect their monopoly in 1869 the NYSE absorbed the Open Board brokers (as well as a separate organisation of Government bond brokers),

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<sup>12</sup> The fact that there is one exception, and that call markets no longer exist, appears to cast doubt on Walras claim that this is the most efficient organisational form. The explanation for London is that trading started before basic attributes such as alienation of rights and obligations through contract of sale and limited liability for purchasers had been established. Exchange was thus based on personal trust between individual or third parties who evolved into intermediaries.

increasing the number of traders participating in the formal NYSE calls from 533 to 1060 (cf. Leffler, Niell).

Thus, between the end of the Civil War and 1869 both the number of shares on the List and the number of brokers trading them was subject to rapid growth. This large and rapid expansion produced severe diseconomies in the operation of the Call market (cf., Kregel, 1988). First, the List of official and unofficial stocks became so long that it frequently could not be completed before the next scheduled call. As the time between Calls got shorter, the delays between trading in individual stocks increased. Second, the process of tabulating buy and sell orders as prices are called out became increasingly difficult as the number of brokers participating in a Call increased. In short, the organisational efficiency of the Call market eroded rapidly as its size increased.

As seen above, the efficiency of the Call market is the presumption that all available information is revealed in the market because all traders have specified the equivalent of their demand and supply functions to their agents. But, when the time required to complete bargains increases, clients may become locked into orders which new information reveals as inopportune. Unless they can perfectly predict future conditions, even with fully specified contingent contracts, trading outside the market Call will become more attractive. The increased attractiveness of trading outside the market joined the increased competition from public street brokers and started to draw orders away from the exchange in continuous trading outside the organised NYSE Call. This eroded the presumption that prices were based on complete information because all orders were represented at the Call.

The solution proposed by the Exchange was to try to preserve the Call system, but to split the List into a number of smaller Lists which would be "called" at six separate locations marked by iron posts placed on a reconfigured trading Floor. This meant that the entire list could be completed in a shorter time, but it meant that Calls would occur at each post simultaneously. This reduced the time necessary to complete the Call, but created another problem. The original Call auction produced perfect information because each broker was present to contribute information concerning his orders to the process of fixing the price of every stock on the List. With a number of calls occurring simultaneously, no matter how agile, a broker could not be present for all of them and thus information was no longer complete. The solution of hiring additional clerks to represent the broker at the other posts

would only have reproduced the problem of overcrowding.

As a result, the NYSE introduced continuous trading at the same time as it split the List into six separate, simultaneous calls in 1871. The formal Calls quickly lost importance, although they were only formally abolished in 1882.<sup>13</sup> With continuous trading a broker could trade at one post and move on to the next post to execute another order, solving the problem created by the impossibility of being in two places at once. But, this produced another difficulty.

In a continuous market, spatial sequencing replaces the temporal sequencing of the Call, but it does not preserve the sequential order. It was now possible for a broker to miss a counterparty since there was nothing to guarantee that all brokers with buy and sell orders for a particular stock would arrive at the post at the same time. Thus "random order arrival" could produce order imbalance in which brokers executing buy orders could not find sellers and vice versa, even when the overall supply and demand present in the market were perfectly matched. This is precisely the problem which Marshall faced in his corn market example.

Without the mysteries of the law of large numbers there is no reason for even average daily prices in continuous trading markets to converge to the prices that would have been produced in discrete Call markets. In general, because of the spatial and temporal fragmentation of trading, continuous markets will be less liquid and more volatile, and have more frequent order imbalance.

The increased price volatility caused by random order arrival produced two responses in the New York market. Some members started trading as principals for their own account (i.e. they did not take customer orders), acting as "floor traders" (the real world equivalent of Marshall's "well-informed" dealers). The floor trader provided temporal arbitrage, buying stocks from brokers who wanted to sell, but who could not wait at the post long enough for a buyer to appear, and vice versa, in the expectation that there was a counterparty who happened to be absent because he was dealing in another stock at another post who would eventually appear. If the expectation was correct, the floor trader reversed every trade before

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<sup>13</sup> I have been able to find only one other explanation of the change to continuous trading. Garbade and Silber (1979) consider the increased costs of being unable to trade on information arriving from the front in conditions of more volatile prices caused by the Civil War as leading to an increased demand for trading immediacy and thus more frequent trading. But, it seems that this need could have been satisfied by increasing the frequency of the calls.



the end of the trading day. This provided a substitute for the continuous presence of brokers in the Call market, and dampened price volatility by providing offers to buy when there is an excess of sellers in a stock and vice versa. What were virtual trades in a Call now became actual trades, but which had no impact if they were reversed within the market day.

This explains why continuous markets are not single price markets; the floor broker will only be willing to buy below the price at which he expects to be able to sell later in the day, and vice versa, for no commission is paid. The spread between the bid and ask price is the only compensation for their risk, time and trouble. The equivalent of the services the auctioneer provided is now remunerated through price. The floor trader eventually evolved into a "dealer", willing to quote firm bid and ask prices to all comers. Although this activity requires a good deal of information about prices and order conditions in particular stocks, contrary to Marshall's assumption, it need not concern the average or equilibrium price, and there is no reason for it to be perfect.<sup>14</sup>

In the Call market all information is available because trading is discrete. In a continuous market, even if there is no change in the information available, that information cannot be complete until the day is over and every deal has been executed. If "dealers" are not perfectly informed, they will require a return to cover their risk from occasionally being unable to reverse their positions at their bid and ask prices, and this risk is thus reflected in the size of the spread.

In addition to the appearance of floor traders, brokers sought to overcome the problem of random order by consolidating orders. Thus, two brokers, each trading the same two stocks, would exchange their orders so that each had only one post to visit and thus could spend more time there waiting for counterparties and thus get better prices. The "floor broker" (called "two-dollar" brokers) emerged from this practice, taking a fixed commission, but also no risk because he did not act as principal. Bargains executed by two floor brokers were thus pure bilateral call auctions of "higgling and bargaining" and produced a single price.

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<sup>14</sup> Indeed, if there were perfect information it would have to be somehow restricted to floor traders; if anyone could become a floor trader with perfect information, competition would drive the bid-ask spread to zero and the traders would disappear. Thus the "public" market is replaced by a "private" market in which information is restricted to certain traders. In pure dealer markets such as the London Stock Exchange attempted to institute after the Big Bang this need for "private" information becomes complete, cf. Kregel 1990a, 1990b.

The introduction of continuous trading and the elimination of an official "fix" price also made it more necessary to specify contingent conditions in the form of instructions to brokers. This produced, among others, the limit order which is an instruction given to a floor broker to stand at the post until trading takes place at a particular price and then to try to execute the order at that price.<sup>15</sup>

It was a combination of the roles of floor trader and the floor broker that produced the "assigned dealer", more familiarly known as the "specialist", a combined broker-dealer that is at the centre of the market organisation that eventually replaced the Call system.<sup>16</sup> The role of the specialist is to act as auctioneer by quoting bid-ask prices for a single stock and supervising the auction process which takes place as brokers bargain around those prices, acting as agent in executing orders that have been left with him if contingent conditions are met, and trading as principal for his own account if this is required to provide a fair and orderly market. The evolution from the auction directed by the auctioneer to the specialist auction highlights the similarity between the informational problems raised by simultaneous and continuous trading, for it proved impossible in practice to introduce one without the other.

This would seem to suggest that Walras' judgement concerning the superiority of single price discrete auction markets was mistaken. At the beginning of the 20th century, the specialist system was the natural response to the difficulties created by rapid expansion in the extent of the market. But, had the computer and telecommunications revolution occurred in 1870 when the Call market was experiencing diseconomies, the natural response would have been to give each broker a computer linked by modem to a central market-making computer; the number of brokers would be irrelevant since they do not require physical space. Given the available supercomputers, neither is there any difficulty in tabulating their bids and offers at particular prices to discover equilibrium. Further, there need be no limit on the number of stocks traded, for computers can handle the determination of the equilibrium market price of virtually any number of stocks trading simultaneously; it would not longer be necessary to

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<sup>15</sup> Rule 123 which defines and regulates permissible orders runs to some 12 pages in the NYSE Rules of Board of Directors.

<sup>16</sup> The exchange folklore is that the first specialist was a broker who was immobilised by a broken leg; he thus set up a chair at the Western Union post and offered to execute orders for other brokers.

have sequential determination of prices of stocks on the List, and multiple contingent contracts could also be traded simultaneously. Modern computer and communications technology thus creates the possibility for a call market which corresponds almost perfectly to the Walrasian ideal type. Thus, the major factors which led to the change in organisation have now been overcome by technology. It is interesting to note that such a system already exists<sup>17</sup> -- the near perfect Walrasian Call market, but as yet very few traders use it. And, contrary to those who argue that market organisation is primarily driven by technology, it is not clear that it will eventually dominate existing markets.

The reason is the same which led the NYSE to incorporate the Open Board brokers and close the Long room to the general public, changes in organisational form are primarily driven by a need to preserve its trading monopoly. Had modern technology been available in 1870 when the NYSE was subject to competitive pressure, it would not have put anyone except the auctioneer on the unemployment rolls. Today, an electronic call market would replace a substantial number of both brokers and specialists, since orders could be made directly to the system by principals. Further, it would make the imposing exchanges premises redundant, as trades could be entered from brokers' offices or customers' houses. There are thus substantial vested interests in preserving the monopoly over trading and thus its organisational structure.

*The London Stock Exchange: From Dual to Single Capacity and Back Again*

The emergence of single capacity trading on the London Stock Exchange provides an example of the defence of the monopoly franchise on trading as a factor determining the organisational structure of trading. Brokers in London had been subject to regulation by the City of London as all other intermediary agents, and thus forbidden from dealing for their own account. On the other hand, it was only with the erection of the new Stock Exchange building in 1802 and defeat of Parliamentary legislation to impose public trading that a private monopoly over trading was established. (cf. Morgan and Thomas, Ch. 4).

Exchange members never recognised the right of the City to regulate them, and the deed of settlement for the first Stock Exchange building in 1802 recognises a distinction between broking and jobbing, but does not differentiate Exchange members as brokers and

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<sup>17</sup> Originally introduced as SPAworks (for single price auction) the system is currently being used to organise call trading for the Arizona Stock Exchange. cf., Kregel, 1992b.

jobbers, as would have been required by City regulations. A 1847 Exchange rulebook does however prohibit partnerships between brokers and dealers, suggesting that a natural division had grown up in which brokers acting as agents, individuals "jobbing" for their own account, and larger partnerships acting as dealers, were all active in the market. The real distinction appears to have been between individuals acting as jobbers (or "floor traders" who did not carry over position across account periods) and the dealers who undertook long-term investments for their own investment purposes.

The new Exchange had competition from brokers who continued to deal in the Royal Exchange and in the Rotunda of the Bank of England rather than seeking admission to trade on the new premises. But, the threat from external competition took on a new dimension with the growth of the provincial exchanges during the latter half of the 19th century. With the railway boom and industrial growth in Scotland and the Midlands, companies were financed by local shareholders who traded their shares on local exchanges in Manchester, Birmingham, Liverpool, Glasgow and so forth. While London had a monopoly position in international issues, its trading of industrial stocks was limited to those in the surrounding area. Correspondent relations were maintained between the London and provincial brokers in order to provide London and international clients with access to British industrial stocks traded on the regional exchanges.

The arrival of telegraphic communications between London and the regional markets brought with it the possibility of price arbitrage across regional markets, called "shunting".<sup>18</sup> Since provincial brokers were not subject to City of London regulation they was no impediment to their acting simultaneously as brokers and dealers. They naturally sought to do their arbitrage trading in London stocks directly with London jobbers, eroding the monopoly right of access to the Exchange, and the price quotes of the jobbers, granted to London brokers. The London brokers responded by offering to make markets in London stocks by quoting bid-ask prices to their own provincial correspondents.

The introduction of the telephone accentuated this arbitrage activity and the London jobbers and brokers who installed direct lines soon came to dominate both London and the regional markets by offering to quote and deal in any stock quoted on any exchange in the UK. As the level of activity on the provincial exchanges increased many of them abandoned

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<sup>18</sup> See the account given in Michie, from which most of this discussion is drawn.

the twice daily call auction system of price setting, but did not introduce an alternative trading organisation. Since the level of business was not generally large enough to support full time dealers, the London "shunters" working through telephone links filled a natural gap in the provincial markets trading systems by providing them with dealer services. The shunters thus provided arbitrage between London and provincial markets' prices, and between provincial markets; by being ready to take advantage of any price discrepancy they became the de facto dealers in a developing integrated national market system. By 1904 ten London firms with fixed lines dominated national market making in both London and provincial stocks. It soon became clear that there was little need for any of this trading to take place through the Exchange itself; it could all be done by telephone.

It was the threat of the loss of monopoly control by the Exchange, which was owned and operated by a group of private individuals, to a small number of dealing firms which raised the question of the lack of any Exchange regulations prohibiting jobbers from dealing with non-members. In order to prevent access to the market-making services of the Exchange offered by London brokers and jobbers to provincial brokers without paying for it via direct membership in the London Stock Exchange, an Exchange regulation was approved which took effect in February 1909 to forbid brokers from making prices and dealing with non-members, while jobbers were forbidden from dealing with non-members.<sup>19</sup> When this regulation proved ineffective in stopping shunting because the jobbers found the expedient of friendly brokers who were willing to official intermediate the orders of the provincial exchanges without charging commission, the Exchange moved in 1912 to introduce minimum commission rates.

Thus, the proscription by the Exchange of dual capacity trading and the introduction of fixed minimum commissions took effect in order to protect the franchise of the London Stock Exchange from the potential threat of a national market in which a small number of its members did a majority of their trading off the Exchange.<sup>20</sup> It is not surprising that when

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<sup>19</sup> The only regulations at that time were the contested City regulations prohibiting brokers from acting as principal; they were permitted to act as agent for non-members. Jobbers, who did not act as agent were not covered by the City regulation and the Exchange had never previously instituted a regulation differentiating activities from brokers.

<sup>20</sup> An example of the dominance of the managers of the Exchange over the membership was the refusal to install an exchange telegraph in 1868 in order to prevent non-Exchange members from trading on London made prices. Of course, this did not prevent the private

the Thatcher government proposed elimination of the restrictions on Exchange trading that members (jobbers had virtually disappeared) requested abolition of single capacity trading, and the trading floor or the newly constructed Exchange premises were instantly deserted. It could have occurred 75 years early.

#### ***IV. By Way of Conclusion***

There is thus no general explanation of the evolution of organisation structure toward a dominant structure. Both the attempts of Marshall and Walras to provide theoretical descriptions, and the inspection of actual changes in organisation do suggest however that there is one basic principle, and that is that since the efficiency of a market organisation depends on its ability to monopolise order flow, competition will not function to determine organisational structures. When existing market organisation experiences inefficiencies which encourage external competition, then the need to preserve monopoly control becomes an impulse for change. This was the case of the New York market in the 1870s. On the other hand, when defence of monopoly control becomes identified with a particular organisation of trading, as it was in London at the turn of the century, this can prevent change, even when technological innovations provide a more efficient alternative relative to the existing structure. This suggests that new technology alone is not sufficient to produce evolutionary change.

Whether an existing trading structure produces inefficiencies which will increase external competition for order flow depends on the ability of a particular organisational structure to resolve the problem of simultaneous trading, and the costs involved in doing so.<sup>21</sup> Here technology will play a crucial role, for it determines whether continuous trading is the only alternative solution, as it was in the 19th century.

There are two possible paths open for the future development of stock market organisation: a return to the public market-public liquidity single price Call system based on available technology or the private market-private liquidity continuous trading bid-ask price system in which technology simply reinforces the already existing dealer system, and has been

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transmission of such information. Finally, the refusal to provide adequate telephone services within the Exchange led to the first serious threat by traders to abandon the exchange in 1888.

<sup>21</sup> In Kregel, 1992a the capital costs of different trading organisations are analysed and its impact on the costs of price determination identified. Kregel 1993 builds on this idea to try to explain the composition of different financial institutions which will compose a financial market structure.

introduced in London after the Big Bang. It is interesting that even the latter change had to be imposed on the market. This suggests that although current technology would allow the establishment of Walras' optimum market, it is not likely to be the natural result of market competition.<sup>22</sup>

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<sup>22</sup> Not that either of these two systems are without faults. Cf. Mayer, 1988 and 1992.

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